Initial replication results of learning assistants in University Physics

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Abstract

During the 2011-2012 academic year, West Virginia University began a learning assistants (LA) program in its introductory calculus-based physics course targeted at increasing course effectiveness and recruiting future STEM teachers. The LA program was modeled after the Colorado Learning Assistant model. This poster describes the setting and initial results from the implementation, including learning gains (measured with the Force and Motion Conceptual Evaluation) and attitudes (measured with the Colorado Learning Attitudes about Science Survey). These data are combined with demographic data about the individual students and compared to baseline data collected prior to the implementation of the LA program.

Results: Big Picture

The West Virginia Learning Assistants Program was established with the intention of replicating the success in Colorado and answering some research questions. Goals include:

- Producing qualified physics teachers for the state—*it's early…but no LAs have committed to teaching.*
- Increasing student learning in our service courses—*so far, it works with "full implementation," but this is very dependent upon instructor involvement.*

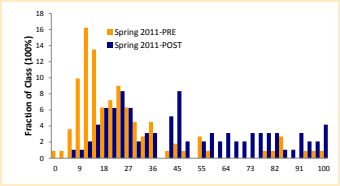
Research Questions to be answered: How does the implementation of a Learning Assistant Program in Large Lecture Courses affect underrepresented populations in comparison to majority populations? *Our numbers of underrepresented students are too small to draw statistically significant conclusions as of now.*

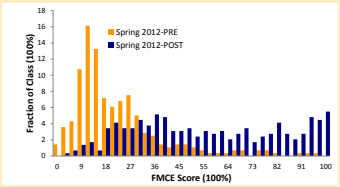
Background

- The program was modeled on the Colorado Learning Assistants Program.
- There were five full-time LAs working 7-10 hours per week, including Physics 111 (Calculus-based General Physics I) lab sessions and Physics 101/111 learning center hours.
- LAs attended tutorial training meetings every Wednesday to work through the next week's tutorial. Tutorial training consisted of reviewing student pretests on the topic, working through the week's tutorial, and discussing both the physics content and strategies for addressing possible student misconceptions.
- The 19 Physics 111 lab sessions are divided into two segments: the 1st hour of each session the LA supervises the tutorial assignment, the 2nd hour the physics graduate teaching assistant (TA) supervises the lab activity. Homework is assigned from *Tutorials in Introductory Physics: Homework* and collected in the subsequent lab session. LAs are only required to attend the 1st hour of the lab session that they supervise in this transitional course structure.
- All LAs are enrolled in a science-focused section of EDUC 200: Professional Inquiry, Mondays 4-7 pm, taught by Dr. Jeffrey Carver during the fall semester.
- Physics content pretesting was done in all lecture sections of Physics 111 using the Force and Motion Conceptual Evaluation (FMCE), and attitudes pretesting was done using the Colorado Learning Attitudes about Science Survey (CLASS).
- Baseline data was collected in the Spring of 2011, implementation occurred in Fall of 2012, and the study compared baseline data to two sections in Spring of 2012. (Fall 2011 data was not considered because different instructors were used.)
- The program will be expanded to Physics 112 in the Fall of 2012, using the Conceptual Survey of Electricity and Magnetism (CSEM) and CLASS.

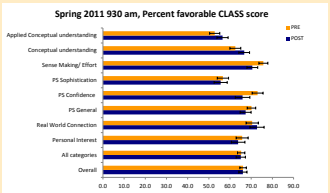
Results: Survey data from marked sections

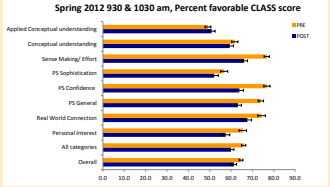
FMCE





CLASS





Conclusions

We have shown that gains in student learning can be achieved at a university that teaches a fairly large number of introductory students, but which is not a Physics Education Research institution. Going forward, we plan to continue to improve our implementation of the LA program. We have already begun to expand the implementation to the second semester introductory course, and have additional LAs coming on board to help us.

Our initial data suggest that, while our LA program is proving successful, we have room to improve our implementation to achieve higher student gains and recruit new prospective teachers. Also, in addition to improving the education of students in LA-supported courses and recruiting future teachers, the goals of the Colorado model of the learning assistant program also include engaging tenure-track faculty more in teacher education and discipline-based educational research. While this study shows improvement, this broader transformation of departmental culture to value research-based teaching is still a work in progress.

Content Data in General Physics I
(sections marked with arrows compared)

TABLE 1. Normalized content gains (average of matched pair gains) on the FMCE before and after implementing the LA program at WVU. LAs were used in Fall 2011 and Spring 2012 semesters, but lecture instructors in the fall of 2011 did not meet with LAs (see text).

Semester	Section	Instructor	Enrollment	# Pretests	# Pairs	Hake gain (%)
Spring 2011	7:30 AM section	A	72	61	41	25
Spring 2011	Honors/majors section	B	46	45	33	37
Spring 2011	Regular section*	A	115	111	96	32
Spring 2011	Regular section	C	116	105	47	6.4
Summer 2011	Regular section	A	55	55	46	32
Fall 2011	7:30 AM section	D	120	99	57	19
Fall 2011	Regular section	E	122	94	51	13
Fall 2011	Regular section	E	124	119	54	12
Spring 2012	Honors/majors section	F	23	24	21	42
Spring 2012	Regular section†	A	178	171	143	48
Spring 2012	Regular section**	A	181	168	136	47

The average pretest (posttest) scores for these sections in 2011 and 2012 were 25.6% (48.5%) and 22.4% (56.1%) respectively.

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