SRC Education Alliance
Undergraduate Research Opportunities
Year 1 (2009-2010) Final Report

Introduction

The first year of the Undergraduate Research Opportunities (URO) program was supported by a generous grant from the Intel Foundation. Funds from this grant have supported a total of 230 students at 14 universities over the term of the grant. Students have been involved in research projects for the academic year and/or the summer, working with a faculty advisor and, in most cases, a graduate student mentor. All programs included workshops and other opportunities for student learning and interaction. SRCEA leveraged its strengths and networks to add value to a program already producing outstanding results.   SRC's experience in working with top faculty and ability to leverage its connections to these faculty have proved valuable in creating the Faculty Resource Center which promises to be a very exciting addition to this program. SRC has also leveraged its experience in building industry/faculty/student networks by inviting URO Program Managers and students to be part of TECHCON, SRC's annual technical conference. SRC provided the keynote speaker for the year-end event at UCLA and included GA Tech URO students in an SRC research review on that campus. In addition, SRC was able to leverage its government connections to secure three internships at Brookhaven National Laboratory for URO students. SRC has also facilitated quarterly WebEx Conferences for the Program Managers, encouraging an exciting exchange of ideas and best practices.

Participating Universities

Each of the URO programs is managed by an on-site Program Manager, which is a real strength of the overall program. Programs varied from campus to campus as Program Managers pursued methodologies that worked best in their environment, but all included the basic elements of mentored research and a cohort setting. Both UCLA and the University of Texas/Austin had two separate programs working under one grant during the first year so that there were sixteen programs on fourteen campuses. Participating universities included:

Carnegie Mellon University	Purdue University
Cornell University	University of Michigan
Georgia Institute of Technology	University of California/Berkeley
Howard University	University of California/Los Angeles
North Carolina A&T University	University of Illinois/Urbana-Champaign
Oregon State University	University of Washington
Portland State University	University of Texas/Austin

Student Participation/Demographics

Two hundred thirty students from 14 universities participated in the first year of the URO program, 147 during the academic year, and 115 during the summer of 2010. Student information was collected with a New Student Form which included the student's permission to use the provided information in aggregate. The URO students are pursuing a variety of research projects in engineering and science

disciplines under the direction of faculty and graduate student mentors.   All programs have met the demographic/student participation requirements listed in their proposals with the exception of one. One program was unable to meet a goal for recruiting visiting students from other URO programs for a summer segment. SRC views this as a very desirable outcome and other programs have expressed interest. SRC plans to work with all interested programs to make this exchange happen during the second year of the URO program.

The URO program includes a focus on diversity; all programs include women and underrepresented ethnic minority students in their cohort. All programs except one reported a diverse population in terms of gender; the exception is the program at NC A&T which is made up entirely of ethnic minority women. The total population for this first year is described as follows:

57% Male   43% Female

17% Freshmen 31% Sophomores   34% Juniors   18% Seniors*

*Level is based on expected graduation date, i.e., students classified as freshmen will graduate in 2013 and are currently in the summer after their freshman year, most of them having joined the program in the summer term.

	Hispanic Male	Hispanic Female	Af Am Male	Af Am Female	Caucasian Male	Caucasian Female	Asian Male	Asian Female	Other Male	Other Female
Gender Split	11%	3%	8%	7%	18%	18%	9%	9%	7%	5%
Combined Gender	14%		15%		37%		17%		12%	
Unreported Gender	0%		2%		0%		0%		2%	

Program Managers were encouraged to identify a mix of students with great potential as well as those with high academic achievement. Their success is reflected in GPAs ranging from 2.6 to 4.0 for an average GPA of 3.5. All schools reporting GPAs included a wide range (one school did not report GPAs because of university restrictions).

Of the 31 students completing their undergraduate degrees during this first year of the URO Program, all are in STEM disciplines and 21 will continue to graduate school in STEM disciplines (on additional student will attend law school).   Of special note is Patrick Tuen, UC/Berkeley, who will continue at UC/Berkeley as an IBM/SRC Graduate Fellow. Anthony Erlinger, UCLA, will continue as a GRC Master's Scholar at Columbia, and Eric Padilla, UCLA, will continue as an Intel Foundation/SRCEA Master's Scholar at Arizona State. At least 3 other URO graduates will continue their graduate study on SRC-funded research.

Of the students not graduating, Program Managers anticipate that 75% will continue in the URO program in its second year and, therefore, will definitely retain in a STEM discipline. Those that leave the program are most likely to do so because of class load so the percentage retaining in a STEM discipline will be higher.   Total retention in STEM disciplines (graduates and anticipated to continue in the program) is 86%.

Student Events

All programs reported structured on-campus events where students presented their research, some through presentations, some through poster sessions. Program Managers reported student participation in a number of workshops focusing on graduate school opportunities, some led by faculty and some by graduate students. Overall, the programs reported that students co-authored seven journal articles (in one case, the student was the first author), made 118 presentations outside their research groups, received four university-level awards for outstanding research, and one was included as an inventor in a patent application.

The SRC URO programs are part of larger programs at each university so students participate in a variety of larger events, especially in the spring term, in addition to ongoing regular program events. Larger events in which URO students participated included:

- Meeting of the Minds at Carnegie Mellon University where eight URO students presented their research in poster sessions
- CENS SRC Event at UCLA included student poster sessions and the keynote delivered by Dr. Celia Merzbacher, SRC Vice President for Emerging Initiatives
- Eighth Annual Research Awards Banquet at Georgia Tech that included poster presentations from teams of URO students with two URO students receiving Presidential Undergraduate Research Awards
- 2010 Engineering Discovery Showcase and Mesa Day at Portland State each included five URO student presenters
- CAL Day at UC/Berkeley included five URO student poster presentations
- Engineering Learning Initiatives Undergraduate Research Poster Session at Cornell included URO students
- CEED's 6th Annual Undergraduate Research Poster Competition at UCLA will include five URO summer students
- The Undergraduate Research Symposium at UIUC included a separate poster session for URO students
- URO students participated in poster presentations at the EOE Excellence Awards Banquet at UT/Austin
- Pacific Northwest Symposium on Graduate Education for Women in Engineering included URO students from Oregon State
- The Howard University Undergraduate Research Symposium included a presentation by two URO students
- Three NC A& T URO students placed in poster or oral presentations at the Beta Kappa Chi National Institute of Sciences Conference in New Orleans
- URO students at the University of Washington participated in the Annual Undergraduate Research Symposium that included 750 student presentations

Students had ample opportunities to share and gather information about research, graduate education, and careers. Regularly scheduled activities included:

- More than 140 workshops on various subjects, e.g., applying to graduate school, financing graduate school, ethics in engineering, research presentation, etc.
- Seminars with faculty and graduate student participants on technical subjects and career opportunities
- Regular research discussions/presentations by participating students within their research groups

Opportunities Created by SRCEA

Besides providing a greater data tracking capability, SRCEA has developed several program elements that have added direct value for students in this first year. Students completing their undergraduate degree in 2010 could opt in to a Faculty Resource Center that provided their information to SRC-funded faculty at universities identified by the students as being of interest. A follow-up survey of these faculty determined that the set of information provided is the correct set and useful for faculty in recruiting for their research programs. The responding faculty recommended that the information be provided earlier next year. SRCEA will meet that request and also include a broader spectrum of faculty, including all faculty participating in the URO program.

Graduating URO students were also included in the distribution of application information for SRC-funded scholarships and fellowships. Three students were successful in competing for these highly competitive awards. SRC awarded an IBM/GRC Fellowship to Patrick Kwong at UC/Berkeley, an Intel Foundation/SRCEA Master's Scholarships to Eric Padilla at Arizona State University and a GRC Master's Scholarship to Anthony Erlinger at Columbia University.   At least three more students joined SRC-funded research projects and so will be funded through SRC contract funding for their graduate work.

SRCEA was able to facilitate summer opportunities including one internship at Intel and several student exchanges among the participating universities.   The beginning of what we anticipate will be an ongoing relationship with Brookhaven National Laboratory was created with three URO students receiving internships, with support from IBM as well as from Intel.   Two students from the University of Illinois/Urbana-Champaign and one from the University of Michigan are participating in this opportunity. Summer opportunities will be an area of focus in the second year of the URO program.

Another outstanding opportunity for networking with the SRC community, including some of the country's most outstanding graduate students and faculty, is provided at TECHCON, SRC's annual technical conference. Program Managers were invited to participate in TECHCON 2009 to help them understand the SRC community and the opportunities it offers to undergraduates. At TECHCON 2010, 30 URO students will present their research in poster sessions throughout the two-day conference. They will also have structured events with graduate students and industry representatives and will participate in the technical sessions. Each URO student will be assigned a graduate student "guide" who will help them navigate the events and provide "on the spot" mentoring.

SRCEA has also worked to promote an exchange of ideas and best practices among the Program Managers. A web page that is restricted to the Program Managers provides a forum for posting information of common interest, e.g., summer research opportunities and workshop materials. A quarterly WebEx teleconference has fostered a very lively exchange of information and best practices and has created a sense of community among the Program Managers and with SRCEA staff.

SRCEA staff visited several participating universities, allowing a direct interaction with students and faculty. On-site visits were made by Virginia Wiggins to UCLA, Georgia Tech, and Carnegie Mellon. Celia Merzbacher visited UCLA in the spring and delivered the keynote address at the end-of-year event. Dr. Merzbacher also visited the University of Washington. The intention next year is to visit each of the programs on-campus.

Results
In addition to the demographic results detailed earlier in this report, students were surveyed upon entering the program for career interests and their reasons for joining the URO program.   Seventy-three percent of survey respondents said they intend to go to graduate school in a STEM discipline; it should be noted that many of these students had previously participated in undergraduate research.   Of the two graduating students who originally said they would not go to graduate school, one is going to Harvard in a STEM discipline. Of the six graduating students who said they were undecided, two are going to graduate school in STEM disciplines, and one is working in a university lab still trying to decide. Career interests included industry research and development, energy, programming, academia, biomedical, nanotechnology, consulting, educational game development, artificial intelligence, materials science, theoretical physics, and "programming robots to do stuff." A few were interested in careers outside high tech industries, e.g., patent law. And, of course, some are not sure where their career interests lie.

Many reported that friends or faculty suggested the URO program to them, and they participate primarily because research is interesting. They want to explore various research projects and prepare for graduate school. Several said the stipend makes a difference.

Students were also surveyed for attitudinal changes from the time they enter the program until they either graduate or leave the program. Not all forms have been received for graduating students, but of those that have responded, 65%, reported a very positive experience with the URO program.

Going Forward
Considerable effort has been applied during this first year of the URO program to develop sources of funding to compliment the Intel Foundation grant.   SRC is focusing on developing support from three types of sources: Corporate, Government, and philanthropic (individual and foundation). Exploration and relationship building continues with SRC member companies and other companies outside the SRC community but with a strong interest in STEM education.   SRC is in discussions with managers responsible for funding higher education programs at the National Science Foundation and the Department of Defense regarding possible partnerships and funding. A campaign is being developed to

reach out to SRC alumni and "friends" and provide opportunities to give back to the Education Alliance by supporting the URO. SRCEA anticipates having additional staff dedicated to the URO program in 4Q2010, which should greatly enhance fund raising initiatives.

Intel Foundation has committed funding to continue the URO program for a second year. Grants to the same set of universities that participated in the first year of the URO program are in place for the second year. If additional funding is identified, these grants could be increased or additional programs could be established. SRCEA views the URO program as an ongoing initiative and anticipates that it will quickly become a strong feeder to SRC research initiatives at the graduate level. However, for that vision to become reality, additional sponsors must be identified to provide both funding and industry interaction. Developing this sustaining support system will be a primary focus of the second year of the URO program.