

Undergraduate Research Annual Report
University of California, Santa Cruz
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Introduction

The University of California at Santa Cruz (UCSC) is a public research university, where professors and researchers expand the boundaries of knowledge in their fields. Many undergraduates participate in this research, which includes discovery, design, performance arts, critical analysis of primary sources, scientific investigations in social, physical, and biological sciences, and other endeavors that make original intellectual or creative contributions to a discipline. Participating in undergraduate research (UR) is a critical component of an effective undergraduate education, since it offers students the opportunity to interact personally with professors and to apply what they learn in their coursework as they engage in the practice of their discipline.

While excellent UR programs and opportunities are found throughout UCSC, prior to the summer of 2012 there was no central online location or designated individual to provide information about UR to the student community. To address this need, the Deans of Physical and Biological Sciences (PBSci), the School of Engineering, and Undergraduate Education (DUE) funded the new position of Undergraduate Research Coordinator, which I began in July, 2012. My responsibilities include creating and building a comprehensive website, *UCSC Undergraduate Research Opportunities*, ugr.ucsc.edu, presenting workshops, advising students, and providing information about UR to faculty, staff, and students. In the fall of 2015, I will move to a new position, and the UR Coordinator responsibilities will become part of the new Coordinator of Undergraduate Honors and Research Opportunities. This change presents an excellent opportunity to summarize what we have learned about UR at UCSC during the last three years and to identify priorities for the future.

This report is divided into two sections. The first section presents new data on UCSC UR participation rates and on UR website and advising utilization. In the second section, I draw on this information and my own experience to highlight students' critical need for basic information about UR.

Section 1

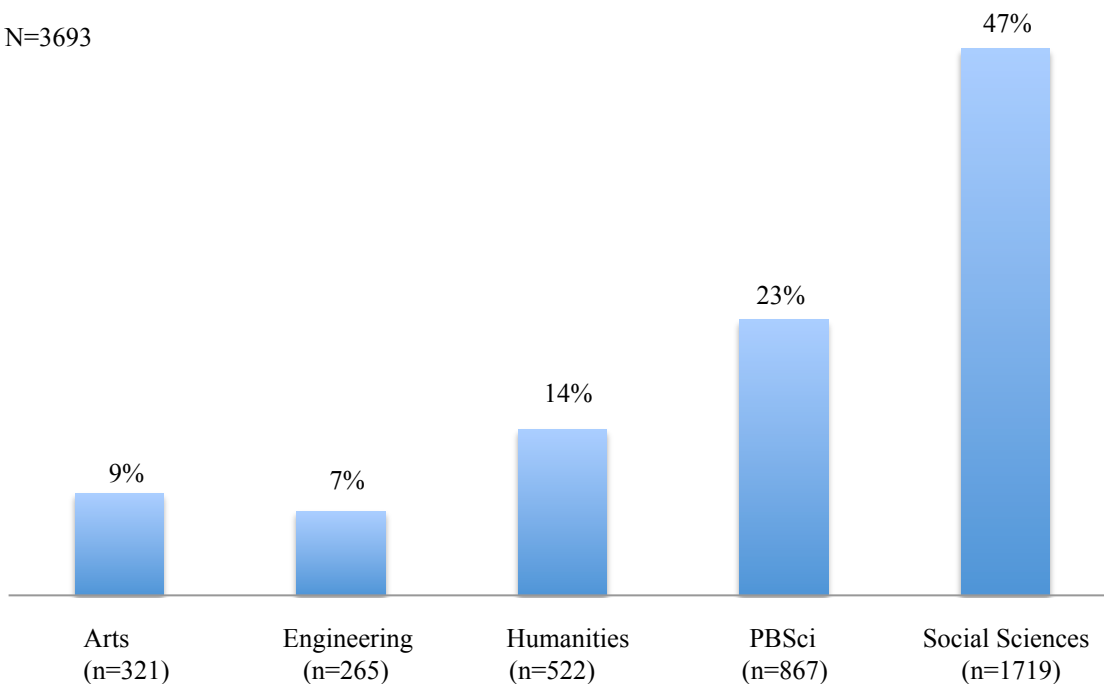
UR Participation Rates

UCSC's approximately 15,000 undergraduate students choose between more than 30 majors across the Divisions of Arts, Humanities, PBSci, Social Sciences, and the School of Engineering. As shown in Figure 1, the undergraduates are not equally distributed across the divisions. Almost half (47%) of all graduating seniors in the 2013-14 academic year

earned degrees from Social Sciences, while approximately (23%) earned degrees from PBSci. A much smaller fraction of graduating seniors earned degrees in the Humanities (14%), Arts (9%), or Engineering (7%).

Figure 1. Graduating seniors by division in academic year 2013-14. Values are rounded to the nearest whole number.

N=3693



Data source: <http://planning.ucsc.edu/irps/studentDegrees.asp>. Most Current Academic Year, 3-Quarter-Average of Undergraduate Majors, Declared & Proposed [Major Fraction](#) for current academic year, retrieved 8/21/15

Since I began this position, I have been working to rigorously quantify UCSC students' UR participation rates. Answering this apparently simple question is actually quite challenging. One source of reliable data about students is the [University of California Undergraduate Experience Survey \(UCUES\)](#), an online census survey administered every other spring quarter that asks undergraduates about their academic and extra-curricular activities. To investigate UR participation rates and how they varied across demographic groups, Dr. Sher analyzed graduating seniors' responses to the 2010 and 2012 UCUES; the results were reported in the [UCSC Undergraduate Research Annual Report, July 1, 2012-July 1, 2013](#).

The analysis suggested that about 60% of UCSC graduating seniors participated in UR, as defined in the report, though participation rates between groups varied widely. For example, reported participation rates among the UCSC divisions were higher for students in Arts and SOE (74% in Arts and 67% in SOE) relative to Social Sciences and PBSci (about 58% and 60% respectively) and a lower proportion in the Humanities (54%). In addition, the survey data indicated that UR participation rates were significantly higher for graduating seniors who entered UCSC as frosh than for those who entered as junior transfer students (60% and 50%, respectively; Chi-square test, $p < .01$).

While these data provided a reasonable first approximation of UR participation rates, we were concerned that there was not a clear definition of UR in the survey, and students in each division might interpret the questions differently. To further investigate UR participation rates, I collaborated with Dr. Sher and Dr. Richard Hughey, the DUE, to add a question to the UCSC portion of the 2014 UCUES. The new question clearly defined UR and asked if the student had participated in research or a creative activity under the supervision of a professor or had assisted a professor in his or her research or creative activity. The analysis focused on graduating seniors and investigated the role of the students' division, transfer status (if a student entered UCSC as a frosh or junior transfer), and first generation status (if a student was the first in his or her family to complete a degree at a 4 year university). The results are presented in the [Report on Undergraduate Research from the 2014 UC Undergraduate Experience Survey](#). The following figures show graduating seniors' participation in research or creative projects under faculty guidance by division (Figure 2), by transfer status (Figure 3) and by first generation status (Figure 4) as reported on the 2014 UCUES survey.

Figure 2. Graduating seniors who participated in research or creative projects under faculty guidance by division.

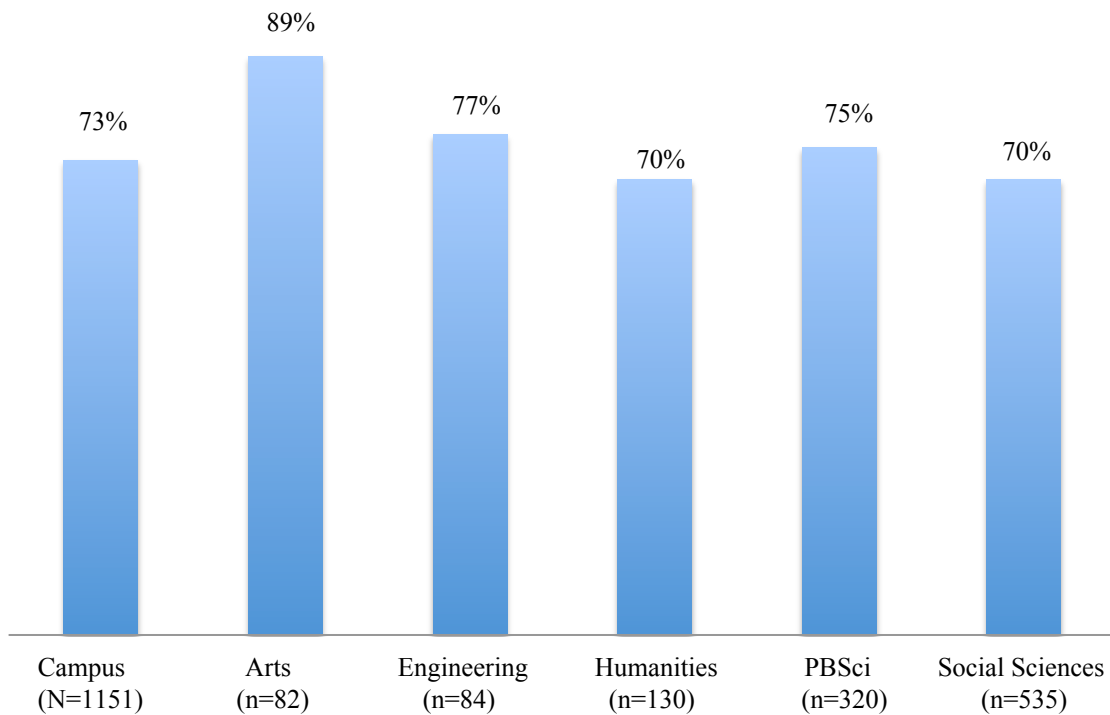


Figure 3. Graduating seniors who participated in research or creative projects under faculty guidance by transfer status.

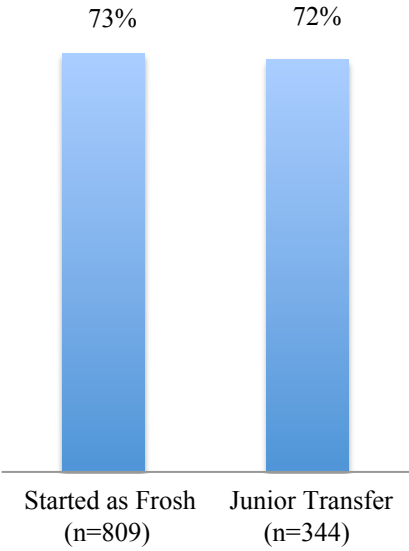
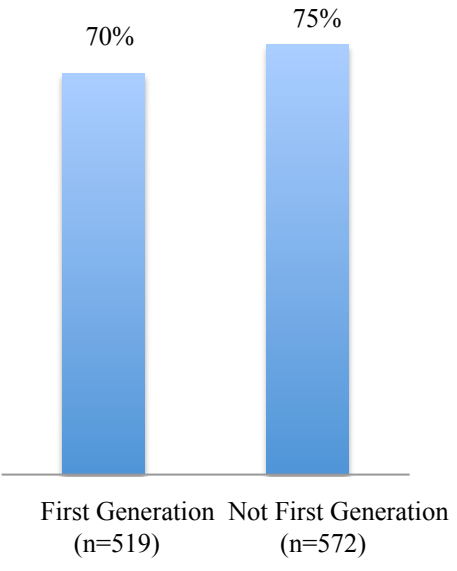


Figure 4. Graduating seniors who participated in research or creative projects under faculty guidance by first generation status.



Overall, 73% of graduating seniors reported that they had worked on research or a creative activity under the supervision of a professor or had assisted the professor in his or her research or creative activity (Figure 2). Participation rates did not vary statistically significantly by division (Figure 2), transfer status (Figure 3), or first generation status (Figure 4).

UCSC Undergraduate Research Opportunities Website

The website serves as the central online location for the UCSC community to access information about UR. I track utilization through Google Analytics, which provides detailed information going back to the site launch on October 26, 2012. The website covers a wide range of topics, including division-specific information, preparing for undergraduate research, joining a lab or research group, independent study options, and how to email professors. In addition, there is a searchable database of selected UR programs at UCSC and in the region, and brief descriptions of large, multi-site summer programs, such as the National Science Foundation Research Experience for Undergraduate Program (REU).

The following tables present website utilization data for the last three years. Table 1 shows website utilization for all users and for users with a California IP address. Table 2 shows website utilization for all new users and for all new users with a California IP address. Note that each count is unduplicated, such that a single user is counted at most once per year and once overall. Year 1 is October 26, 2012-June 30, 2013; Year 2 is July 1, 2013-June 30, 2014, Year 3 is July 1, 2014-June 30, 2015.

Table 1. Website utilization by all users and by users with a California (CA) IP address. Percentages are rounded to the nearest whole number. Each year is an unduplicated count.

Year	# Visits	# Visits with CA IP address	% Visits with CA IP address
1	13,708	10,015	73%
2	58,716	20,615	35%
3	188,732	56,037	30%
Total	261,156	66,052	26%

Table 2. Website utilization by all new users and by new users with a California (CA) IP address. Percentages are rounded to the nearest whole number. Each year is an unduplicated count.

Year	# New Users	# New Users with CA IP Address	% New Users with CA IP Address
1	9,712	6,411	66%
2	46,882	13,386	29%
3	157,237	37,787	24%
Total	212,731	44,198	21%

Website utilization grew phenomenally during the three years, from under 15,000 visits during the first year to almost 190,000 visits during the third year. While almost three quarters of visits in the first year were from users with a California IP address (73%), in the last two years the percentage of users with a California IP address fell to approximately

one-third of the number of annual visits (Table 1). Website utilization by new users follows similar patterns to utilization by all users, with the highest fraction of new users coming from IP addresses in California during the first year (66%), and then in the last two years falling to approximately one-quarter of new visits (Table 2).

Table 3 presents website utilization for users with a California IP address.

Table 3. Website utilization for users with a California IP address. Percentages are rounded to the nearest whole number. Each year is an unduplicated count.

Year	# Visits with CA IP Address	Annual % Change	# New Users with CA IP Address	Annual % Change
1	10,015	----	6,411	---
2	20,615	+106%	13,386	+109%
3	56,037	+172%	37,787	+182%

While the relative proportion of visitors with a California IP address in comparison to all visitors declined annually (Table 2), there were substantial annual increases for both all visitors with a California IP address and new visitors with a California IP address. In the second year, there was over 100% growth, and in third year, the growth was even higher, with an increase of 172% for the total number of visits of students with a California IP address and 182% for the number of new users with a California IP address (Table 3).

Utilization data for specific webpages provide insight into what specific topics are of most interest to website visitors. Table 4 shows the 10 most visited webpages during the three-year period.

Table 4. Most visited webpages during years 1-3. Numbers are rounded to the nearest whole number.

Webpage Title	# of Pageviews	% of Pageviews
Examples of Emails to Professors	211,099	49%
Homepage	37,003	9%
Join a Lab or Research Group	16,359	4%
UR Database	11,042	3%
Physical and Biological Sciences	10,546	2%
Application Dates and Tips	7,109	2%
Engineering	5,333	1%
Overview	4,369	1%
Preparing for Undergraduate Research	4,253	1%
For Students	3,872	1%

The “Examples of Emails to Professors” webpage accounts for approximately half of all pageviews in the last three years. In contrast, the next most frequently viewed webpage, the “Homepage” has only 9% of pageviews. The remaining pages contributed less than 5% of total pageviews, with the highest contributions from “Join a Lab or Research Group” (4%), the UR Database (3%), Physical and Biological Sciences (2%) and Application Dates and Tips (2%).

Student Advising

I record detailed utilization data in a FileMaker Pro database for the advising do for individual students, including student demographic information and the topic(s) addressed.

From October 26, 2012 to June 30, 2015, I provided individual advising through emails or in-person to 373 students, with 742 contacts for a total of 229 hours. Table 5 presents the most common subjects that I addressed with students. Since multiple topics are typically addressed in each communication, the total number of topics is higher than the total number of contacts.

Table 5. Topics addressed in advising for individual students in years 1-3. Percentages are rounded to the nearest whole number.

Topic	Count	% Total
How to get involved/find a lab	393	26%
Communicating with professors	251	16%
General introduction	170	11%
Summer research and programs	121	8%
Getting reference letter	112	7%
Graduate school	84	5%
CV/resume/personal statement/cover letter	57	4%
STEM Diversity Programs	57	4%
Options after graduation	47	3%
Funding	37	2%
Options with low GPA	36	2%
Eligibility	35	2%
UCSC programs, general	31	2%
Professional Development Workshops	27	2%
Other	25	2%
Post-baccalaureate programs	16	1%
UR awards	16	1%
Poster questions	10	1%
International student questions	5	<1%
How to get credit	3	<1%
Publishing	2	<1%
TOTAL	1535	

During the three-year period, students approached me for information on a wide range of topics. Approximately half of the students I advised sought my help for information related to finding a lab or research group (26%), help for communicating with professors (16%), or for a general introduction of UR at UCSC (8%). Smaller fractions of students were interested in application materials or about their options for after college, including graduate school (5%), options after graduation (3%), post-baccalaureate programs (1%).

Section 2

The new UR participation rate data presents an encouraging snapshot of UR at UCSC. I am pleased to see the evident equality in participation rates between divisions, transfer status, and first generation status. Overall, these data suggest that UCSC is doing an excellent job engaging most of our students in UR before they graduate. These data are especially compelling because the disparities between divisions and transfer status found in the first analysis were not found in the new analysis.

However, 23% of seniors who meet the academic qualifications to graduate lack this critically valuable experience. We need to commit ourselves as a community to making UR accessible to all students who graduate. An essential first step is to make sure that all undergraduates have the basic information they need so that they can prepare to become active participants in their own education.

Based on my own experience and the website and advising utilization data, students need to know:

- What UR is
- Why it is important
- That it is available in every major
- That students usually must take the initiative to contact professors
- That there are specific guidelines to follow when communicating with a professor
- That they need to build relationships with professors so that they can get advice and/or letters of recommendation

Many faculty and staff members I have met point out that the students have been given this information many times. From the first quarter, students are repeatedly reminded that participating in UR is one of the most important benefits for coming to UCSC and that it is critical for the student's success to go to office hours and to interact with professors. However, in my experience, many students, especially frosh in fall quarter, are intensely focused on simply adjusting to and learning to negotiate the university.

Providing basic information about UR to all frosh would be challenging, but feasible. Since they take a required writing class at their colleges, undergraduate peer advisors from that college could make short presentations at the winter quarter class and be available to answer questions. The students could be directed to the website and encouraged to build relationships with professors.

Providing this information to transfer students, however, is more difficult. They need the information sooner, since their time at UCSC is limited. I am not aware of any opportunity to reach all transfer students; each division and department would need to identify the most appropriate time.

The establishment of an Undergraduate Research Center in a highly visible, central location could demonstrate a university wide commitment to UR. In my second annual report, I

outlined a proposal for such a center that extensively utilized peer mentors. Staff at the Center could coordinate the hiring and training of peer mentors to both staff the center and to provide presentations to students. Once students know that UR is an option, there are clearly more advanced topics, such as funding and applying to graduate school, that could be addressed by workshops on site.