Interactive Learning Toolkit: Tools for the Interactive Classroom

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Division of Engineering & Applied Sciences
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University of Limerick
17 Dec 2003
Outline

- Interactive Teaching Techniques
- 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.

PhD Research

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
Promotes student interaction

Peer Instruction

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

1. Pose question
2. Think
3. First answer

Answer correct?
Peer Instruction

1. Pose question
2. Think
3. First answer

Answer correct?

35% - 70%

4. Peer Discussion
5. Second Answer
Peer Instruction

1. Pose question
2. Think
3. First answer

Answer correct?

35% - 70%

4. Peer Discussion
5. Second Answer

Answer correct?

Majority

6. Explain
Peer Instruction

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

Answer correct?

35% - 70%

4. Peer Discussion
5. Second Answer

Minority

Answer correct? Majority

Slow down, readdress topic

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

Slow down, readdress topic

Majority

6. Explain
Feedback

- PRS - Personal Response System
Feedback

• PRS - Personal Response System
• Flashcards
Feedback

- PRS - Personal Response System
- Flashcards
- Colour Cards
Feedback

- PRS - Personal Response System
- Flashcards
- Colour Cards
- Heads down/Hands up
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
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
Add questions to Reading Assignment

Question Text:

Multiple choice question:

1

2

3

4

5

Answer:
Students respond 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:
<table>
<thead>
<tr>
<th>Student</th>
<th>Answer</th>
<th>Time</th>
<th>Response</th>
</tr>
</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>
</tr>
<tr>
<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>
</tr>
<tr>
<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>
</tr>
<tr>
<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>
</tr>
<tr>
<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>
</tr>
<tr>
<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>
</tr>
<tr>
<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>
</tr>
</tbody>
</table>
Dear Emilia,

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]
Select ConcepTest Q’s from database

<table>
<thead>
<tr>
<th>READING</th>
<th>LECTURES</th>
<th>ASSIGNMENTS</th>
<th>FORUMS</th>
<th>NEWS</th>
<th>HANDOUTS</th>
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</thead>
<tbody>
<tr>
<td>Courses &gt; VU Course &gt; Introduction &gt; Add CT</td>
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</tbody>
</table>

Please select the CTs you want to add to your lecture and click “Add to lecture”. You can also click “Generate slides” to produce slides of question selected. You can modify your search or perform a new search using the search tools on the left. You can change the view of the CTs using the “Expand all” or “Collapse all” links on the left.

1 - 10 of 156 CTs ▶ ▶ ▶

Sort by: Question text ▼ Sort

1. Consider two identical resistors wired in series. If there is an electric current through
   the combin:
   1. equal to
   2. half
   3. smaller than, but not necessarily half

2. A CuSO₄ solution is placed in a container housing coaxial cylindrical copper electrodes....
   1. positive.
   2. negative.
   3. both positive and negative.

3. A battery establishes a steady current around the circuit below. A compass needle
   is placed successi...
   1. P, Q, R,
   2. Q, R, P,
   3. R, Q, P,
Create your own ConcepTest Q’s
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 of charged objects with electric fields and potential differences]

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 of electric field lines around a cylinder]
Assignments: upload problem sets
Grade book: database of students grades

Select the students to grade. Select the question to be graded. Enter grade, comments and click "Save".

Name: 
Student ID: 
Sections: Unsected students

Question No: PS 1: 2 Maximum Grade: 5

Found 1 students matching description.

<table>
<thead>
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<th>Name</th>
<th>Student ID</th>
<th>Grades</th>
<th>Comment</th>
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</thead>
<tbody>
<tr>
<td>Lisa Simpson</td>
<td>11112222</td>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>

Save
**Facebook: connects all elements of course**

Lisa Simpson  
F1112222  
l simpson @ fas.harvard.edu

<table>
<thead>
<tr>
<th>Class:</th>
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<tbody>
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<tr>
<td>Registered on:</td>
<td>2/2/2003</td>
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<td>Final grade:</td>
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<td>Reading FAQs:</td>
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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;
Email: priority listed and FAQ

From: Lisa Simpson <lsimpson@fas.harvard.edu> (reply)
To: Eric Mazur <emazur@fas.harvard.edu>  Brendan Connors  Transfer
Received: Mon, 2 Jun 2003 00:50:38 -0400

Subject: RE: Office Hours

Dear Professor Mazur,

Thank you so much for your response. I would love to have meet up with you, but as soon as my finals were over I left for San Diego. In just two days I will be heading off to Argentina for the summer to begin an internship with the NGO Medicos Del Mundo Argentina.

Now that the class has drawn to a close, I'd like to express my appreciation for Physics 1B. While the class does require a serious commitment, in the end I have come out with a solid understanding and appreciation for the E/M that you have taught us. Your teaching style has given us concepts rather than many equations, and we've learned how to apply fundamental principles to virtually any situation. Too many classes make the mistake of teaching students how to answer questions rather than teaching students the concepts and letting the answers flow from them. For that, I am very grateful.

Thank you again for agreeing to write a letter of recommendation for me. I will send all of the information to you tomorrow morning. The letter doesn't need to be back to the House office until the end of the month. I hope that leaves enough time for you. I appreciate that I couldn't get these materials to you sooner, included you will find 1) A resume, 2) A waiver form, 3) A brief description of my interest in medicine and my plans for the future.

Affects Grade  Message does not require response

RESPONSE

To: Lisa Simpson <lsimpson@fas.harvard.edu> (edit)
Cc:  (separate emails with ,)

Subject: RE: RE: Office Hours

Dear Lisa,

[Email body content]

[Editor or copy over FAQ response:
- RA not saved
- Please post on forum
- no CT scores
- Some CT points missing
- Lab 1 grade missing
- waiting on a problem set grade
- Missed CTs due to absent work
- PS extension
- RA change on 4/21
- Online test make
- Online Test 1
- Problem set #5 - optional
- No more availability during Reading Period
- Goes to online tests]
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