

Why Do Faculty Try Research Based Instructional Strategies?

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Abstract. As part of a larger ongoing study of physics faculty, we report on analysis of 15 interviews with Peer Instruction (PI) users. The analyses presented here address the following two research questions 1) How did PI users come to know about PI? and 2) What reasons do PI users give for first trying PI? In this paper we describe how faculty were first exposed to PI, and the avenues faculty used to subsequently learn more about PI such as workshops, informal discussions with colleagues, reading journal articles, etc. We also describe reasons that faculty give for initially trying PI such as dissatisfaction with lecture methods, easy trialability of PI, or their intuitive sense that PI was a better way to teach. Following a summary of our findings, we discuss implications for dissemination.

Keywords: Dissemination, Faculty Development, Peer Instruction, Introductory Courses

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INTRODUCTION

The common dissemination model (demonstrate need for change, introduce a new way, provide resources, and expect change to happen) is only marginally effective at impacting mainstream physics teaching. [1] We are engaged in an on-going project to better document and understand the change process in order to ultimately provide a research-based model to better enable the transition from traditional teaching practice to practices based on research in student learning.

Previously, we have reported on some of the implementation barriers [3] and intend to further this analysis in future papers. In this paper we focus on what has worked by exploring the fundamental question of how faculty come to learn about and why they implement a research-based innovation. Specifically, we look at how faculty come to learn about and implement Peer Instruction [2], an innovation for which 63.5% of faculty report familiarity and 29.2% of faculty report being current users. [1]

METHODS

Survey: In the Fall of 2008, a sample of physics faculty from across the country were asked to complete a web survey about their instructional goals

and practices as well as their knowledge about and use of research-based instructional strategies (see Ref. 1 for more details). Three types of institutions participated in this study: 1) two-year colleges, 2) four-year colleges that offer a physics bachelor's degree as the highest physics degree, and 3) four-year colleges that offer a graduate degree in physics. The overall response rate for the survey study was 50.3%. A subset of survey respondents was purposefully chosen to participate in an associated interview study.

Interview Focus: We chose to interview faculty about two specific research-based innovations (Peer Instruction, an easy to integrate with traditional instruction method, and Workshop Physics, a method that requires abandonment of most traditional practices). Faculty members from the three types of institutions were contacted to participate in the interview study. For each of the two target innovations, we sought to interview four faculty from each type of institution in each of three categories of users: User, Former User, and Knowledgeable Non-users (36 interviews for each instructional strategy). Here we present analysis of interviews with Peer Instruction [PI] users only.

Interview Sample: In selecting our interview sample, we decided to only interview full-time permanent faculty since 1) they were the primary target of the web survey, 2) they tend to be the primary

target of dissemination efforts, and 3) their institutional situation is different from part-time or non-permanent staff. Since the survey results showed that gender and years of teaching experiences were correlated with innovation use, we decided to purposefully sample to obtain some diversity in these variables within each group of four faculty. Each of the three researchers was randomly assigned to contact and conduct interviews with particular participants.

A total of 15 interviews were conducted with faculty who indicated during the interview that they were current users of PI. It should be noted that faculty were considered users of PI if they identified themselves as such. As described in separate papers [1,3], the interviewees were not necessarily users of PI in the same way that someone from the field of Physics Education Research, familiar with Mazur's work would identify a PI user. Faculty conceptions of PI ranged from a general sense of having students work together to the fully formalized implementation of Mazur's detailed protocol.

Interview protocol: During the semi-structured interview PI users were asked to describe their instructional practices in introductory quantitative physics, their implementation of various features of PI, how and why they began to use PI, and their departmental context. These interviews typically lasted over one hour, were audio recorded and transcribed for analysis.

Interview analysis procedures: The interviews were analyzed using emergent coding with the assistance of qualitative analysis software (Atlas.ti). After the researchers had analyzed 4 initial interviews collaboratively, a fairly stable coding scheme was developed. The coding scheme was refined, with definitions becoming more fully explicated, through analysis of additional interviews. Each interview was coded by at least two of the researchers. In addition to coding of each interview, two summary paragraphs were written to address each guiding research question. The raw coding, along with the big picture paragraph summaries, were used to determine the final categories for each interviewee.

HOW DID FACULTY LEARN ABOUT PEER INSTRUCTION?

Interviewees were asked how they first learned about PI. Additionally, they commonly added more details about their initial exposure to PI as they answered other questions throughout the interview.

Through a system of emergent coding, we were able to represent the majority of responses with the categories presented below in Table 1.

Also shown in Table 1 is the number of interviewees in each category. All but one interviewee was coded for more than one method, causing percentages to add to more than 100%.

First Exposure to PI: Believing that the first exposure to PI is of particular importance we also categorized each interviewee based on their reported first significant exposure to PI. Each faculty would appear only once in this coding scheme. A summary of the first exposure coding is also reported in Table 1. Three faculty did not have a clear recollection of their first exposure so are not coded and one faculty's first exposure was watching a video which was an isolated category and not included in the main category list.

Reading vs. Social Interactions: Most interestingly, while many faculty reported having read Mazur's Peer Instruction book [2] and/or journal articles about PI, only one of the fifteen interviewees said this was their first significant exposure to PI. And no interviewee reported journal reading as their first exposure. It appears that written materials do not generally expose faculty to research-based ideas. Rather, faculty turn to these materials as a source of additional information after they have encountered the ideas through a more social mechanism (colleague, presentation, workshop).

This is a particularly interesting finding for PI since Prentice Hall made an effort several years ago to distribute unsolicited free copies of the Peer Instruction book to all physics faculty teaching introductory courses, giving widespread access to the book. It is reasonable to assume that many of the faculty had easy access to the PI book, yet they appear to have read it only after learning about PI through other means.

WHAT MOTIVATED FACULTY TO TRY PEER INSTRUCTION?

Interviewees were asked several questions to understand why they first tried, and initially continued to use PI. Through emergent coding we were able to classify the majority of responses in the categories described in Table 2.

TABLE 1. Summary of main categories for how faculty were exposed to PI and the distribution of faculty indicating each method of exposure to PI as well as the first exposure to PI.

| Category and Description | Sample Quote | Number of Faculty | First Exposure |
|--|--|-------------------|----------------|
| COLLEAGUE: The interviewee learned about PI through a colleague. This category includes cases where the colleague was another faculty member in their department (most common), a professional colleague outside their local environment, or a faculty member they worked with as a graduate student. | “I learned about it from my college. I’ve been here 10 years and when I arrived, they had settled on this text and settled on this general approach. And it seemed eminently reasonable to me. So I was happy to adopt it and learn from them” | 10 (67%) | 3 |
| READING JOURNAL: The interviewee learned about PI through reading a journal article. | “I always read The Physics Teacher Journal and The American Journal of Physics. And whenever there’s anything about Peer Instruction in there, I pay particular attention.” | 4 (27%) | 0 |
| READING BOOK: The interviewee learned about PI through reading Mazur’s book Peer Instruction [2]. | “Yes. I read Eric Mazur’s book, you could have the title, “Peer Instruction.” Yeah, and then that was about eight or nine years ago and so I’ve implemented it ever since.” | 7 (47%) | 1 |
| PRESENTATION: The interviewee learned about PI through a formal presentation or workshop. This category includes AAPT meetings (most common) as well as other meetings and workshops with the exception of the workshops for new physics and astronomy faculty which are in a separate category. | “I attended a workshop at the AAS. And a couple of years later I attended a second workshop at the AAS.” | 7 (47%) | 2 |
| FACULTY WORKSHOP: The interviewee learned about PI through the physics and astronomy New Faculty Workshop (most common) or the equivalent workshop for two-year college faculty (one interviewee). | “I just didn’t ever hear about it until I’d been there like, four or five years. And I went to [the New Faculty Workshop]. ... it more was like, you know, wow, this is something I really should work harder on. ... And I got so many different kinds of materials that it made it a lot easier to start thinking about doing those things.” | 4 (27%) | 2 |
| FIELD OF EDUCATION: The interviewee learned about PI through work in the field of education. | “My degree is in science education and so I had some exposure in my graduate program.” | 3 (20%) | 3 |

It is particularly interesting that of the 15 faculty interviewed, all but one had responses that were coded in the “intuition” or “dissatisfied with lecture” categories, with eight faculty having responses in both categories. This, combined with the ease with which PI can be tried, appears to be the primary motivation to try PI. Faculty believe the lecture approach is not working, value a more interactive approach, and

find PI to be an easy way to start making the transition.

While the interviewees did often mention supportive data, this data was generally only a confirmation of what they already believed and not a strongly convincing factor. It does appear that data help faculty feel confident in their efforts to be more interactive and support them as they justify their diversion from the norm to their colleagues.

IMPLICATIONS AND FURTHER STUDY

This analysis points toward two implications for disseminators. First, dissemination should focus on methods that involve direct and personal contact with faculty, utilizing written materials as a resource for faculty already exposed to the innovation. Second, time and effort is likely better spent focused on helping faculty implement successfully than convincing them of the need for change.

These 15 interviews are part of a larger study of 72 interviews. The full collection of interviews includes users, past users and knowledgeable non-users of both PI (and easy to implement innovation) and Workshop Physics (a more radical innovation). Thorough an analysis of the entire set we hope to report on more insights in the future. For example, we will be able to test our hypothesis about the importance of personal exposure to PI by comparing the exposure methods, especially first exposure, between the user, former user, and knowledgeable non-user categories. Similarly, we can examine differences between PI and Workshop Physics. For example, we suspect that different exposure methods and motivations may apply to Workshop Physics since the barriers to entry are significantly higher than they are for PI.

TABLE 2. Main reasons found for why faculty were motivated to try Peer Instruction along with number of faculty (out of 15) indicating each reason

| Category and Description | Sample Comment | Number of Faculty |
|--|--|-------------------|
| INTUITION: PI was consistent with the interviewees' sense about how students learn best. | "I think I just always had an inherent belief that [lecture is] not really how people learn physics. They really learn by doing problems or doing things or seeing things. That there has to be more than sitting and listening." | 12 |
| DISSATISFIED WITH LECTURE: the interviewee felt that the lecture method was unsuccessful and wanted an alternative. | "When you are up there lecturing you are vaguely always aware of, but never really want to admit to yourself is that after about 15 minutes or so they are not really listening to you anymore. Or they are not really actively thinking anymore." | 9 |
| CONVINCING DATA: Interviewee was motivated by evidence of effectiveness. | "I was impressed with the research that suggested that traditional lecturing, even from a good lecture, isn't all that effective, especially at developing conceptual understanding in students." | 8 |
| EASY: It was easy to integrate PI into the traditional format. | "I hate to sound bad, but it seemed like the least work. It seemed like the most doable, ...just pausing a few times during lecture to ask a conceptual question and giving them a few minutes to mull it over" | 6 |

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