Findings from 10 years of math instructor teaching professional development

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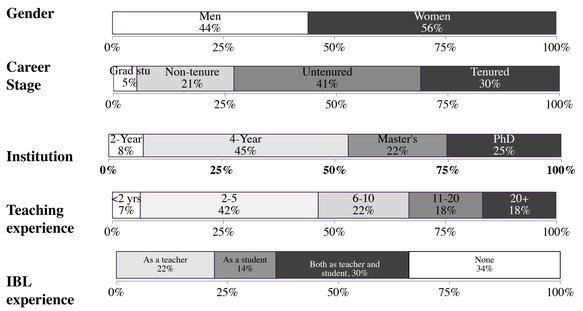
The Problem

- Research-based instructional strategies (RBIS) such as inquiry-based learning (IBL) improve learning and persistence in US undergraduate STEM education.[1,2]
- However, only about 20% of instructors extensively use these strategies--most students do not experience active learning.[3,4]
- Instructor professional development (PD) is seen as the most influential factor in advancing the uptake of RBIS in US undergraduate STEM classrooms.[5]
- While there is evidence from large studies[6] in other fields about the influence of PD on teaching practice, we know of no longitudinal studies of PD in mathematics of this size, with a sample of several hundred instructors.

The Workshop Approach

- Four-day intensive workshops were held in summer around the US. From 2010-2020, 22 workshops served ~700 participants.
- Workshops seek to encourage instructors to use IBL and help them implement these approaches in their own classrooms.
- A four-stranded workshop model incorporates video lesson study, educational research, IBL facilitation skills, and personal work time. Collectively these strands respond to identified instructor needs and provide engaging, personalized learning opportunities.
- Workshops accommodate instructors' diverse teaching settings and focuses on pedagogy, an area where most university educators have little formal preparation.

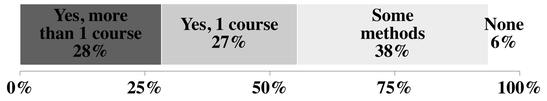
Workshop Participants



Methods

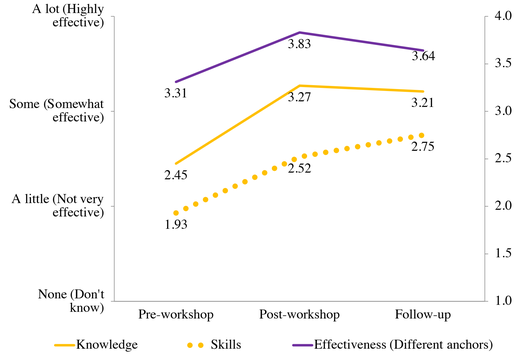
- Pre workshop survey, post workshop survey, 1-year follow-up survey
- To date, ***n* = 312** respondents have completed all the pre-workshop, post-workshop, and follow-up surveys (2010-2018 workshops)
- Survey measures: Participant characteristics, institutional characteristics, use of teaching practices, IBL implementation, IBL capacity: knowledge, skills, and effectiveness

IBL Implementation



➢ ***Workshops are effective in encouraging instructor adoption of IBL teaching methods.***

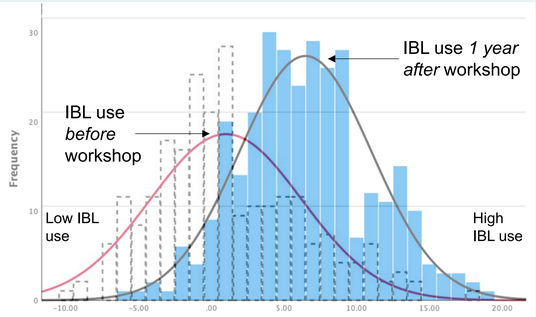
Gains in IBL Capacity



➢ ***Participants reported gains in IBL knowledge, skills, and effectiveness.***

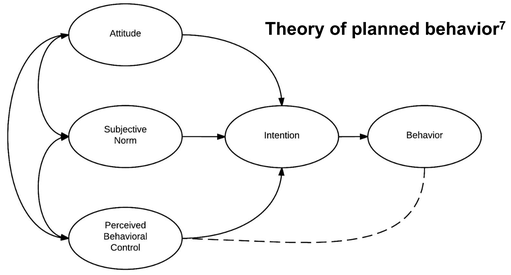
➢ ***Gains are sustained 1.5 years after the workshop.***

IBL Implementation Intensity



IBL intensity = student group work + student presentation + class discussion – lecture – instructor solving problems

Theoretical Framework



Attitude: Degree to which a person has a favorable or unfavorable evaluation of the behavior of interest
-To what extent do you believe inquiry-based strategies are an effective learning method?
Scale: 1 = "Don't know" to 4 = "Highly effective"

Subjective Norm: Belief about whether peers approve or disapprove of behavior
-Support from your colleagues in the department to use IBL in your teaching
-Support from our department head or chair to use IBL in your teaching
Scale: 1 = "Not at all supportive" to 4 = "Mostly supportive"

Perceived Behavioral Control: Perception of the ease or difficulty of performing the behavior
-Rate your current level of skill in inquiry-based teaching
-Rate your current level of knowledge of inquiry-based learning in math education
Scale: 1 = "None" to 4 = "A lot"

Intention: Intent to perform the behavior
-How likely are you to implement IBL in the coming academic year?
Scale: 1 = "Not at all likely" to 5 = "Definitely"

Behavior: Intensity of IBL implementation
-Intensity of IBL teaching= student group work + student presentation + class discussion - lecture - instructor solving problems
Scale: 1 = "Never" to 7 = "Every class"

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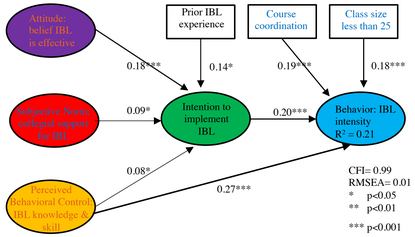
Workshop and contextual factors drive IBL intensity



➢ ***Workshop participants' gains in IBL capacity (attitude & perceived behavioral control) are positively associated with their intention to use IBL and their IBL intensity.***

➢ ***Perceived behavioral control (IBL knowledge & skill) is more strongly related to IBL intensity than all other factors.***

➢ ***Contextual factors (norms of support from colleagues & department heads) influence intent to implement IBL and, subsequently, intensity of IBL teaching practices.***

➢ ***Contextual factors (course coordination & small class size) are positively related to intensity of IBL teaching practices.***

➢ ***Conclusion: Workshop model and experience are effective in increasing IBL use, and local contextual factors are also influential.***

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