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 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.

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 knowledge, skills, and effectiveness

Results

- Workshops are effective in encouraging instructor adoption of IBL teaching methods.
- Participants reported gains in IBL knowledge, skills, and effectiveness.
- Gains are sustained 1.5 years after the workshop.

IBL Implementation

<table>
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<tr>
<th>Yes, more than 1 course</th>
<th>Yes, 1 course</th>
<th>Some methods</th>
<th>None</th>
<th>None</th>
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</thead>
<tbody>
<tr>
<td>Percentage</td>
<td>25%</td>
<td>50%</td>
<td>75%</td>
<td>100%</td>
</tr>
</tbody>
</table>

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

Gains are sustained 1.5 years after the workshop.

Theoretical Framework

- Attitude: Degree to which a person has a favorable or unfavorable evaluation of the behavior of interest
- Subjective Norm: Belief about whether peers approve or disapprove of behavior
- Perceived Behavioral Control: Perception of the ease or difficulty of performing the behavior
- Behavioral Intention: Intention to perform the behavior

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 & skills) is more strongly related to IBL intensity than all other factors.

 Contextual factors (norms of support from colleagues & departmental leadership) influence intent to implement IBL and, subsequently, intensity of IBL teaching practices.

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

Acknowledgment: This work was funded by the National Science Foundation under grant DUE-1525077. All findings and opinions are those of the authors.

References

5. *Note: p < 0.05. **Note: p < 0.01. ***Note: p < 0.001. All findings and opinions are those of the authors.

 IBL use f year after workshop

Workshop Participants

<table>
<thead>
<tr>
<th>Gender</th>
<th>Career Stage</th>
<th>Institution</th>
<th>Teaching experience</th>
<th>IBL experience</th>
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