Evaluation of the Physics and Astronomy New Faculty Workshops

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Abstract

Four distinct data sets suggest that the Physics and Astronomy New Faculty Workshop (NFW) is very successful at increasing participant knowledge about research-based instructional strategies and motivating participants to try incorporating these strategies in their teaching. However, it also appears that many of the participants struggle to successfully implement these research-based instructional strategies and some discontinue use or modify strategies in ways that likely diminish their effectiveness. Additional post-NFW support may improve the success rate of participants in the customization and implementation process.

Overview of successful dissemination strategies

The presentation was framed by the results of a literature review of change strategies in higher education (Henderson, Beach, & Finkelstein, 2011). Based on an analysis of 191 journal articles, successful disseminating strategies involve more than one of the following: (1) coordinated and focused efforts lasting over an extended period of time—usually a semester or academic year, (2) use of performance evaluation and feedback, (3) deliberate focus on changing faculty conceptions. In contrast, the Physics and Astronomy New Faculty Workshop is a short (four-day) one-time intervention, does not include performance evaluation or feedback, and is focused primarily on providing information and motivation.

Data Set 1: Evaluation surveys directly after each NFW

The author has been involved in post-workshop evaluation surveys for the 10 NFWs offered since 2006. A short web-based evaluation survey is due approximately two weeks after each workshop. Response rates are typically high (>80%). In both forced-choice and open-ended questions, participants are asked to rate their satisfaction with the workshop as a whole as well as the individual sessions and make suggestions for improving the workshop. Participants are overwhelmingly happy with the workshop and nearly all (>95%) express the intention to use specific instructional materials or ideas from the NFW in their teaching. The most common criticism of the workshop (typically expressed by 10-20% of respondents in open-ended comments) is the packed conference schedule.

Data Set 2: Evaluation survey of all NFW participants (Henderson, 2008)

During spring 2007, a web survey was sent to all former NFW participants who were still in academia and could be located. A response rate of 76% resulted in 527 usable responses. Results indicate that the NFW increases participant knowledge about and attitudes toward research-based instructional strategies and results in changes in teaching behavior. A separate survey of department chairs corroborates the participant self-reports (see Fig. 1).

In addition to having an impact on the participants directly, in many cases the NFW also impacts the departmental

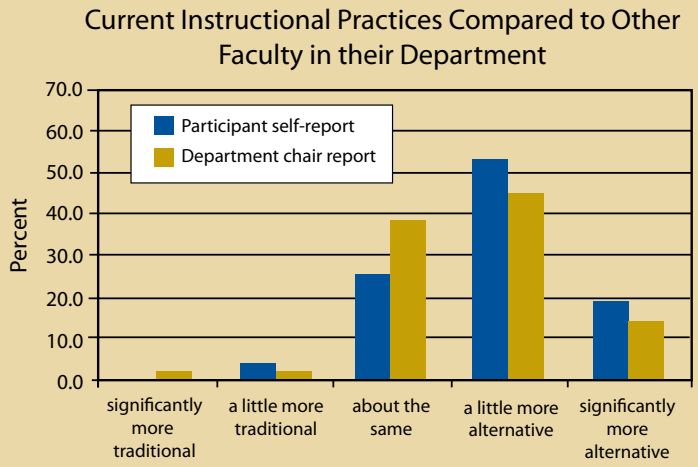

Fig. 1. Participant and department chair ratings of NFW participant's instructional styles.

colleagues of participants. Most participants (87%) report sharing NFW ideas with their colleagues. Common mechanisms mentioned were informal conversations, formal colloquia or faculty meetings, as well as discussions following pre-tenure teaching observations by colleagues. Many participants (40%) and many department chairs (51%) believe that the NFW participants have had an influence on faculty in the department who have not attended the NFW.

Data Set 3: National web survey of randomly selected physics faculty (with M. Dancy)

During fall 2008, as part of a separate NSF-funded project (NSF #0715698), a web survey was distributed to a randomly-selected sample of U.S. physics faculty (Dancy and Henderson, 2010. Henderson and Dancy, 2009. Henderson, Dancy, and Niewiadomska-Bugai, 2012). A response rate of 50% resulted in 722 usable responses. Thirteen percent of the respondents had attended the NFW. NFW attendees were significantly more likely to know about and try research-based instructional strategies than non-attendees. For example, as shown in Fig. 2, 99% of NFW attendees (compared to 85% of non-attendees) indicated knowledge of one or more of the 24 research-based instructional strategies (RBIS) asked about in the survey and 96% of NFW attendees (compared to 67% of non-attendees) indicated that they had tried at least one. Of the 20 personal and situational variables asked about in the survey, the NFW had the largest correlation with knowledge about and trial of at least one research-based instructional strategy.

However, attendance at the NFW was not significantly associated with current use vs. discontinued use or being a high vs. a low RBIS user. Of the NFW participants who initially try one or more RBIS, 27% indicate that they no longer use any RBIS. This is not significantly different from the 33% of non-NFW attendees who have tried one or more RBIS and no

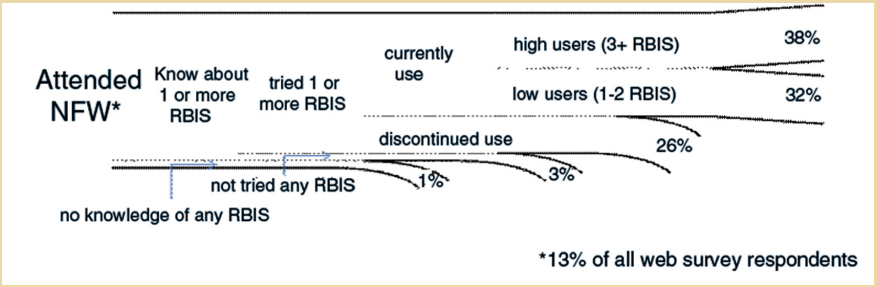

Fig. 2. Where do New Faculty Workshop participants leave the innovation-decision process?

longer use any RBIS. Current users are also approximately evenly split between high users and low users for both NFW attendees and non-attendees.

Data Set 4: Longitudinal study of NFW participants (with M. Dancy)

Beginning in fall 2010, as part of a separate NSF-funded project (NSF #1022186 and #1065714) 15NFW participants were followed for five semesters after the workshop. Data collected each semester includes: pre- and post-semester interviews, teaching artifacts, student course evaluations, student learning outcomes as measured by national-normed conceptual inventories, and time spent on teaching. Consistent with web survey results, all participants reported enjoying the NFW, reported increased knowledge and attitudes toward research-based teaching methods, and reported making changes in their instruction. Preliminary analysis of year 1 data suggests that all faculty ran into implementation difficulties and all made modifications to their planned instruction. In some cases this meant a decrease in the use of research-based methods.

What makes the New Faculty Workshop successful?

It was hypothesized that there are four main reasons that the NFW is successful at increasing participants' knowledge about and motivation to try research-based instructional strategies. (1) It is sponsored and run by three major disciplinary organizations. Research has shown that disciplinary cultures can play an important role in faculty behavior (Fairweather, 1996). (2) It introduces participants to a wide variety of research-based instructional strategies and materials. Research has shown that faculty members are often skeptical of workshops that "sell" one particular strategy (Henderson & Dancy, 2008). (3) Presentations are made by the leading curriculum developers in physics education research. Research has shown that the reputation of the reformer and/or their institution impact how a reform message is received (Foertsch, Millar, Squire, & Gunter, 1997). (4) It targets new faculty. Research has shown that new faculty are already struggling with their teaching responsibilities (Boice, 1991).

Improving the New Faculty Workshop

Based on the four data sets discussed above, it is possible to make the strong conclusion that the Physics and Astronomy New Faculty Workshop is highly successful at informing new physics and astronomy faculty about research-based instructional strategies and at motivating participants to try using these strategies in their teaching. The evidence also suggests, however, that most of the participants struggle to successfully implement these research-based instructional strategies. Some of the participants are eventually successful in their use of these instructional strategies, but others end up modifying the strategies in ways that likely diminish their effectiveness or giving up use of these strategies entirely. It is recommended that appropriately developed post-NFW support be added to improve the success rate of participants in the customization and implementation process.

References

Note: Slides from presentation at CSSP meeting can be found at: http://homepages.wmich.edu/~chenders/Publications/2012HendersonCSSPPresentation.pdf.

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

Dancy, M. & Henderson, C. (2010). "Pedagogical practices and instructional change of physics faculty," *American Journal of Physics* **78** (10), 1056-1063.

Fairweather, J. S. (1996). *Faculty Work and Public Trust: Restoring the Value of Teaching and Public Service in American Academic Life* (Boston: Allyn and Bacon).

Foertsch, J., Millar, S. B., Squire, L., & Gunter, R. (1997). *Persuading Professors: A Study of the Dissemination of Educational Reform in Research Institutions* (Madison, WI: University of Wisconsin-Madison, LEAD Center).

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. & Dancy, M. (2008). "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.

Henderson, C. & Dancy, M. (2009). "The impact of physics education research on the teaching of introductory quantitative physics in the United States," *Physical Review Special Topics: Physics Education Research*, **5** (2), 020107.

Henderson, C., Beach, A. & Finkelstein, N. (2011). "Facilitating change in undergraduate STEM instructional practices: An analytic review of the literature," *Journal of Research in Science Teaching* **48**(8), 952-984.

Henderson, C., Dancy, M. & Niewiadomska-Bugaj, M. (2012). "The use of research-based instructional strategies in introductory physics: Where do faculty leave the innovation-decision process?" *Physical Review Special Topics: Physics Education Research* **8** (2), 020104.