

Pedagogical Practices of Physics Faculty in the USA



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Problem

The last 30 years has seen the development and dissemination of many **Research-Based Instructional Strategies (RBIS)**. Although substantial time and money has gone into developing these RBIS, little effort has gone into understanding whether typical physics instructors use or even know about these products. In this poster we describe and present the results of a web survey designed to document the degree to which Physics Education Research (PER) has impacted the teaching of introductory physics.

Research Questions

1. What general instructional practices do physics faculty use?
2. Why don't physics faculty use more research-based instructional strategies?

Methods

A web-based survey was developed by the authors in consultation with researchers at the American Institute of Physics Statistical Research Center (SRC). The survey consisted of 61 questions and asked about:

- Demographic information (years teaching, rank, employment status, gender, type of institution, etc.)
- Information about a particular course the faculty member had taught recently (for example, calculus or algebra based, class size, structure of labs and recitation, number of sections, etc.).
- Participant's knowledge and use of 24 specific research-based strategies. Please see poster "The Impact of Physics Education Research on the Teaching of Introductory Quantitative Physics" for more information about the results from these questions.
- General questions about teaching goals and practices.

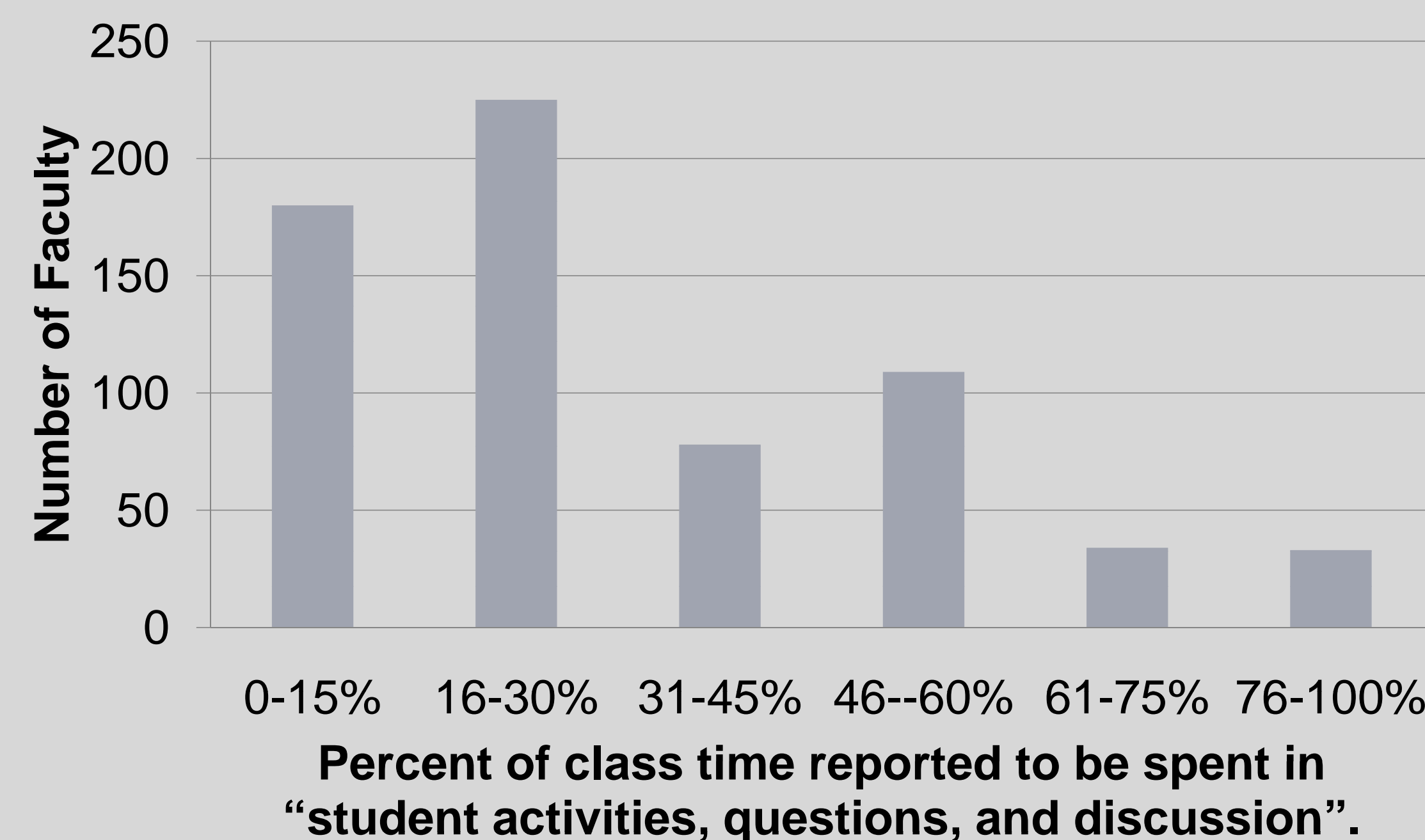
The survey was administered in Fall 2008. The overall response rate was 50.3% resulting in 722 usable responses

Institution	Rank	Gender	Semesters Taught
Two-Year College 25.8%	Lecturer 7%	Male 83%	1-4 Semesters 15%
Four-Year College (BA) 35.3%	Assistant Professor 20.8%	Female 17%	5-10 Semesters 20%
Four-Year College (With graduate program) 38.9%	Associate Professor 24.2%		>10 Semesters 65%
	Full Professor 35.6%		
	Other Rank 12.3%		

TABLE 1: Characteristics of Survey Respondents

In the lecture portion of your introductory course, please estimate the percentage of class time spent of student activities, questions and discussion."

- The average of all answers was 32% with a standard deviation of 22%
- Most of the time, in most classes, class time is spent in a passive learning mode.



In thinking about the last time you taught an introductory algebra- or calculus-based course, how frequently did you use ...

- Top three most used methods are the ones where the instructor is active and students are passive.
- The most common type of question used on exams are well-defined quantitative problems that often lend themselves to "plug-n-chug".

	Never	Once or Twice	Several Times	Weekly	For Nearly Every Class	Multiple Times Every Class
Traditional Lecture	4%	4%	6%	16%	48%	22%
Students Discuss Ideas in Small Groups	25	14	12	19	17	13
Students design experiments/activities	63	19	10	7	1	0
Students required to work together	25	10	16	22	15	12
Instructor solves/discusses quantitative/mathematical problem	1	2	9	23	43	24
Instructor solves/discusses qualitative/conceptual problem	1	3	8	20	45	22
Students solve/discuss quantitative/mathematical problem	12	10	18	25	25	10
Students solve/discuss qualitative/conceptual problem	11	9	15	23	28	14
Whole class voting	22	9	18	14	18	19

TABLE 2: Percentage of faculty reporting use of a particular teaching strategy.

	Never Used on Tests	Used Occasionally on Tests	Used Frequently on Tests	Used on All Tests
Well-defined quantitative problems	2%	6%	23%	69%
Open-ended quantitative problems	59	30	8	3
Novel problems	22	45	23	10
Multiple choice questions	34	21	17	29
Conceptual questions	7	22	26	45
Questions that require students to explain their reasoning	16	30	24	30

TABLE 3: Percentage of faculty reporting use of particular types of test questions.

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Why do faculty not use more research-based practices?

- 70% report being interested in using more research based strategies.
- 92% report that their department is either very encouraging or somewhat encouraging about efforts to improve instruction.
- Faculty report goals generally consistent with research-based strategies.

	Goal is "very important"	"extremely or somewhat satisfied" with extent goal reached
Problem Solving	90%	72%
Conceptual Understanding	92	69
Attitudes and Appreciation	51	47

TABLE 4: Percentage of faculty indicating importance of goal and satisfaction of goal reached.

For the 70% of respondents who said they were interested in using more research-based strategies they were asked "What prevents you from using more of these strategies?"

TIME	
Time to learn about and implement changes	28.6%
Time (not elaborated)	24.1
LACK OF KNOWLEDGE ABOUT/ ACCESS to RBIS	
Lack of familiarity with many RBIS	22.4
Lack of access to RBIS	3.1
WEAKNESSES OF RBIS	
Difficult to cover material (uses too much class time)	8.0
Not convinced of benefit	6.6
Requires too much instructor time to use	2.4
Student resistance (real or perceived)	2.1
Lack of ready-to-use materials	0.7
LACK OF MOTIVATION TO ADOPT RBIS (other than TIME)	
I don't follow one method, but adapt pieces of many to fit my teaching style.	6.1
Nothing	1.9
Inertia	1.2
LACK OF FIT WITH DEPARTMENT OR INSTITUTION	
Cost to implement (e.g., lab equipment, additional staff)	4.0
Need to coordinate changes with colleagues	3.8
Lack of appropriate classroom space/class scheduling	3.7
Cost (not elaborated)	2.6
Colleagues would not approve	2.1
Cost for students (e.g., books, clickers)	0.7
UNCLEAR	
Unclear response	4.7

TABLE 5: Reasons given for not using more research-based strategies. (coded qualitative data)

Conclusions

- Faculty are aware of research-based innovations and willing/motivated to try them.
- Faculty report non-supportive work environments.
- Dissemination is often undertaken without a clearly articulated change strategy. A model that accounts for the complexity of real classroom change is in need of development.