October 17 2016

Professional Development Day for a Chinese Physics Teacher Delegation

Dr. Marina Milner-Bolotin

UBC Department of Curriculum and Pedagogy

Agenda for the Day

1. **9:00 – 9:15: Introductions**
2. 9:15 – 10:30: Canadian education and teacher ed.
3. 10:30 – 10-45: break
4. 10:45 – 12:15: Technology in M&S teacher ed.
5. **Lunch 12:30 – 2 pm**
6. 2 pm – 3:15 pm: A physics methods course
7. 3:30: Exploring UBC campus/Museum visit
8. 5 pm: Pick up at the Faculty of Education lobby.

1 Dr. Marina Milner-Bolotin

- Associate Professor in

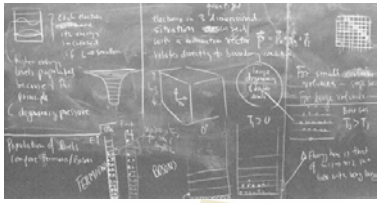
  Science Education, UBC, Canada

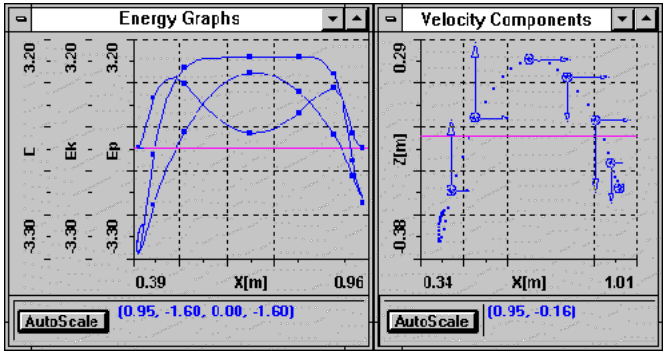
- Department of Curriculum & Pedagogy

- **e-mail:** marina.milner-bolotin@ubc.ca

- **Web site:** http://blogs.ubc.ca/mmilner/

1 My Math & Science Education Trajectory





V-scope

1 UBC (University of British Columbia)

13,189 international students from 139 countries!

UBC Facts:

- Public university
- Established: 1908
- 2 campuses: Vancouver & Kelowna
- ~61,000 students
- Academic staff: 5334+
- Acceptance rate: 64%
- International ranking – 34th (U.S. News and World Report 2016)

1 UBC Outreach Experience

1 Getting to Know Each Other

What subjects do you teach?

1. Mainly physics
2. Physics and mathematics
3. Physics and chemistry
4. General science
5. Other

1 Getting to Know Each Other

What is your favourite subject to teach?

1. Mathematics
2. Biology
3. Chemistry
4. Physics and astronomy
5. Other science

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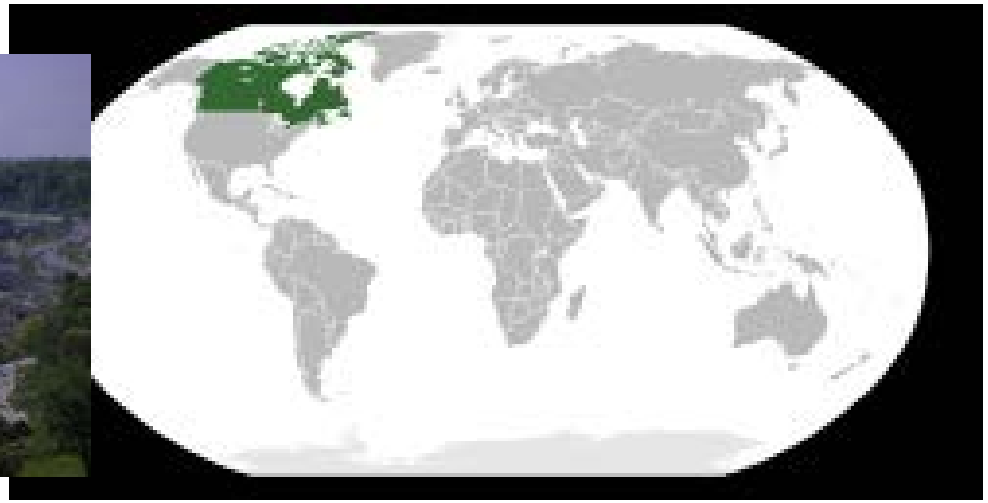
2 Canadian Education and Teacher Education



20.6% of the total population of Canada are immigrants! Toronto transit offers information in > 70 languages. English is often 2nd language.

~75% of Canada's population live within 150 km of the US border.

Science Education in Canada

Science Exposure

K-12

- Elem
- Second

University

- B. Science
- Other fields

Teacher Education in Canada

Bachelor Subject + B.Ed.

Elem

B.A.

B.Ed.

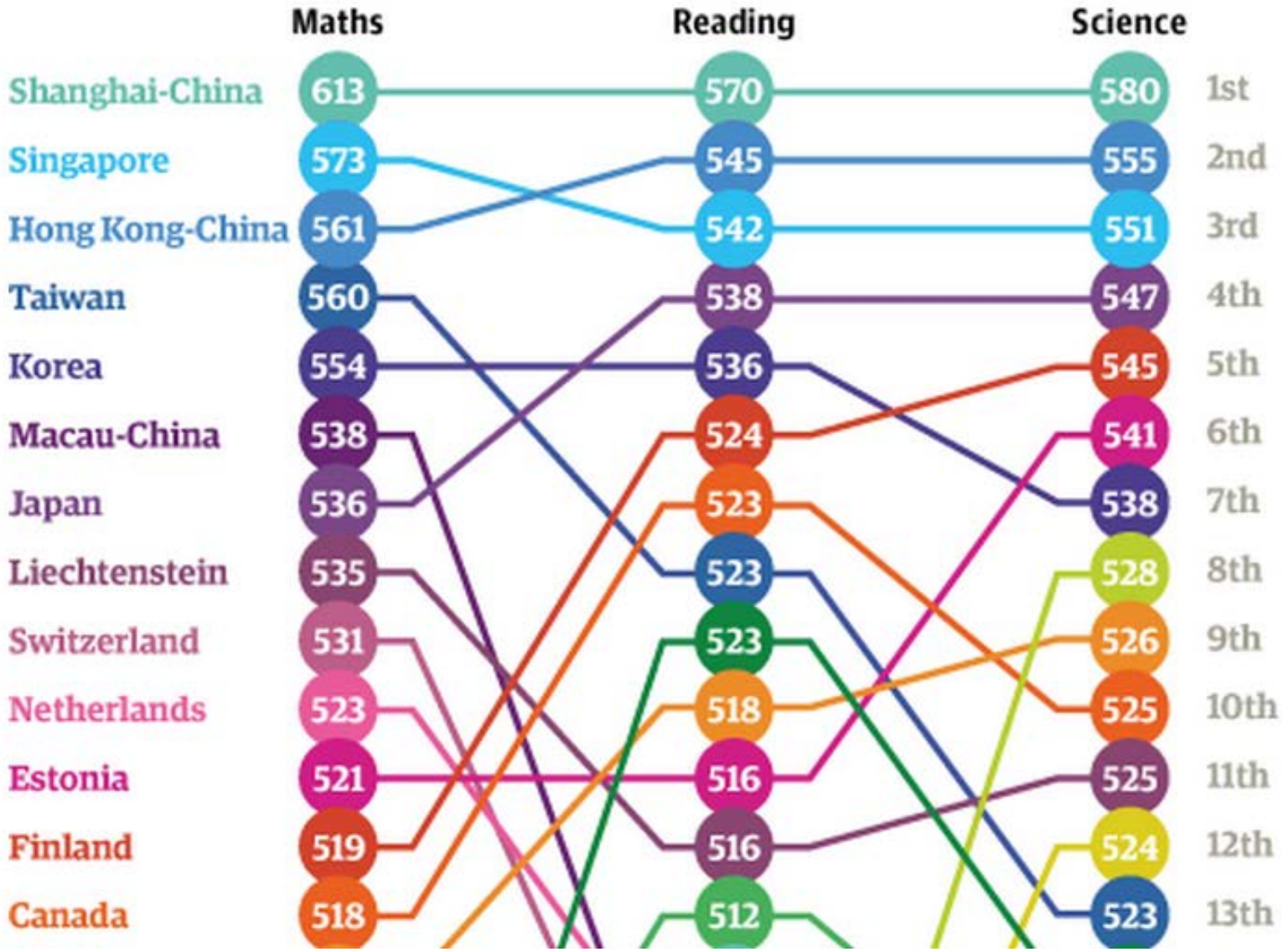
Secondary

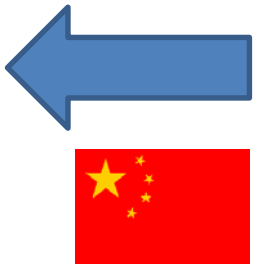
B.Sc.

B.Ed.


raphicMaps.com
Arctic Ocean
Banks Island
Prince of Wales Island
Somerset Island
Bylot Island
Beaufort Sea
Victoria Island
Nunavut
Baffin Bay
MacKenzie R.
Arctic Circle
Baffin Island
Greenland
Foxe Basin
Great Bear Lake
Yukon Territory
Northwest Territories
Southampton Island
Davis Strait
Iqaluit
Godthab
Yukon River
Nunavut
Hudson Strait
Yellowknife
Mt. Logan
Whitehorse
Great Slave Lake
Canada
worldatlas.com
Labrador Sea
Lake Athabasca
Manitoba
Newfoundland & Labrador
Alaska (U.S.)
British Columbia
Alberta
Churchill River
Hudson Bay
Lake Winnipeg
Quebec
Queen Charlotte Islands
Fraser River
Edmonton
James Bay
Saskatchewan
New Brunswick
Calgary
Regina
Winnipeg
Ontario
St. Lawrence River
Vancouver Island
Vancouver
Quebec
PEI
St. John's
Victoria
Lake Manitoba
Ottawa
Great Lakes
Nova Scotia
Fredericton
Montreal
Charlottetown
Halifax
Toronto
800 mi
800 km
Pacific Ocean
United States of America
Atlantic Ocean

PISA 2012 Results





[OECD, PISA 2012 Results]

2 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

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4 Clickers & Active Learning

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

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

Marina Milner-Bolotin, Physics and Astronomy Department, Rutgers, The State University of New Jersey
Piscataway, NJ 08854-8019; milnerm@physics.rutgers.edu

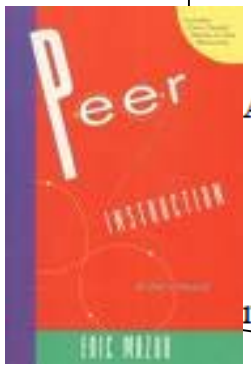
Clickers beyond the First Year Science Classroom

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

4 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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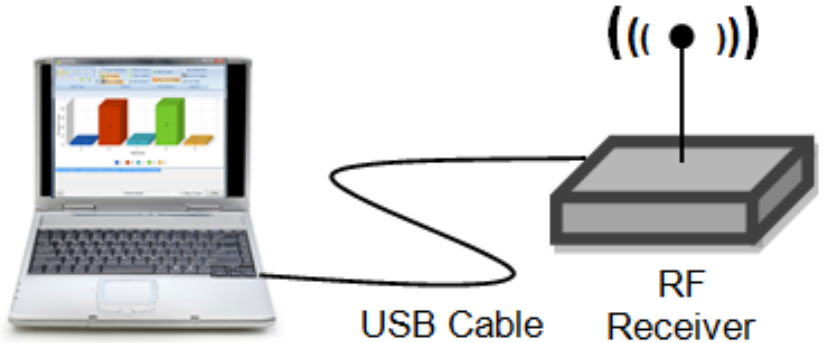
Department of Curriculum and Pedagogy, Faculty of Education, The University of British Columbia

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.]

4 Technology for Peer Instruction



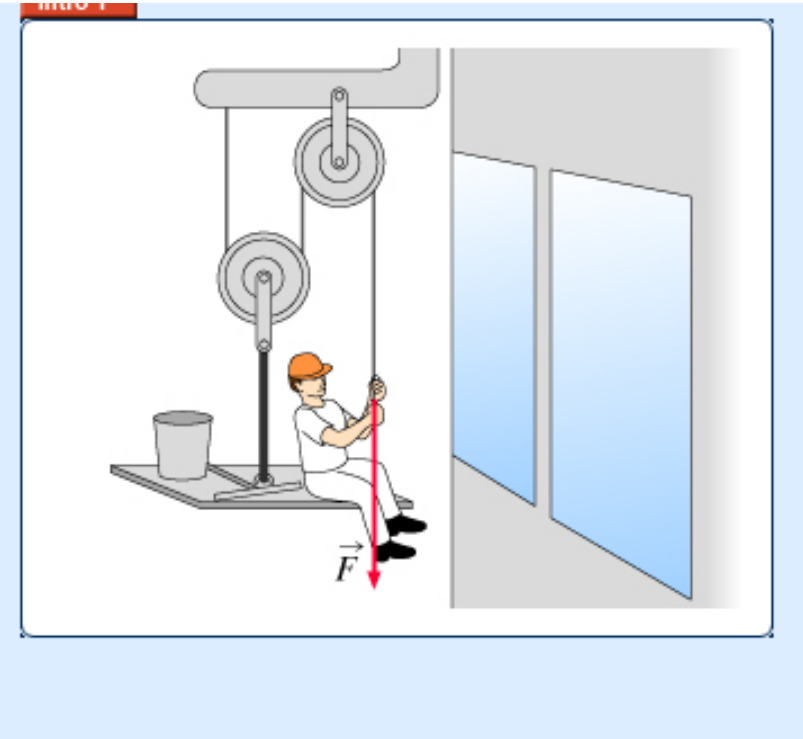
Software installed on the teacher's computer connected to a classroom projector

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**…

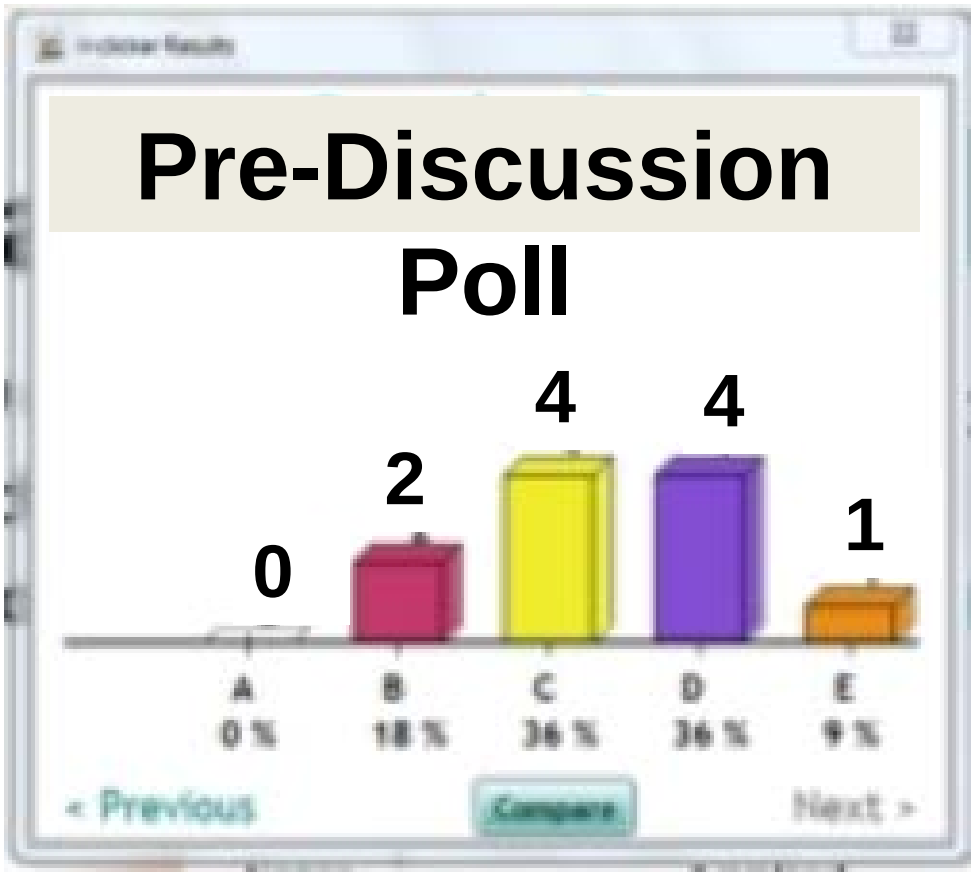
4 Peer Instruction Example 1

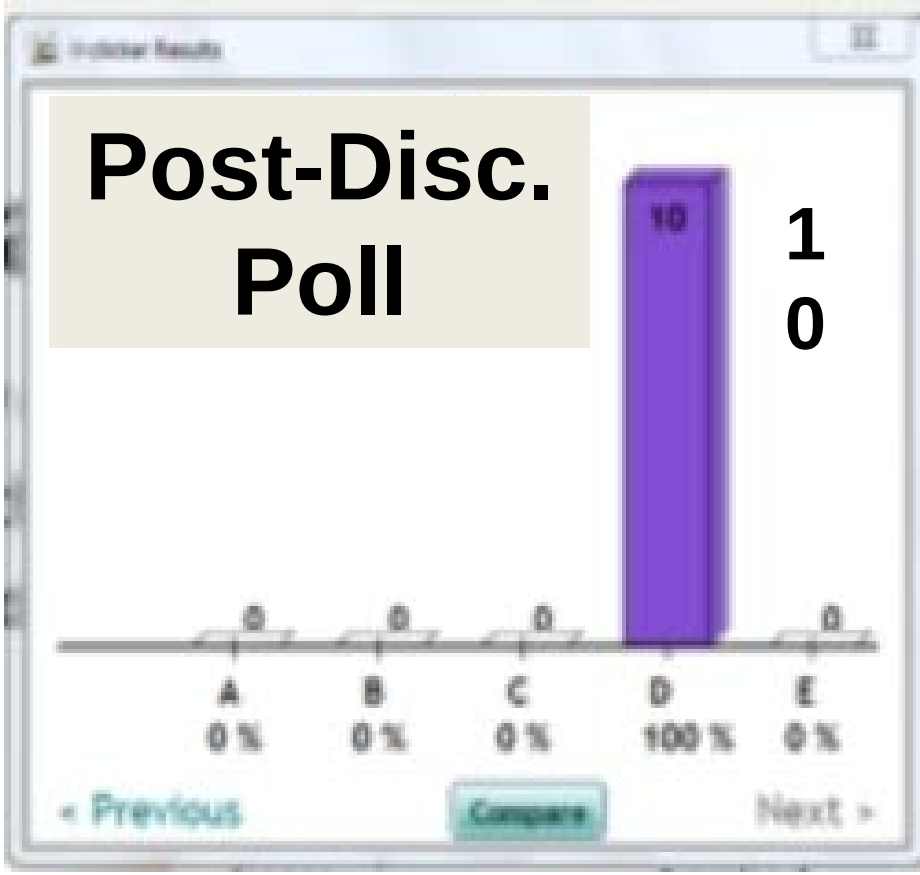
Find the magnitude of the force a 60 kg person has to pull the rope with in order to pull himself upwards with a **constant speed.**



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

4 Peer Instruction in Action



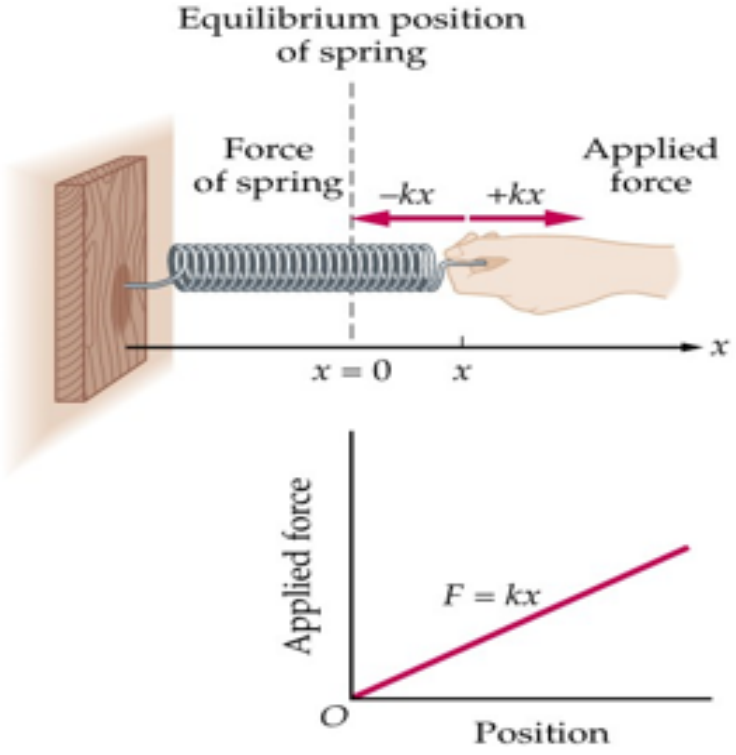


Respondents: Physics Teacher-Candidates

4 Peer Instruction Example 2

The work needed to stretch a spring **10 cm** from equilibrium (from $x_1 = 0$ m to $x_2 = 0.1$ m) is **10 J**. How much work needs to be done to stretch the spring additional **10 cm** (from $x_2 = 0.1$ m to $x_3 = 0.2$ m) ?

A. 5 J
B. 10 J
C. 20 J
D. 30 J
E. 40 J

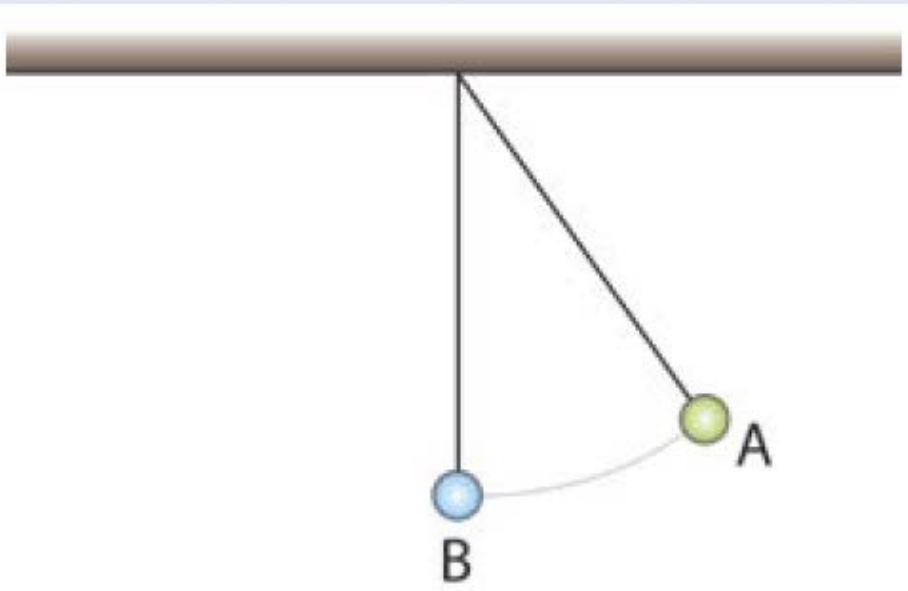


4 Peer Instruction Example 3

A 0.2-kg pendulum bob is attached to a string 1.2 m long. The bob is released at the point A as shown in the picture. The tension in the string as the bob passes its lowest position is about (use g = 10 m/s2):

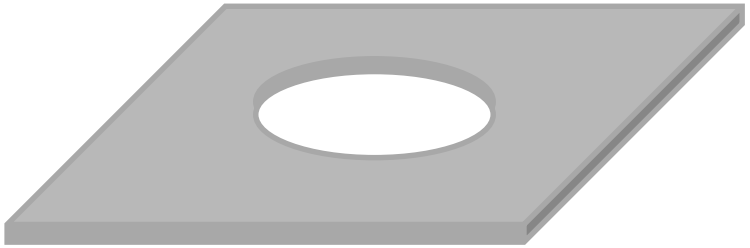
(A) 0.00 N (B) 0.70 N (C) 1.30 N (D) 2.00 N (E) 2.70 N

A. (A)
B. (B)
C. (C)
D. (D)
E. (E)



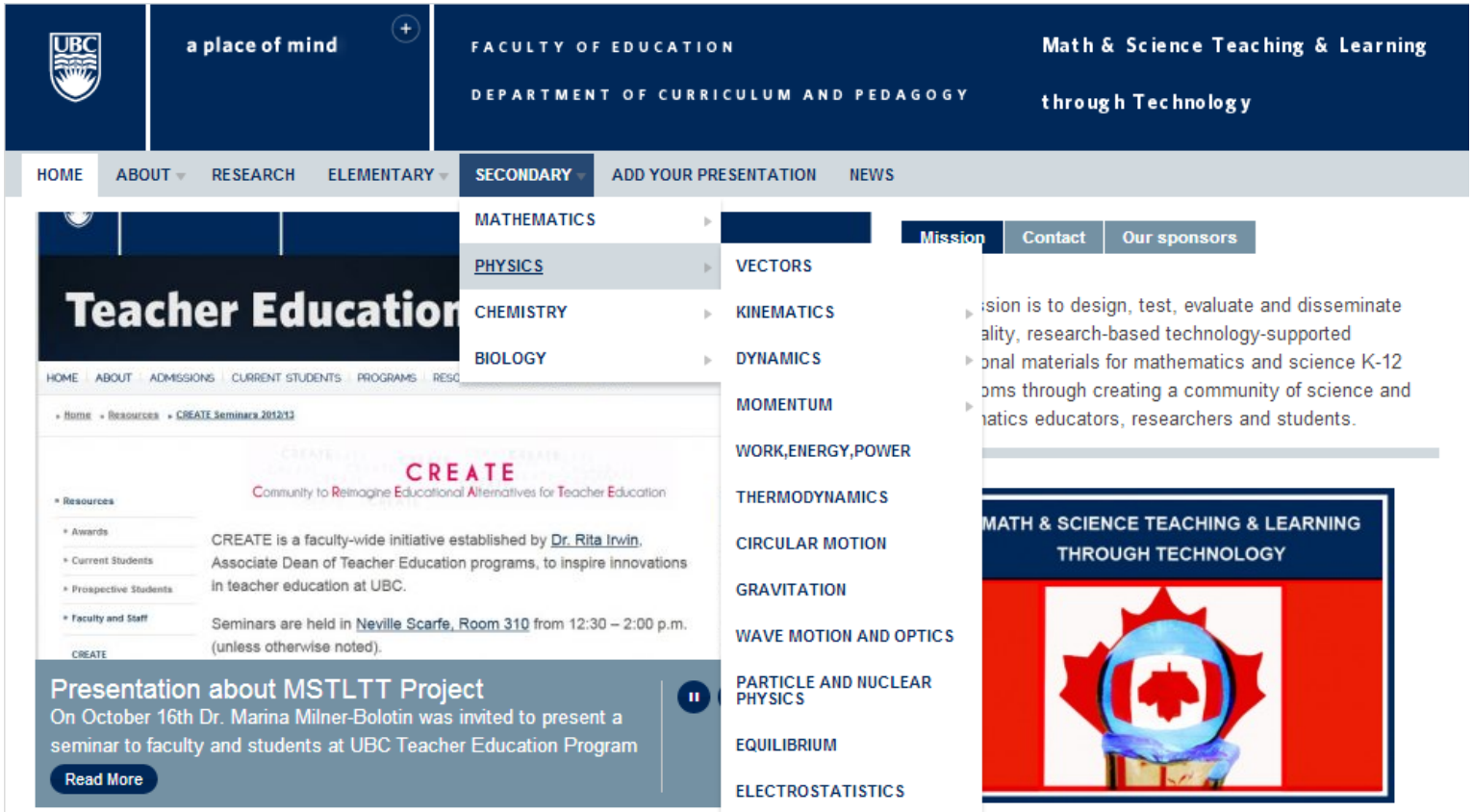
4 Peer Instruction Example 4

You have a uniform metal plate with a circular hole inside it. You heat it up by 200°C. **As a result of heating, the hole will:**



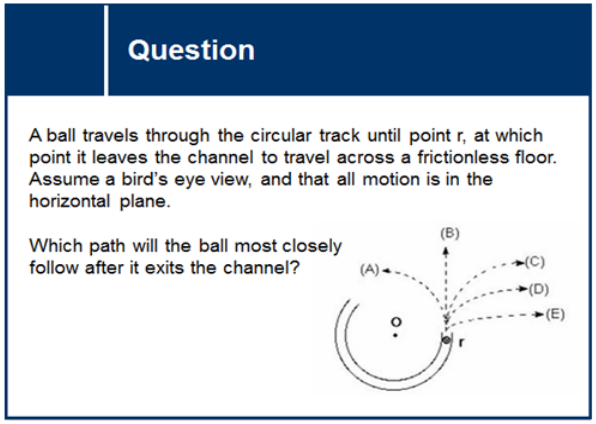
1. Increase
2. Decrease
3. Remain the same

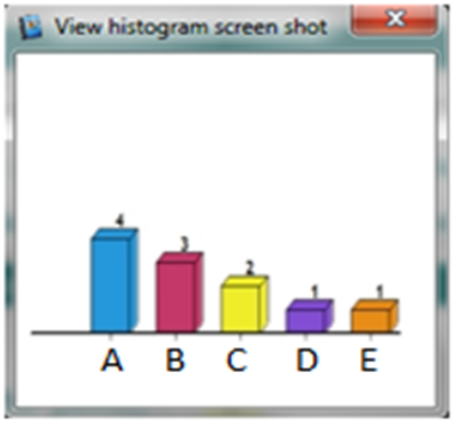
4 Math & Science Teaching & Learning through Technology



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

4 Technology-Enhanced Science Education





Peer Instruction and PeerWise integration

4 PeerWise Online System

PeerWise

EDCP357 (Winter 1, 2013)

Home | Main menu > Comments written by you

Comments written by you

Comments written by you, about questions you have answered, are shown below.

Select an order:

New replies | Most recent first | Show agreements only | Show disagreements only

Showing new replies only

No comments to view

Return to main menu

What is PeerWise?

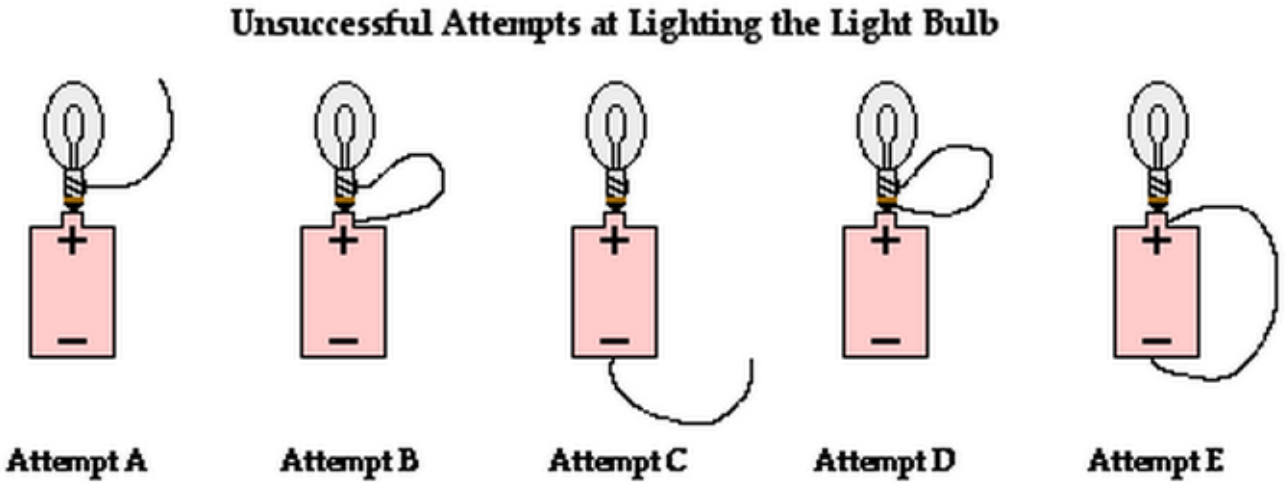
Students use PeerWise to create and to explain their understanding of course related assessment questions, and to answer and discuss questions created by their peers.

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

4 Let us Play a Game

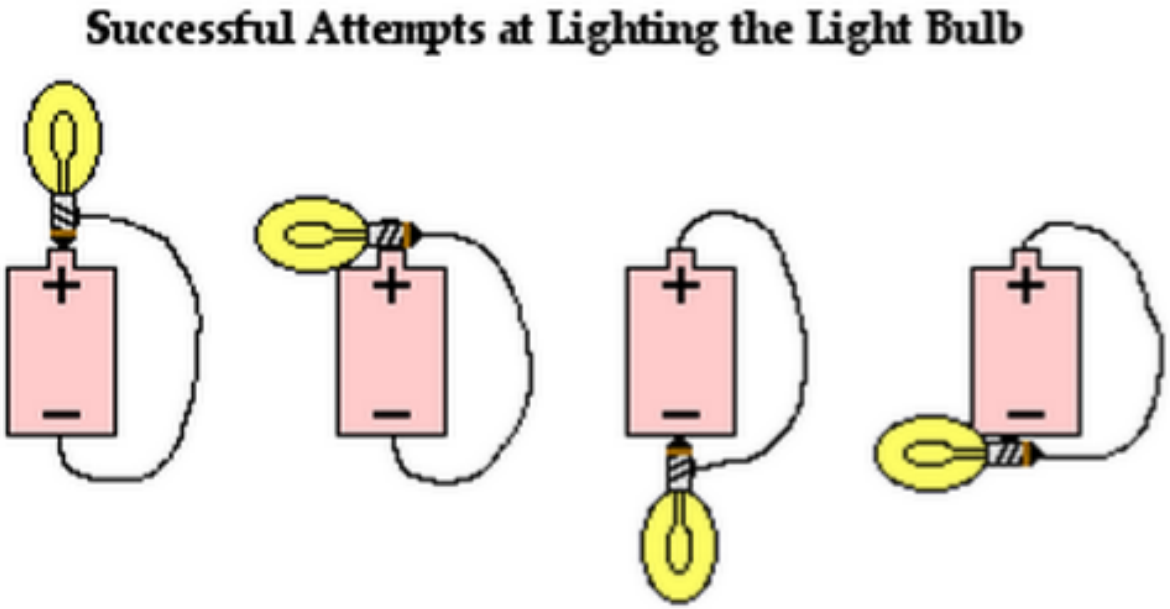
You have a light bulb, a battery and a wire. Draw all possible way how you can connect them to light up the light bulb

4 How Students Learn



Unsuccessful attempts

4 How Students Learn



Unsuccessful attemps

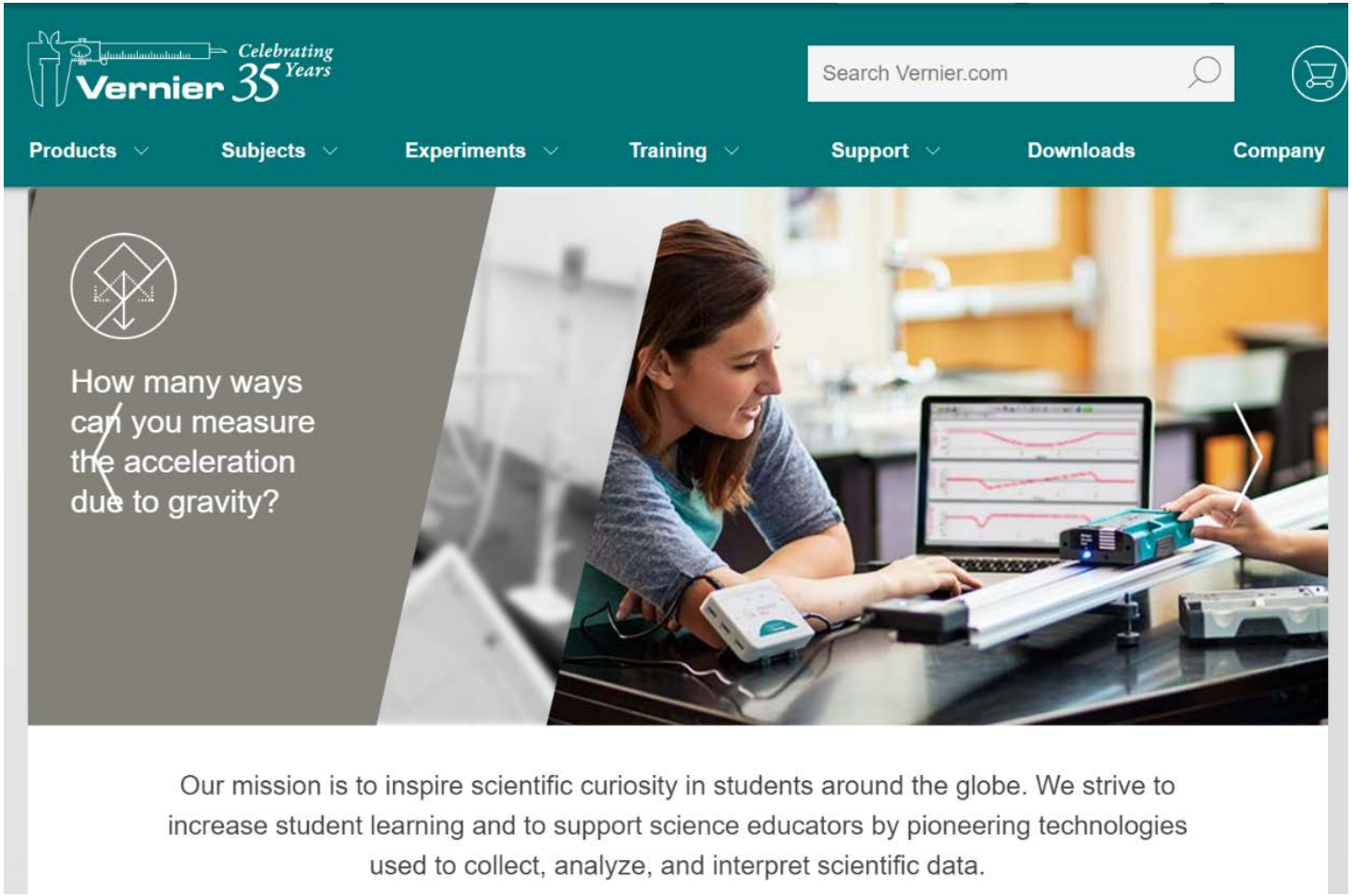
4 What is PhET?

FREE resources

PhET Computer simulations from the University of Colorado, Boulder

You can download the simulations. You can also use Chinese!

4 Sensors in Physics Teaching



4 Reconsidering Assessment

Your friend analyzed a video clip of a basketball shot using a Logger *Pro* Video Analysis feature. However she was not certain how to find the acceleration of free fall from his analysis and turned to you for advice. What is the **reasonable experimental value** of the **magnitude** of the acceleration of free fall your friend should report during the next class?

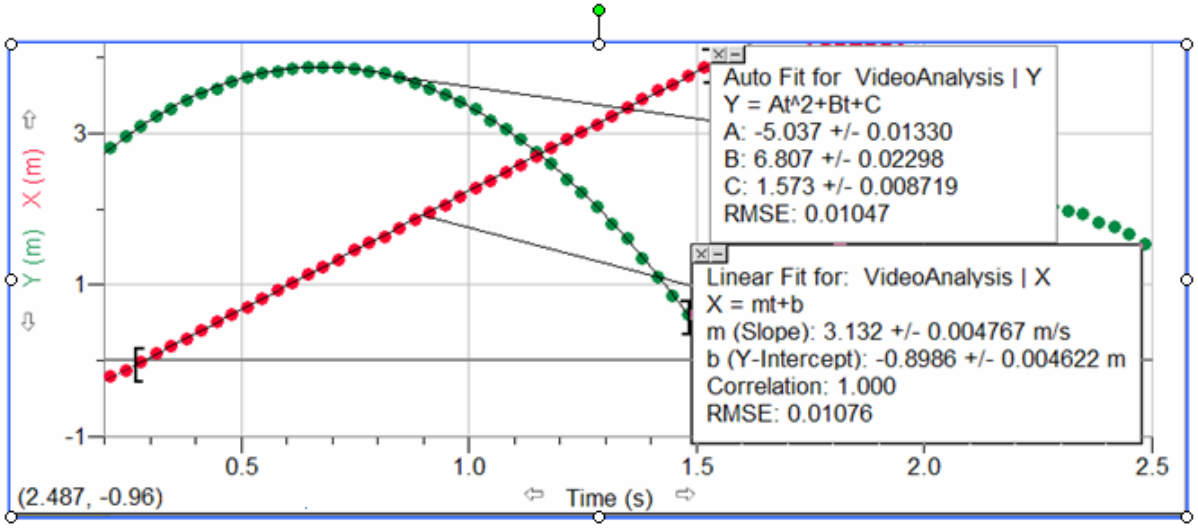
a) 5.037 m/s^2

b) 6.807 m/s^2

c) 9.823 m/s^2

d) 10.074 m/s^2

e) 10.10 m/s^2



Workshop: Feedback 1

How satisfied are you with the day?

1 3 5

Workshop: Feedback 2

Do you feel you have learned new ideas for math and science teaching?

1 3 5