Interactive Learning Toolkit: Tools for the Interactive Classroom

Veronica McCauley

Mazur Group
Division of Engineering & Applied Sciences
Harvard University

New York University
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Outline

• Interactive Learning
• Web-based support
• Summary
• Resources
The ‘large lecture’ problem

Students passively receive information with no emphasis on interaction
68% of students do not have the ability, motivation or discipline for self-study!

Shift the focus in lecture from delivering to synthesizing information

The solution

• Information transfer - outside classroom:
  Just in Time Teaching

• Discussion, interaction - in classroom:
  Peer Instruction
Just in Time Teaching Strategy

- Pre-lecture reading assignment (2 X content and 1 X feedback)
- Graded on effort - 10% final grade

Ref: Novak et al. (1999) See: www.jitt.org
Just in Time Teaching works!

- Improves preparation
- Feedback
- Better use of class time

Ref: Novak et al. (1999) See: www.jitt.org
Peer Instruction

Promotes student interaction

Peer Instruction

1. Pose question
2. Think
3. First answer
1. Pose question
2. Think
3. First answer

Answer correct?
1. Pose question
2. Think
3. First answer

Answer correct?

35% - 70%

4. Peer Discussion
5. Second Answer
1. Pose question
2. Think
3. First answer

Answer correct?

35% - 70%

4. Peer Discussion
5. Second Answer

Answer correct?

Majority

6. Explain
1. Pose question
2. Think
3. First answer

Answer correct?

35% - 70%

4. Peer Discussion
5. Second Answer

Answer correct?

Minority

Majority

6. Explain

Slow down, readdress topic
1. Pose question
2. Think
3. First answer

Answer correct?

35% - 70%

4. Peer Discussion
5. Second Answer

Answer correct?

Minority
Slow down, readdress topic

Majority
6. Explain
Peer Instruction

1. Pose question
2. Think
3. First answer

< 35%

Answer correct?

35% - 70%

4. Peer Discussion
5. Second Answer

> 70%

Answer correct?

Minority

6. Explain

Majority

Slow down, readdress topic
Feedback from ConcepTest Q’s

- PRS - Personal Response System
Feedback from ConcepTest Q’s

- PRS - Personal Response System
- Flashcards
Feedback from ConcepTest Q’s

- PRS - Personal Response System
- Flashcards
- Color Cards
Force Concept Inventory

Standardized Assessment

Interactive Learning Toolkit [ILT]

www.deas.harvard.edu/galileo
Create calendar-based lecture schedule

Set the start and end dates for your lecture. Select the days of week of your lecture. Add a header that will show up in the student view of the lecture. You can also set when the students can access the lecture content. Select the time, whether it is to be available before or after the start of the lecture. You can also change the enrollment dates for the students.

Start date: Sep 10 2003
End date: Jan 31 2004
Lectures on: Mon Tues Wed Thurs Fri Sat Sun
Lecture start: 9:00 am Eastern Standard Time
Lecture duration: 1 Hrs : 30 Mins
Student Access: 1 hours after start of lecture

Lecture header:

Enrollment dates: Sep 1 2003 - Sep 7 2003
Create Reading Assignment schedule

Use this page to create a schedule of reading assignments. Each lecture will have a reading assignment associated with it. Use this page to specify how long before the lecture you want to publish the assignment to students. Also specify when you want to make it due.

At what time do you want the reading assignment to be made available?

At 12:00 AM

2 day(s) before start of lecture

At what time do you want the reading assignment to be due?

At 6:00 PM

1 day(s) before start of lecture

Create
Add questions to Reading Assignment
Due: 6/29/2003 at 11:59 PM
Status: Not completed

1. Suppose that objects A and B are electrically charged and are observed to attract each other. Both A and B are observed to attract a third object C. Is it true or false that these observations, if correct, would imply the existence of three different kinds of charge? Explain your reasoning.

Answer:

2. Consider three charged particles carrying nonzero charges q1, q2, and q3. The vector sum of the forces exerted by 1 and by 2 on 3 is zero. Is it true that (a) 3 must necessarily lie somewhere along the line connecting 1 and 2 or (b) 3 must lie somewhere along that line, but only between 1 and 2?

Answer:

3. Please tell us briefly what single point of the reading you found most difficult or confusing. If you did not find any part of it difficult or confusing, please tell us what parts you found most interesting.

Answer:
### Responses: work, face & name connected

<table>
<thead>
<tr>
<th>Student</th>
<th>Answer</th>
<th>Time</th>
<th>Response</th>
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</thead>
<tbody>
<tr>
<td>Mysha Mason</td>
<td>terminology question – are neutral objects considered to be electrically charged (i.e. their charge is zero), or just positive and negative objects?</td>
<td>2/3/2003 7:59:16 pm</td>
<td>0 / 2</td>
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<td>Alyssa Berman</td>
<td>Pg. 12 of the reading states that &quot;any two dissimilar materials become charged when brought in contact.&quot; Why, then, is no &quot;static electricity&quot; created when wood is rubbed against wool, for example? (Unlike glass against silk.)</td>
<td>2/3/2003 8:47:20 pm</td>
<td>0 / 2</td>
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<td>Leslie Garbarino</td>
<td>I had difficulty reading the force diagrams for different charges. It was tricky to figure out which forces were acting on which particles, given attraction and repulsion and also the fact that in a set of two particles, each is exerting a separate force on the other. I would like to see a diagram like this drawn out and have each force named as it is drawn. It would help me get a hold on them as opposed to seeing a bunch of arrows on the paper.</td>
<td>2/3/2003 9:23:39 pm</td>
<td>0 / 2</td>
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<td>Christine Tran</td>
<td>I found the concept of elementary charge confusing, and I am still hoping that I can get more clarification about Coulomb's Law -- that part is still shaky for me.</td>
<td>2/3/2003 9:29:44 pm</td>
<td>0 / 2</td>
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<td>Andrea Li</td>
<td>26.7 was conceptually difficult for me, the electrostatic equilibrium example specifically.</td>
<td>2/3/2003 10:20:37 pm</td>
<td>1 / 2</td>
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<td>Neil Shah</td>
<td>I had a bit of difficulty understanding why a neutral object is attracted to a charged object and not repelled by the charged object (since the neutral object has equal amounts of both charges).</td>
<td>2/3/2003 10:27:58 pm</td>
<td>1 / 2</td>
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<td>Lisa Simpson</td>
<td>The last 2 sections on coulomb's law was a bit confusing. Some of the notation and the math was not as clear as I would have hoped. Perhaps more numerical examples to help show the application of the equation into real charges.</td>
<td>2/3/2003 10:50:46 pm</td>
<td>1 / 2</td>
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### Face book: connects all elements of course

**Lisa Simpson**
F1112222
ljsimpson@fas.harvard.edu

**Class:** 2004  
**Major:** economics  
**Registered on:** 2/2/2003  
**PRS Unit ID:** 0248  
**Final grade:** B

**Forums:** 4 posts  
**Email:** 36  
**No. of self-tests:** 1 self-tests  
**Reading FAQs:** 1

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</table>

RA: Reading assignments; CT: Concept Tests; PT: Pretest; L: Laboratory; PS: Problem Set; HE: Hour Exam; OT: Online Test; FE: Final Exam;
I am confused about part b of Checkpoint 29.6. I don’t really understand why there is no electrostatic force between C and B. After further reading, I figured that this is probably an equipotential line, but I don’t really understand how we would know that from the diagram.

Hope this helps.

Best, [Name]

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Response email to a RA question

[Image of web page with text input fields and a response]

[Text: I am confused about part b of Checkpoint 29.6. I don’t really understand why there is no electrostatic force between C and B. After further reading, I figured that this is probably an equipotential line, but I don’t really understand how we would know that from the diagram.]
Select ConcepTest Q’s from database
Create your own ConcepTest Q’s

Introductory text of your question.

Upload image ...

Text to appear after image.

1 Multiple choice no. 1

2 Multiple choice no. 2

More choices

Text to appear after answer choices.

Explanation of answer.

Add choices in bulk

Upload explanatory image...
1. A charged object is brought near an uncharged metal object. Negative charges accumulate on the side of the uncharged object nearest to the charged sphere, positive charges on the opposite side. On the uncharged metal object, the potential is

![Diagram](image1.png)

1. largest on the positive side
2. largest on the negative side
3. largest in the middle
4. the same everywhere

**Answer**

2. A cylindrical piece of insulating material is placed in an external electric field, as shown. The net electric flux passing through the surface of the cylinder is

![Diagram](image2.png)
Assignments: upload problem sets

- Name: Problem Set 1
- Category: Problem Set
- Link Type: No link
- Issue Date: Feb 1, 2003
- Due Date: Feb 11, 2003
- TimeZone: Eastern Standard Time
- Solution Issue Date: Feb 3, 2003
- Questions: 1: 5, 2: 3
Grade book: database of students grades

Select the students to grade. Select the question to be graded. Enter grade, comments and click "Save."
Calendar-based reminders: students & staff

COMING UP

2/13 Lecture 0
2/16 Reading 0
2/12 Assignment 0
Clone course: saves time & great template
Essential Elements

- Reading (before class)
- Participating (in class)
- Problem solving (after class)
- Appropriate testing/assessment
- Technology Support - Interactive Learning Toolkit
Acknowledgments

**NSF** Distinguished Teaching Scholar Award

**DEAS** Information Technology Group

**ASA** Assessment of Student Achievement in Undergraduate Education

Mazur Group website (papers/talks):

http://mazur.deas.harvard.edu/
Resources

- Peer Instruction: A User’s Manual (Prentice Hall, 1997)
- Galileo Website: http://galileo.harvard.edu/home.html
- Interactive Learning Toolkit: http://www.deas.harvard.edu/galileo
- Just In Time Teaching http://www.jitt.org
- Assessment techniques: FLAG (Field-tested Learning Assessment Guide) http://www.flaguide.org