Peer Instruction





Peer Instruction





lectures focus on information transfer...

lectures focus on information transfer...

but education is much more!

1. information transfer

1. information transfer

2. assimilation of information

1. information transfer (easy)

2. assimilation of information (hard and left to student)



Solution: move information transfer out of classroom!



How to move information transfer out of classroom?



How to move information transfer out of classroom?

Use JiTT (before class) and PI (in class)!

Outline

No



Outline

PI & JiTT Overview

Implementing PI & JiTT

ConcepTests

"How can I be sure that my students will prepare for class?"

Students do not come to class prepared, because...

- 1. they don't have time.
- 2. they are not motivated to learn.
- 3. their instructors take away the incentive.
- 4. they do not have the requisite skills.
- 5. of some other reason.
- 6. They do come prepared in my class!

(select what you consider to be the main reason)



Just-in-time-Teaching (JiTT)

www.jitt.org



JiTT workflow

topic 1 reading assigment













JiTT:

- prepares you for class
- prepares students for class
- helps you address student difficulties

Peer Instruction (PI)



Includes Class-Tested, Ready-to-Use Resources

NSTRUCTION NOT AND NOT

FRIC MALUA

A User's Manual

Main features:

- pre-class assignment
- in-class: depth, not 'coverage'
- ConcepTests

brief presentation






















PI:

- helps students overcome difficulties
- encourages deep learning
- provides depth, not "coverage"
- helps you become aware of misconceptions

"Can this method be used in my class,

where questions don't necessarily have right answers?"



original



1. adjust contrast



2. remove blemishes



3. crop



4. remove outliers







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Whom would you triage first?

2. 6-wk old



Don't need a correct answer!

"Why does it work?"

discussion or more time to think?

compare three activities







question

distract

question

compare three activities



question

reflect

question

compare three activities







question

discuss

question











Implementing PI & JiTT

ConcepTests

"Will it work at my institution?"

It works here...



...but will it work here?

8.87











exam performance



exam performance



student retention



student retention



student retention



similar learning gains in different environments
"How is preparing a PI class different from preparing a lecture-based class?"

preparing for a lecture-based class



transitioning: where does the effort go?



transitioning: where does the effort go?



New activities:

- **1. Reading assignment**
- 2. ConcepTests

"How do I cover everything using this method?"

	traditional	PI
in-class coverage	complete	partial

	traditional	PI
in-class coverage	complete	partial
out-of-class coverage	?	complete

	traditional	PI
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what good is coverage if little is retained?

"Do I need clickers?"

Flashcards: simple and effective



Flashcards: simple and effective



Meltzer and Mannivanan, South Eastern Louisiana University



circumference



circumference

of a circle of radius R is $2\pi R$

Imagine a rope that fits snugly along the equator.



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- 1. the width of a few atoms
- 2. the width of a few hairs
- 3. about 0.15 m
- 4. exactly 1 m
- 5. more than 1 m





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circumference at the equator:

 $2\pi R_{\rm E}$

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new circumference:

 $2\pi R_{\rm E} + 1 \,{\rm m}$

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 $2\pi R_{\rm E} + 1 \,{\rm m}$

radius of circle with new circumference:

 $2\pi R = 2\pi R_{\rm E} + 1 \,{\rm m}, \text{ and so } R = R_{\rm E} + \frac{1 \,{\rm m}}{2\pi}.$

Research: same learning gains with and without clickers!

Clickers or Flashcards: Is There Really a Difference? N. Lasry, *The Physics Teacher* 46 (2008) 242

It's not the technology, but the pedagogy!

It's not the technology, but the pedagogy!

(but clickers do offer advantages)

"How should I assess my students

when using this approach?"

Begin by setting learning goals



Grant Wiggins and Jay McTighe, Understanding by Design (Prentice Hall, 2001)

Begin by setting learning goals



approach, not content

• focus on understanding

backward design

Grant Wiggins and Jay McTighe, Understanding by Design (Prentice Hall, 2001)

Traditional approach to course planning



Traditional approach to course planning



Traditional approach to course planning



Backward design





Backward design


Backward design



Backward design



Evaluate assessment by comparing

student performance on various kinds of problems

"What constitutes a good problem?"

On a Saturday afternoon, you pull into a parking lot with unmetered spaces near a shopping area. You circle around, but there are no empty spots. You decide to wait at one end of the lot, where you can see (and command) about 20 spaces.

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Requires:

Assumptions Developing a model Applying that model

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Requires:

Applying a (new) model

On a Saturday afternoon, you pull into a parking lot with unmetered spaces near a shopping area, where people are known to shop, on average, for 2 hours. You circle around, but there are no empty spots. You decide to wait at one end of the lot, where you can see (and command) about 20 spaces.

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Requires:

Using a calculator

 $t_{wait} = \frac{T_{shop}}{N_{space}}$

Need to test meaningful skills!

Some additional ideas:

- Open book/computer exam
- Collaborative exam
- Multidimensional testing

"How do I deal with students who resist this new approach to studying?"

After changing, things might get *worse* before they get better!



Written on Wednesday Feb 16, two weeks into the course: Here are a few concerns. I speak for many of my classmates. 1) You are giving us WAY to much work. After spending multiple hours on the problem set and not being able to figure out many of the Subject: concerns I) TOU WE YIVING US WAT O MUCH WORK. AND SPENDING INDUM the problem set, and not being able to figure out many of the queetione. I now eee that we have an additional 6 or 7 name Professor Mazur, IIIE PIODIEITI SEL, and not being able to tigure out many of the questions, I now see that we have an additional 6 of 7 pages and i homework in the workbook Livet enert A houre on the lab and questions, I now see that we have an additional o or / pages or homework in the workbook. I just spent 4 hours on the lab, and I am confident on almost half of the questions. This is more work than I nomework in the workbook. I Just spent 4 hours on the lab, and I an confident on almost half of the questions. This is more work than I have had all eemeeter in all of my other claeses combined confident on almost fian of the questions. This is more work have had all semester in all of my other classes combined. 2) If you are going to give us this much work, I would suggest re-structuring the lectures. I find the readings very difficult to understand. I am not a bad student (I got a solid A in physics nost it is very difficult to internalize the readings. You should sh (2) If you are going to give us this much work, I would sugges re-structuring the lectures. I find the readings very difficult to underetend Lam not a bad etudent (Lanta enline). understand. I am not a bad student (I got a solid A in physics 1a), but it is very difficult to internalize the readings. You should spend most of the lecture going over point by point the readinge in their It is very unicule to internative the readings. The should specify of the lecture going over, point by point, the readings in their entirety. While the DRC clickere are function they do not be in the process. of the lecture going over, point by point, the readings in them entirety. While the PRS clickers are fun, they do not help me I am extremely flustered by the incredibly large amount of work, and my inshility to understand it and Lam etronoly considering dronning the I am extremely flustered by the incredibly large amount of work, and inability to understand it, and I am strongly considering dropping the understand the complex material. course.

Written on Monday May 23, just after the final exam: First of all I want to thank you for a great semester. You are an First of all I want to thank you for a great semester. You are an excellent professor, and it is clear that you truly care about each and every etudent Subject: Thanks! The exam went well today. I'm not sure to what extent you will curve the final gradee (if at all), but it looke like I may be right around Professor Mazur, The exam went well today. I'm not sure to what extent you will (the final grades (if at all), but it looks like I may be right around the cutoff point between an A and an A- Leturlied as bard as the final grades (if at all), but it looks like I may be right around as I could the cutoff point between an A and an A-. I studied as hard as matter what and I'm keening my fingers crossed about the A but no matter. The cutoff point between an A and an A-. I studied as nard as I could and I'm keeping my fingers crossed about the A, but no matter what hannens with my drade you should know that you are one of the and I'm keeping my tingers crossed about the A, but no matter what happens with my grade you should know that you are one of the best professors that I have ever had at Harvard. every student. professors that I have ever had at Harvard. Thanks again!



you made a difference.

Lupe thisiandas "I wanted to hand you this card as a token of my

deep appreciation of how you have helped memer throughout the semester

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and don't forget...

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PI leads to better learning and retention!



• PI & JiTT Overview

Implementing PI & JiTT



"Where can I get examples of good questions?"













... or try searching Google:

<subject> "Peer Instruction" <subject> ConcepTest <subject> "Concept Test" <subject> clickers



PeerInstruction.net



Types of questions

- survey
- model testing
- discussion
- select from list



hole in plate/circumference model

microscopy image

discussion

airline

fact


hole in plate/circumference model

microscopy image

discussion

airline

fact

fact-recall not engaging

Good conceptual questions (ConcepTests):

- focus on interpretation/model (not recall)
- stimulate discussion
- are not "leading questions"
- are of manageable difficulty



"How can I promote active/fruitful discussions?"



















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