The Effects of Pedagogical Enhancements on Classroom Climate Perceptions and Motivational Beliefs among College Students Enrolled in Freshman Biology Courses

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Introduction

• Loud and sustained calls have been made for increased representation of traditionally underserved students, in the science, technology, engineering, and math (STEM) majors (Adkins, 2012).

• Improving student performance in introductory or “gatekeeping” courses provides an opportunity to increase STEM representation (Crisp, Nora, & Taggert, 2009).

• Active learning environments promote better academic performance in STEM courses (Freeman et al., 2014).
Introduction

• Active learning environments facilitate deeper conceptual understanding of material through activities that foster engagement and promote relevancy (Swiderski, 2011).

• Facets of active learning environments: (Prince, 2004)
  – In-class problem solving
  – Discussions
  – Mechanisms to monitor learning and enhance engagement (e.g., clickers)
  – Opportunities for collaboration
Gaps in the Literature

- Less is known about the extent to which active learning environments influence students’:
  - perceptions of the classroom climate
  - motivational beliefs associated with STEM persistence

- Little research has examined the effect of specific active learning pedagogical enhancements on students’:
  - perceptions of the classroom climate
  - motivational beliefs associated with STEM persistence
Background

• Three aspects of the classroom climate may be perceived differently by whether courses facilitate active learning opportunities or are more exposition-centered:
  – Instructor support
  – Academic press
  – Situational interest
• Active learning environments may enhance motivational beliefs that predict persistence in STEM domains: (Wigfield & Eccles, 2000)

  – Self-efficacy: students' beliefs about their ability to successfully perform academic-related tasks (Bandura, 1986).

  – Task value: students’ beliefs about the extent to which they find course material interesting, personally important, and useful (Pintrich et al., 1993).
Research Questions

1. To what extent does participation in a course-based intervention that facilitates active learning positively influence students’ classroom climate perceptions and motivational beliefs compared to traditional large lecture courses?

2. To what extent do students’ perceptions of classroom-based active learning pedagogical enhancements relate to their classroom climate perceptions and motivational beliefs?
Method: Procedure

• Students randomly enrolled in sections assigned to the intervention or control

<table>
<thead>
<tr>
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• Pedagogical enhancements (Allen & Tanner, 2005)
  – Utilization of clicker-based technology
  – In-class problem-solving (think-pair-share)
  – In-class demonstrations
  – Peer-led recitations
Method: Participants

- 962 undergraduate students
  - 576 Fall
  - 386 Spring

- Student demographics

![Gender Pie Chart](image)

- Female: 35%
- Male: 65%

![Race/Ethnicity Pie Chart](image)

- Caucasian: 27%
- African American: 23%
- Asian: 14%
- Other: 8%
Method: Instruments

- Classroom climate
  - Instructor support (Fisher & Fraser, 1983)
  - Academic press (Middleton & Midgley, 2002)
  - Situational interest (Linnenbrink-Garcia et al., 2010)

- Motivational beliefs (Pintrich, Smith, Garcia, & McKeachie, 1993)
  - Biology self-efficacy (Pre & Post)
  - Biology task value (Pre & Post)

- Value of pedagogical enhancements (α = .83)
  - Clickers
  - Problem-solving
  - Demonstrations
Results: Table 1

Summary of Regression Analyses Predicting Aspects of the Classroom Climate and Motivational Beliefs: Intervention Effect

<table>
<thead>
<tr>
<th>Variable</th>
<th>Instructor Support&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Academic Press&lt;sup&gt;b&lt;/sup&gt;</th>
<th>Situational Interest&lt;sup&gt;c&lt;/sup&gt;</th>
<th>Self-efficacy (post)&lt;sup&gt;d&lt;/sup&gt;</th>
<th>Task Value (post)&lt;sup&gt;e&lt;/sup&gt;</th>
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Note. β indicates standardized regression coefficient. N = 954–955. *p < .05. **p < .01. ***p < .001. <sup>a</sup>R<sup>2</sup> = .16, p < .001. <sup>b</sup>R<sup>2</sup> = .16, p < .001. <sup>c</sup>R<sup>2</sup> = .26, p < .001. <sup>d</sup>R<sup>2</sup> = .30, p < .001. <sup>e</sup>R<sup>2</sup> = .36, p < .001.
Results: Table 2

**Summary of Regression Analyses Predicting Aspects of the Classroom Climate and Motivational Beliefs: Pedagogical Enhancements Effect**

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*Note.* \(\beta\) indicates standardized regression coefficient. \(N = 588–589.\) \(*p < .05.  **p < .01. ***p < .001.\) \(^aR^2 = .28, p < .001.\) \(^bR^2 = .28, p < .001.\) \(^cR^2 = .27, p < .001.\) \(^dR^2 = .27, p < .001.\) \(^eR^2 = .37, p < .001.\)
Discussion

- This intervention promoted more adaptive beliefs about the classroom climate and enhanced students’ confidence in and value for biology.

- Findings suggest that students in the intervention may be more likely to enroll in subsequent biology courses (Wigfield & Eccles, 2000).

- This intervention will be broadly useful to other campuses interested in increasing student success even when faced with large enrollments and minimal faculty and staff support.
THANK YOU!

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