

Materials Connection REU Site (MacREU R'Side)
Evaluation, 2015*

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Abstract

This is the evaluation for the third year of the MacREU-UCR REU site. Overall, the program performed very well in exposing students to science and engineering, building their scientific skills and encouraging them to pursue a PhD. As we report in the first year's evaluation (2014), the program's first year had a number of organizational challenges; virtually all of these challenges were overcome in 2015 and the second year evaluation of the program showed that the students gained considerable research skills and professional development that year in every respect we measured. This evaluation shows that on every measure, the 2016 program equaled or exceeded the already very strong results of the second year..

1 Introduction

“Materials Connection REU” (MacREU R’Side) was a 10 week REU site in which 18 undergraduate students, mostly from Southern California colleges, had the opportunity to conduct research in science and engineering labs on the UCR campus in the summer of 2014. The students came from demographic groups that are under-represented in STEM fields, and were carefully selected among applicants as those who were at risk of not pursuing a career in science.

All of the students’ research projects were related to the growth and application of thin films or monolayer materials. Students were placed in a variety of labs within the Materials Science and Engineering program. Participants are exposed to a wide area of fields from catalytic chemistry to semiconductor processing and from solar cell manufacture to the improvement of medical devices. To learn more about the MacREU site at UCR, visit <http://macreu.ucr.edu/>. At this site, one can view short video presentations from each of the students that describes their research and experience in the program.

This evaluation draws on the REU survey template available on the “Student Assessment of Learning Goals” website <http://salgsite.org>, providing both qualitative and quantitative evaluation data.

Overall, the third year of the program well met its academic goals of exposing students to research, building their academic research skills, and gaining their interest in pursuing science and engineering as a career at the PhD level. In every measure in this evaluation, the 2016 program equalled or exceeded the extremely strong results we observed from the 2015 program. In sum, the program was a strong success and met its goals of instilling an interest in science and engineering among students from under-represented backgrounds.

2 Student Assessment of Learning Goals Survey Results

In this section, we present the results of a survey we administered to the 18 participating students, and 17 of these students filled out a survey. The survey comes from a template for REU evaluations available at the Student Assessment of Learning Goals website. We used this website to administer the survey and to generate the figures showing results.

Overall, the program well met its goals of introducing students to scientific research as a career and helping them to build capacity for conducting scientific research. This can be seen for example in Figure 1. In this section of the survey, students were asked to rate their own gains from the program in learning how to think scientifically and work like a scientist, and to apply scientific knowledge to research. On average, students report good to great gains in skills such as analyzing data for patterns, formulating a research question and understanding theory and concepts. While there is a little variability in responses, virtually all students report great gains in developing this capacity such that each of the confidence intervals exceeds the good category. This shows an improvement compared to year 1’s responses on these items, in which many of the confidence intervals overlapped the good category.

Gains in THINKING AND WORKING LIKE A SCIENTIST: APPLICATION OF KNOWLEDGE TO RESEARCH WORK.

1. How much did you GAIN in the following areas as a result of your most recent research experience?	1:no gains	2:a little gain	3:moderate gain	4:good gain	5:great gain	9:not applicable	Mean	N
1.1 Analyzing data for patterns.	0%	5%	10%	30%	35%	5%	4.2	16
1.2 Figuring out the next step in a research project.	0%	0%	0%	30%	55%	0%	4.6	17
1.3 Problem-solving in general.	0%	0%	5%	35%	45%	0%	4.5	17
1.4 Formulating a research question that could be answered with data.	0%	5%	10%	25%	45%	0%	4.3	17
1.5 Identifying limitations of research methods and designs.	0%	0%	0%	30%	55%	0%	4.6	17
1.6 Understanding the theory and concepts guiding my research project.	0%	0%	0%	25%	60%	0%	4.7	17
1.7 Understanding the connections among scientific disciplines.	0%	0%	0%	35%	50%	0%	4.6	17
1.8 Understanding the relevance of research to my coursework.	5%	0%	0%	30%	50%	0%	4.4	17

Summary of scale results

The graphic below lists the mean and confidence interval (± 3 times the standard error) for each item.

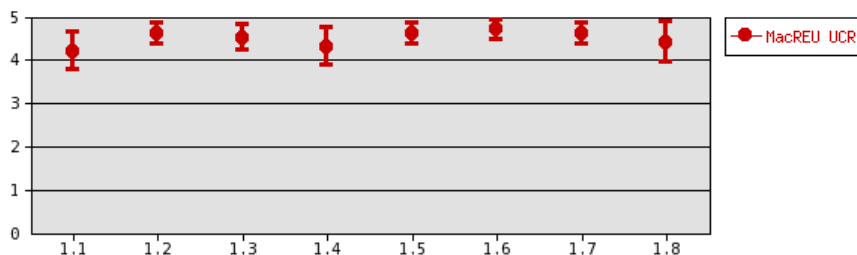


Figure 1: Gains in Thinking and Working Like a Scientist

Likewise, in figure 2 students reported considerable personal gains in their own capacity to do research, in areas such as their own ability to contribute to science, their confidence to do well in future science courses, and understanding what everyday research is like. Like in Figure 1, in no case did a confidence interval around a question mean include only a good level of gain response, and again showing an improvement over year 1.

Figure 3 also presents considerable evidence that students improved their professional skills such as how to prepare a scientific poster, keeping a detailed lab notebook and understanding journal articles. Students tend to report good gains in these skills across the board.

Figure 4 continues to support the view that students gained in their self-efficacy for conducting research, where students typically indicated they gained a fair amount or a great deal in their own feelings of efficacy in engaging in real-world science research, feelings of responsibility for their research project, feeling part of the scientific community, confidence in their own ability to try out new ideas or procedures on their own and interacting with scientists from outside of the school.

Overall, students rated the quality of their research experience as very good, including their working relationships with their research mentor, the amount of time doing

PERSONAL GAINS RELATED TO RESEARCH WORK

2. How much did you GAIN in the following areas as a result of your most recent research experience?	1:no gains	2:a little gain	3:moderate gain	4:good gain	5:great gain	9:not applicable	Mean	N
2.1 Confidence in my ability to contribute to science.	0%	0%	10%	30%	45%	0%	4.4	17
2.2 Comfort in discussing scientific concepts with others.	0%	0%	10%	15%	60%	0%	4.6	17
2.3 Comfort in working collaboratively with others.	0%	0%	0%	20%	65%	0%	4.8	17
2.4 Confidence in my ability to do well in future science courses.	0%	5%	0%	35%	45%	0%	4.4	17
2.5 Ability to work independently.	0%	5%	15%	25%	40%	0%	4.2	17
2.6 Developing patience with the slow pace of research.	0%	10%	5%	30%	40%	0%	4.2	17
2.7 Understanding what everyday research work is like.	0%	0%	5%	10%	70%	0%	4.8	17
2.8 Taking greater care in conducting procedures in the lab or field.	0%	0%	10%	20%	55%	0%	4.5	17

Summary of scale results

The graphic below lists the mean and confidence interval (± 3 times the standard error) for each item.

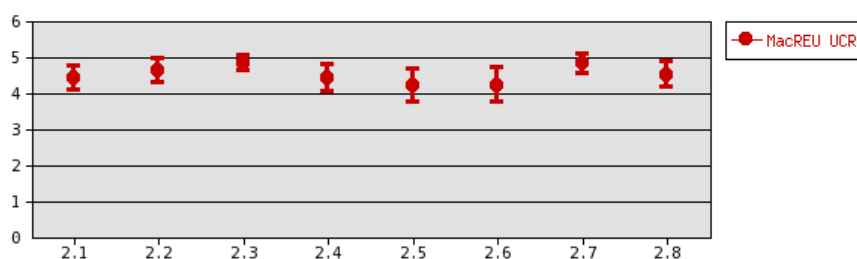


Figure 2: Personal Gains Related to Research Work

meaningful research and the overall experience, and the amount of time spent with their mentors and getting advice from their mentors about graduate schools. The questionnaire also give students an opportunity to add more thoughts on the quality of their research experience and they wrote as follows.

- I really enjoyed my lab. They were so welcoming and taught me a lot about myself and science overall. I was hands on in what it will be like in grad school and did techniques that will help me when I enter industry and graduate school.
- My mentor and group were superb to say the least. They assisted me in understanding the real world applications of my work.
- This experience has given me great insight towards my future in graduate school and research.
- Enjoyed working in the lab a lot, wish I could have more time to work
- My mentor was over good, and answered my questions. However the first few weeks, there was not much I could do and seems as if the mentors were not as prepared to have an intern.

Gains in SKILLS

3. How much did you GAIN in the following areas as a result of your most recent research experience?	1:no gains	2:a little gain	3:moderate gain	4:good gain	5:great gain	9:not applicable	Mean	N
3.1 Writing scientific reports or papers.	5%	5%	20%	25%	30%	0%	3.8	17
3.2 Making oral presentations.	0%	0%	5%	30%	50%	0%	4.5	17
3.3 Defending an argument when asked questions.	0%	5%	15%	40%	25%	0%	4.0	17
3.4 Explaining my project to people outside my field.	0%	0%	0%	30%	55%	0%	4.6	17
3.5 Preparing a scientific poster.	0%	5%	0%	30%	50%	0%	4.5	17
3.6 Keeping a detailed lab notebook.	5%	15%	10%	20%	30%	5%	3.7	16
3.7 Conducting observations in the lab or field.	0%	10%	10%	30%	35%	0%	4.1	17
3.8 Using statistics to analyze data.	5%	10%	10%	35%	10%	15%	3.5	14
3.9 Calibrating instruments needed for measurement.	5%	5%	5%	25%	45%	0%	4.2	17
3.10 Working with computers.	0%	5%	15%	20%	40%	5%	4.2	16
3.11 Understanding journal articles.	5%	0%	25%	20%	35%	0%	3.9	17
3.12 Conducting database or internet searches.	0%	5%	20%	25%	35%	0%	4.1	17
3.13 Managing my time.	0%	5%	20%	35%	25%	0%	3.9	17

Summary of scale results

The graphic below lists the mean and confidence interval (± 3 times the standard error) for each item.

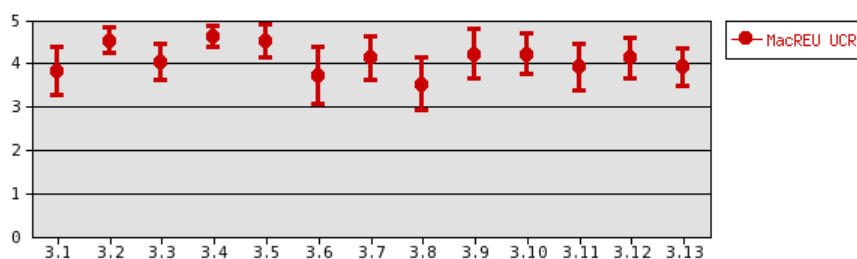


Figure 3: Gains in Academic Skills

- I think it was really nice to be placed with a mentor that also attended a community college because he was able to advise me on more aspects than just research, like what classes to take in community college versus saving for transfer which was really nice
- I felt welcome in my lab. Everyone was very supportive of my work. My graduate mentor and my PI both told me about opportunities in research that may be even more in-line with my interests and academic goals, such as a computational physics approach to the same research. In addition, my graduate mentor also always made time for either lunch or coffee to share her graduate experience as well as answer any questions that I had about grad school. There were often times when I wasn't working on an experiment, but I used that time to educate myself and collect relevant articles. Overall it was a very fulfilling and intellectually stimulating experience, and the applications of the research was in an area that I care about.
- I really enjoyed the partnership my research mentor and I formed

The following questions ask about your overall research experience and about any changes in your attitudes or behaviors as a researcher.

4. During your research experience HOW MUCH did you:	1:none	2:a little	3:some	4:a fair amount	5:a great deal	9:not applicable	Mean	N
4.1 Engage in real-world science research	0%	0%	0%	35%	50%	0%	4.6	17
4.2 Feel like a scientist.	0%	0%	5%	5%	75%	0%	4.8	17
4.3 Think creatively about the project.	0%	0%	15%	25%	45%	0%	4.4	17
4.4 Try out new ideas or procedures on your own.	0%	5%	20%	30%	30%	0%	4.0	17
4.5 Feel responsible for the project.	0%	5%	15%	20%	45%	0%	4.2	17
4.6 Work extra hours because you were excited about the research.	0%	10%	10%	5%	60%	0%	4.4	17
4.7 Interact with scientists from outside your school.	0%	5%	5%	20%	55%	0%	4.5	17
4.8 Feel a part of a scientific community.	0%	0%	0%	30%	55%	0%	4.6	17

Summary of scale results

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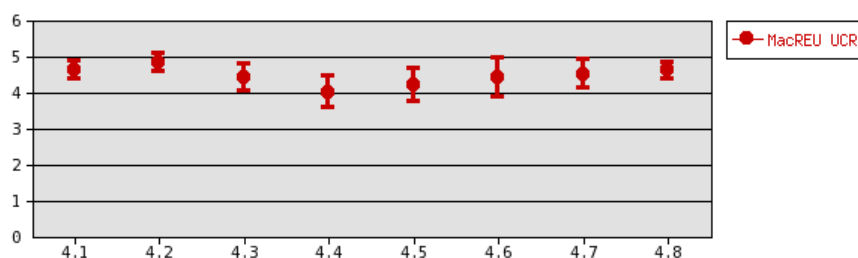


Figure 4: Attitude and Behavioral Changes

- I very much enjoyed the opportunity to have a single mentor and be able to work and learn directly from him. My mentor and lab where great contributions to my experience and I feel like I could not have been put into a more fitting lab.

Figure 6 summarizes the research communication activities students participated in. The program expected students to prepare a scientific poster as a part of the program, and most of them indicated that they either presented the poster or planned to present it. The program did provide students an opportunity to prepare a talk, but they did not have the opportunity to attend a conference or publish a paper during the summer session, but the large majority plan to do these activities subsequently.

Figure 7 continues to lend support to our belief that the program enhanced students' interest in science and engineering as a career, typically indicating that the program confirmed and clarified their scientific career interests.

Figure 8 also confirms that the program enhanced students' expectations and interests in pursuing research and science as a career, indicating gains in interest in enrolling in a STEM PhD or masters' program and working in a science lab. The program did not enhance students' interest in medical, dental or law school which is expected. This figure overall indicates both the effectiveness of the program in enhancing students' interest in science and also that the program did not typically select students already on the science

These questions ask about your research experience.

5. Please rate the following:	1:Not applicable	2:Poor	3:Fair	4:Good	5:Excellent	Mean	N
5.1 My working relationship with my research mentor	0%	0%	5%	25%	55%	4.6	17
5.2 My working relationship with research group members.	0%	0%	5%	20%	60%	4.6	17
5.3 The amount of time I spent doing meaningful research.	0%	0%	15%	40%	30%	4.2	17
5.4 The amount of time I spent with my research mentor.	0%	0%	5%	45%	35%	4.4	17
5.5 The advice my research mentor provided about careers or graduate school.	0%	0%	5%	40%	40%	4.4	17
5.6 The research experience overall.	0%	0%	5%	20%	60%	4.6	17
5.7 Please comment on any of these aspects.	Enter codes for text answers					--	9

Summary of scale results

The graphic below lists the mean and confidence interval (± 3 times the standard error) for each item.

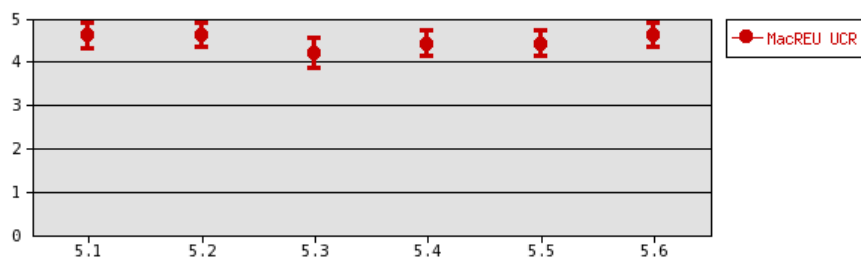


Figure 5: Quality of Research Experience

track, since if students entered program on a science career track they also would have indicated no gains.

The questionnaire also asked them to type in their intended degree and, “compared to your intentions BEFORE doing research, HOW LIKELY YOU ARE NOW to enroll in a graduate program leading to an advanced degree.”

- My intentions were to always go to graduate school then work for a cosmetic company to be a cosmetic chemist and doing this program reassured that I am on the right path to what I want to achieve.
- My intended degree is in Chemical engineering, however after this experience I intend to get a masters or PhD in Material Science and Engineering
- I majored in biology , I was not sure what route I wanted to take with it but after this experience I am certain that I am interested in pursuing chemical and materials engineering. I also hope to be an instructor sometime in my career.
- My intended degree is Material Science and Engineering, before doing research my intention was to work in the aerospace industry. I am now mostt likely to pursue my Ph. D.
- Chemistry, planning on doing MD/PhD now

Research experience

6. As part of my most recent research experience...	1:yes	2:no	:	:	:	:	Mean N
6.1 I presented a talk or poster to other students or faculty	80%	5%					-- 17
6.2 I presented a talk or poster at a professional conference	25%	60%					-- 17
6.3 I attended a conference	25%	60%					-- 17
6.4 I wrote or co-wrote a paper that was published in an academic journal	5%	80%					-- 17
6.5 I wrote or co-wrote a paper that was published in an undergraduate research journal	0%	85%					-- 17
6.6 I will present a talk or poster to other students and faculty	75%	10%					-- 17
6.7 I will present a talk or poster at a professional conference	85%	0%					-- 17
6.8 I will write or co-write a paper to be published in an academic journal.	40%	45%					-- 17
6.9 I will write or co-write a paper to be published in an undergraduate research journal.	20%	65%					-- 17
6.10 I won an award or scholarship based on my research	0%	85%					-- 17

Figure 6: Research Activities

- I want to stay in the engineering field however I would like to get a master or PhD in Materials or Mechanical.
- M.S. or Ph.D.
- I am more likely to pursue a degree because it is very important to understand advanced science for particular jobs and graduate school is the perfect option.”
- My goal is to get a PhD degree in either physics, applied physics, or material science and engineering. Although I had the inkling before that I want to pursue a graduate education in these areas, I wasn’t sure if I would want to be working in a lab all day every day. However, after participating in the MacREU program, I found how fun, intellectually stimulating, and rewarding research can be. After participating in this program I have no doubt that I will pursue an advanced degree in one of these fields.
- Before I was intimidated at the prospect of finding research I enjoyed for graduate school, now I am a bit more informed about it.
- Before this research experience I had the intent of attending graduate school but with the help of the program I feel much more prepared for my own graduate student years

The questionnaire included an open-ended question asking students to reflect on how their research experience influence their own thinking about future career and graduate school plans. The students wrote,

Research experience

7. Rate how much you agree with the following statements.	1:Strongly disagree	2:Disagree	3:Agree	4:Strongly agree	Mean	N
7.1 Doing research confirmed my interest in my field of study.	0%	0%	45%	40%	3.5	17
7.2 Doing research clarified for me which field of study I want to pursue.	0%	10%	35%	40%	3.4	17
7.3 My research experience has prepared me for advanced coursework or thesis work	0%	15%	25%	45%	3.4	17
7.4 My research experience has prepared me for graduate school.	0%	0%	40%	45%	3.5	17
7.5 My research experience has prepared me for a job.	0%	0%	50%	35%	3.4	17

Figure 7: Effects of Research Experience on Personal Advancement

- My research experience confirmed that I wanted to pursue medical school and biomedical research as a second option.
- It showed me how hard grad students work and now I have to decide if that amount of work for reward is suited for me, or if industry is my path.
- It showed me how graduate school is such as troubleshooting and having patience when things do not go your way. Also, utilizing techniques that will help me in my future plans only strengthens my knowledge I need in my particular field.
- Before partaking in MacREU I was just planning on trying to get a job out right out of college and start my career. Now I plan on entering a graduate school and furthering my education
- Research confirmed a lot for me but, it confirmed most of all that I want to attend graduate school and become a teacher at the college level.
- I was unsure about enrolling in graduate school or even considering a Ph.D but after seeing that I was more than capable of doing challenging science that kept me eager to get back into lab, I knew that was the feeling I wanted to pursue as a career. I will be attending graduate school.
- I am now considered double majoring in Computer Science and Material Science because as I conducted research I found areas where writing simple programs or scripts can solve simple issues.
- Think research isn't that bad, MD/PhD would be nice
- My research experience got me interested in attending graduate school instead of going straight into the industry after graduation.
- I want to pursue a degree, but will possibly look for a future employer to pay for costs. Becoming familiar with the GRE has given better insight into what is expected for the application process.

Research experience

8. Compared to your intentions BEFORE doing research, HOW LIKELY ARE YOU NOW to:	1: not more likely	2: a little more likely	3: somewhat more likely	4: much more likely	5: extremely more likely	9: not applicable	Mean	N
8.1 enroll in a Ph.D. program in science, mathematics or engineering?	0%	5%	10%	30%	35%	5%	4.2	16
8.2 enroll in a masters program in science, mathematics or engineering?	5%	5%	20%	5%	45%	5%	4.0	16
8.3 enroll in a combined M.D/Ph.D program	25%	0%	10%	25%	15%	10%	3.1	15
8.4 enroll in medical or dental school?	45%	5%	5%	5%	5%	20%	1.8	13
8.5 enroll in a program to earn a different professional degree (i.e. law, veterinary medicine, etc.)	55%	0%	10%	0%	0%	20%	1.3	13
8.6 pursue certification as a teacher?	45%	10%	15%	0%	10%	5%	2.0	16
8.7 work in a science lab?	0%	5%	10%	30%	40%	0%	4.2	17
8.8 Other. Please state your intended degree and, compared to your intentions BEFORE doing research, HOW LIKELY YOU ARE NOW to enroll in a graduate program leading to an advanced degree.	Enter codes for text answers						--	10

Summary of scale results

The graphic below lists the mean and confidence interval (± 3 times the standard error) for each item.

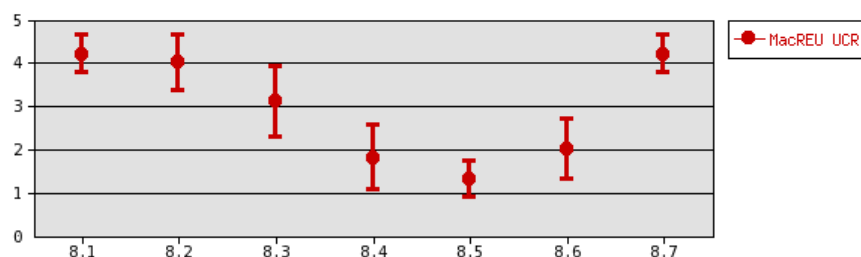


Figure 8: Effect of Experience on Entering the Pipeline

- My research experience not only made me realize that I want to do research as a career, but also that I CAN do it. I tend to doubt myself a lot, but this experience made me much more confident in my abilities. There is no doubt in my mind that I want to go to graduate school, and I know I can tackle every challenge.
- Doing this research really allowed me to see all the possibilities as far as the fields I would be able to enter with the degree i would like to receive
- As I mentioned before, the excitement and reward of performing scientific research outweighed my hesitation to be working in a lab long hours, since I enjoy being in the outdoors. I had a feeling before that I want to pursue research in renewable energy technology, an area that I am excited and care about, and after completing the program I now know that is possible for me to follow my interests in solar energy in graduate school.
- It made me decide I wanted to do something more interdisciplinary like materials, for grad school.

- It has broaden my horizon to the many opportunities that exist concerning my research for graduate school, some that I did not take into consideration before.

The questionnaire also asked students to reflect on other ways the program enhanced their interest in science as a career and led to personal gains, and they wrote,

- Networking with student with the same goals as mine, vocabulary enrichment and professionalism.
- The opportunity was priceless, absolutely amazing and I could not write how much I gained from it.
- I made personal gains such as learning I can be independent and that I should not be afraid to step out of my comfort zone. This was my first time being in an intensive lab as well as being away from home, but being able to put all my focus into my research helped me gain these things that I knew I had in me.
- I gained confidence in myself as a scientist and a person. I also gained a new outlook on my future.
- The networking I was able to make with mentors and peers is of utmost gain. I was able to gain perspectives from many colleges in the sciences. Ranging from communication about research, hardships in the field, and opportunities in scholarships and internships.
- I gained a deeper insight on what is considered to be the forefront of certain technologies such as why batteries today are so limited.
- Made friends with a lot of new people, stepped out of comfort zone
- I learned how to better network and how to become confident in presenting research.
- I have never liked working in groups, but I became friends with my lab mates. I looked forward to working with my fellow colleagues, and now understand the benefit of working with a team. I now regularly study with other classmates.
- One of the most important aspects of the program is that I now feel more prepared for grad school and applying for grad schools. Not only did we get to pursue research, but the program also prepared us for the GRE.
- My research was not just a great experience along with being able to co-publish the work done with my mentor but I was allowed to continue working in my lab as an undergraduate researcher.

Figure 9 indicates that students overall were satisfied with the organization and structure of the program itself. These scores are a strong improvement over last year's evaluation, in which students gave relatively low marks to support and guidance from the program staff, few research group meetings and lack of social activities. We readily admit that the first year of the program was a learning experience for the PIs and we took care

The following questions ask about aspects of the research program.

11. How satisfied were you with the following aspects of the research program?	1:Not applicable.	2:Very dissatisfied	3:Somewhat dissatisfied	4:Somewhat satisfied	5:Very satisfied	Mean	N
11.1 The application process.	5%	0%	5%	40%	35%	--	17
11.2 Support and guidance from program staff.	0%	0%	0%	30%	55%	--	17
11.3 Support and guidance from my research mentor.	0%	0%	0%	20%	65%	--	17
11.4 Support and guidance from other research group members.	0%	0%	0%	15%	70%	--	17
11.5 Research group meetings.	15%	0%	5%	15%	50%	--	17
11.6 Financial support.	5%	0%	5%	30%	45%	--	17
11.7 Group social activities.	0%	0%	5%	30%	50%	--	17

Figure 9: Satisfaction with the Program

to work with the program staff to improve the program. In particular, we included better training and involvement with lab personnel; we hired a staff person (Velveth Klee) who was able to provide constant attention to the group training and activities, and more planned social activities.

Training Sessions

12. How MUCH did the following activities support your learning?	1:Did not do this activity	2:Not at all	3:A little	4:A good amount	5:A great deal	Mean	N
12.1 Workshop(s) on science writing and presentation.	0%	0%	30%	45%	10%	--	17
12.2 Training in library/internet/database search methods.	5%	5%	50%	10%	15%	--	17
12.3 Safety training	0%	0%	40%	15%	30%	--	17
12.4 Ethics seminar(s)	5%	15%	15%	40%	10%	--	17
12.5 Training in human or animal subjects regulations.	30%	10%	20%	20%	5%	--	17

Figure 10: Gains from Professional Training

Figure 10 also indicates mixed views of the training offered, although in each case students typically report gaining a good amount or a great deal of learning from each program element. This might be an area for future improvement, although there is only so much training students can do over the course of a 10 week program.

Figure 11 indicates that students learn about research opportunities such as MacREU from a variety of sources. Students also indicated other sources for this information in an open ended question, including two that learned of the program from the previous year's participants:

- The NSF website.
- I was already working in the lab and my advising professor recommended it.
- I found out from looking up on a search engine "research opportunities."

How did you find out about research opportunities on campus?

14. I found out about research opportunities from:	1:yes	2:no	:	:	:	:	Mean N
14.1 I knew this institution offered research opportunities to undergraduates before coming here	10%	75%					-- 17
14.2 in class	0%	85%					-- 17
14.3 an academic advisor	20%	65%					-- 17
14.4 an announcement (flyer, poster, email, website, etc.)	40%	45%					-- 17
14.5 a presentation given by professors or students about their research	5%	80%					-- 17
14.6 Other (please specify):	Enter codes for text answers						-- 7

Figure 11: Ways to Learn about Research Opportunities on Campus

- My PI asked if I wanted to partake in the summer research
- Direct contact to professor participating in program
- I found the MacREU on the NSF REU website given to me by my faculty advisor.
- Nick Corum had told me about this great opportunity and we where both lucky enough to join.

What motivated you to do research?

15. I WANTED TO DO RESEARCH TO: (select all that apply)	1:yes	2:no	:	:	:	:	Mean N
15.1 explore my interest in science	85%	0%					-- 17
15.2 gain hands-on experience in research	85%	0%					-- 17
15.3 clarify which field I wanted to study	85%	0%					-- 17
15.4 clarify whether graduate school would be a good choice for me	80%	5%					-- 17
15.5 clarify whether I wanted to pursue a science research career	75%	10%					-- 17
15.6 have a good intellectual challenge	80%	5%					-- 17
15.7 work more closely with a particular faculty member	35%	50%					-- 17
15.8 participate in a program with strong reputation	40%	45%					-- 17
15.9 get good letters of recommendation	45%	40%					-- 17
15.10 enhance my resume	75%	10%					-- 17
15.11 Other (please specify)	Enter codes for text answers						-- 2

Figure 12: Motivations to do research

Figure 12 shows that students report a wide range of motivations for participating in research. The questionnaire also provided students an open-ended question to report motivations they have to do research. Not many students responded to the question, but the ones that did respond wrote as follows:

- To reaffirm my profound interest in the sciences.
- I also wanted to get experience that would help me develop as a scientist and influence my thoughts on possible graduate research projects.
- Clarify if a lab setting is a fit for me.

Students were also given the opportunity to reflect on how the program impacted their career plans, and they wrote as follows. Typically the responses were quite positive although we do note some suggestions.

- The workshops were a perfect supplement to the program. The additional learning experiences in these sessions allowed me to truly look and understand that the working in the lab goes beyond the research. It also encompasses a code of ethics and the social setting of the laboratory.
- Although helpful, this activity should be shorter, earlier in the program, and a selection of graduate students more relevant to the REU students.
- They were very informative and should continue to be offered.
- The graduate student panel was very helpful with questions for the graduate school application process.
- Making the talks optional would be better.
- The information sessions with panelists from non stem related fields was not very helpful. There needs to have been more structure to the talk.
- The graduate student panel was very helpful

Students also were given an opportunity to write suggestions on how to make the program experience better.

- I would've liked to have more of a choice in which lab I worked in. Although I immensely enjoyed working in my lab, I would've liked to have been in a lab more related to my future career plans.
- I think one group activity a week to foster friendship would have been greatly appreciated.
- There was group drama a lot. It would have been nice to not have been involved in this.
- Having graduate students that were more available and responded to my emails/messages more consistently.
- If my mentor would have allowed me to brain storm ideas about how to approach my research instead of him just telling me what to do.

- A more hands-on mentor who is organized and allowed undergraduate students to perform significant experiments (given proper training).
- A possible allocation of funds for materials specific to the undergraduates' direct project, since resources can sometimes impede progress.
- I know conferences are sometimes inevitable but I would have liked if my research group was not absent for more than a couple of days. At times, my research group would leave for a week or so for conferences. I do want to point out that when they were in the lab, they were extremely helpful but I feel like I could have gained more if they were not gone for long periods at a time.
- Nothing. It was great.
- Having a more class-like GRE training; including weekly quizzes, homework from the book, etc.
- More time. I was sad to have it end.
- Making the program longer would be excellent.
- I believe having less seminars such as every Thursday would have made this experience a little more desirable. The 10 week research experience was intellectually stimulating and I am thankful for that.
- I had a great experience. Many of my colleagues did not. Talking with them I learned that the thing that could have enhanced their experience would have been having contact with their PI and grad mentor prior to the first day. I understand that we could have communicated through email, but I feel that person to person is better when trying to build rapport.
- A more interactive mentor

And students were asked an open-ended question on how to make the experience better overall.

- I had a really great graduate student mentor, but I know that not all of the program participants felt the same way. I believe that there should be a more careful selection of the graduate student mentors so that all of the participants get along with and enjoy working with their mentors.
- It was overall pretty good, thank you.
- Having field trips during the week (not on the weekend)
- If they offered the research conference there at UCR
- A selection and interview process of mentors assigned to undergraduate students will help improve the experience of this program significantly to those participating.

- Some preview of the research topics and up to date projects for the labs might help prepare undergraduates for their research.
- I would recommend to hold social gatherings in the beginning of the program so the students can get to know one another sooner. There were a couple of students I seldomly spoke to throughout the program. Also, if it is possible to have someone like Ashley a bit sooner. Ashley was very helpful and it would you been nice to get more help from her sooner in the program.
- Fieldtrips
- Everything was fine.
- An increase in stipend funds for students who had to commute. Reimbursements for mileage would have put financial concerns to rest and allow for students to focus more on research and not on how they will get to campus.
- Having the option of meeting your mentor before the program starts.
- Having more time with the professors to talk about your graduate school plans.
- Having more outings during the week, as a whole group. I feel that doing that could have enhanced everyones experience. Some people confessed to me that they felt excluded. One outing as a group could have established a great rapport in the beginning of the program.
- Smaller more frequent assignments and updates in order to keep us on track.

3 Conclusion

Overall, the program was very successful in its goals of interesting students in a career in science and engineering, in equipping them for such a career, and providing with strong research experience and skills. Furthermore, the evaluation scores for this year were equal to or greater across the board compared to the second year of the program (2105).