Evaluation of the Physics and Astronomy New Faculty Workshop

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Abstract

Between 1996 and 2006, 759 new physics and astronomy faculty have participated in the New Faculty Workshop. This represents approximately 25% of all new physics and astronomy faculty in the US. The workshop is jointly administered by the American Association of Physics Teachers (AAPT), the American Astronomical Society (AAS) and the American Physical Society (APS) with funding from the National Science Foundation. The goal of the workshop is for participants to learn about new developments in physics and astronomy pedagogy and to integrate these ideas and materials into their instruction. During the spring of 2007 a web survey was administered to all former workshop participants as part of an evaluation of the impact of the New Faculty Workshop. This talk presents selected results from the survey.
Overview

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   Warren Hein
Robert Hilborn      Theodore Hodapp
Bernard Khoury      Kenneth Krane
Tim McKay           Laurie McNeil
Steven Turley
New Faculty Workshop

Goals:
1. Reach a large fraction of new physics and astronomy faculty.
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

Attendees
Average of 69 attendees/year – 25% of all new physics and astronomy faculty

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## Attendees

Represent institutional types of the national population of faculty

<table>
<thead>
<tr>
<th>Highest Phys. and/or Ast. Degree</th>
<th>Percentage of NFW Attendees</th>
<th>Percentage of Faculty at Degree Granting Institutions*</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>1.5%</td>
<td>N/A</td>
</tr>
<tr>
<td>Bachelor's</td>
<td>38.9</td>
<td>30%</td>
</tr>
<tr>
<td>Master's</td>
<td>5.5</td>
<td>10</td>
</tr>
<tr>
<td>PhD</td>
<td>54.0</td>
<td>60</td>
</tr>
</tbody>
</table>


### 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).


The NFW Does Work

Data from a web-based survey of all 690 NFW participants who were still in academia and could be located. Response rate of 76%.

The NFW:
1. Increases knowledge about and attitudes towards PER-based instructional strategies
2. Results in changes in teaching behavior

Examples of supporting data will be presented here. More complete support can be found on my web site.

Knowledge/Use of PER Strategies

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Currently Use</th>
<th>Used in Past</th>
<th>Familiar, But Never Used</th>
<th>Little or No Knowledge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Astronomy Tutorials</td>
<td>8.7%</td>
<td>5.0%</td>
<td>30.2%</td>
<td>56.1%</td>
</tr>
<tr>
<td>Collaborative Learning</td>
<td>39.2%</td>
<td>17.2%</td>
<td>23.0%</td>
<td>20.6%</td>
</tr>
<tr>
<td>Cooperative Group Problem Solving</td>
<td>47.2%</td>
<td>21.9%</td>
<td>22.9%</td>
<td>8.0%</td>
</tr>
<tr>
<td>Interactive Lecture Demonstrations</td>
<td>46.1%</td>
<td>24.2%</td>
<td>23.4%</td>
<td>6.3%</td>
</tr>
<tr>
<td>Just-In-Time Teaching</td>
<td>22.9%</td>
<td>18.0%</td>
<td>50.9%</td>
<td>8.2%</td>
</tr>
<tr>
<td>Peer Instruction</td>
<td>54.1%</td>
<td>21.4%</td>
<td>22.4%</td>
<td>2.1%</td>
</tr>
<tr>
<td>Realtime Physics</td>
<td>5.2%</td>
<td>7.5%</td>
<td>46.6%</td>
<td>40.7%</td>
</tr>
<tr>
<td>Personal Response Systems</td>
<td>32.6%</td>
<td>15.0%</td>
<td>43.7%</td>
<td>8.7%</td>
</tr>
<tr>
<td>Physlets</td>
<td>19.7%</td>
<td>21.4%</td>
<td>41.3%</td>
<td>17.5%</td>
</tr>
<tr>
<td>Tutorials in Introductory Physics</td>
<td>13.1%</td>
<td>20.9%</td>
<td>45.8%</td>
<td>20.3%</td>
</tr>
</tbody>
</table>
Reinvention of Instructional Strategies is Common

Self-reported instructional practices of self-reported users of Peer Instruction (N=192)

22. During the most recent time you taught the course, over the semester or quarter, how frequently did/do you use the following teaching strategies during the lecture portion of your course?

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Never</th>
<th>Once or twice per term</th>
<th>Several times per term</th>
<th>Every Week</th>
<th>Nearly every class</th>
<th>Multiple times every class</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Students solve/discuss qualitative problem</td>
<td>3%</td>
<td>1%</td>
<td>12%</td>
<td>25%</td>
<td><strong>33%</strong></td>
<td>27%</td>
</tr>
<tr>
<td>2. Pair or small group discussion</td>
<td>4</td>
<td>2</td>
<td>15</td>
<td>24</td>
<td>25</td>
<td><strong>30%</strong></td>
</tr>
<tr>
<td>3. Instructor questions answered simultaneously by entire class</td>
<td>8</td>
<td>2</td>
<td>8</td>
<td>15</td>
<td>26</td>
<td><strong>40%</strong></td>
</tr>
</tbody>
</table>

All three ‘multiple times every class’ = 19%
All three at least ‘nearly every class’ = 38%

Positive Attitudes

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

<table>
<thead>
<tr>
<th>Response</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td><strong>93.7%</strong></td>
</tr>
<tr>
<td>No</td>
<td>2.1</td>
</tr>
<tr>
<td>I don't recall</td>
<td>4.2</td>
</tr>
</tbody>
</table>
Changes in Instructional Practices

Self-Assessment of Overall Teaching Style

- Highly traditional
- Mostly traditional with some alternative features
- Mostly alternative with some traditional features
- Highly alternative

Current Instructional Practices Compared to Other Faculty in Their Department

- Participant Self-Report
- Department Chair Report
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.

All new faculty struggle with teaching. Most faculty respond by focusing on better preparation of facts and principles lecturing and lowering standards.*

The NFW appears to help faculty find a different, more productive path.


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?

Evidence for the Gateway Theory: 
Changes Less Attributable to NFW As Time Passes
(participants have sought out other information or experiences for instructional improvement)

How much of this change in teaching do you attribute to 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

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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).

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Summary

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.

The NFW appears to be contributing significantly to the spread of PER ideas.
The End

More information at:
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