Increasing Educational Transformation in STEM: Faculty Buy-In

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Awards: #0715698, #1022186, #0623009, #0723699
Big Picture Questions

1. Why has the uptake of research based reforms been slower than expected given the enormous expenditures of money, time and effort?

2. What can members of this community do to better enable research-based educational transformation?
Data and Analysis

- Interviews with senior, respected, traditional physics faculty (n=5).
- Representative survey of physics faculty (n=722).
- Interviews with faculty using or knowledgeable about Peer Instruction and Workshop Physics (n=72).
- Longitudinal study of participants of the New Faculty Workshop (n=15)
- Literature review of change strategies in higher education (n=191)
- Survey of New Faculty Workshop participants (n=527)
- Survey, Interviews, and Site Visits with adopters, knowledgeable non-users and discarders of studio approach (just starting, stay tuned)
Faculty are Unfairly Blamed!

False!

- 70% of physics faculty report being interested in using more research-based instructional strategies.

Faculty don’t believe in or are not interested in research-based methods.
Faculty are Unfairly Blamed!

False!

- Studies of faculty time consistently indicate many put significant effort into teaching, often to the detriment of research.

Faculty are too busy with their research to put time into improving teaching.
We Blame Fate

False!

- Rapid social change can happen. (i.e. testing/standards movement)
- Self-defeating thinking: when nothing happens as a result of your efforts to change the system you are not likely to rethink your efforts and try something different

Change takes time.
Development and Dissemination Model of Change

- **Development**: Specialists research student learning and develop strategies and materials with proven success.

- **Dissemination**: Publish journal articles, books and websites, give talks, run workshops (i.e. NFW) ....
  - Inform faculty of the failures lecture based methods.
  - Introduce new methods and data showing their effectiveness.
  - Provide curricular materials.

- Expect change.

- Wonder why change didn’t happen.

- Assume change takes time and/or faculty are stupid and don’t care.

- Repeat (perhaps louder)

**Assumption**: Faculty can easily change if they want to.
Reform is complicated!

Culture, policy, resources, physical space, etc.

Traditional Teaching

Innovative Teaching

Students learn best when actively engaged.

Dissemination alone unlikely to produce sustained reform!
Rogers* Stages of the Adoption Process

Knowledge

Persuasion

Decision

Implementation

Confirmation

D&D Successes: Knowledge, Persuasion, Decision

D&D reform model insufficient for effective and sustained reforms.

Biggest loss point: 1/3 of those who try, abandon!
### Correlated Variables†

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<thead>
<tr>
<th>Variable</th>
<th>Know</th>
<th>Tried</th>
<th>Continue</th>
<th>High</th>
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<tbody>
<tr>
<td>READ (teaching-related journals)</td>
<td>*</td>
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<tr>
<td>NFW (Physics New Faculty Workshop)</td>
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<td>ATND (talks/workshops)</td>
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<td>MORE (interest in using more RBIS)</td>
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<td>GEN (gender)</td>
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<td>SATF (satisfied with meeting goals)</td>
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<td>PSTN (full-time, permanent vs. other)</td>
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<tr>
<td>RSH2 (research publications)</td>
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<td>*</td>
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<tr>
<td>SIZE (class size)</td>
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### Some non-correlated Variables

<table>
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<th>Teaching/Research Focus</th>
<th>Individual Characteristics</th>
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<tr>
<td>• % of job related to teaching</td>
<td>• Academic rank</td>
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<tr>
<td>• Number of research presentations given</td>
<td>• Years of teaching experience</td>
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<td>• Research grants</td>
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†Controlling for other study variables using a logistic regression model.

*Strength of effect is based on size of odds ratios (each * ~ odds ratio of 2).
Big Picture Questions

1. Why has the uptake of research based reforms been slower than expected given the enormous expenditures of money, time and effort?
   - Most reforms efforts utilize the Development and Dissemination (D&D) Model
   - Intuitive rather than research-based model

2. What can I do to better enable research-based educational transformation?
   - Look for ways to support change beyond dissemination.
   - Develop a research-based model of change.
Common Perceived Constraints

- **Need better resources to reduce time and energy to change:** "it was a struggle for me to find resources at the beginning ... so I ended up wasting a lot of time making up my own questions and I'm not doing a good job about it because it's difficult"

- **Content coverage concerns:** [I’m concerned about] sacrificing class time for other activities which I think are valuable but still figuring out how to get through the textbook by May.”

- **Difficult to get students engaged:** “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”
Common Perceived Constraints

- **Students Unhappy with Innovation:** “Students said that they just kind of wished that I would just lecture instead of doing all these things.”

- **Implementation didn’t go well:** “Last year I tried more inquiry type labs in my mechanics course and because it didn’t work ... I’m replacing those with traditional lab write-ups.

- **Lack administrative support:** "some of the feedback [my department head] gave me was that I need to lecture them more ... so I am questioning myself, am I spending enough time just talking to them and explaining”
Common Perceived Affordances

- **Positive Experience with Innovation**: “I noticed a huge difference in kind of the level of student engagement... the students were more engaged during class...I noticed that those classes [where lectured the whole class] didn't go as well”

- **Dissatisfaction With Traditional Practice**: “I've discovered that if I'd lecture for 10-15 min I feel kind of stupid because I ask questions and people kind of look at me ... I feel kind of silly, I feel uncomfortable if I lecture too long”
Common Perceived Affordances

- **Departmental Support:** "it's really nice having other people in the department who are doing this to help and support and brainstorm and work through how to make this work well."

- **Structural Support:** “the university has a huge push to encourage us to use [iphones] in class and it it looks wonderful whenever we can ... when I saw...peer instruction at the workshop last summer, I thought, well, this is a great for a win-win-win-win setup. The students get to use the devices. They get to learn more. I get to improve the test scores, and the university is really, really happy.”
What Assessment Sources are Currently Used?
(Faculty perceptions inferred from interviews, N=72)
A Better Model: Collaborate with Faculty

- Respect faculty, their experiences and knowledge.
  - “The first word out of their [a typical PER presenter] mouth is you’re not doing things right.” “If you tell me that you think my teaching is bad that automatically sets up a barrier.” (senior faculty)

- Provide modifiable curricular materials.

- Target “new” faculty
  - Faculty who are teaching a course for the first time see curricular materials as a time saver.
  - “Repeat” faculty are more likely to see them as a time sink.
A Better Model: Foundation of Social Interactions

- Colleagues are biggest influence, not data ...  
- The most common way faculty report learning about an innovation (67%) is through a colleague.  
- *Then* they turn toward traditional dissemination modes (i.e. papers, workshops, websites).  
- They use data mainly to justify what they do to others.  

- Colleagues can be barriers or affordances  
  - “It felt like there was some hesitation both from students and from other members of the faculty predominantly in chemistry and biology?” (new faculty)  
  - “We are all kind of rolling this out together and it's really nice having other people in the department who are doing this to help and support and brainstorm and work through how to make this work well.” (new faculty)
A Better Model: Ongoing Implementation Support

- Need more research on secondary implementations
  - “I guess my frustration is getting some of the many resources to actually work for what I’m doing and I have no idea how that hurdle can be overcome because everybody teaches their lessons in a different way. I don’t know how to beat that problem.” (new faculty)

- Dealing with student pushback, encouraging productive group discussions, guidelines for modifications, etc.

- (Virtual?) Faculty Learning Communities?
  - “Something I’d really want in life is to have some kind of very common resources and that we talk to each other or communicate with other instructors in the field, for example [teaching] similar course and we share with each other how to teach things or something like that.” (new faculty)
A Better Model: Work In Environments and Structures

- Teaching assessed based on student learning.
  - Neither faculty nor their institutions know whether they are teaching well or if they are improving.

- Encourage structural support (i.e. redesigned rooms, clickers etc.)

- Encourage culture of student centered teaching.
Better access to curricular materials.

“Right now, more of the time goes into finding the resources. Once that problem is solved, then more time will be spent incorporating them but, if the time to find it could be shortened, then so what if there is still some spent trying to figure out how to imbed it in my lesson?” (new faculty)

Difficulties include

- Lacking knowledge of available resources
- Available resources being too time consuming to sort through
- Lack of information about how to adapt available resources to their unique environment.
Summary

• Reforms based on D&D alone are not highly successful.

• Include in your project
  • Research on secondary implementations.
  • Ongoing implementation support.
Discussion Scenario

- Dr. Anyone is a department head at Anywhere State. Her department of 35 faculty utilize a mostly lecture based approach in the introductory courses accompanied by separate lab sections. There are multiple lecture sections taught by multiple faculty. The lecture meets in a large lecture hall with individual desks attached to the floor and 200 students are assigned to each section. Clickers are available and most faculty currently use them.

- Dr. Anyone wants to convert all the intro courses into flipped classrooms which requires the department as a whole to “buy-in”. Among her faculty, some are very enthusiastic about the idea, most think it is a good idea in theory but have concerns about it and a few are strongly opposed.

- Dr. Anyone plans to recruit the enthusiastic faculty to flip the calculus based sections first with the hope that all sections and all faculty will be flipped within 3 years.
Conditions for Sustained Transformation

- Initial implementation with enthusiastic faculty needs to go well
  - Evidence of improved outcomes
  - Implementers feel it went well
  - Students don’t complain (too much)
  - Time to teach reformed course does not exceed time to teach traditional course

- Department wide implementation needs to go well
  - All of the above
  - Faculty are able to uptake reform without an extensive time commitment.
Discussion Questions

- What structures might hinder the implementation of the reform? How can these structures be changed or modified so that the reform is more likely to be successful?

- What resources will help faculty implement the reform in a time effective and successful way? How can these resources be provided, or if need be, developed so that faculty will have high quality resources available to them with minimal time investment?

- How can a social support network be created and maintained to help faculty through the implementation process?

- How might the emotional reactions of faculty to change be acknowledged and respected so as to increase faculty buy-in?
THE END


