

Promoting Instructional Change in New Faculty

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Abstract

Roughly 300 new physics faculty are hired each year into tenure-track positions at degree granting physics departments. These new faculty often have little preparation for their teaching roles and frequently struggle with their teaching responsibilities. Thus, an opportunity exists for the physics education research (PER) community to help new faculty in their teaching and promote the spread of instructional strategies and materials based on PER. This talk will discuss the rationale, outcomes, and costs of two strategies for promoting instructional change in new faculty: 1) the Physics and Astronomy New Faculty Workshop and 2) co-teaching.

Agenda



Part 1:

What do we know about New Faculty with respect to Teaching?

Part 2:

Physics and Astronomy New Faculty Workshop

Part 3:

Co-Teaching

- Henderson, C. (2008) [Promoting Instructional Change in New Faculty: An Evaluation of the Physics and Astronomy New Faculty Workshop](#), *American Journal of Physics*, **76** (2), 179-187.
- Henderson, C., Beach, A., and Famiano, M. (2009). [Promoting Instructional Change via Co-Teaching](#). *American Journal of Physics (Physics Education Research Section)*, **77** (3), 274-283.

Part 1: What do we Know about new Faculty?

- Comprehensive study of 197 new faculty at two universities.
 - Teaching (comprehensive)
 - Research (doctoral)
- Conducted interviews and teaching observations during first four semesters.



JE Robert Boice

New Faculty as Teachers

In the midst of growing concerns for college teaching [1] we produce more and more useful advice about ways to improve instruction [8]. Yet, we know almost nothing about how (and how quickly) professors establish their teaching styles. And, it follows, we too rarely consider strategies for dealing with their teaching in its formative stages.

This article depicts the experience of new faculty as teachers over periods of one and two years and across two large campuses. It shows a surprisingly slow pattern of establishing comfort and student approval, of moving beyond defensive strategies including overpreparation of lecture content, and of looking for supports in improving teaching. The few prior efforts at observing new faculty have been enlightening but limited to smaller groups, to fewer observations, or to nonteaching activities [3, 5, 6].

The aim of this study, though, is not simply to document the teaching experiences of new faculty but to answer four related questions. First, do initial teaching patterns, adaptive and maladaptive, tend to persist? Second, what can we learn from the experiences of new faculty who master teaching quickly and enjoyably? Third, how does success in teaching correspond to prowess in areas including the establishment of collegial supports and of outputs in scholarly writing? And, fourth, how do initial teaching experiences compare at a "teaching" (comprehensive) and at a "research" (doctoral) campus?

Robert Boice is director of the Faculty Instructional Support Office and professor of psychology at the State University of New York, Stony Brook.

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Boice, R. (1991). New faculty as teachers. *Journal of Higher Education*, 62(2), 150-173.

First Semester

- Prior to first semester (common concerns)
 - Felt pressure to prepare publications and were worried that teaching would suffer in the process
- Middle of first semester (common concerns)
 - Lecture preparation dominated workweeks -- writing “could wait”
 - A lack of collegial support – in all areas, but especially related to teaching
 - When asked about what teaching help they needed
 - Determining the appropriate level of lecture difficulty
- “Facts-and-Principles Lecturing” dominated instructional activities

Expectations for Second Semester

- More Balance between Teaching and Research

Activity	Teaching Institution (Expected)	Research Institution (Expected)
Teaching	8.5	4.8
Lecture Prep	13.0	7.8
Scholarly Writing	13.7	8.0

Table: Expectations of typical workweek, in hours per week, for 2nd semester. Made at middle of first semester.

Reality of Second Semester

- Teaching still dominates work week, leaving little time for scholarly writing.
 - (15:1 Teaching:Research ratio at both institutions)

Activity	Teaching Institution (Expected)	Research Institution (Expected)	Teaching Institution (Actual)	Research Institution (Actual)
Teaching	8.5	4.8	8.4	4.1
Lecture Prep	13.0	7.8	22.4	16.6
Scholarly Writing	13.7	8.0	0.7	1.3
Committees	-	-	3.1	3.8

Table: Actual typical workweek, in hours per week, reported for 2nd semester.

Reality of Second Semester

- Most new faculty focused on content and over prepared for teaching (in the sense of having too much material to present).
- Despite having no immediate plans to change their workweeks, new faculty predicted more balanced schedules in the near future.
- Most new faculty received mediocre teaching ratings – far worse than they had anticipated.

Third Semester

- Teaching still seen as facts-and-principles lecturing
 - Content Knowledge and Enthusiasm were most important teacher characteristics
- Plans for Improving Teaching (similar on both campuses) included:
 - Teaching at lower levels of difficulty
 - Preparing lectures with better and more organized content
- Teaching continued to dominate work week.
- Began to attribute classroom difficulties to students, specifically their lack of preparation and motivation.

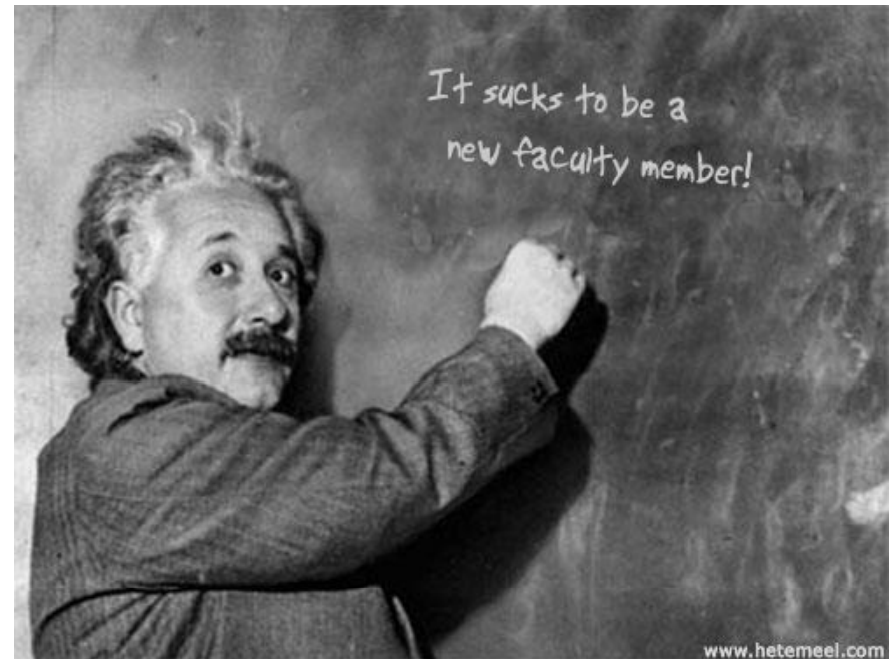
Fourth Semester

- Student evaluations remained mediocre
 - Faculty tended to attribute poor ratings to students' inability to handle challenging material.
 - Faculty assumed that their usual plans for improvement (better organization, lowered standards) were sufficient
 - They almost never sought out advice about alternative styles of teaching that might improve ratings.
- Faculty at both campuses were producing manuscripts at rates well below the 1+ per year necessary to meet tenure requirements.
- With this imbalance in time, new faculty began to express resentment toward the demands of teaching.

Summary – New Faculty

- New Faculty

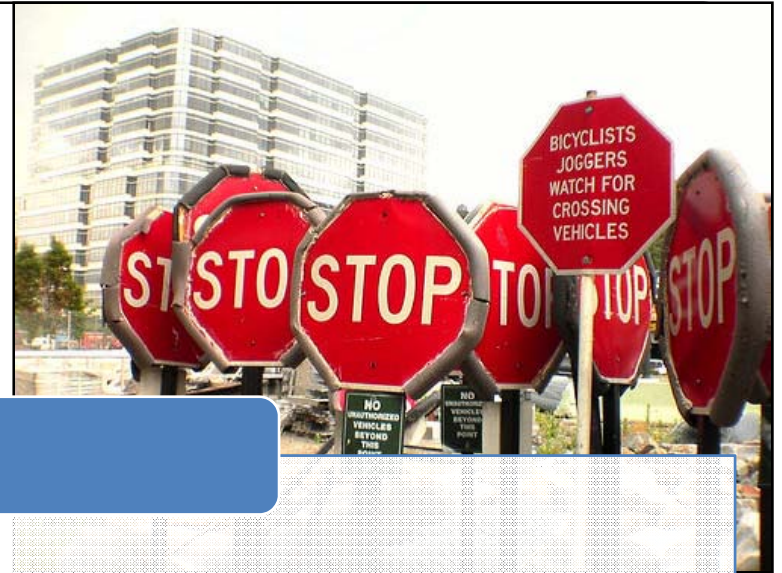
- Equate good teaching with good content.
- Teach cautiously and defensively to avoid criticism.
- Often blame external factors for teaching failures (e.g., poor students, heavy teaching loads)
- Do not know how to improve their teaching beyond improving lecture content and making assignments and tests easier.



- Recommendations from Boice:

- We tend to let new faculty “sink or swim” with respect to teaching. Many sink.
- Helping faculty find alternative styles of teaching can make faculty more productive teachers as well as more productive researchers.

Barriers to Instructional Change



Teaching is Complex

- Much decision making is implicit.
- Lack of how to and principles knowledge can lead to inappropriate modifications of a new instructional strategy.

Teaching is Context Dependent

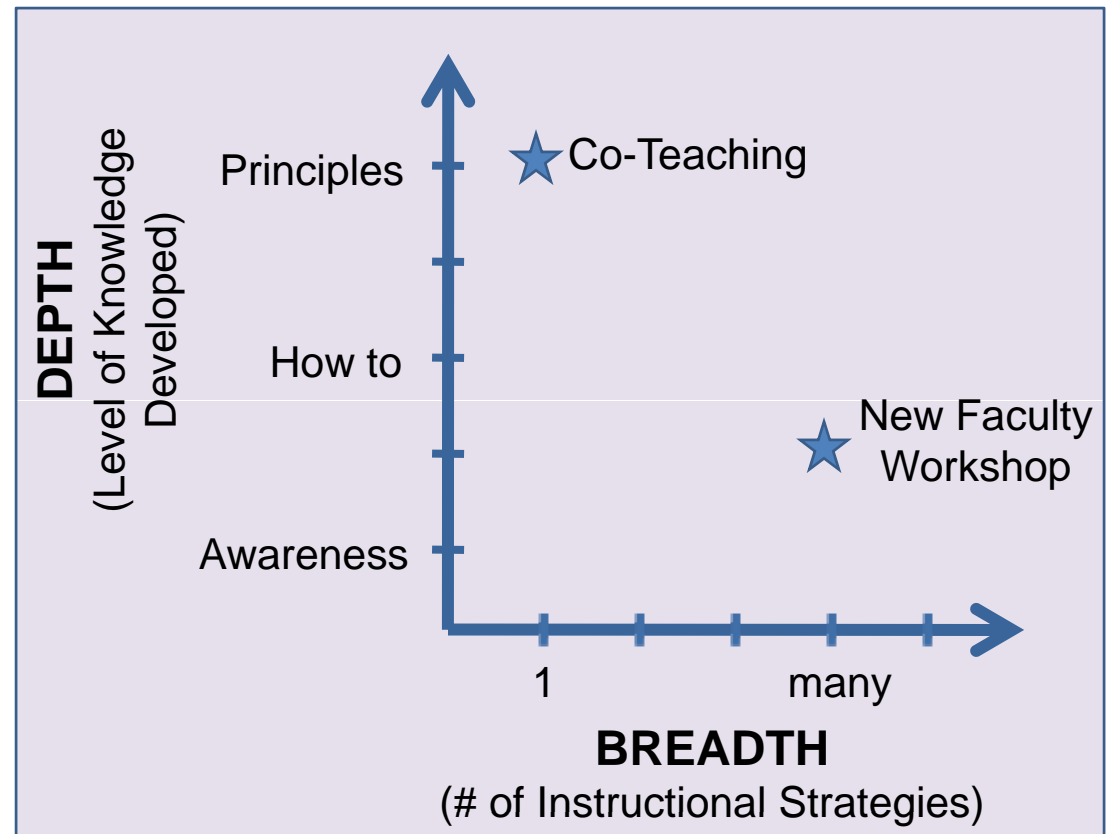
- Depends on student, institution, and teacher characteristics.

Instructional Change can be Dangerous

- May lead to lower student evaluations (at least initially).
- May be seen by colleagues as an inappropriate use of time.

Two Approaches to Supporting New Faculty

- New Faculty Workshop – Brief introduction to a variety of types of innovative instruction.
- Co-Teaching – Immersion in one particular type of innovative instruction



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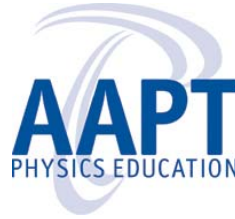
Overview – New Faculty Workshop

1. Description of the New Faculty Workshop (NFW)
2. Why the NFW should not work
3. Evidence that the NFW does work
4. Possible reasons for success



The New Faculty Workshop

Run by professional societies: AAPT, AAS, APS



Funded by NSF



NFW Organizers and Advisory Committee:

Susana E. Deustua
Robert Hilborn
Bernard Khoury
Tim McKay
Steven Turley

Warren Hein
Theodore Hodapp
Kenneth Krane
Laurie McNeil



New Faculty Workshop

- Goals:
 1. Reach a large fraction of new physics and astronomy faculty. (25% of all new faculty and rising)
 2. Help participants develop knowledge about recent developments in physics pedagogy.
 3. Have participants integrate workshop ideas and materials into their classrooms.
- Activities:
 - 4-day conference at American Center for Physics
 - Presentations by prominent curriculum developers (e.g., Bob Beichner, Eric Mazur, Lillian McDermott, Evelyn Patterson, David Sokoloff, Ronald Thornton)
 - Small group breakout/discussion sessions
 - Limited follow-up at professional meetings

The NFW Should Not Work

1. It is a short (4-day), one-time intervention
2. It is transmission-oriented
 - “Faculty development benefits from making use of extended interventions, over a full semester, a year, or more.” (Emerson, 2000, p. 29).
 - Workshops and seminars “are unlikely to produce lasting changes in teacher behavior or lasting impact on students unless participants continue skill practice and receive critical feedback on their efforts.” (Levinson-Rose, 1981, p. 419).

J. Levinson-Rose and R. J. Menges, "Improving college teaching: A critical review of research," *Review of Educational Research* 51, 403-434 (1981).

J. D. Emerson and F. Mosteller, "Development programs for college faculty: Preparing for the twenty-first century," in *Educational media and technology yearbook 2000*, edited by R. M. Branch and M. A. Fitzgerald, 2000), Vol. 25, p. 26-42.

The NFW Does Work

- Fall 2007 web-based survey
 - All 690 NFW participants who were still in academia and could be located.
 - Response rate of 76%.
- The NFW:
 - Increases knowledge about and attitudes towards PER-based instructional strategies
 - Results in changes in teaching behavior

Examples of supporting data will be presented here. More complete support can be found in Henderson (2008).

Knowledge/Use of PER Strategies

	I currently use	I have used in the past	I am familiar, but have never used	Little or no Knowledge
Astronomy Tutorials	8.7%	5.0%	30.2%	56.1%
Collaborative Learning	39.2	17.2	23.0	20.6
Cooperative Group Problem Solving	47.2	21.9	22.9	8.0
Interactive Lecture Demonstrations	46.1	24.2	23.4	6.3
Just-In-Time Teaching	22.9	18.0	50.9	8.2
Peer Instruction	54.1	21.4	22.4	2.1
Realtime Physics	5.2	7.5	46.6	40.7
Personal Response Systems	32.6	15.0	43.7	8.7
Physlets	19.7	21.4	41.3	17.5
Tutorials in Introductory Physics	13.1	20.9	45.8	20.3

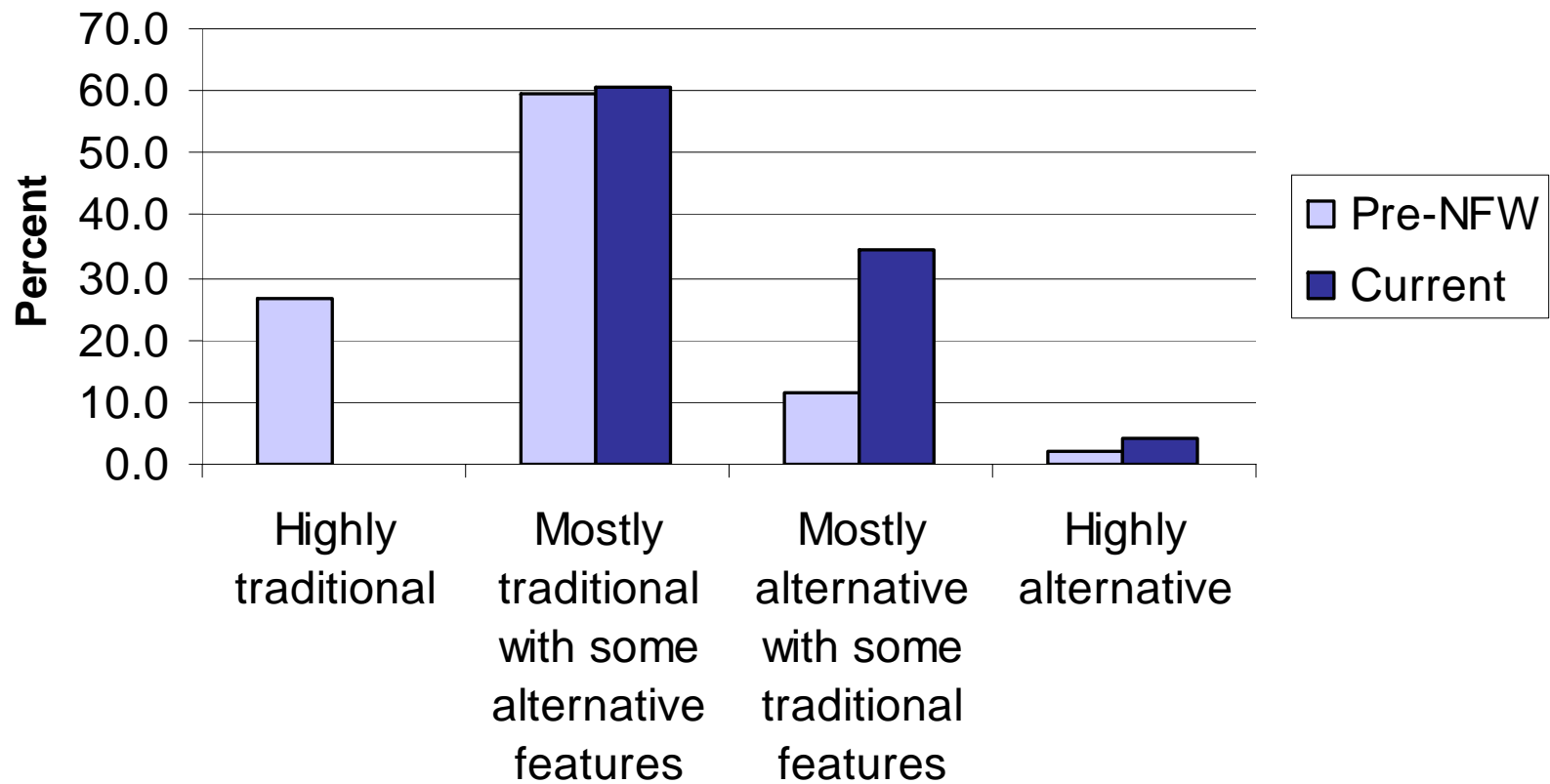
Positive Attitudes

11. Right after the New Faculty Workshop weekend were you interested in incorporating some of the workshop ideas into your teaching?

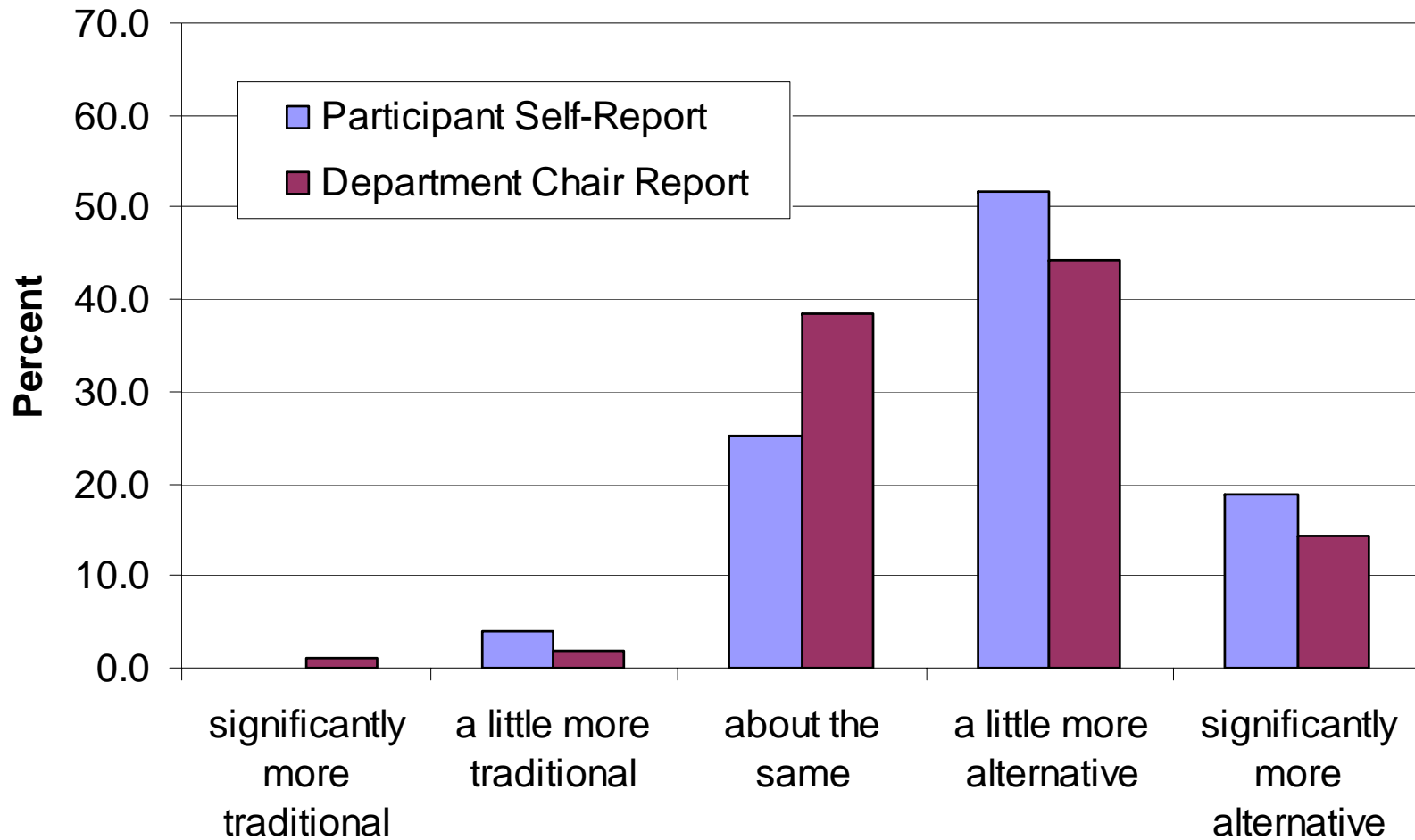
Yes	93.7%
No	2.1
I don't recall	4.2

Changes in Instructional Practices

Self-Assessment of Overall Teaching Style



Current Instructional Practices Compared to Other Faculty in Their Department



Why is the NFW Effective?

Hypothesis: It is a gateway experience that introduces faculty to PER-based instruction and motivates them to work on instructional improvement after the NFW.



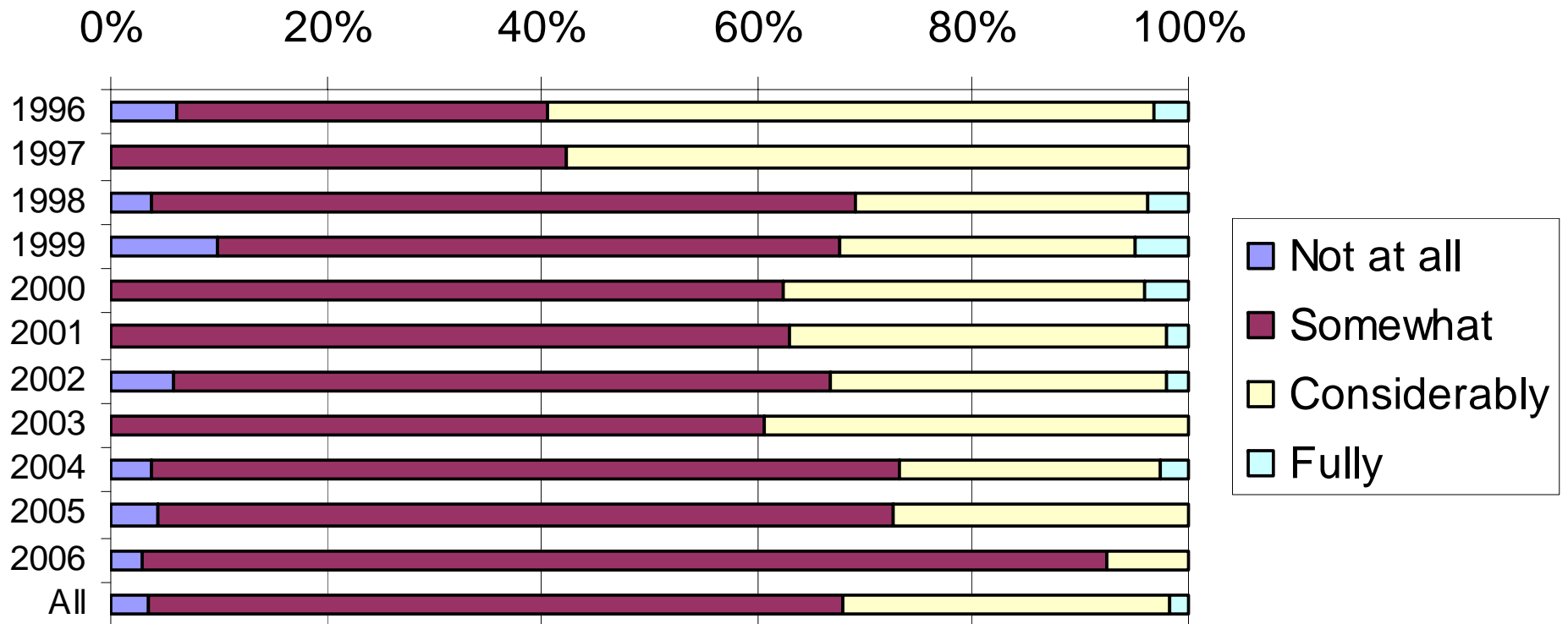
Evidence for Gateway Theory

Participant self-report

-
- It [the NFW] provided an important seed, and in that sense has influenced much of what I've done.
 - It's [the NFW] biggest impact was to make me aware of teaching issues. It led me to later participate in many other teaching workshops.
-

Evidence for the Gateway Theory: More Changes Made As Time Passes

How much has your teaching changed since your participation in the NFW?



Why is the NFW an Effective Gateway Experience (when many other programs are not)?

Keys to the success of the NFW may be that:

- 1) It is sponsored and run by three major disciplinary organizations.
- 2) It introduces participants to a wide variety of PER-based instructional strategies and materials.
- 3) Presentations are made by the leading curriculum developers in PER.

Disciplinary cultures can have a significant impact on faculty behavior.¹

Faculty may be skeptical of workshops that “sell” one particular strategy.²

Reputation of the reformer and/or their institution impact how a reform message is received.³

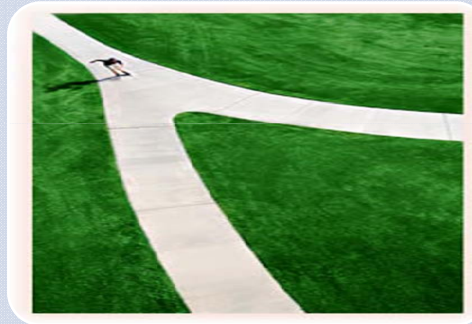
1. J. S. Fairweather, *Faculty work and public trust: Restoring the value of teaching and public service in American academic life* (Allyn and Bacon., Boston, 1996).
2. C. Henderson and M. Dancy, "Physics faculty and educational researchers: Divergent expectations as barriers to the diffusion of innovations," *American Journal of Physics (Physics Education Research Section)*, **76** (1), 79-91, 2008.
3. J. Foertsch, S. B. Millar, L. Squire, and R. Gunter, *Persuading professors: A study of the dissemination of educational reform in research institutions* (University of Wisconsin-Madison, LEAD Center, Madison, 1997).

Summary – New Faculty Workshop

- The NFW has been effective in meeting its goals of introducing new faculty to PER-based ideas and materials and motivating faculty to try these ideas and materials.



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Co-Teaching: Who?



CH: Experienced faculty member in WMU PhysTEC courses, experienced PER researcher with knowledge about many PER instructional interventions, co-teaching participant



MF: New faculty member in WMU Physics Dept., all prior teaching experience as a TA, some familiarity with PER via. grad study at OSU, co-teaching participant



AB: Faculty member in college of education, experience evaluating instructional changes in college faculty, outside observer of co-teaching

Co-Teaching: Why?

Goal: Enculturate MF into PhysTEC teaching

- Help MF understand how and why PhysTEC courses work through **direct experience** – and to see that it does work.
- **Reduce the risks** of instructional experimentation by working with an experienced instructor.
- Help MF **develop a repertoire of materials and strategies** that can be used in subsequent PhysTEC-style courses.

Co-Teaching*: What?

- Fall 2005: CH and MF co-taught Phys 2050: Introductory Calculus-Based Mechanics
 - CH and MF alternate being in charge of class each week
 - Weekly meetings between CH and MF to reflect on previous week and discuss initial plans for coming week
 - Course structure set up by CH to support PhysTEC design principles
 - MF had access to materials used by CH in previous semesters
- Spring 2006: MF teaches Phys 2050 on his own
- Data Collected
 - Individual interviews (conducted by AB) with CH and MF at beginning, middle, end of semester.
 - Teaching observations (conducted by AB) of CH and MF at beginning, middle, end of semester.

* More info about co-teaching in K-12 settings is available in Roth, W.-M. and Tobin, K. (2002) *At the elbow of another: Learning to teach by coteaching*, Peter Lang.

Results: MF Instructional Practices

- Observed instructional practices were consistent with PhysTEC principles from the start
 - Few differences observed between MF and CH
- MF instruction likely would have been more traditional without co-teaching:
 - *“I probably wouldn’t do as many in-class activities as we are doing now. . . . and so it will probably be a little bit more like the formal lecture.” (F1#228-233)*

Results: MF Beliefs and Intentions

- Initial Beliefs: **Skeptical**
 - *“When I first came I was skeptical about having students do nothing but problems in class. Just sort of standing by while they do problems.” (F2#84-87)*
- Mid-term Beliefs: **Some parts are OK**
 - *“It taught me something that I am going to adopt aspects of in future courses. You know, pick up the things that I think are working really well and the interactive and the discussions, things that are really useful.” (F2#194-198)*
- End of term Beliefs: **It is working very well**
 - *“My class is going to be very similar to what we did last semester, even the structure will be the same structure. It’s going to be almost identical.” (F3#272-273)*

Conclusions

1. **It worked!**
 - Significant changes documented in beliefs and intentions.
2. **Course structure was important.**
 - Practices started out in PhysTEC mode and did not change. This was likely due to **course structure that constrained possibilities.**
3. **The entire semester was necessary**
 - Although practices did not change, **beliefs and intentions continued to change throughout the semester.**
4. **Co-teaching was important**
 - Not student-teacher or mentor-mentee, but **collegial relationship.** *“Well the thing that I liked the most about this is it wasn’t like I was Charles’ protégé. He recognizes me as a colleague and we were teaching this class together. . . . it wasn’t like teacher-apprenticeship which at this level it might seem sort of insulting.”* (F3#283-286)

Why is Co-Teaching Effective?

Hypothesis: It is an immersion experience where faculty develop how to and principles knowledge by performing the target activity alongside an expert for an extended period of time.



Summary – Co Teaching

- Co-teaching is a cost-effective model that shows significant promise as a way to promote research-consistent instruction in new faculty.
- It may also be an applicable for graduate students or experienced faculty.

Conclusions

- New faculty typically struggle with their teaching and need additional support.
- NFW and Co-Teaching can help and offer complementary strengths.

	New Faculty Workshop	Co-Teaching
Upsides	<ul style="list-style-type: none">•Expose faculty to a wide variety of instructional strategies and ideas.•Sponsored and run by major disciplinary organizations.•Features prominent curriculum developers.	<ul style="list-style-type: none">•Provides direct experience with a particular instructional strategy that works in the given context.•Results in a set of instructional materials.•Removes much of the risk of instructional innovation.
Downsides	<ul style="list-style-type: none">•Requires considerable additional learning after NFW.•Does not help faculty in the customization process.	<ul style="list-style-type: none">•Restricts faculty to a single instructional strategy.•Requires the availability of an appropriate 'master teacher'.

Thank You



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