



Three Training Programs for Preparing Undergraduates to Conduct Research

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Overview

Three instructional formats for preparing STEM students for successful research endeavors is the focus of this project. All formats are intended to reach undergraduate students early in their academic careers. The three formats include:

- a semester long seminar,
- a one week faculty led “boot camp”, and
- a 2½ day peer mentor led short course.

The investigators attempt to keep the main topics in each format the same, although time constraints do not allow thorough review of each topic in the latter two formats. The topical content and activities cover the following areas:

- resume building,
- finding a faculty mentor
- reading and analyzing journal articles,
- understanding the different types of literature available,
- using campus library resources,
- performing a literature review,
- discussion of intellectual property,
- tips on effective presentations, and
- career guidance.

This project is a collaborative effort between institutions with experience in teaching preparatory research skills. Working together to develop the appropriate course modules for dissemination to interested institutions, the team is preparing a set of best practices and evaluating the costs associated with each format. A pre- and post-test, in the style of a concept inventory, has been developed. Initial results show similar gains in conceptual awareness at each institution. This suggests that the educational models may be transferrable and easily adopted by other institutions. To date, the team has impacted over 500 students and a web site is under development for disseminating project information.

Photos



Attributes

Retention rate of STEM students have been found to increase with participation in undergraduate research. One of the limiting factors from the mentor’s perspective is the “incubation period”. We want to provide students with the necessary skills to be successful in research. This preparation step has been described as a “research oriented” approach where students are learning specific skills needed for becoming active research participants. This is distinguished from the “research-based” courses that involve research in a course or more mentored and tutored methods.

Table 1: Overview of the Three Introduction to Research Models

	Faculty Led Boot Camp (FLBC)	Peer Mentor Short Course (PMSC)	Semester Long Seminar (SLS)
Originally Developed	Washington State (since 2007)	University of Central Florida (since 2004)	University of Wisconsin-Madison
Description	<ul style="list-style-type: none"> • 40 hours in one week • Workshop style 	<ul style="list-style-type: none"> • 2.5 days, 20 hours • Held during summer • Roundtable style 	<ul style="list-style-type: none"> • Faculty led seminar • 1 credit hour • Meets weekly • Classroom style
Unique features	<ul style="list-style-type: none"> • Very close group • Create a research poster • Mock interviews • Invited speakers • Research presentations 	<ul style="list-style-type: none"> • Includes Lab tours • Students attend a research poster session • Work closely with a peer mentor 	<ul style="list-style-type: none"> • Students choose a topic and create a literature review through a step by step process • Students attend research seminars around campus
Who teaches it?	Faculty with guest speakers	A combination of guest speakers and peer mentors working with small groups in an interactive style	Faculty with guest speakers
# of Students	20-30 (offered 3 times)	75-100 (offered 4 times)	20-30 (offered 5 times)
PI Comments	<ul style="list-style-type: none"> • Week after spring classes or week before fall classes seems ideal • Makes for a busy week but over quickly 	<ul style="list-style-type: none"> • Ideal for transfer and non-traditional students • Big undertaking to organize • Able to accommodate a large number of students 	<ul style="list-style-type: none"> • Fits into traditional schedules • Easiest to implement with no centralized research office • Less community feel for students
Student participant focus group comments	Overall high levels of satisfaction with their learning experience		
	<ul style="list-style-type: none"> • Days were long 	<ul style="list-style-type: none"> • Enjoy lab tours and meeting student researchers • Like working with peer mentors 	<ul style="list-style-type: none"> • High work load for one credit

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Assessment

To date, assessment activities include the following:

- Focus Groups – Students participate in a focus group at the end of each model (see Table 1).
- Pre/Post Test – A multiple choice test is used to assess understanding of concepts important in conducting research. The test is administered before and after each class model. Fig. 1 shows results for SLS and FLBC models. Generally, the lower a student’s pre-test score is, the higher the difference between pre- and post-test scores.

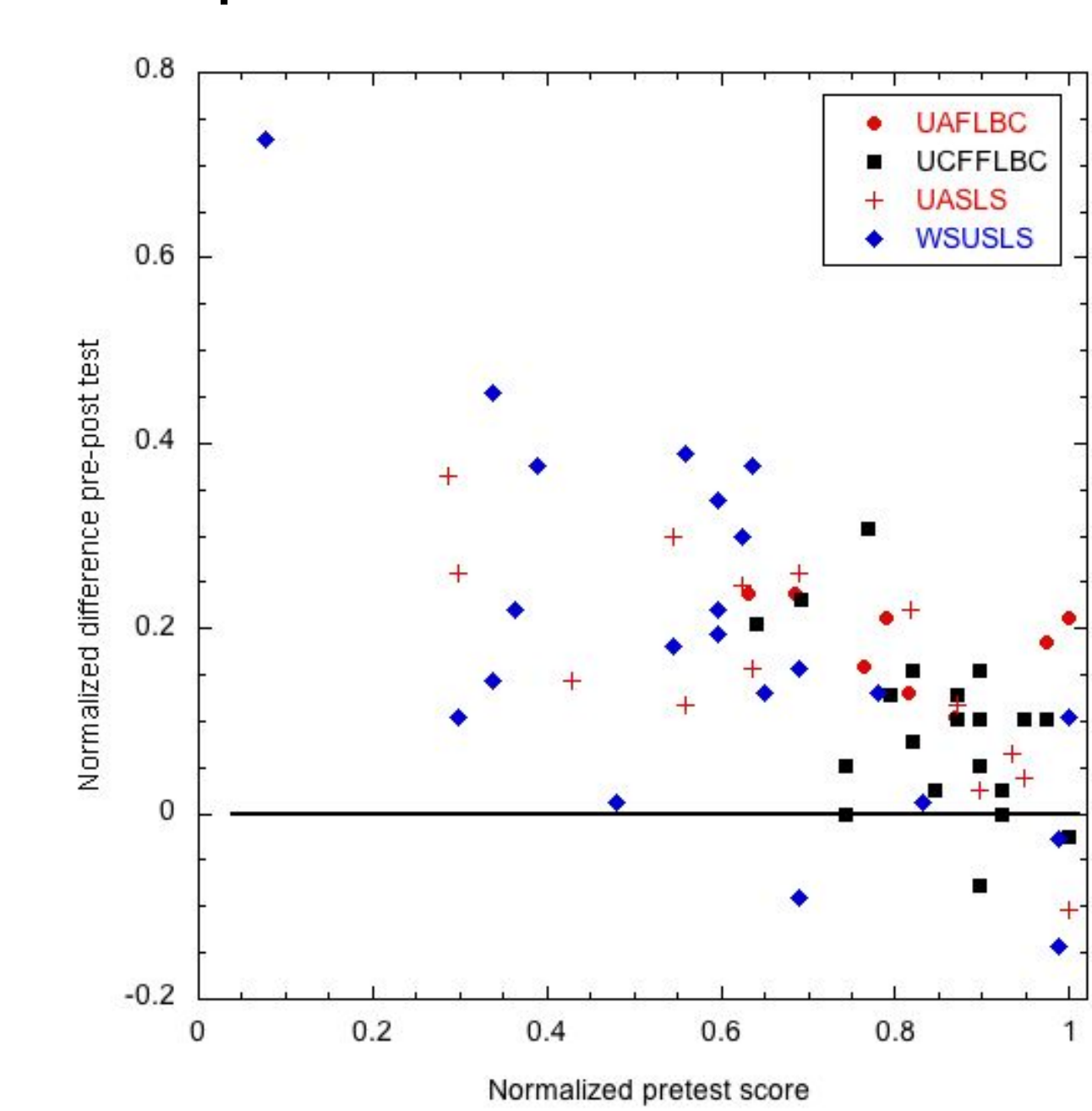


Figure 1. Normalized change in score as a function of normalized pre-test score from Semester Long Seminar (SLS) and Faculty Led Boot Camp (FLBC) students.

- Student surveys – Students complete a survey one-year after each course. Although our data set is small for students that completed one of our courses 1 year ago, Fig. 2 shows the percentage of students obtaining research positions for each institution.

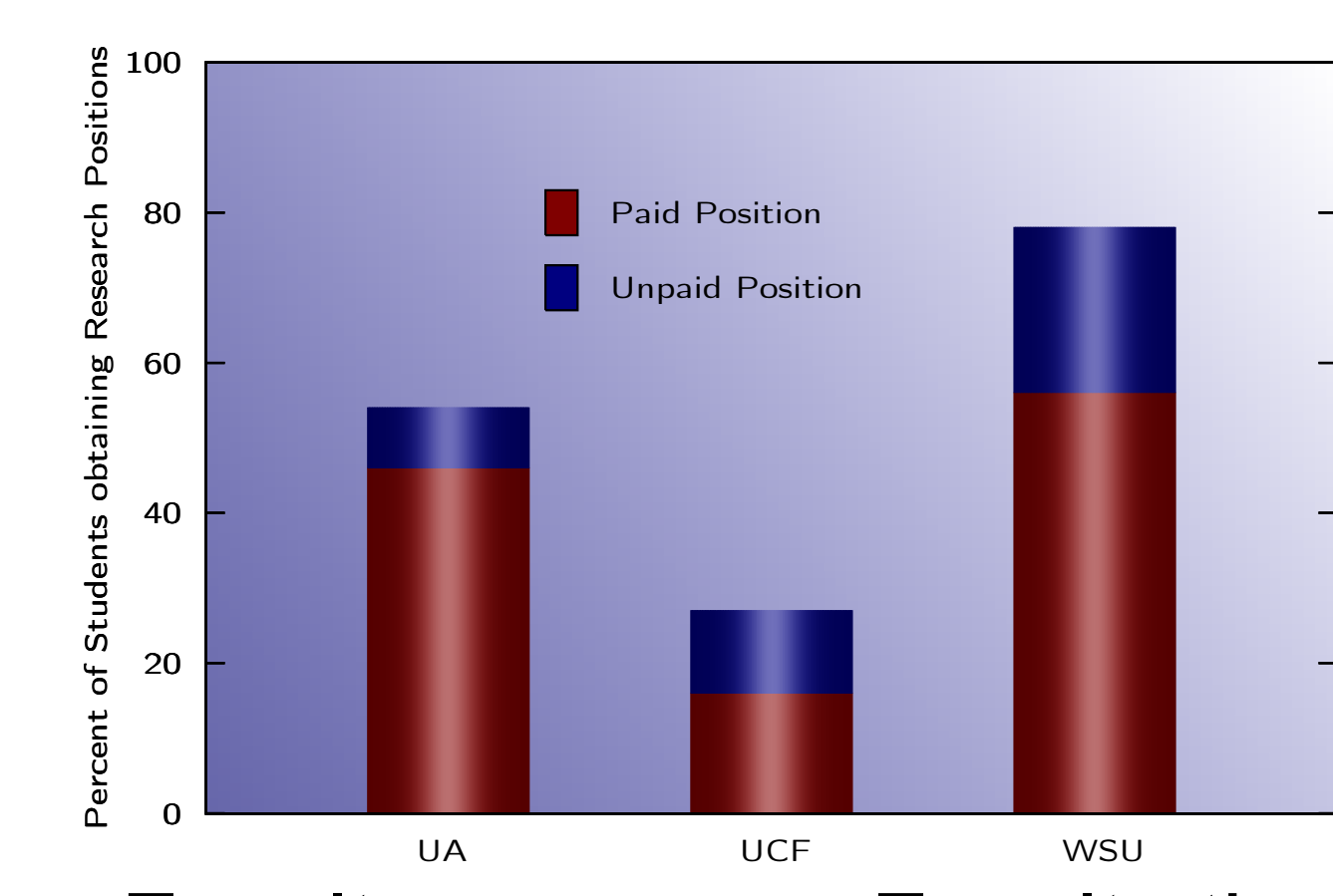


Figure 2. Percentage of students obtaining research positions one year after the course for each institution.

- Faculty surveys – Faculty that host participants in their laboratories will be surveyed to determine if these students have shorter ‘incubation’ periods (Survey ready for dissemination).

