

Faculty Perspectives on Using Peer Instruction: A National Study

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Introduction

In order for Research-Based Instructional Strategies (RBIS) to support widespread educational change, **how curricula are implemented in specific, complex educational settings must be better understood** [1].

We investigate:

- 1) What features of RBIS do faculty report using?
- 2) What modifications do faculty commonly make to RBIS?

Based on interviews with 15 self-reported users of Peer Instruction (PI) [2] from across the country, we characterize:

- reported PI practices,
- prevalence of modifications to PI,
- challenges in implementing PI,
- strategies developed to addressing these.

Discussion & Conclusions

- Modifications to RBIS are common.
- The effectiveness of common alterations should be investigated.
- Curriculum developers could offer several examples of successful implementation rather than one.

Many PI users encountered difficulties in implementing PI, at times devising their own solutions. Student resistance, for example, was a common implementation barrier which faculty worked hard, and often creatively, to address. However, they did so with little guidance from the research community. We can learn from the solutions that PI users have designed. In future work we will investigate whether PI former users encountered similar difficulties and whether they were as successful at coming up with strategies to address them.

Struggles in using PI & Related Modifications

PI users expressed four common tensions or struggles in making PI work in their specific educational contexts:

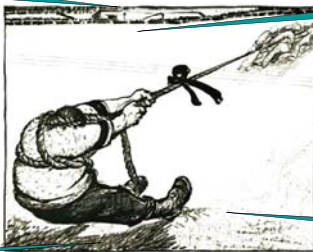
1) Finding “good” PI Questions

“It’s way easier to just pull the quantitative problem out of the book than to come up with a conceptual question that’s really one that kind of digs down to the heart of what they don’t understand” (L247, T2).

Almost all professors (14/15) use questions beyond those published by Mazur. Twelve faculty draw from external sources for PI questions such as...

- textbooks (8)
- other RBIS (8)
- other colleagues (3)
- other materials, vague (3)
- Physics Teacher (1)
- FCI questions (1)

Many describe writing some PI activities themselves (12). Many find it hard to get or write “good” PI questions (8).



3) Student Resistance to PI

It is really interesting how sometimes getting them to talk to each other is like pulling teeth. Somehow they seem like they’re brought up in that they’re not allowed to talk in class” (L80, T3).

Most (11/15) professors had problems with student resistance towards or complaints about PI. Professors discussed the difficulty of changing students’ expectations. Ten professors had developed strategies for addressing these issues:

- Milling around the room (5)
- Telling students why they were doing PI (4)
- Joking with students (2)

2) Combining PI with other RBIS

“...as I talk to you I realize, I’m like, you know, I’m just pulling scattershot from this and that and this other thing. You know, and I’m kind of just making it up on my own” (L435, F2).

More than half (9/15) describe working to combine PI with other RBIS. Other RBIS [4] commonly used in tandem with PI include:

- Ranking Tasks (3)
- PhET simulations (3)
- Interactive Lecture demonstrations (3)
- UW Tutorials (3)
- Knight workbooks (2)
- Workshop Physics (2)

4) Concerns about Content Coverage

Most (10/15) professors brought up concerns about content coverage, expressing a tension between covering canonical content and spending class time on PI activities. Sources of concern varied:

- own personal concern (5)
- concern for potential users (2)
- concern of departmental colleagues (4)
- concern of students (1).

PI Features & Definitions

Adapts* : How class proceeds adapts to students’ PI responses.
Answers not graded* : Students are not graded on PI responses.
Commit to answer* : Students have a dedicated time to think about the question and commit to answer independently.
Conceptual questions* : Uses conceptual questions in-class.
Conceptual exams : Uses some conceptual questions on exams.
Tasks draw on student ideas* : In-class PI tasks draw on common student prior ideas or common student difficulties.
Out-of-class assignments : Some student work is moved to out-of-class time which gives more flexibility during in-class time.
PI tasks multiple choice : In-class PI tasks have discrete answer options (multiple-choice, Yes/No, or True/False).
Questions interspersed* : PI questions are interspersed in class.
Students discuss* : Students discuss their ideas with their peers.
Vote after discussion* : Students commit to an answer after peer discussion.
Walks around the room : Instructor walks around the classroom during PI.

What is essential to PI According to Mazur [3, 5]?

A series of short presentations are followed by conceptual questions designed to expose common student difficulties (these questions are not graded).

A ConceptTest sequence:

- Students...
- 1) formulate individual answers,
 - 2) report their answers,
 - 3) discuss their answers with peers,
 - 4) report their answers.
 - 5) Instructor explains correct answer.
 - 6) If the percent correct is low, the concept is discussed again and another question cycle follows.

How do users implement PI?

Characterization of Participants’ Self-Reported PI Implementation: Columns show interviewees by institution type: Two-year colleges (T), four-yr. colleges offering BS/BA as highest phys. degree (F), & four-yr. colleges that a graduate degree in physics (G).

PI Feature	T1	T2	T3	T4	T5	T6	F1	F2	F3	F4	F5	G1	G3	G4	G5	% Δ
PI tasks multiple choice	✓	Δ	✓	Δ	✓	Δ	✓	Δ	✓	Δ	✓	Δ	✓	Δ	Δ	53%
Vote after discussion*	✓	Δ	✓	Δ	✓	Δ	✓	Δ	✓	Δ	✓	Δ	✓	Δ	Δ	50%
Out-of-class assignments							✓	Δ	✓	Δ	✓	Δ	✓	Δ	Δ	50%
Commit to answer*	✓	Δ	✓	Δ	✓	Δ	✓	Δ	✓	Δ	✓	Δ	✓	Δ	Δ	33%
Conceptual exams	Δ						✓	Δ	✓	Δ	✓	Δ	✓	Δ	Δ	33%
Tasks draw on student ideas*	Δ						✓	Δ	✓	Δ	✓	Δ	✓	Δ	Δ	33%
Adapts*	✓	Δ	✓	Δ	✓	Δ	✓	Δ	✓	Δ	✓	Δ	✓	Δ	Δ	25%
Questions interspersed*	✓	Δ	✓	Δ	✓	Δ	✓	Δ	✓	Δ	✓	Δ	✓	Δ	Δ	23%
Conceptual questions*	✓	Δ	✓	Δ	✓	Δ	✓	Δ	✓	Δ	✓	Δ	✓	Δ	Δ	20%
Walks around the room	✓	Δ	✓	Δ	✓	Δ	✓	Δ	✓	Δ	✓	Δ	✓	Δ	Δ	20%
Students discuss*	✓	Δ	✓	Δ	✓	Δ	✓	Δ	✓	Δ	✓	Δ	✓	Δ	Δ	13%
Answer not graded*	✓	Δ	✓	Δ	✓	Δ	✓	Δ	✓	Δ	✓	Δ	✓	Δ	Δ	0%
% modified by person	27%	75	0	30	9	22	8	27	33	9	8	38	64	38	78	
Fraction Modified by person	3/11	6/8	0/8	3/10	1/11	2/9	1/12	3/11	3/9	1/11	1/12	3/8	7/11	3/8	7/9	

KEY

- ✓ : PI feature present as described
- Δ : Large change (or deletion) made to PI feature
- Δ : Small change made to PI feature.
- : Insufficient evidence available.

- On average, participants modified approximately 30% of PI features.
- Although most people use many PI features, only 5/15 modified less than 20% of features rated.
- PI tasks multiple choice & Vote after discussion were the most commonly modified PI features.

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5. A related list of essential features was vetted by Eric Mazur through personal communication 08/04/2009.