

Enhancing Research Pipelines for Underserved Students through a Lower-Division Research Experience at a Minority-Serving Institution (Experience)

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ACADEMIC RESPONSIBILITIES: (2017-Present) Associate Professor for the STEM Affinity Group, School of Natural Sciences and Mathematics, California State University, Bakersfield. Duties included teaching responsibilities in Undergraduate Biology. Additional duties included grant writing, management, and evaluation.

RESEARCH INTERESTS: Include teaching and learning cognition skills, informal learning environments and strategies, and science/technology curriculum design/implementation/evaluation.

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Abstract

This work presents the findings from multiple years of a lower-division summer research program at California State University, Bakersfield (CSUB). The first and second years are a critical intervention point to increase persistence in STEM careers, as over 70% of the non-retained STEM students at CSUB leave in the first two years. Additionally, while there are numerous works that examine the effectiveness of research activities for retention and persistence of underrepresented minority students, very few programs focus on lower-division students. The analysis of data shows that the program has been highly effective at increasing positive attitudes towards STEM careers and towards pursuing research at the upper-division and graduate level.

Introduction

As part of a U.S. Department of Education Minority Science and Engineering Improvement Program (MSEIP) grant, California State University, Bakersfield (CSUB) began a summer research experience for lower-division STEM students in 2015. CSUB is a public, regional, comprehensive university that carries designations as both a Hispanic Serving Institution (HSI) and a Minority Serving Institution (MSI). Its demographics reflect the demographics of the service region, which is a majority minority area. The service region for CSUB is also a fast-growing area marked by historic lags in the number of residents with university degrees and by a high rate of poverty compared to the state as a whole. CSUB is the only public four-year institution in the region, and it fills a vital role in enhancing the education and economic welfare of the region.

One of the goals of the MSEIP grant was to provide research opportunities for lower-division students to promote interest in STEM research and careers, and to increase success and retention rates among participants, particularly among underrepresented minority (URM) students. Research activities are an effective strategy for increasing success and retention. Many programs exist nationally to provide research opportunities for upper-division students, but there is a gap in available programs at the lower-division level. The program was modeled on previous programs that had been shown effective at retaining URM students [1] [2]. First and second year students were targeted for this research program because over 70% of the STEM students who leave CSUB without a degree leave in the first two years. The first two years are a critical intervention period for promoting success and retention.

In [3], we described the first two years of the program and presented preliminary results with respects to attitudes and awareness, along with one-year retention data. In this paper, we look at

the full four years of the program to analyze multi-year retention rates, the survey and interview data collected during the program, and the follow-up surveys conducted in Fall 2018.

Related Works

Numerous related works have examined the effectiveness of research activities for retention and persistence of URM students in STEM degrees [1] [2] [4] [5]. In [1], the summer research experience had a positive impact on URM students' attitudes towards learning. In [2], previous works were surveyed, which showed that research and faculty mentorship was an effective strategy to increase the number of URM students who pursue STEM degrees.

Further, students who participate in undergraduate research have better attitudes towards their academic careers in general and are more likely to pursue graduate degrees [6] [7] [8]. In [8], they also found that the students participating in such programs tended to be upper-division students with higher GPAs and that the positive effects of research experiences were higher among Hispanic/Latinx students than among other URM students.

Similar surveys and studies have shown that undergraduate research is an effective tool to increase interest and persistence in STEM majors [7] [9] [10] [11] [12] [13] [14] [15]. However, the focus of most of these studies are at the upper-division (junior and senior) level, rather than at the lower-division level. Upper-division students have already conquered some of the major bottlenecks towards successful degree completion, such as completion of lower-division calculus and physics for engineering students.

The impact of such programs on lower-division students is less studied [12] [13]. In [12], a one-month January research course for lower-division biology students was effective at increasing the number of students who were retained and who participated as research or teaching assistants after the program. In [13], a research methodologies and peer-mentoring program during the academic year for first year and sophomore students in a variety of disciplines, including non-STEM disciplines, was effective at decreasing attrition. Our program differed from these programs in that it was a summer, hands-on research program for first year and sophomore students.

Detailed Description of Summer Program

The summer program was a four-week, all-day program on campus at CSUB. Each research topic group consisted of up to ten lower-division students, who worked with a faculty mentor and an upper-division student peer mentor on a research topic chosen by the faculty member. Faculty members proposed topics to the grant team mid-way through the academic year. The grant team would select topics for the upcoming summer, then advertise the program to the students through the campus website, social media, flyers, and visits to lower-division core courses. The full list of topics offered over all four years of the program is given in Table 1.

Faculty mentors were responsible for selecting the upper-division peer mentor for their projects but they did not select the participants. Students submitted applications to the grant team. Each summer had at least four different research topics to choose from and students could indicate a preference for specific topic(s) on their application. The grant team reviewed student applications and assigned qualified students to faculty mentors, following student preferences if there was sufficient room available in that project. Students selected for the four-week research experience were expected to complete the appropriate first-year curriculum for their major before participation in the program. Students who were not on track to complete the first-year curriculum were referred to another summer program at CSUB for first year students who were struggling with their first-year curriculum. First year transfer students were also accepted if they were at the lower-division curriculum level within the major. First year transfer students with credit for all of their lower-division major coursework were referred to other research programs for upper-division students.

Stipends were provided to the student participants, the upper-division student peer mentor, and the faculty members. Faculty members were also given a budget to purchase equipment and supplies for their projects.

Table 1: List of programs offered over the course of the summer program. Discipline is determined by the faculty mentor.

Discipline	Programs Offered
Biology / Biochemistry	Research in Human Physiology (2015) Detection of <i>C. immitis</i> in Highly Endemic Areas of the Pathogen (2017)
Computer Science	Driving Enjoyment Detection from Video of the Face (2015) Software Design and Implementation on Mobile Devices (2017) Plant Species and Disease Identification with Raspberry Pi's (2018)
Electrical and Computer Engineering	Home Energy Monitoring and Control System (2015) Coding and Decoding of Information in Mobile Communication (2015) IoT Based Air Pollution Monitoring System (2017) Smart Electronics for Everyday Applications (2018)
Geology	Late Cenozoic Paleodrainage, Basin Boundary, & Landscape Evol. (2016) Late Cretaceous – Cenozoic Paleodrainage in S. San Joaquin Valley (2017) Late Cretaceous – Cenozoic Paleodrainage in Southern California (2018)
General Engineering	Study of Mechanical Behavior of Hydrocarbon-bearing Rocks (2015) Determination of Injection Well Location for Oil Recovery (2015) Smart and Automatic Irrigation System using Sensor Network (2016) Measurement of Oil-Water Interfacial Tension (2016)
Mathematics	Seasonal Effect of Air Pollution on Lung Disease (2015) Modeling with Differential Equations (2018)
Physics	Wave-particle Duality of Light and the Photoelectric Effect (2016)

Detailed Description of Evaluation Instruments

Evaluation instruments for the MSEIP summer research program included a pre-survey administered at the start of each program, a post-survey administered at the end of each program, interviews conducted by either the external evaluator or the internal evaluation consultant during or after each program, and a follow-up survey administered in Fall 2018.

The pre-survey (Table 2) and post-survey (Table 3) contained a set of paired questions to gauge the effects of the summer program on participants' attitudes towards careers and research in STEM. Since our previous experience with attitudinal surveys has shown that students tend to circle "strongly agree" on the pre-survey, leaving no room for improvement on the post-survey, the post-survey also had three self-rated change of interest questions. The pre-survey had open-ended questions to gauge students' expectations and goals at the start of the program, while the post-survey had open-ended questions about what they learned from the program, if the program changed their goals/plans, and their satisfaction with the program. The pre-survey also gathered demographic information and background academic information.

Table 2: Questions from the pre-survey administered at the start of each summer program.

Pre-Survey Question	Question Type
Participant identification (Student ID Number, Year, Faculty Mentor)	Text boxes and Lists
Participant background academic information (Major, GPA, etc.)	Text boxes and Lists
Participant demographic information (Gender, Race and Ethnicity)	Select from lists
Q: What interested you about this summer program?	Open-ended comment
Q: What do you expect to learn and experience in this summer program?	Open-ended comment
Q: How do you expect this program to help your academic career?	Open-ended comment
Q: What are your academic plans and/or career goals after you complete your undergraduate degree?	Open-ended comment
Q: Rate your agreement with the following statements (Paired pre-/post-survey questions) <ul style="list-style-type: none"> • I am interested in the field that I am studying. • I am interested in a career in STEM. • I am confident that I am prepared for this program. • I am aware of the academic knowledge required for a career in STEM. • I understand what skills are required for a career in STEM. • I understand what "research" in STEM means. • I am interested in research in STEM. 	5-point Likert scale (strongly agree = 5, agree = 4, neutral = 3, disagree = 2, strongly disagree = 1)

Table 3: Questions from the post-survey administered at the end of each summer program.

Post-Survey Question	Question Type
Participant identification (Student ID Number, Year, Faculty Mentor)	Text boxes and Lists

Q: Rate your agreement with the following statements: <ul style="list-style-type: none"> • My faculty facilitator has been supportive. • My student mentor has been supportive. 	5-point Likert scale (same scale as pre-survey)
Q: Rate your agreement with the following statements (Paired pre-/post-survey questions) <ul style="list-style-type: none"> • I am interested in the field that I am studying. • I am interested in a career in STEM. • I was prepared for this program. • I am aware of the academic knowledge required for a career in STEM. • I understand what skills are required for a career in STEM. • I understand what “research” in STEM means. • I am interested in research in STEM. 	5-point Likert scale (same scale as pre-survey)
Q: What did you like about this activity?	Open-ended comment
Q: What specific knowledge and/or experiences did you gain from this activity?	Open-ended comment
Q: If anything, what would you change about this activity?	Open-ended comment
Q: Rate your change of interest in the following areas: <ul style="list-style-type: none"> • The field that I am studying. • A career in STEM. • Research in STEM. 	3-point Likert scale (increased = 3, no change = 2, decreased = 1)
Q: If you indicated a decrease in interest in any of the above areas, please give a brief reason why.	Open-ended comment
Q: Have your academic plans and/or career goals changed as a result of this program?	Open-ended comment
Q: Would you recommend this program to your friends?	Yes/No/Uncertain
Q: If you have additional comments, please leave them here.	Open-ended comment

In Fall 2018, the follow-up survey described in Table 4 was sent to the participants by email. The purpose of this survey was to find out the students’ current academic progress, whether participation in MSEIP had influenced their participation in research, and what impacts the program had on their career goals and plans.

Table 4: Questions from follow-up survey sent to MSEIP participants in Fall 2018.

Follow-up Survey Question	Question Type
Q1: Survey informed consent and agreement	Yes/No
Q2: Please enter your information. (Name and Student ID Number)	Text Boxes
Q3: Which year did you participate in the MSEIP program?	Select from List of Years
Q4: After participation in the MSEIP Summer Research Program, have you engaged in other research activities with faculty at CSUB?	Yes / No If Yes, text box for details
Q5: After participation in the MSEIP Summer Research Program, have you engaged in other research activities outside of CSUB?	Yes / No

	If Yes, text box for details
Q6: Have you received your Bachelor's degree?	Yes / No
Q7: What is your current academic status?	Select from Undergrad Student, Grad Student, Left Without Degree, Decline to State, Other
Q8: After completing your Bachelor's degree, did you further your studies?	Select from No, Currently Grad Student, Finished Graduate Degree, Declined to State, Other
Q9: If the MSEIP program has impacted you either positively or negatively on your plans for a career in STEM, please comment here.	Open-ended Comment

Findings

In total, 103 students participated in the summer experience from 2015 to 2018. While this was a STEM grant, more than half the participants were engineering students, as shown in Figure 1.

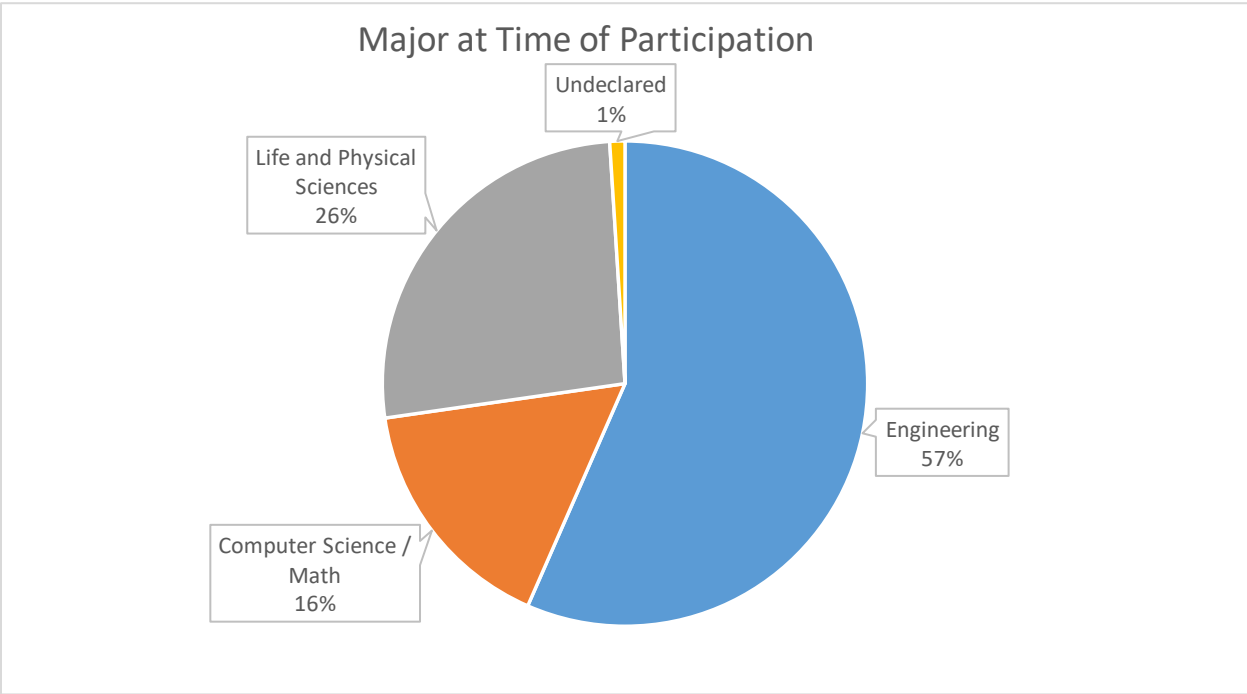


Figure 1: Major at the time of participation as indicated by the student on the demographics section of the pre-survey.

With respects to gender and ethnicity, as shown in Figure 2, about 56% of the participants were Hispanic, which matches the demographics of CSUB. Overall, about 62% of the participants were underrepresented minority students and about 37% were female.

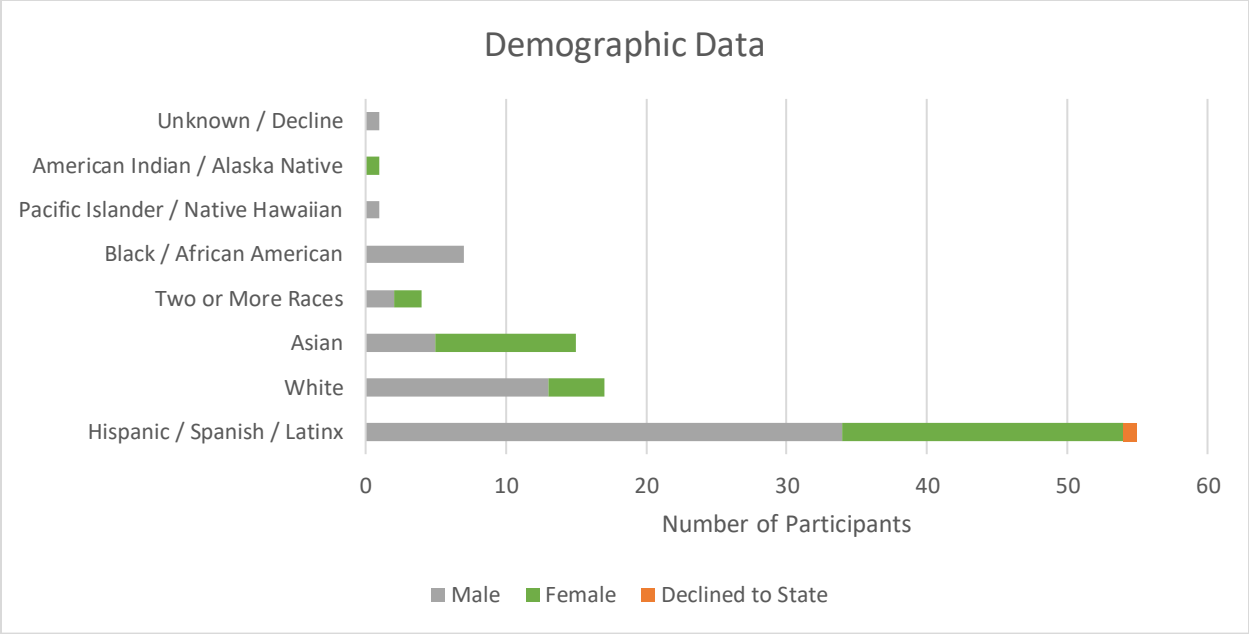


Figure 2: Gender and ethnicity data for participants as indicated by the students on the demographic section of the pre-survey.

Retention of the participants at CSUB is also tracked, as shown in Figure 3. The Summer 2018 cohort is excluded from the retention figure since less than one year has passed since that cohort participated in the program. Overall, retention rates are nearly 90% for all three cohorts, which is much higher than the institutional average retention rates at CSUB (one-year 75%, two-year 63%, three-year 57%). URM students have a slightly higher retention rate, although this is not statistically significant.

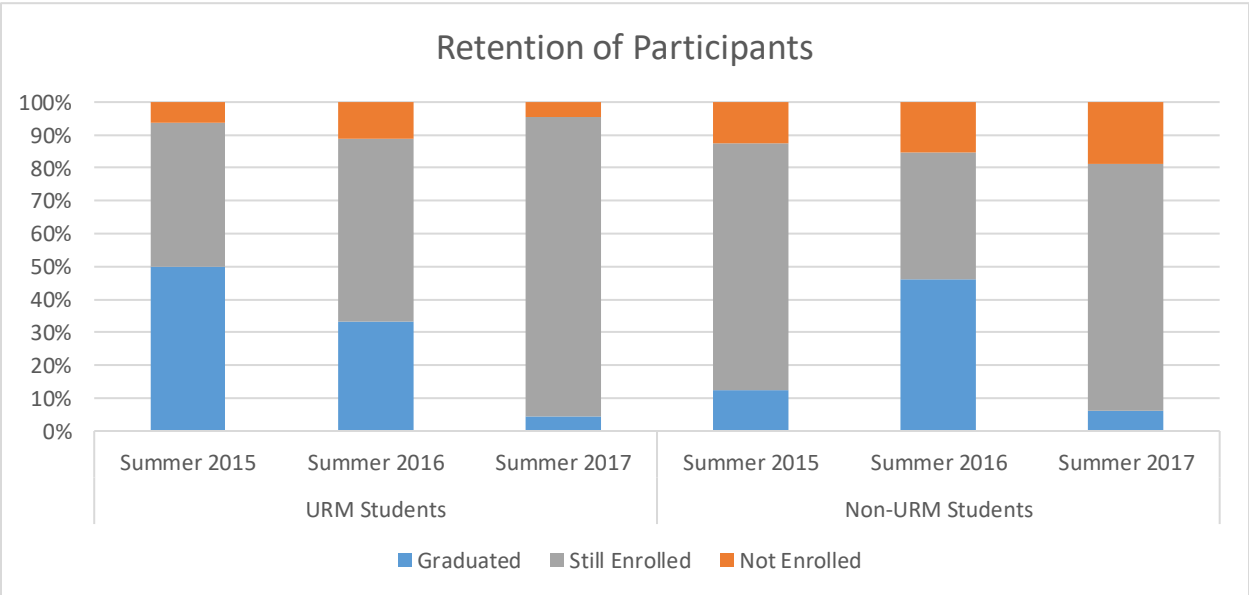


Figure 3: Retention of participants from the first three summers of the program by URM status.

Over 50% of the Summer 2015 and Summer 2016 participants graduated by Fall 2018. Summer 2016 had a high sophomore and first year transfer student participation rate, which is why it has a high graduation rate. Of the students still enrolled at CSUB, almost all are still pursuing a STEM major and are enrolled in appropriate courses for their STEM major in Spring 2019. One student switched majors to Criminal Justice.

Findings from Paired Pre- and Post-Surveys

Pre-surveys and post-surveys were administered to the participants with paired Likert-scale questions about their attitudes towards STEM careers and research and their interest in their field of study. While 97 participants completed the post-survey, only 82 participants completed both the pre-survey and the post-survey. The difference between their paired pre-survey and post-survey responses are visualized in Figure 4. Most of the questions had no change in interest, and the majority of this is due to students selecting “Strongly Agree” on both the pre-survey and the post-survey.

There are two questions where there was a significant change in interest. Knowledge of research in STEM increased after participation in the program ($p < 0.05$ with a two-tailed test). Several student comments in the open-ended questions said that the program exposed them to research and helped them connect the theoretical topics in the classroom to applied, real-world projects. Feeling confident in their preparedness for the program decreased after participation in the program ($p < 0.05$ with a two-tailed test). This is not a surprising result, as students become more aware of what they don’t know about their field of study after participation in such an activity. They come in at the pre-survey with a level of naiveté that is dispelled as they participate in the program, which is reflected as a decrease in confidence in their preparedness for the program on the post-survey.

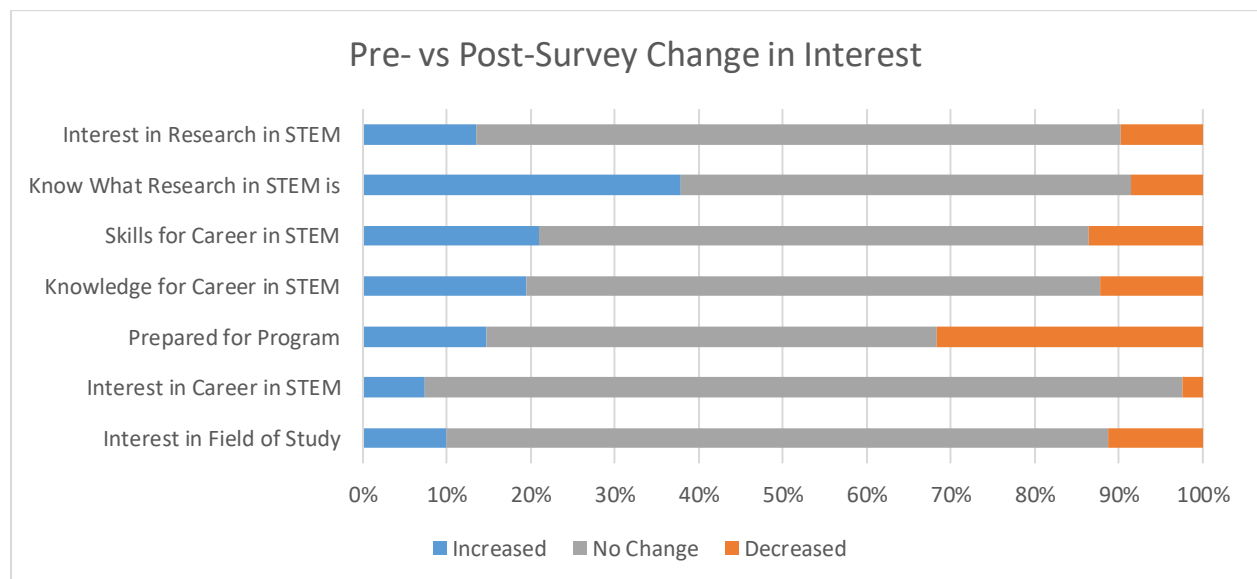


Figure 4: Comparison of pre-survey Likert response to post-survey Likert response for participants of all summers.

In a previous work-in-progress report for the first two years of the research experience [3], we noted that the majority of respondents indicated an increase in interest in STEM research and careers and an increase interest in their field of study as a result of their participation in the summer program. These trends continued across the entire cohort in the self-rated change of interest, as shown in Figure 5.

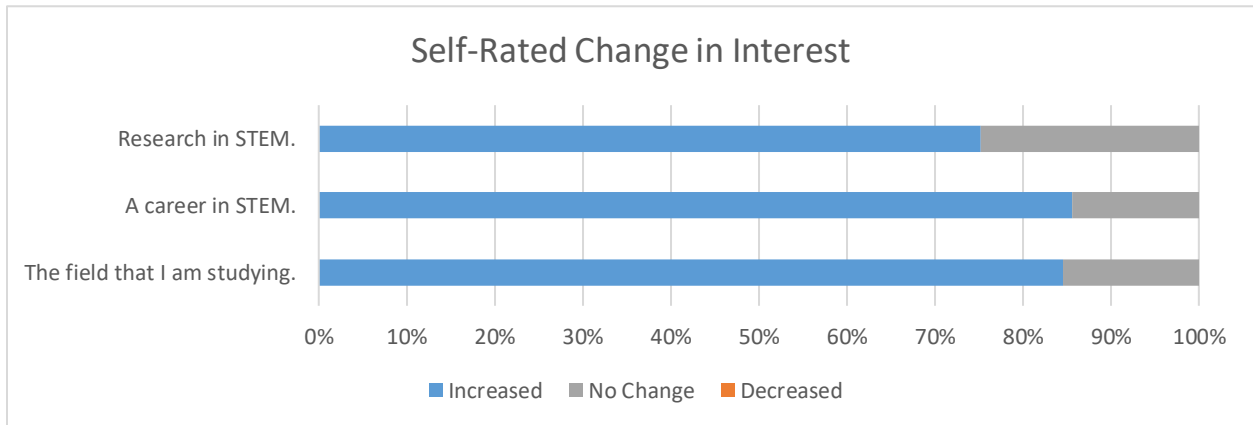


Figure 5: Self-rated change of interest data from the post-survey for participants of all summers.

We also analyzed the trends in the open-ended questions on the post-survey. When asked what they liked about the activity, many of the students talked about conducting hands-on projects and/or projects with real-world applications. They also commented on learning new skills and knowledge and on enjoying the teamwork involved in the project. Almost all of the students in the geology groups had positive comments about going out into the field to collect samples before coming back to the lab to analyze the samples. The trends in the comments are summarized in Figure 6.

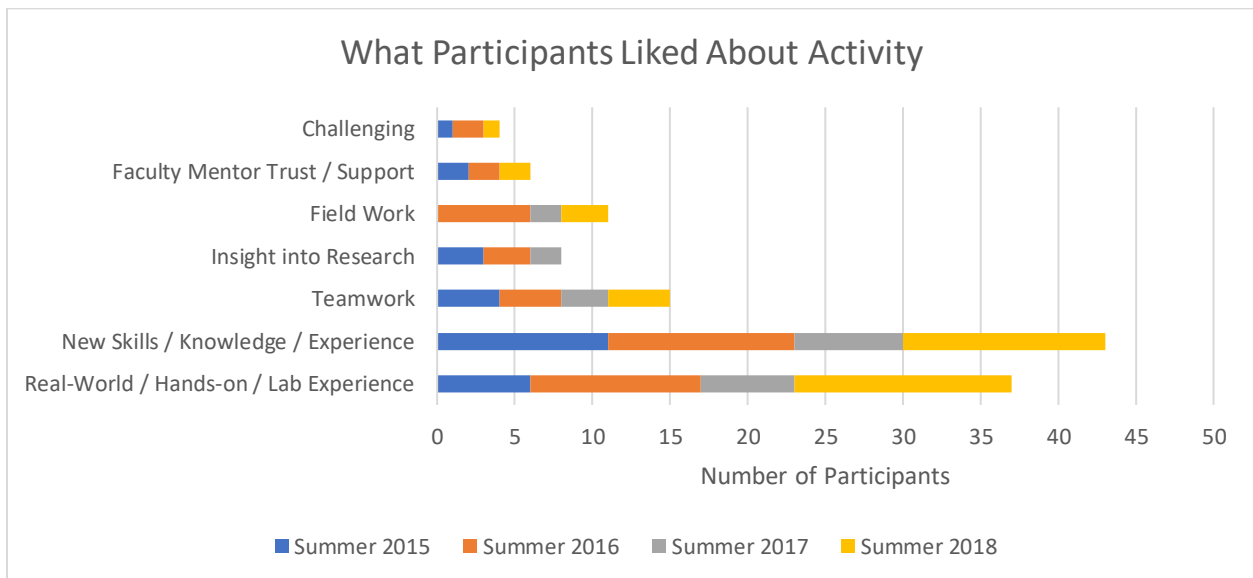


Figure 6: Classification of open-ended responses from post-survey on question “What did you like about this activity?”

When asked what they learned during the program, most students stated a major-specific skill, tool, or equipment such as sampling techniques, building circuits, coding an Arduino, or learning to use MATLAB. Several students also talked about new concepts or knowledge that they gained such as learning about neural networks, matrices, microorganisms, and the physics of light. Students also noted research-specific skills such as conducting a literature survey, visualizing data, and preparing a research paper. These trends are summarized in Figure 7.

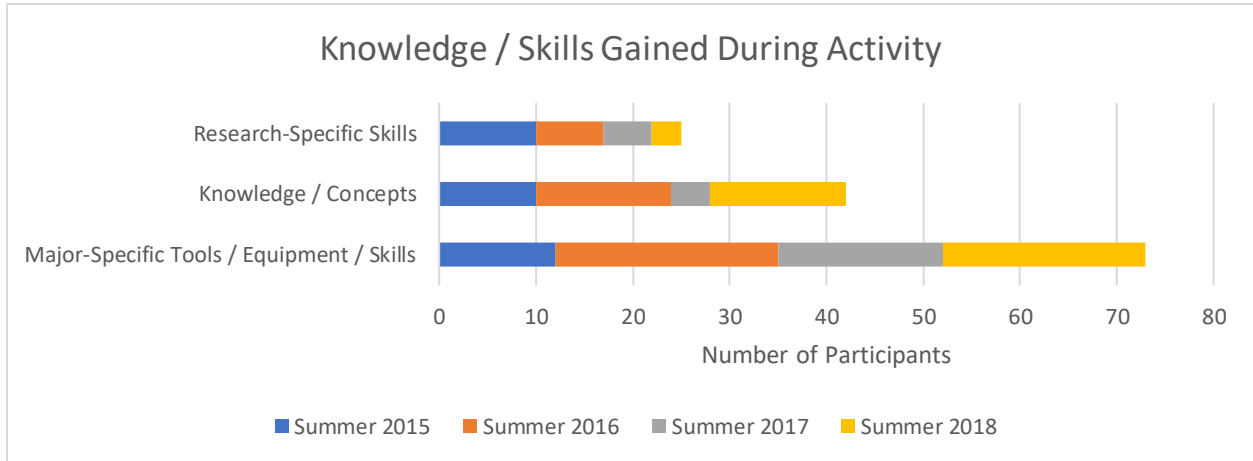


Figure 7: Classification of open-ended responses from post-survey on question “What specific knowledge and/or experiences did you gain from this activity?”

We also asked students if they would change anything about the program. Most students said there was nothing to change, but the second most common response was a desire for the program to be longer. There were also some organizational issues with specific faculty mentors in 2016, which were addressed by the grant team on an individual basis. These issues decreased in 2017 and decreased further in 2018. The responses to this question are classified in Figure 8.

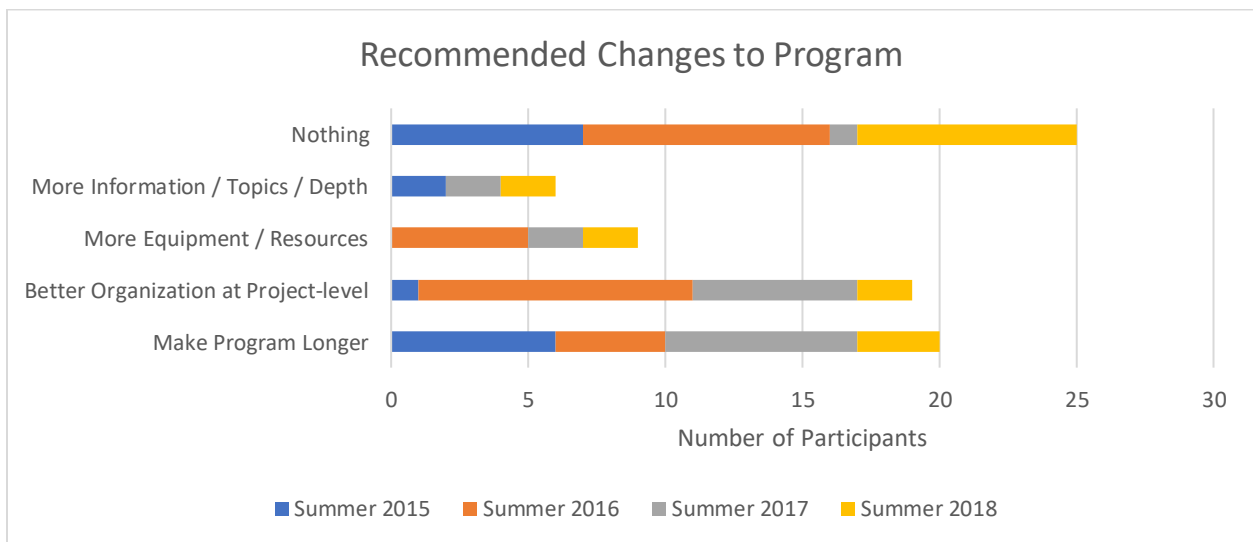


Figure 8: Classification of open-ended responses from post-survey on question “If anything, what would you change about this activity?”

Students were also asked if their participation in the summer research program had changed their career goals and/or academic plans, as shown in Figure 9. Most students said that their plans were unchanged because they were already planning on a career in STEM before participating in the program. Some students noted that the program reaffirmed their plans or encouraged them to pursue their original plans. Another group of students noted that the program made them more aware of the possibilities within their major and/or within closely related STEM disciplines.

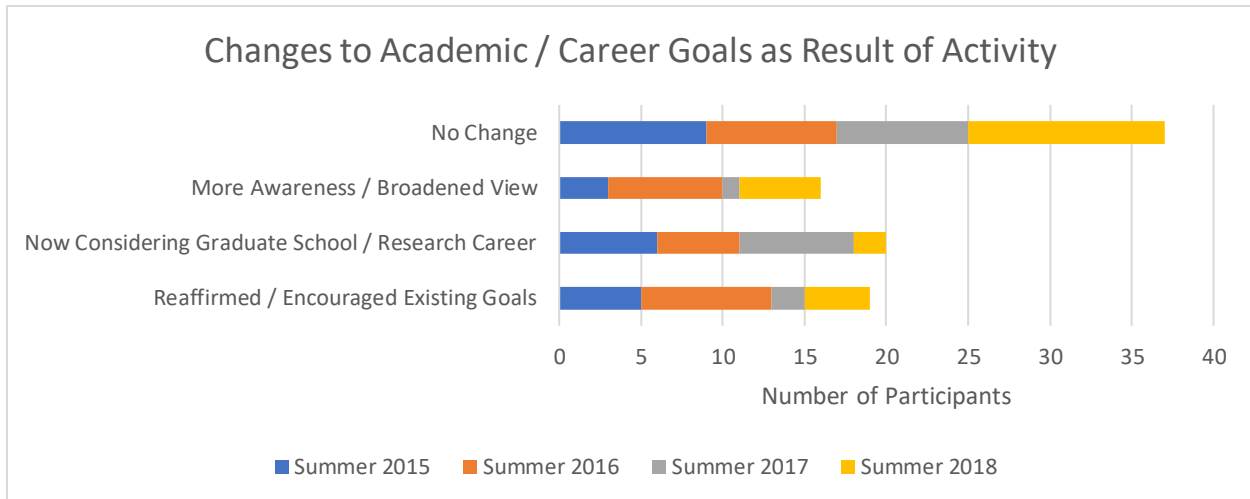


Figure 9: Classification of open-ended responses from post-survey on question “Have your academic plans and/or career goals changed as a result of this program?”

Most notably, 20 of the participants said that this activity has encouraged them to pursue a graduate degree and/or a research career when they had not previously planned on such a path. Given that the majority of our participants are URM students and/or from a socio-economically depressed background since CSUB has a high rate of Pell grant recipients, this is a very promising result. Research programs for lower-division undergraduates may be a way to encourage more URM students to attend graduate school, which will help address equity gaps in the STEM disciplines at the graduate level.

In the final open-ended question for additional comments, students had mostly positive feedback. Even those students who found the program challenging were enthusiastic about the experience:

- “I’m so thankful for this opportunity and for being able to participate. I enjoyed the process and was able to create relationships with others in the same field as well as our advisor. Thank you!”
- “This was fairly overwhelming at the start, but I am happy I learned a lot and hopefully I can use these new concepts in my future work.”
- “I loved participating in this program, even though at times it was a challenge to code. I look forward to learn more on coding on Matlab!”
- “Thank you for making this program available. This has been an invaluable opportunity that I’m very thankful for.”

- “This program was a great experience for me. This was my first time doing research with a professor and I gained more knowledge of what research really was.”
- “I think it would be great to continue this program with students because we can expand the research we have performed. We were able to work together as a group and we achieved great results. This research program is very relevant to our community because many individuals have the valley fever fungus.”
- “I really enjoy this program. It gives you the liberty to develop your scientific skills without following a specific method given by an instructor. It gives you the tools and you have to develop something for a specific purpose which is the main purpose of engineering.”

Findings from Interview Data

Interviews were conducted with students and faculty mentors during and after the summer programs. Comments made during those interviews confirm that the program has helped foster interest in research and helped students in their academic careers.

With respects to helping students gain a better understanding of the professional opportunities offered in their respective majors or disciplines:

- Student Response: Last year, I did the MSEIP program. And last year I knew nothing about geology - I did not take a single [geology] class. Everyone [students] was so helpful. [Names of students 1 and 2] were also in here. They helped me out a lot - learning about the history of the area, and just practical things that we were doing in the lab. I would not have known how to do that without their help. They really came together and helped out me, and a couple other people, that were not too sure how to do things. Talking to these people who are in higher classes levels [upper academic year] that you, it definitely gave you some insight on how you want your future pathway and what direction you may to go.
- Student Response: I actually did this last summer. Before then, I have never taken a computer science course, or an engineering course. It is actually what pushed me to change my major from biology to computer science.
- Faculty Response: The program gave an opportunity for students, who were freshman and sophomores, to get some experience doing research. Some of them [students] may not even realize that research was an option. Especially exposing some of the underrepresented groups [of students] to research when they might have just inherently not been aware that the obvious opportunities existed.

With respects to enhancing content knowledge in their respective majors:

- Student Response: The benefit of the hands-on experience, and of working in groups on this. It really contributed to our understanding of circuitry.

- Faculty Response: We talked about the chemicals used here. We did some calculations, it is bringing together math, chemistry, biology, and fine motor skills working with this [science problem].
- Faculty Response: They go to their [academic-year] classes, but there is not much that they can see what they can do in their future. With this project this summer, they basically can do in electrical engineering, what they can do: the programming, the micro-controller, they can do lots of things. It helps them basically, not create the program, because it is very difficult. They can see what is [involved with electrical engineering] and in the end, be successful.

With respects to enhancing process knowledge (lab or field-work skill investigation) in their respective majors or disciplines:

- Student Response: I would definitely like to say that it helped me with understanding class environments, because you are actually out there in the [fieldwork] environment. In mineralogy, you have actual samples. Unlike only studying everything from a book, it actually throws you out there. For example, in mineralogy, you handle samples; hand-picked to look just like that mineral - compared to out in the field where that is not the case at all. Where you have to identify rock that has been covered in calcite, parts of carbonite, and basically everything else – all this other junk in it.
- Faculty Response: I think it is their age. The very young ones [freshman & sophomores] are usually... they probably will become really good, but they are not there yet. Some things are a little above their heads. But if you give them time, and let them do things again, it “clicks.”

With respects to enhancing research experiences / knowledge / communication in their respective majors or disciplines:

- Student Responses: I did class and size [and shape] research in Tejon. That just really helped me to organize my thoughts, and put data together in a presentable way, which I think is really useful when it comes to your professional career. You can understand everything you are trying to do out there, but once you try to put it on paper, it is easy to get ambiguous and less clear. It is a thorough way to put your thoughts on paper.
- Student Response: It really helped in general too. I also helped with the size and shape data. We all helped each other a lot – a lot of different abstracts. It’s kind of a big pool. We all helped each other out. It definitely gave us an idea of what scientists actually do – how they actually gather data, how they interpret it, how they share the statistical data. [Interviewer: Are all of you, or some of you, presenting this? Do you hope to present this? You have the abstract out there. Does this follow with attending a conference?] Yes, GSA in Seattle in October. We are also considering Flagstaff (AZ) in May. We are all going to be presenting at GSA.

- Faculty Response: A lot of students who do the MSEIP [activity] return a semester or maybe some years later, to actually be a full-blown undergraduate research assistant with me, and publish papers, and that sort of stuff.

Findings from Follow-up Surveys

Since a goal of the MSEIP grant was to encourage upper-division research through this lower-division research experience, we surveyed faculty mentors who led the summer experiences in 2015 through 2017 to determine how many of their MSEIP students went on to conduct upper-division research with them. Faculty mentors for 33 of the participants responded. Of that group, 14 of their MSEIP students went on to conduct research at the upper-division level with the faculty member, including publications at local or national conferences. All of the faculty respondents indicated that the MSEIP experience was a great recruitment tool for their upper-division research projects and that their MSEIP students were very successful at upper-division research.

We also surveyed the MSEIP participants directly in Fall 2018 to get additional self-reported data on upper-division research with faculty members at CSUB and/or at other institutions. Students were sent a survey link to their preferred email address and 31 participants completed the follow-up survey. A majority of the respondents are underrepresented minority students, as indicated in Figure 10. The participants with unknown demographics were ones who answered “Decline to State” on the demographic questions in the pre-survey and on the demographic information on file with CSUB. Most of the responses were from the participants in 2016 (32%) and 2017 (42%).

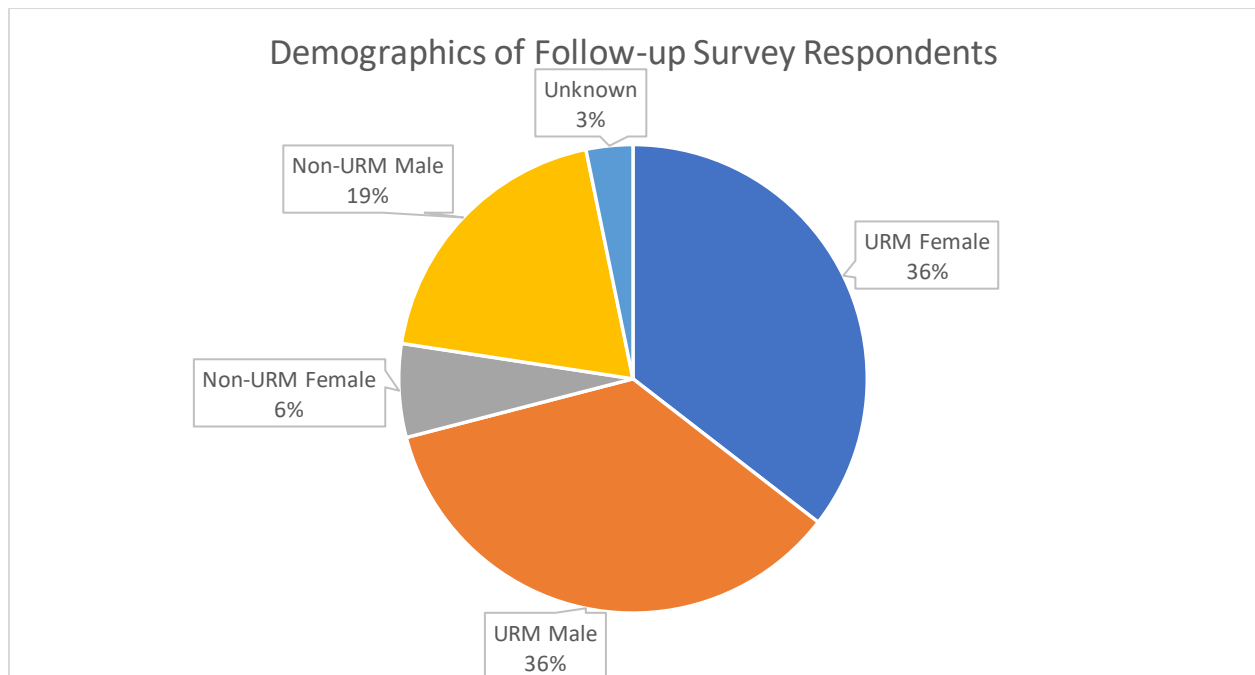


Figure 10: Demographics of the respondents for the follow-up survey administered In Fall 2018.

When asked about their research experiences after participating in MSEIP, 14 of the respondents (45%) indicated that they have engaged in other research projects at CSUB, either with their MSEIP faculty mentor or with another faculty member. Of those students, 9 are URM students. Only 4 of the respondents (13%) indicated that they have participated in research activities outside of CSUB, but 3 of those respondents are URM students. Only 7 respondents (33%) indicated that they have graduated, while the other 24 respondents are still pursuing their degree at CSUB. Of the 7 respondents who have graduated from CSUB, 3 indicated that they are in graduate school and another indicated that she is currently working but has applied to graduate school.

The responses to the open-ended question “If the MSEIP program has impacted you either positively or negatively on your plans for a career in STEM, please comment here” were overwhelmingly positive. Several students commented about how it exposed them to research and encouraged them to pursue research further. Sample responses include:

- “The MSEIP program has impacted my career plans positively because it opened a new light to research I would have never considered.”
- “MSEIP did impact me in a positively way it motivated me to get involved with research in my university.”
- “It significantly helped introduce me to academic research, contributed to my CV, and the funding helped me with cost of living while I was not working.”
- “The MSEIP project has positively influenced my direction into graduate studies. I believe that the MSEIP program as well as working hands on with Dr. <redacted> (our program advisor) pushed me to be where I am today.”

Other trends in the comments were how the program helped the students solidify their career plans, exposed them to new concepts and skills, built up their confidence in their academic skills, and helped them make connections with their peers and their faculty mentors. One student commented: “It was a great opportunity to be placed in academically challenging and uncomfortable moments. I don't mean that in a bad way, because becoming good at STEM is learning to become comfortable with discomfort. MSEIP gave me opportunity to branch out of physics and to learn the struggles of learning new things constantly. Over the period of a month I underwent stress, hatred, appreciation, and dread of going to see my advisor Dr. <redacted>, but he ultimately meant well and I became a better student because of that.”

Conclusions

The MSEIP summer research program at CSUB had highly positive effects. Students are retained at rates much higher than the institutional average. The one-year, two-year, and three-year retention rates for program participants are nearly 90%, compared to the one-year rate of 75%, two-year rate of 63%, three-year rate of 57% at CSUB. Students report learning more about research and becoming more interested in their fields of study and career goals.

About one-fifth of the students report that they are now considering pursuing a graduate-level degree when they had not considered that career path before participating in the program. In follow-up surveys with the students and faculty mentors, many students are continuing to participate in research at the upper-division level and several students attributed the MSEIP summer program as a driving factor in continuing to pursue research.

This program has been a highly effective tool to retain students during the critical first two years of their university career path and to encourage them to pursue STEM careers in general and STEM research in particular. CSUB is currently seeking additional funding to continue the program beyond the end of the MSEIP grant.

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