



Exploring Technology- Enhanced Active Learning in Physics Teacher Education Part 1/2

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Modeling Active Engagement in Teacher Education

1. What are your **reasons for choosing active engagement pedagogies** in physics teacher education courses?
2. How do you know if these pedagogies are **having a positive impact** on teacher-candidates?
3. What is the **role of technology** in this process?

Technology-Enhanced Active Engagement

PeerWise

EDCP357 (Winter 1, 2013)

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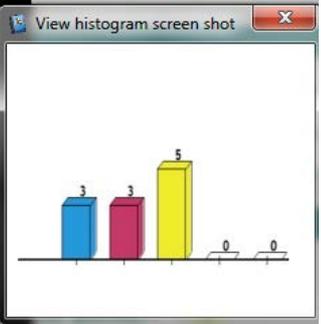
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PW&PI

iGrader

The Monty Hall Problem: Let Us Make a Deal

- A. Stick with the original choice
- B. Swap doors
- C. It doesn't matter

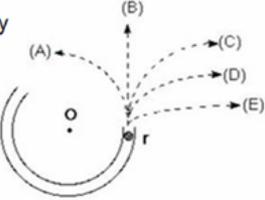


Option	Count
A	3
B	3
C	5
Other	0

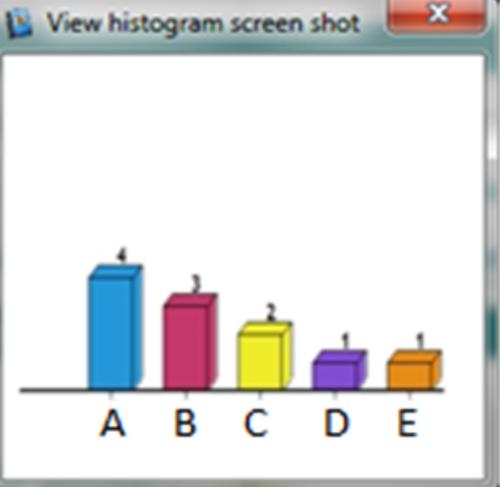
Question

A ball travels through the circular track until point r , at which point it leaves the channel to travel across a frictionless floor. Assume a bird's eye view, and that all motion is in the horizontal plane.

Which path will the ball most closely follow after it exits the channel?



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



Option	Count
A	4
B	3
C	2
D	1
E	1

Research-Based Objectives

Investigate the effect of Active Engagement (AE) on teacher-candidates' (TCs') epistemologies

Explore a possible mechanism for AE pedagogy

Model AE in the context of the course content



Course-Based Objectives

Experience learning science through AE

Value conceptual knowledge

Evaluate/develop resources that match TCs' values

Create a long-term connection with UBC community

Math & Science Teaching & Learning through Technology



a place of mind



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mission is to design, test, evaluate and disseminate quality, research-based technology-supported educational materials for mathematics and science K-12 classrooms through creating a community of science and mathematics educators, researchers and students.

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CREATE
Community to Reimagine Educational Alternatives for Teacher Education

CREATE is a faculty-wide initiative established by [Dr. Rita Irwin](#), Associate Dean of Teacher Education programs, to inspire innovations in teacher education at UBC.

Seminars are held in [Neville Scarfe, Room 310](#) from 12:30 – 2:00 p.m. (unless otherwise noted).

Presentation about MSTLTT Project

On October 16th Dr. Marina Milner-Bolotin was invited to present a seminar to faculty and students at UBC Teacher Education Program

Read More

Navigating the Resource



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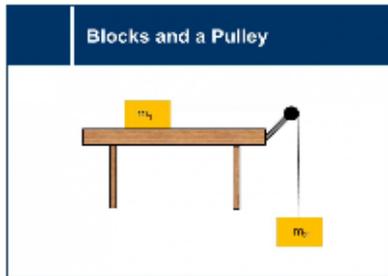
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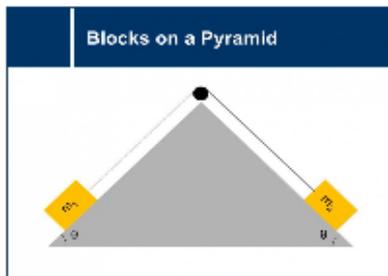
FORCES



Exploration of free body diagrams, two body acceleration, and Newton's law through the system of two blocks attached through a pulley and one of them resting on a table.

[acceleration](#), [forces](#), [friction](#), [Newton's laws](#), [pulleys](#), [string tension](#)

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Exploration of free body diagrams, two body acceleration, and newton's laws through the system of two blocks resting on a pyramid and attached by a pulley.

[acceleration](#), [forces](#), [friction](#), [gravitational acceleration](#), [net force](#), [normal force](#), [weight](#)

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+ Mathematics

- Physics

» Vectors

+ Kinematics

- Dynamics

» Forces

» Springs

» Newton's Laws

+ Momentum

» Work,Energy,Power

» Thermodynamics

» Circular Motion

» Gravitation

» Wave motion and Optics

» Particle and Nuclear Physics

Navigating the Resource



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Cruising Car

A diagram showing a light blue car moving to the right. An arrow points to the right from the car, labeled "60 km/h".

An introduction to acceleration and newton's laws using a demonstration of a commuting car.
[acceleration](#), [displacement](#), [distance](#), [forces](#), [net force](#), [velocity](#)

rating ★★★★★ (No Ratings Yet)

Weight in an Elevator

A graph showing force (F) on the y-axis and time (t) on the x-axis. The force fluctuates over time. To the right of the graph is a scale with a weight on it, labeled "kg" and "a = ?".

How does a reading on a scale change when on a moving elevator? Scenarios with an elevator moving at different velocities and acceleration will be considered. The concepts learned will then be used to analyze data from a real-life experiment.
[acceleration](#), [gravitational acceleration](#), [mass](#), [net force](#), [normal force](#), [real-life data](#), [velocity](#), [weight](#)

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Tension Forces

The following set of questions apply Newton's Second Law to scenarios with multiple blocks held together by the tension force from strings.

[acceleration](#) [area](#) [centripetal force](#) [common ratio](#)
[conservation of energy](#) [conservation of momentum](#) [Conversion Factors](#) [counting](#) [current](#)
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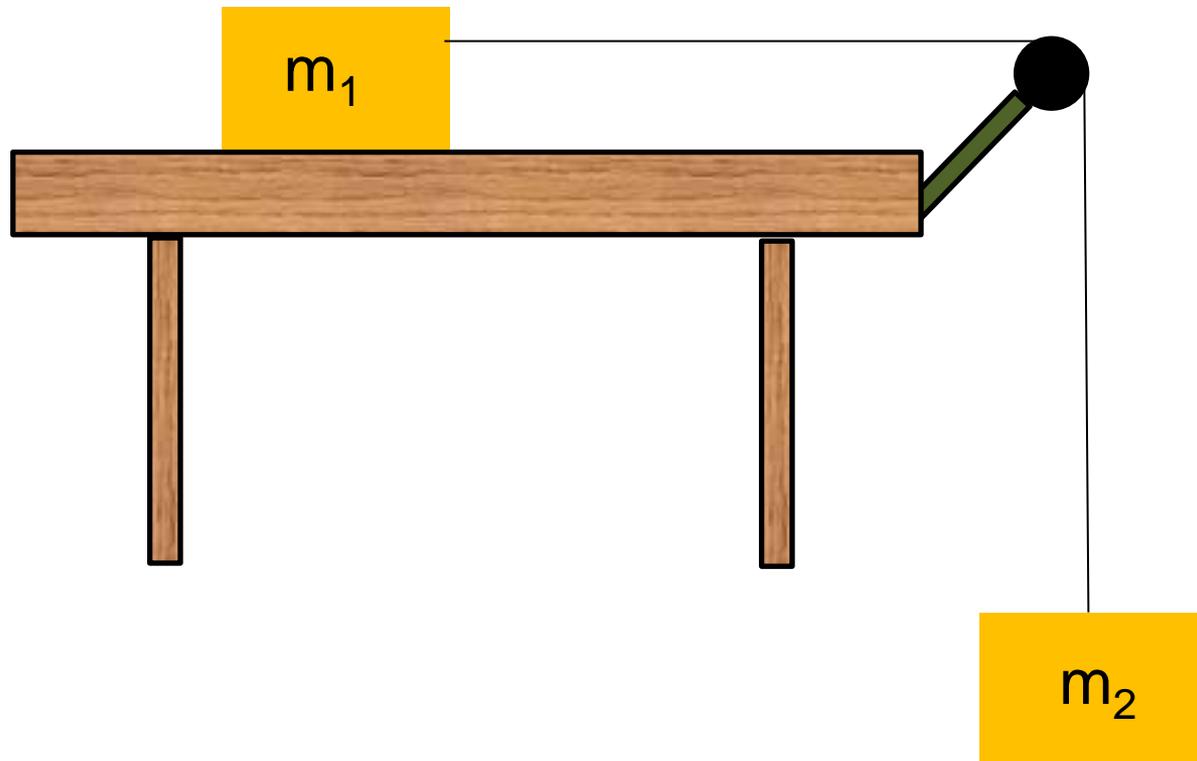


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Instructor modeling
AE pedagogy

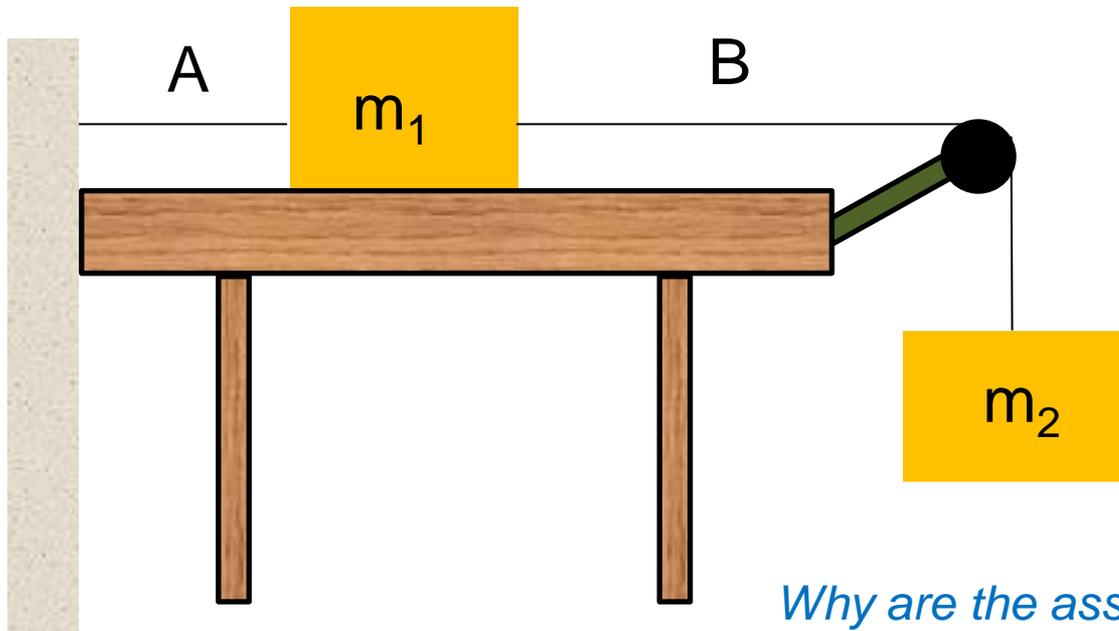
TCs experience
developing
questions

Blocks and a Pulley



Blocks and a Pulley II

Two blocks are connected via a pulley. The blocks are initially at rest as block m_1 is attached to a wall. If string A breaks, what will the accelerations of the blocks be? (**Assume** friction is very small and strings don't stretch)



A. $a_1 = 0$; $a_2 = 0$

B. $a_1 = g$; $a_2 = g$

C. $a_1 = 0$; $a_2 = g$

D. $a_1 = g$; $a_2 = 0$

E. None of the above

Why are the assumptions above important?

Solution

Answer: E

Justification: None of the above answers is correct. Consider two blocks as one system: one can see that the system has a mass of (m_1+m_2) , while the net force pulling the system down is m_1g . Therefore, applying Newton's second law, one can see that the acceleration of the system must be less than g :

$$a = \frac{m_2g}{(m_1 + m_2)} = \frac{m_2}{(m_1 + m_2)} g < g$$

Some people think that the acceleration will be g . They forget that the system consists of two blocks (not just m_1) and the only pulling force is m_1g . Thus the system is NOT in a free fall. Compare this questions to the previous one to see the difference.



Integrating into the Classroom

Instructor modeling
AE pedagogy

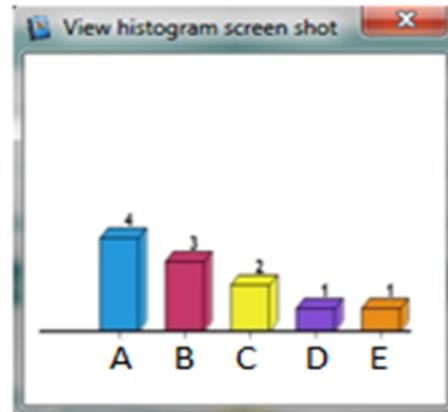
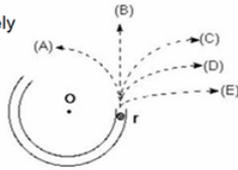
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Technology-Enhanced Active Engagement Integration

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PI modeled in every class

PW used to design, critique, respond to Conceptual Questions as a community of future teachers

Resources

- Beatty, I., Gerace, W., Leonard, W., & Defresne, R. (2006). Designing Effective Questions for Classroom Response System Teaching. *American Journal of Physics*, 74(1), 31–39.
- CWSEI Clicker Resource Guide: An Instructors Guide to the Effective Use of Personal Response Systems (Clickers) in Teaching. (2009, June 1).
- Lasry, Nathaniel. (2008). Clickers or Flashcards: Is There Really a Difference? *The Physics Teacher*, 46(May), 242-244.
- Milner-Bolotin, Marina. (2004). Tips for Using a Peer Response System in the Large Introductory Physics Classroom. *The Physics Teacher*, 42(8), 47-48.
- Mishra, P., & Koehler, M. J. (2007). Technological pedagogical content knowledge (TPCK): Confronting the wicked problems of teaching with technology. In *Society for Information Technology & Teacher Education International Conference* (Vol. 2007, pp. 2214–2226). Retrieved from <http://www.editlib.org/p/24919/>