Peer Instruction

Teaching and Learning Physics, Fall 2015

Check In

- How class is going?
- Include 3 questions/comments in summaries of readings
- Field notes
  - Ground, put in practice, and reflect on things discussed in class.
  - Helps us keep up with what you are doing at site to give feedback
  - Data for your final project
- Thursdays "develop curricular toolbox" of research based approaches

TABLE VI. Ranking of the 24 RBIS according to level of Knowledge (percentage of faculty who indicate that they are familiar with or have used the RBIS).

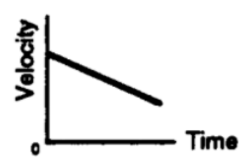
RBIS	All institutions	Two-year college	Four-year college (B.A.)	Four-year college (Grad)
Peer instruction	63.5%	46.6%	73.4%	65.8%
Physlets	56.3%	55.5%	66.4%	47.8%
Cooperative group problem solving	49.3%	43.4%	59.5%	43.9%
Workshop physics	48.2%	47.2%	66.5%	32.0%
Just in time teaching	47.7%	44.5%	55.1%	43.1%
Tutorials in introductory physics	47.0%	42.4%	55.7%	42.0%
Interactive lecture demonstrations	45.4%	42.0%	57.4%	36.7%
Activity based problem tutorials	43.0%	42.8%	53.2%	33.9%
Ranking tasks	38.7%	45.6%	45.3%	27.9%
SCALE-UP	34.5%	23.5%	50.8%	27.0%
Active learning problem sheets	34.3%	36.4%	38.3%	29.5%
Modeling	32.7%	34.8%	39.9%	24.7%
RealTime physics laboratories	32.4%	37.6%	39.2%	22.8%
Context rich problems	30.4%	25.7%	36.7%	28.0%
Overview case study physics	24.7%	31.1%	28.4%	17.3%
Open source physics	21.8%	19.1%	28.3%	17.9%
Investigative science learning environment	21.1%	24.4%	25.4%	14.9%
TIPERS: Tasks inspired by physics education research	20.9%	31.4%	23.1%	11.6%
Open source tutorials	20.8%	17.4%	25.2%	19.0%
Video laboratory	18.8%	22.5%	21.8%	13.4%
Workbook for introductory physics	18.5%	17.9%	24.1%	13.8%
Experiment problems	17.3%	25.4%	19.8%	9.3%
Socratic dialogue inducing laboratories	16.3%	17.1%	19.6%	12.8%
Thinking problems	15.1%	17.1%	16.6%	12.4%

Henderson, C. & Dancy, M. (2009) The Impact of Physics Education Research on the Teaching of Introductory Quantitative Physics in the United States, *Physical Review Special Topics: Physics Education Research,* **5** (2), 020107.

What is the most common wrong answer?

To the right is a graph of an object's motion. Which sentence is the best interpretation?

(A) The object is moving with a constant acceleration.
(B) The object is moving with a uniformly decreasing acceleration.
(C) The object is moving with a uniformly increasing velocity.
(D) The object is moving at a constant velocity.
(E) The object does not move.



R. Beichner
Testing student interpretation of kinematics graphs
Am. J. Phys. 62(8), 750-62, (1994).

What is the most common constraint faculty, who do not use PI state about PI use?

a) It takes too much time and energy to change instruction.
b) Students aren't skilled enough to learn this way. (i.e. they explain things badly to each other).
c) It reduces the content that can be covered.
d) Difficulty getting students to engage in activity.
e) Difficulty finding good questions to use.

Turpen, C., Dancy, M., & Henderson, C. (submitted). Perceived Affordances and Constraints Regarding Instructors' use of Peer Instruction: Implications for Promoting Instructional Change.

What is the most common constraint faculty, who use PI give state for PI use?

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	Most Prevalent Perceived Affordance of PI Use	Most Prevalent Perceived Constraint to PI Use
HIGH	1) Dissatisfaction with traditional lecture (86%, 6/7) 2) Evidence of effectiveness, personal experience (71%, 5/7) 3) Forces more students to participate (71%, 5/7) 4) Evidence of effectiveness, data (57%, 4/7) PI makes intuitive sense (57%, 4/7) Provides feedback to the instructor (57%, 4/7)	1)Difficulty of getting students engaged (100%, 7/7) 2) Trouble finding good questions (57%, 4/7)
MIXED	1) Dissatisfaction with traditional lecture (78%, 14/18) 2) Gets students active in class (67%, 12/18) 3) Evidence of effectiveness, personal experience (56%, 10/18) 4) Departmental support or encouragement (50%, 9/18)	1)Time and energy required to change (56%, 10/18) 2) Personal commitment to content coverage (50%, 9/18)
NON	1) Evidence of effectiveness, personal experience (50%, 5/10)	1)Time and energy required to change (90%, 9/10) 2)Student shortcomings make them unable to learning through PI(60%, 6/10) 3) Personal commitment to content coverage (50%, 5/10) 4) Structural, Lack of resources (50%, 5/10) 5) Structural, Class size (50%, 5/10) 6) Current practice effective (50%, 5/10) 7) External requirement of content coverage (50%, 5/10)

Constraint Code	Percentage	Example Quotation
Requires time and energy to change	57	I mean the biggest problem aside from this whole student popularity contest issue is time. You know, having enough time to sit down and figure out what I'm going to do in class. So sometimes in the past we've gotten, you know, you might get a development block, you know, like an extra block off to develop the class or something like that would be really useful.
Content coverage concerns based on personal commitment	49	There is a certain amount of material and a certain order to that material that we're going to get through in the course of the semester. What it does change is the rate at which we move onto the next topic. And, of course, for me to say those two things there's an inherent contradiction. If they're having trouble day after day after day then in principle you would slow way down, but then you wouldn't get through the requisite amount of material
Difficulty to getting students engaged	49	Getting students to interact in a meaningful way I think sometimes is an issue. We have - just our student population is real varied. So we could have students with a lot of different ability levels, and so just getting them to interact with each other.
Student shortcomings make them unable to learn through PI	37	It seemed like a good idea and it's, he [*Mazur*] said that he thought that peers could explain things to peers better than physicists could explain it to undergraduates in many cases. And that sounded good but I think physics is really hard to explain in a way that makes sense after you leave the discussion, in a way that you retain the explanation and it makes sense in a bigger context. And I think he's done a lot more on this than I have, but I just think he's underestimating how difficult it is to really explain this, that's one of the reasons physics is taught so badly, it's not easy to explain things
In personal experience it did NOT work	34	I'm not sure what the biggest difficulty was other than I felt like it really stopped the class on occasion… especially if it was a conceptual question that 90 percent of the people got immediately, it just felt like a waste of time.
Structural, lack of resources	34	I would say to make it [*the continued use of PI*] better, it would be helpful to, you know, have more access to physics teaching literature and more access to teaching conferences
Structural, class size	31	I generally do Peer Instruction when I have class size between 50 and 100 people. If I have more than 100 people it gets too much out of hand. I tried it with a 200 people class and it wasn't successful because the groups are just too - you can't, as a single instructor cannot - I don't know, you don't have enough control over what's going on in the room during that time if you have too many people.
Structural, lack of appropriate classroom	31	Well we have probably one room that I teach and that I think is well suited for it [*PI*], where they actually are at round tables, but they can still all see the front of the classroom essentially. So they can face each other. And in a traditional chairs facing forward, all in a row format, the Peer Instruction thing is a little more difficult because they can really only talk effectively with probably the person next to them. With one other person it is hard for them to have a little bit more than two people discussing. … I'd say the majority [*of classrooms*] are not well suited [*for use of Peer Instruction*]
Trouble finding good questions	31	[*I have a*] little bit more of a global understanding of what some of those materials were that I got. But at the same time I have to say, it's like there's so much that it's just daunting. Like I have no idea really where to start if that makes sense. …there's just so much research and so many materials that I just - I feel like, well, it's so hard to figure out where to start that I don't even know if I want to start.

How can these be overcome?

a) It takes too much time and energy to change instruction.
b) Students aren't skilled enough to learn this way. (i.e. they explain things badly to each other).
c) It reduces the content that can be covered.

Non-Users

d) Difficulty getting students to engage in activity.
e) Difficulty finding good questions to use.

Users

In what ways does this method draw on the research base? (what makes it effective)

In what ways is it limited?