

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



Background (cont.)

- 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

	Semester 1		Semester 2	
Courses	Biology for Major	Biology for Non-Major	Biology for Major	Biology for Non-Major
Intervention	1	1	1	1
Control	1	1	1	1

- Pedagogical enhancements (Allen & Tanner, 2005)
 - Utilization of clicker-based technology
 - In-class problem-solving (think-pair-share)
 - In-class demonstrations
 - Peer-led recitations

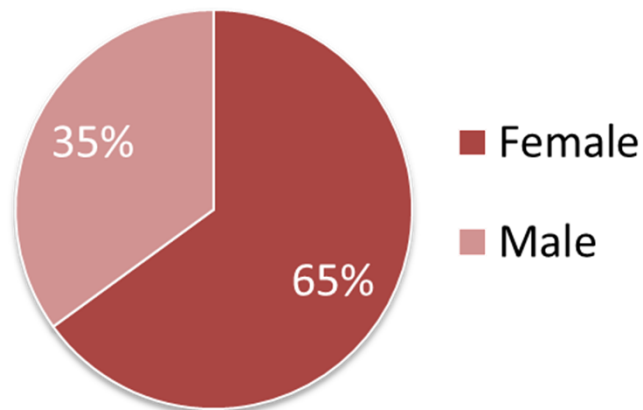
James Watson



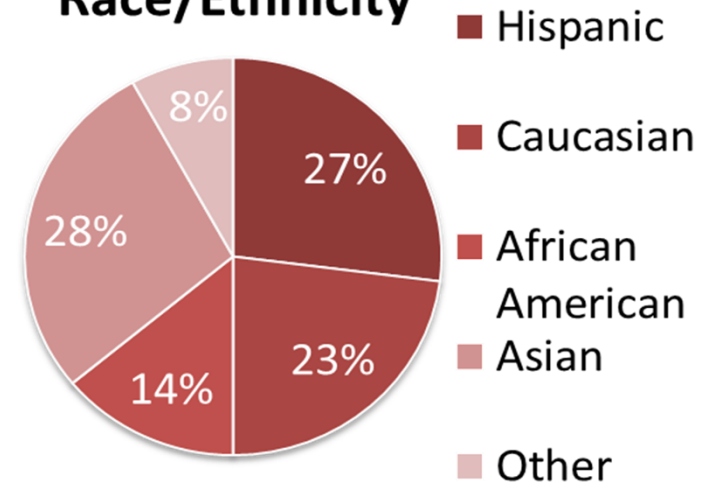
Method: Participants

- 962 undergraduate students
 - 576 Fall
 - 386 Spring
- Student demographics

Gender



Race/Ethnicity





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 ($\alpha = .83$)
 - Clickers
 - Problem-solving
 - Demonstrations

Results: Table 1

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

Variable	Instructor Support ^a	Academic Press ^b	Situational Interest ^c	Self-efficacy (post) ^d	Task Value (post) ^e
	β	β	β	β	β
Spring Semester	.04	.02	.10***	.09**	.03
Biological Science	-.07*	-.05	-.06*	.08**	.10***
Female	.06	.08*	.00	-.05	.02
Hispanic	-.02	-.02	.02	.02	.07
Black	-.01	.01	.00	-.03	-.02
Other Ethnicity	-.05	-.04	-.02	.01	.02
At-Risk	-.09**	-.06	-.04	-.25***	-.13***
Self-efficacy	.01	.01	-.04	.21***	.02
Task Value	.23***	.25***	.25***	.24***	.51***
Intervention	.29***	.28***	.43***	.13***	.11**

Note. β indicates standardized regression coefficient. $N = 954-955$. * $p < .05$. ** $p < .01$. *** $p < .001$. ^a $R^2 = .16, p < .001$. ^b $R^2 = .16, p < .001$. ^c $R^2 = .26, p < .001$. ^d $R^2 = .30, p < .001$. ^e $R^2 = .36, p < .001$.

Results: Table 2

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

Variable	Instructor Support ^a	Academic Press ^b	Situational Interest ^c	Self-efficacy (post) ^d	Task Value (post) ^e
	β	β	β	β	β
Spring Semester	-.02	.05	.05	.04	-.00
Biological Science	-.09*	-.05	-.07	.05	.11**
Female	.10**	.14***	.02	-.07	-.02
Hispanic	-.02	-.01	.00	-.02	.05
Black	.01	.05	.00	-.05	-.02
Other Ethnicity	-.02	-.00	-.01	.00	.00
At-Risk	-.08*	-.05	-.04	-.23***	-.10**
Self-efficacy	.06	.04	-.05	.19***	.02
Task Value	.11*	.13**	.15**	.21***	.44***
Pedagogical Enhancements	.46***	.45***	.47***	.22***	.27***

Note. β indicates standardized regression coefficient. $N = 588-589$. * $p < .05$. ** $p < .01$. *** $p < .001$. ^a $R^2 = .28$, $p < .001$. ^b $R^2 = .28$, $p < .001$. ^c $R^2 = .27$, $p < .001$. ^d $R^2 = .27$, $p < .001$. ^e $R^2 = .37$, $p < .001$.



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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