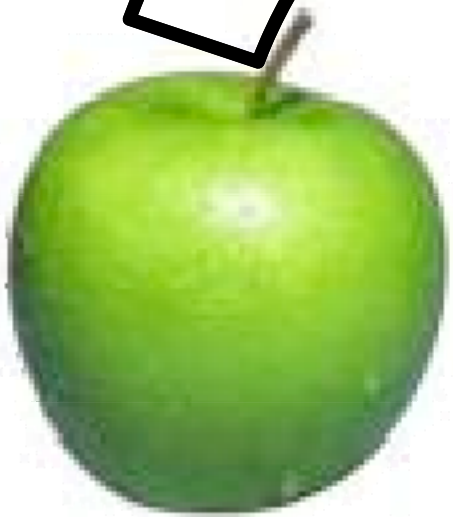
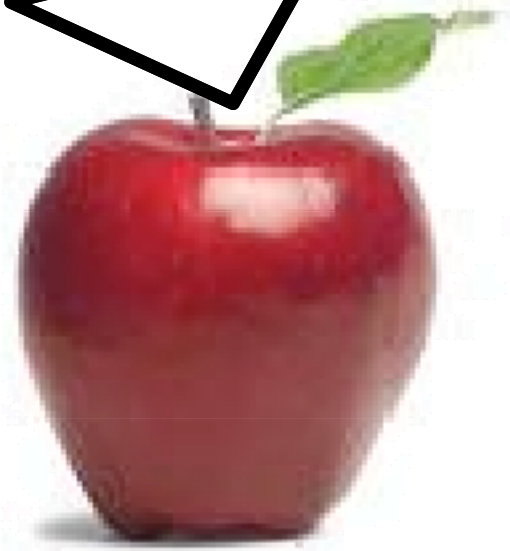
Connecting communities

PER User's Guide





of research and practice

Development of the PER User's Guide:

Identifying key features of research-based pedagogical tools for effective implementation

Sam McKagan
American Association of Physics Teachers
(McKagan Enterprises)

May 20, 2010, University of British Columbia

Outline of Talk

- Overview of PER User's Guide
- Review of previous research on faculty change
- Observations and interviews to study implementation of research-based pedagogical tools
- Findings:
  - No single consistent way to determine key features
  - Key features may not be implemented even by developers
  - Distinction between minimal and ideal implementation
- What I hope to learn from YOU

What is the PER User's Guide?

Vision: A web resource where physics educators* can learn about physics education research (PER) and how to apply it in their classrooms

* K-12 teachers and college faculty

Goals

- Increase communication between PER researchers and practicing educators
- Create online community where educators can connect with others working to improve their teaching
- Help educators teach better by learning about research results
- Help researchers do better research by learning more about what educators need

What will be included

- Guides to research-based “pedagogical tools” (curricula, techniques/methods, resources)
  - Summaries of the tool and key features
  - Tips for implementing tool effectively
  - Summaries of research base of tool
  - Addressing common obstacles to implementation
  - Reviews by researchers and educators
  - Ways to connect with other educators
  - Videos of exemplary classroom practice
  - Videos of teacher training workshops

What will be included

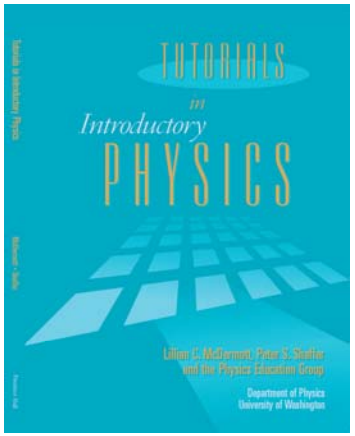
- General Information about PER:
  - Top results of PER
  - Reading lists
  - Guides to convincing skeptics
  - Frequently asked questions (FAQs)
  - Reviews of textbooks and homework systems
  - Lists of teacher training workshops and events
  - Summaries of subfields of PER
  - Open questions in PER
  - Videos of presentations by PER experts

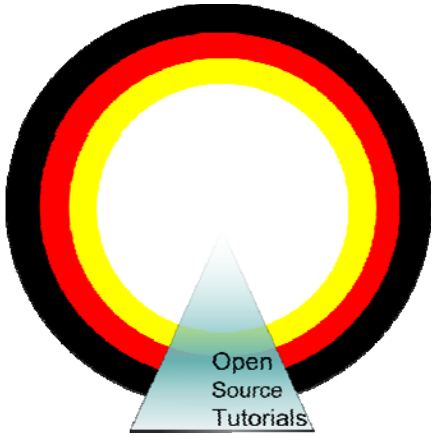
Development Model

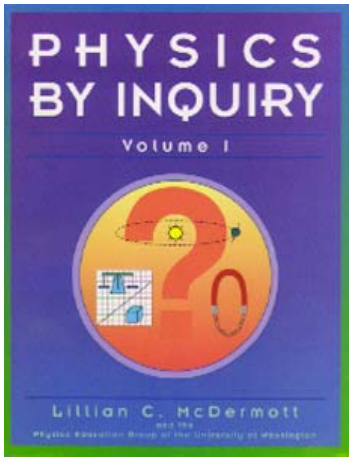
- Based on research – previous research on faculty development, ongoing user testing, measurements of effectiveness, etc.
- Editor collects and creates content
- Site visits to PER research groups to create guides based on insider knowledge
- Build in wiki aspects so that others can contribute.
- Wait to release to the public until well-developed
- Marketing campaign through APS/AAPT mailing lists, workshops at national meetings, etc.
- Will be housed within ComPADRE

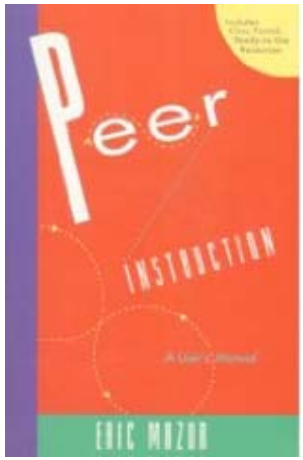
Pilot Site – Fall 2010

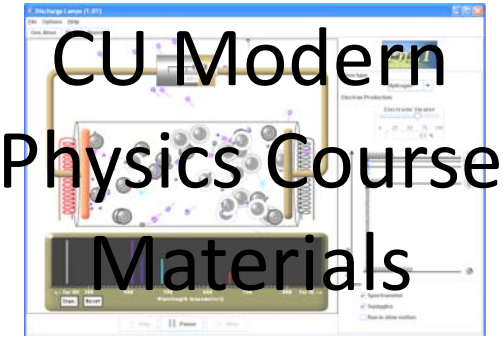
Goal: detailed guides to selected pedagogical tools











CU Modern Physics Course Materials

Learning Assistant Program

Research into faculty change (Henderson and Dancy)

- 87% of physics faculty are aware of at least one research-based instructional strategy
- 48% use at least one in their teaching
- Many (most?) users make significant adaptations (consciously 20-40% or unconsciously 80-90%)
- Adaptations can be positive (adapting to unique institutional circumstances) or negative (e.g. “Peer Instruction” without peer interaction)
- For effective implementation of pedagogical tools, educators must understand “key features”

Henderson and Dancy

Recommendations for curriculum developers

1. Provide easily modifiable materials
2. Disseminate and research ideas in addition to curriculum
3. Explicitly research the conditions for transfer
4. View faculty as partners
5. Acknowledge that change is difficult and support, rather than blame instructors

My work so far:

- Observe pedagogical tools in action
  - Physics by Inquiry
  - UW Tutorials
  - TA Training Sessions
- Interview developers
- Interview adopters
- Identify key features necessary for effective implementation

How to identify key features?

- Your ideas…

How to identify key features?

1. Ask developers
2. Observe developers' implementation
   - What happens in TA prep
   - What happens in class
3. Read developers' published materials
   - Instructor's Guide, research papers, curriculum
4. Ask (expert) adopters
5. Observe adopters' implementation
6. Read adopters' published materials

How to identify key features?

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These methods do not yield consistent results!

Why no consistency?

- Developers may have ideals that curriculum does not actually address
- Tool may “work” just as well without features developers regard as key
- Adopters may have better understanding of key features than developers due to experience implementing in new environment
- Adopters may develop innovations that enhance or improve curriculum
- The reality of what happens in class may not match developers’ ideals – even at their own institutions

Example – Peer Instruction

- Developers say that students must answer individually first, then talk to their neighbors and answer again
- Many adopters don't bother with part 2 (H&D)
- Many adopters don't bother with part 1 (McKagan)
- PER researchers often say informally that part 1 isn't critical but part 2 is
- Even when instructor encourages discussion, many students don't talk to each other
- No careful studies of what really matters for:
  - Conceptual learning
  - Beliefs
  - ???

Many apparent inconsistencies can be resolved by categorizing key features in terms of

Minimal vs. Ideal Implementation

Mostly logistical – how to set up classroom, deal with grading, what TAs should *do* in TA prep, etc.

Mostly pedagogical – how TAs should behave in the classroom, what they should *learn* in TA prep, etc.

Tentative Conclusions

- Reluctance to publicize more than minimal suggestions – want tools to be easy to adopt
- Developers and expert adopters tend to agree on ideal implementation, but are rarely able to put it into practice
- Understanding ideal may be necessary to establish environment for successful implementation, even if classroom practice rarely goes beyond minimal
- Ideal is learned through mentorship and experience, not through reading
- Can I accelerate spread of awareness of ideal?

What I hope to learn from YOU

- STLFs have experience helping faculty implement research-based methods
- What have you learned about:
  - how to guide faculty productively?
  - what faculty need to know?
  - what obstacles faculty face?
  - what resources faculty need that do not yet exist?