

**AN EVALUATION OF THE PATHWAYS AND CAREER EXPLORATION IN STEM
(PaCES) PROGRAM:
COHORT B (TIER 2 PROGRAMMING)**

Executive Summary

Prepared for:



at



Prepared by:

Beth E. Rabin, Ph.D.
2064 Balmer Dr.
Los Angeles, CA 90039
bethrabin@sbcglobal.net

June 2024

INTRODUCTION

Two community colleges in Los Angeles, Los Angeles Valley College (LAVC) and Los Angeles Pierce College, have implemented an NSF-funded program to support their STEM students: Pathways and Career Exploration in STEM (PaCES). Both community colleges are Hispanic Serving Institutions. Partnering with them in this program are the University of Southern California and BioscienceLA, an organization designed to promote the Southern California life sciences industry. The goals of the two-year offerings of the PaCES program are to:

- Increase STEM retention of underrepresented minority students
- Increase the transfer rate from 2-year to 4-year colleges as STEM majors
- Inform changes and improvements of academic resources to support future STEM majors at 2-year institutions

During the 2023-24 school year, 20 students participated in components of the PaCES second year of programming (“Tier 2”), including a research class (Bio 285) that involved several local field trips, a four-day capstone experience at USC’s Wrigley Institute for Environmental Studies on Catalina Island, career and research presentations by graduate students, postdocs, and faculty (Bio 185), support to apply for summer internships, and joining the SACNAS (Advancing Chicanos/Hispanics & Native Americans in Science) chapter at LAVC. The program also offered visits to local four-year colleges.

Methodology

To establish survey benchmarks, students completed an **online pretest** survey as they entered the program; 12 students completed the pretest in the spring of 2023, and then 5 more students were added in the fall of 2023. Of the 18 who completed the posttest (see below), one had not completed the pretest. Pretest questionnaire completion took an average of 14 minutes and included both quantitative and qualitative items. Questions included participant demographics, educational and career goals, and attitudes toward STEM.

Toward the end of the spring semester, in May of 2024, an **online posttest** survey was sent to the 20 students who participated in the full second year of the program; 18 students completed the online survey, averaging 24 minutes (completion rate = 90%). Questions included satisfaction with specific aspects of the program, impact on attitudes toward STEM, educational goals, career goals, and suggestions for program improvement. The survey included both quantitative and qualitative items.

Participant Demographics

Survey participant demographics are shown below. Demographics were drawn from the pretest, so this data represents 17 participants.

Gender:		Ethnicity: (check all that apply)	
Female	44%	African-American/Black	6%
Male	56%	Asian-American/Asian	12%
		Hispanic or Latino/a/x	71%
When they began the program:		Native American or Alaska Native	--
First year student	18%	Pacific Islander	--
Second year student	53%	White	18%
Third year student	29%		
		First-generation college	82%
Home college:			
LA Valley College	94%		
Pierce College	6%		

Analyses

Pre/post program comparisons were calculated using Paired Sample t-tests and z-tests.

This document provides a summary of the responses to the pre- and post-program surveys. Complete posttest data are provided in Appendix A (post-program survey). Pretest data (pre-program survey) are provided in previous reports. Participant comments were copied directly from the online surveys and were lightly edited for spelling and punctuation.

SUMMARY OF FINDINGS

Satisfaction with the Program:

Similar to Year 1 (pilot year) and Year 2 of the program, Year 3 of the PaCES program's Tier 2 programming was again a success. For more than three-quarters of students, the program exceeded their expectations. The participants benefitted from their experiences in a variety of ways, detailed below, and gave enthusiastic high marks to the program overall, as well as to many specific program elements:

- The field trips were the key to the program's success; students appreciated getting out of the classroom, learning about a variety of STEM fields, and getting advice on how to succeed in a STEM career.
- As usual, the time at the Wrigley Institute on Catalina Island was a highlight, giving students the opportunity to connect with each other and immerse themselves into hands-on science.
- PaCES faculty mentors were helpful and encouraging, and PaCES peer mentors were supportive and provided good advice.
- Participants felt strongly that the PaCES program was worthwhile and would recommend it to others.

Program Benefits and Impact:

Participation in the PaCES program influenced students in several ways.

Students' academic and career intentions. As a result of the PaCES program, students:

- have a broader understanding of the range of science careers and how to pursue them, while narrowing their own career focus
- are more likely to know the steps to pursuing a science career
- are aware of STEM research and internship opportunities for college students and are likely to have applied (or plan to apply) for summer internships
- are considering changing their academic pathway and enrolling in a STEM graduate program
- are likely to apply for a STEM summer internship
- are more likely to be interested in a career in biotechnology rather than the health professions

Students' feelings of self-efficacy and connection. As a result of the PaCES program, students:

- felt more supported by and connected to the STEM communities at their colleges
- are more confident in their ability to pursue a STEM career
- are more confident in their research-related skills such as communicating science to the general public, giving presentations, and writing up their scientific work
- feel more able to develop a transfer plan to a four-year college and carry it out
- felt more motivated and confident to succeed in the often-challenging STEM coursework

While it is possible that some of these career and self-confidence changes could be due to time spent in college, the fact that most of the participants are second- or third-year students, combined with their own reflections on the PaCES program, suggests that the program is having the intended effect.

Suggestions for Program Fine-tuning:

- Similar to last year and the pilot, many students requested collecting actual data on the field trips, so they could have experience with that component of the scientific process; they felt some of the field trips were more “showing” and less “doing.”
- Students also suggested ways to expand the field trip offerings, broadening into other fields beyond the biological sciences.
- New this year were peer mentors. This year’s participants found them helpful, but some participants did not meet with them at all, or even know they were available. Providing more structure for the peer mentors will help both the mentors and the participants; this suggestion was echoed in the peer mentor evaluation report as well.

**STUDENT RATINGS OF PROGRAM ELEMENTS:
FIELD TRIPS AND COURSES**

	Mean (0-10)	% 8,9, or 10	N
Science Field Trips	9.6	94%	18
Bio 185 Career/Research Symposia	9.4	100%	13
Bio 285 Research Class	9.4	87%	16

As with the previous cohort, the field trips (offered as part of Bio 185 and Bio 285) were a very popular part of the PaCES program.

- The **science field trips** (in addition to the Wrigley capstone, discussed later) were rated very strongly. Almost all students rated them an “8” or higher, with 83% rating them a perfect “10.” The field trips sparked students’ interest in a variety of STEM fields.
 - “They showed me the varying paths one can take in their career regardless of educational background. So many pieces need to come together to make the STEM fields succeed. The people who agreed to host my peers and I in their labs and business are working to inspire a new generation.”
 - “The Natural History Museum, the mineral lab with Dr. Aaron was incredible as well as the USC lab tour. Being able to see what geologists do to contribute to the community was inspiring and motivating. It helped unlock an interest in the field of geology.”
 - “Every field trip was insightful, learned so much about different branches of a single career. Also the scientific convention exposed us so well to the scientific community.”
 - “The field trips were something I always looked forward to during my week. They were very exciting to attend and interesting to learn about science.”
 - “Science field trips provide students with immersive learning experiences outside the classroom, allowing them to witness scientific principles in real-world settings, spark curiosity, and foster a deeper appreciation for the natural world. Additionally, they offer opportunities for hands-on exploration, collaboration with peers, and interactions with professionals, enriching students' understanding of science and inspiring future careers in STEM fields.”

- The **Bio 185 Career/Research Symposia** in the spring semester was also a very valuable part of the program. All of the students rated it an “8” or higher, with 69% rating it a perfect “10.” Students learned about internships and how to succeed in a STEM career.
 - “Learning about internship opportunities and hearing firsthand experiences from students who have done them was good insight.”
 - “Able to meet amazing people in stem and get insight into their careers and what they did to get there.”
 - “It was fun going to Long Beach and networking with other students. I didn't know that these masters/doctorate students were actually just students.”
 - “Exposure to real internship and research opportunities and got advised how to become a competitive applicant for these opportunities.”

- The **Bio 285 Research Class** in the fall semester also scored well. Most of the students rated it an “8” or higher, with 75% rating it a perfect “10.” Students were exposed to career options that were new to them.
 - “This gave me an outlook of all different careers that would help me in the long run.”
 - “I was exposed to a variety of stem careers and professionals in a stem field. It gave me insight to what the opportunities were in STEM.”
 - “The classes were so engaging and a good introduction to all the STEM disciplines presented, many unknown career paths and variations of biology!”
 - “This class provided me with many different career options that I did not know existed.”
 - “The Biology 285 research class in the fall quarter is excellent because it offers hands-on experience, fosters critical thinking skills, and provides opportunities for collaboration with peers and faculty on cutting-edge research projects.”
 - “I enjoyed learning more about research/internship opportunities.”

**STUDENT RATINGS OF PROGRAM ELEMENTS:
WRIGLEY VISIT, SACNAS CHAPTER**

	Mean (0-10)	% 8,9, or 10	N
Capstone at Wrigley	10.0	100%	12
SACNAS Chapter	8.2	75%	12

- As in previous years, the visit to the **Wrigley** Institute for Environmental Studies on Catalina Island was a program highlight; all students who attended rated it a perfect “10.” Students felt warmly welcomed by the Wrigley staff and were able to experience “real” research, and talk with STEM experts about their career paths.

 - “The Wrigley institute trip was one of the best research experiences I have had. The staff at the institute inspired me with their dedication to their work. I look forward to going back on my own one day as a proper researcher.”
 - “An amazing experience. It was incredible being able to be ‘on the field’ while learning scientific concepts and applying previously acquired skills and knowledge. everyone in the institute was friendly and eager to teach us what they were passionate about most.”
 - “Firsthand I was able to experience what many experienced when doing research on the island. I was also able to speak to scientist and grad students who were very knowledgeable and helpful in explain their route and giving guidance.”
 - “A life-changing moment that I appreciate so much, an immersive experience that showed me that people like me can have these opportunities, and learn more on how to reach these goals.”
 - “Attending the Wrigley Institute has been a highlight in my academic studies. Not only was I able to learn so much about the native species on the island, but I was also able to build many friendships with my peers.”
 - “Very unique experience that facilitated collaboration, hands-on experience, and challenging activities that pushed me outside my comfort zone.”

- About two-thirds of the students participated in the **SACNAS** chapter. Of those who rated it, 75% rated it an “8” or higher; this rating is the same as last year’s SACNAS rating (8.3, 75%). Several students gained STEM support from the SACNAS chapter, but others attended only sporadically.

 - “Professor Rizo as well as the SACNAS chair members provided great resources as well as advice. I really enjoyed our zoom and in person meeting especially when we had guest speakers from different fields.”
 - “The SACNAS chapter made me realize that people with my background can also pursue a career in STEM.”
 - “Participating in the SACNAS chapter provides students with a supportive community, networking opportunities, and access to resources that empower them to thrive in STEM fields.”
 - “I was not an active member of the club but attended a few times and got new information out of it.”

- “All the events I attended of SACNAS were good, but I feel members should put more effort into participating.”
- “I enjoyed participating in SACNAS but wish the club was more active in the community.”
- “I didn't participate in SACNAS until I was elected. This is because I rarely heard of things going on, it wasn't in my field of notifications. Being part of SACNAS had been very stressful, but probably the most fun/satisfaction I have had in Valley outside of my math courses.”

STUDENT RATINGS OF PROGRAM ELEMENTS: MENTORING

	Mean (0-10)	% 8,9, or 10	N
Mentoring from PaCES Professors	9.7	94%	17
Mentoring from PaCES Peer Mentors	9.1	78%	14

Students received mentoring support from PaCES professors. In addition, three of last year's PaCES students acted as peer mentors for this cohort.

- The **PaCES professors** were helpful and encouraging mentors. Almost all students rated the mentoring as an “8” or higher, and 82% rated it a perfect “10.”
 - “My PaCES professors are the most impactful mentors that I have had in my life. They have guided me last two years at Los Angeles Valley College. I plan to stay in contact with my professors as I continue to progress through the STEM field.”
 - “Professor Byrd-Williams and Dr. Green-Marroquin are incredible as well as Sandy Illescas. They are inspirational and always pushing us to be our best.”
 - “I was always able to ask questions and got a lot of guidance for my future.”
 - “I am very grateful for all of the professors in the PaCES program because I have learned a lot from them. From teaching us how to study, to teaching us to get out of our comfort zone and try new things. They are amazing individuals whom I look up to.”
 - “Knowing I have the support of Paces professors and being comfortable enough to communicate anything with them is a huge part of my college experience.”
 - “Luis and Professor Williams have always been so helpful.”
 - “Very supportive, knowledgeable, and encouraging professors that I feel have truly influenced my desire to pursue STEM in higher-level education.”

- The **peer mentors** also provided helpful support to the PaCES students. Over three-quarters (78%) rated the mentoring from the peer mentors an “8” or higher, and 71% rated it a perfect “10.” However, several students didn't talk with the peer mentors at all.
 - “My peers were a respectful and responsible bunch that made me feel welcome during my time in PaCES. We all helped each other with coursework and peer level mentoring. The more social aspect of our field trips helped us to bond and I certainly feel that if I needed to, I could call on my peers in times of need.”
 - “PaCES peers are supportive and share great advice when it comes to maneuvering STEM in college as well as resources.”
 - “It was a great to being able to talk to someone who was in my same shoes at the same time not too long before me.”
 - “The PaCES mentors were very helpful and very easy to talk to.”
 - “I relied more on my professors than the students.”
 - “Honestly I don't know who the peer mentors are.”

**STUDENT RATINGS OF PROGRAM ELEMENTS:
OVERALL PROGRAM**

	Mean (0-10)	% 8,9, or 10	N
PaCES Program Overall	9.8	100%	18

- As with last year’s cohort, students rated the **overall program** very highly, with all rating it an “8” or higher. In fact, over three-quarters (78%) of participants rated the overall program a perfect “10.”
 - “The PaCES program during its two years was a fun and insightful journey through the different fields in STEM that vary from field research, lab work, and industry. The most important thing I learned from this program is that the work I do now may not lead me to where I am expecting, but it will lead me to something exciting and self-rewarding.”
 - “The PaCES program really helped me feel confident in my educational journey as a stem major. I felt that I gained insight I would have otherwise have not been able to acquire. Being able to see and experience what scientist do on a day to day basis helped me feel that although it is a rigorous field, it is not unachievable and I too can do it.”
 - “Giving me a chance to experiences and opportunities.”
 - “I would not have known that going into research was a thing and finding a community here without this program.”
 - “I am so grateful of this program, it helped me to feel as part of the STEM community of this school, it made my STEM career seem less intimidating and obtainable. Not to mention the amazing experiences and opportunities given.”
 - “Overall, this program has been the best academic experience I have had in my life.”
 - “Overall being in the environment alone with the professors and peers give make me feel more confident and secure with my college journey. I'm not one to be extremely social, but constantly learning new terms, environments, and programs have benefited me tremendously.”
 - “I learned a lot more and made lots of new friends and connections in the process.”
 - “Definitely worth meeting other STEM students and going to see other fields of STEM.”

STUDENTS' ATTITUDES TOWARD THE PROGRAM

	Mean (1-5)	% Agree	% Strongly Agree
Would recommend to others	4.7	6%	89%
Worthwhile way to spend my time	4.7	6%	89%
Help me with my career	4.6	17%	78%
Fellow students will provide support	4.1	22%	56%

Students' attitudes toward the program were extremely positive.

- Almost all students (most of them, strongly) would **recommend** the program to other students.
- Almost all the students agreed (most of them, strongly) that the program was a **worthwhile** way to spend their time.
- Almost all the students agreed (over three-quarters of them, strongly) that the program would **help their future career**.
- Over three-quarters of students agreed that their fellow students would provide **support** as they continue their studies. Two students were neutral on this item, and two disagreed.

<i>"The PaCES program..."</i>	
...exceeded my expectations	82%
...met my expectations	12%
...did not meet my expectations	6%

- Almost all students said the program met (12%) or exceeded (82%) their expectations. Only one student said the program did not meet their expectations.

PROGRAM IMPACT ON SENSE OF COMMUNITY/SUPPORT

<i>Please indicate how much you disagree or agree with the following statements: (asked before and after the program)</i>	Before Program		After Program	
	Mean (1-5)	% Agree+ Strongly	Mean (1-5)	% Agree+ Strongly
*I have STEM peers who support me	3.8	65%	4.5	94%
*I feel a part of the STEM community at my college	3.8	71%	4.4	94%
I have a STEM mentor who supports me	3.7	53%	4.1	77%

**Statistically significant pre/post difference, $p \leq .05$.*

As with last year's cohort, the program has positively impacted students' feelings of support and connection with regards to STEM.

- Before the program, about two-thirds of the students felt they had a supportive STEM peer group. At the end of the program, almost all students felt they had **supportive STEM peers**. This change is statistically significant.
- Before the program, less than three-quarters of the students felt they were a part of the STEM community at their college. At the end of the program, almost of the students felt they were a **part of the STEM community** at their college; this was a statistically significant improvement.
- Before the program, just over half of the students felt they had a supportive STEM mentor. At the end of the program, over three-quarters of students felt they had a **supportive STEM mentor**; note that this change was not statistically significant.

IMPACT ON ATTITUDES TOWARD SCIENCE

<i>Please indicate how much you disagree or agree with the following statements: (asked before and after the program)</i>	Before Program		After Program	
	Mean (1-5)	% Agree+ Strongly	Mean (1-5)	% Agree+ Strongly
Science is very interesting	4.8	100%	4.6	94%
I plan to incorporate science into my career	4.3	77%	4.4	94%
Someone like me can succeed as a scientist	4.1	82%	4.1	77%
*I understand the types of careers that are available to scientists	3.6	77%	4.4	94%
*I'm aware of STEM research and internship opportunities for college students	3.3	47%	4.4	88%
*I know the steps to take to pursue a career in science	3.3	41%	4.3	94%

**Statistically significant pre/post difference, $p \leq .05$*

Participants came to the program already predisposed toward science and science careers.

- Before the program began, all students agreed that **science is very interesting**. After the program, most students agreed with the statement; the slight decrease is not statistically significant.
- Most of the students came to the program already intending to **incorporate science into their career**. After the program, almost all students agreed with the statement; this slight increase is not statistically significant.
- At the outset, most students felt that **someone like them can succeed as a scientist**; this did not change after the program.

The program significantly increased students' awareness of the range of science careers and how to pursue them, as well as of STEM internships.

- Before the program, 77% felt they understood the **types of science careers**; after the program, this significantly increased to 94%.
- Initially, less than half (47%) of students were aware of **STEM research and internship opportunities for college students**. As a result of the program, significantly more students, 88%, were aware of these opportunities.
- Before the program, 41% of students knew the **steps to pursue a career** in science. After the program, this increased significantly to 94%.

IMPACT ON SCIENCE EDUCATIONAL ACTIVITIES

<i>Please indicate your level of interest in doing the following (1=Not at all, 2=A little, 3=Somewhat, 4=Very, 5=Extremely): (asked before and after the program)</i>	Before Program		After Program	
	Mean (1-5)	% Very+ Extremely	Mean (1-5)	% Very+ Extremely
Transferring to a 4-year college	4.9	100%	4.9	100%
Graduating from a 4-year college with a STEM degree	4.8	94%	4.8	94%
Take STEM courses in college	4.7	94%	4.8	100%
Having a STEM internship/research experience during college	4.5	94%	4.7	94%
Pursue a higher education degree in STEM (Master's or Ph.D.)	3.9	65%	4.2	73%
Pursuing a post-graduate degree in the medical field (physician, nurse, pharmacist, physical therapy, etc.)	3.0	41%	2.8	34%

There were no statistically significant changes from pre- to posttest on these items.

- Before the program began, all students were interested in **transferring to a four-year college** and **graduating with a STEM degree**. This did not change after the program.
- Before the program began, almost all students were interested in taking **STEM courses** in college and **having a STEM internship/research experience** during college. The slight increases in these items after the program are not statistically significant.
- Interest in pursuing a **higher education degree in STEM** rose slightly from before to after the program—over three-quarters of students were interested in doing so. However, this increase was not statistically significant.
- Interest in **pursuing a degree in the medical field** dropped slightly after program participation; however, this decrease was not statistically significant.

IMPACT ON SCIENCE EDUCATIONAL ACTIVITIES

<i>Which of the following have you done as a result of your participation in the PaCES program?</i>	Definitely Won't Do	Probably Won't Do	Maybe Plan to Do	Definitely Plan to Do	Already Done
Enroll in a variety of STEM college classes			6%	33%	61%
Consider a STEM academic pathway different from the pathway I had when I first started college		6%	22%	33%	39%
Seriously consider a STEM graduate program			17%	50%	33%
Apply for a STEM summer internship		6%	11%	72%	11%

Participants reported a variety of impacts of participating in the PaCES program.

- Almost two-thirds of students (61%) said they have already **enrolled in a variety of STEM classes** as a result of the program and the remaining students said they maybe or definitely plan to do so.
- About one-third of the students (39%) report that they are already **considering a different STEM academic pathway** than when they first started college. One-third (33%) said they definitely plan to consider a different academic pathway, and another 22% said they might do so.
- One-third of students (33%) report they are **seriously considering a STEM graduate program** as a result of the PaCES program. Another half (50%) are definitely planning to do so, and another 17% might do so.
- A few students (11%) have already **applied for a STEM summer internship** as a result of the program. Most other students either definitely (72%) or maybe (11%) plan to do so.

IMPACT ON STEM CAREER FIELD

What are your career goals? (asked before and after the program)	Before Program	After Program
Health professions/medical	46%	50%
***Science industry or biotechnology	41%	83%
Environmental science	27%	39%
University-based science researcher/professor	23%	39%
Veterinary science	9%	--
K-12 education	5%	--
Government/public policy	14%	11%
Energy sector	5%	11%
Undecided	27%	6%
Other, please specify	9%*	6%**

*"Dentistry, plant agriculture, or computer science," "software engineering." **"cybersecurity/computer science"

***Statistically significant differences between pre- and posttest for this item.

- As compared to before the PaCES program, significantly more students are interested in a career in **science industry** or **biotechnology** (41% vs. 83%).
- Interest in a health profession remained stable (46% vs. 50%).
- While not statistically significant, interest rose for careers in environmental science (27% vs. 39%) and **university-based research** (23% vs. 39%).
- Also not statistically significant, after the PaCES program, fewer students report being undecided on their career goal (27% vs. 6%).

IMPACT ON CAREER CHOICE

<i>Thinking about your career plans with regards to STEM in general, where do you place your plans along this scale? (asked before and after the program) (1=Definitely not, 5=Definitely)</i>	Before Program	After Program
Definitely NOT planning to have a career in STEM		
Probably not planning to have a career in STEM	6%	11%
Having a career outside of STEM that still incorporates STEM	24%	
Probably planning a career in STEM	24%	39%
Definitely planning to have a career in STEM	47%	50%
Mean (1-5)	4.1	4.2

<i>Thinking about your career plans with regards to the medical field or health professions, where do you place your plans along this scale? (asked before and after the program) (1=Definitely not, 5=Definitely)</i>	Before Program	After Program
Definitely NOT planning to have a career in the medical field or health professions	12%	22%
Probably not planning to have a career in the medical field or health professions	18%	11%
Having a career outside of the health professions that still incorporates the health professions	24%	17%
Probably planning a career in the medical field or health professions	29%	28%
Definitely planning to have a career in the medical field or health professions	18%	22%
Mean (1-5)	3.2	3.3

**There were no significant differences between pre- and posttest on these variables.*

Respondents were asked about their career intentions in STEM, and in the medical field/health professions.

- At the beginning of the PaCES program, about half of the participants (47%) said they were definitely planning to have a **career in STEM**. After the PaCES program, 50% said they were definitely planning to have a career in STEM. This slight increase was not statistically significant.
- Intention to have a **career in the medical field/health professions** did not change as a result of the program, although shifts show that students are less interested in the health professions after the PaCES program (12% vs. 22% definitely not planning to have a career in the medical field or health professions).

IMPACT ON SELF-CONFIDENCE IN SCIENCE-RELATED ABILITIES

<i>How confident are you in your ability to do the following? 1=Not at all, 2=A little, 3=Somewhat, 4=Very, 5=Extremely (asked before and after the program)</i>	Before Program		After Program	
	Mean (1-5)	% Very+ Extremely	Mean (1-5)	% Very+ Extremely
Transfer to a 4-year college	4.1	82%	4.6	94%
Pursue a STEM major in college	4.1	76%	4.5	89%
Approaching a science professor with a question	3.9	71%	4.0	72%
Explain the scientific method	3.8	59%	4.2	83%
Participate in STEM opportunities beyond coursework while at a 4-year college	3.8	59%	4.1	77%
Quantitative thinking and problem solving	3.7	65%	4.1	77%
Develop a transfer plan to a 4-year college	3.6	47%	4.4	89%
Succeed in college-level STEM classes	3.5	41%	4.1	83%
Communicating scientific concepts to the general public (friends/family without a scientific background)	3.5	41%	4.0	72%
Find STEM resources for transfer students at a 4-year college	3.4	35%	4.2	83%
Give presentations of scientific work	3.2	41%	3.8	61%
Writing up scientific research results	3.1	35%	3.7	56%
Conduct science literature searches	2.9	29%	3.8	44%

**statistically significant difference between pre- and posttest, $p \leq .05$*

Participating in the PaCES program significantly influenced students' self-confidence in their ability to transfer to a four-year college, as well as their science-related abilities.

- After the PaCES program, students' self-confidence was significantly higher in these key four-year college transfer skills than it was before the PaCES program:
 - **Transfer to a 4-year college** (82% to 94%)
 - **Develop a transfer plan to a 4-year college** (47% to 89%)
 - **Find STEM resources for transfer students at a 4-year college** (35% to 83%)
- In addition, PaCES students' self-confidence significantly increased in several science-related soft skills:
 - **Communicating scientific concepts to the general public** (41% to 72%)
 - **Giving presentations of scientific work** (41% to 61%)
 - **Writing up research results** (35% to 56%)
 - **Conducting science literature searches** (29% to 44%)
- Students' self-confidence in **succeeding in college-level STEM classes** also rose significantly (41% vs. 83%) from before to after the PaCES program.

STUDENTS' COMMENTS ON PROGRAM IMPACT ON ACADEMIC/CAREER GOALS

Students reflected on how the program had influenced their academic/educational goals.

- For many students, PaCES helped them refine their career goals toward **specific STEM fields**.
 - “When I first started community college I went in with the idea of eventually earning my bachelors degree in biology. This goal in hindsight is quite vague, however, seeing the varying career paths over the last two years has helped narrow down my goals into working towards a Biotech degree instead.”
 - “When I returned to school I was planning on going into nursing but have now shifted to pursuing a career in research. I'm not sure if I'm going to work in industry or academia but I am definitely planning on pursuing a graduate degree. PaCES exposed me to a wide variety of academic research opportunities that I was unaware of before joining the program.”
 - “Through PaCES, I've recognized the importance of a more comprehensive understanding of healthcare systems, policy implications, and interdisciplinary collaboration in nursing practice.”
 - “Mentorship within the PaCES program has played a pivotal role in shaping my goals. Conversations with nursing mentors have highlighted the diverse career paths within the field, from research and education to policy advocacy and healthcare administration.”
 - “I think my participation in this program has also given me the experience and insight that cements my decision to major in Biochemistry, as well as makes me stand out as a transfer applicant.”
 - “I knew I wanted to work in science and on living organisms even as a child. Nowadays, my interests have moved towards a microscopic direction and gene editing through a career in biotechnology.”
 - “I changed my major from nursing to biology. I wasn't sure what exactly I wanted to do as a biologist but as I refined my interests, I enjoyed microbiology and bio tech. Dr. Green and Professor Byrd have I inspired me to become a clinical laboratory scientist.”
 - “I've shifted from pursuing nursing to pursuing a career in research. The conversations I had with some of the professionals that were on the panels at the symposiums were invaluable in guiding my decision.”
 - “I was able to see and experience many different careers through this program, and some of which I did not know existed. For example, I have always had an interest in our Earth's mass extinctions. At the Wrigley Institute there was a graduate student who spoke to us about her experience in research and she mentioned paleontology. I was unaware there was a career that could be pursued about life on earth many generations ago. After hearing her experiences I am very interested in being able to do that one day.”
 - “I liked the idea of being out in the field, and that was something that the civil engineer spoke about when he came to the campus (via PaCES). Now I want to be a civil engineer.”

- For others, the program showed them the **broad range of STEM fields** open to them.
 - “It showed me other ways to use a stem degree like water, plants and such.”
 - “Plus the fact that I was exposed to more vocabulary and skills of disciplines I never considered before.”
 - “My career goals are relatively similar but I am more open minded now to different careers in stem and how I can use my degree such as through research, or even a museum.”
 - “By giving me different careers that I can go for the same majors.”
 - “I entered community college without expectations. Now I plan to leave community college with an open mind for various careers that I could end up in. I had originally planned to do pre-dental but I felt that it was not for me at the time. Through PaCES, I really enjoyed the field work and lab research aspect, which changed my career path a bit.”
 - “As a result of my experiences in the PaCES program, my career goals have evolved to encompass a broader range of possibilities within the healthcare field. While nursing remains a passion of mine, I am now considering alternative paths such as becoming a physician assistant or pursuing a career in radiologic technology. The program's emphasis on exploration, mentorship, and interdisciplinary learning has empowered me to make informed decisions about my future career path, ensuring that I can find fulfillment and make a meaningful impact in whichever role I choose.”

- The PaCES program helped some students to be **more motivated and confident**.
 - “I started off as a nursing major, had changed to biology but was not feeling confident and lost in my major and wasn't sure if it was for me. After meeting Professor Byrd and Sandy who introduced me to PaCES, I knew immediately I had found my community at LAVC and felt confident in being in my STEM major. Since then, I have grown immensely and it shows in my grades.”
 - “I was not exposed to any STEM related fields growing up, and I did not think that was an option for me, until I joined the PaCES program and everything changed. It kept me motivated to do well in my classes to be able to pursue my career in STEM. With this program, I knew I had the support of my professors and peers and that I could do anything I set my mind to.”
 - “One of the biggest parts is getting help deciding what classes I'm taking as well as having the motivation and inspiration to apply to more than just my safety school for my upcoming transfer.”
 - “I feel more confident in how I approach finding new academic resources and applying for research programs. This past year I have been motivated to seek help through tutoring, office hours, and participating in group study sessions when I struggle in my STEM classes.”

- Some students felt encouraged to attend **graduate school**.
 - “I decided to pursue a graduate degree rather than only a bachelor's. The opportunities showcased by the program really inspired me.”
 - “I would possibly even be interested in pursuing a PhD as I have promising words on the experience I will gain and the opportunities I can unlock.”

- “Since joining this program I have gained an interest in really pursuing research and my PhD. Being able to see grad students and even undergraduate students involving in research got me excited to try it out for myself.”
 - “Academic-wise I am thinking about pursuing a masters in nursing as well. A masters isn't something that I always wanted to pursue but now I was able to see the doors opened for others and the experiences gained I want this to be something else that I will accomplish. I have learned that it is okay to take a few years to work in the career chosen and then go back to school if found something that interest you.”
 - “I wasn't that interested in pursuing research or a masters, but now I am considering it.”
- The PaCES program also helped build a **support system of like-minded peers**.
 - “Going into the PaCES program as a freshman in college, I hadn't really met anyone or been a part of any clubs either. Now at the end of the semester, I have a good group of people I can relate to and am a part of multiple clubs to build my resumé.”
 - “My big takeaway from this program was feeling welcomed in the STEM community, and with this support system, I am confident it had helped me succeed in my STEM courses.”
 - “It pretty much helped me stay on track, ask questions about my major and connect with others.”

STUDENTS' SUGGESTIONS FOR IMPROVING THE PROGRAM

Students were asked specifically for their suggestions for improving the PaCES program.

- Some students suggested ways to **expand the field trips**, especially broadening into other fields.
 - “I would suggest opening up suggestions for where field trips are taken at as I feel my engineering centered peers lacked engagement on a few of the trips than I did.”
 - “I believe this program can have more trips to technological locations like for example SpaceX, startup companies in coding, and corporate industries.”
 - “More night-in field trips or out-of-state field trips.”
 - “If there was something I could suggest is some hiking days with our group of peers. This activity could allow us to develop more social skills and hear about our peers' experiences in STEM.”
 - “I really enjoyed the PACES program and how we were able to meet people from different fields however, I do wish that in the future that we would be able to meet with health professionals like doctors or nurses and be able to know about the paths they took where they got to be and any advice for those who choose to pursue those careers.”
 - “This program seemed very bio focused, and I would like to see other fields like engineering, physics, computer science.”

- While the field trips were very popular with participants, some wished they could have done “**real research**” or **data collection on the outings**. This suggestion was also made by last year's participants.
 - “I would have like to experience more hands tasks on our field trips, where we got to experience what it is like to conduct those specific jobs within those stem fields. I did appreciate the lab skills with Dr. Bingli Mo and Professor Haley in entymology. The tide pool fieldtrip was fun because we were hands on as well as at the Wrigley Institute we did get to catch plankton and had the opportunity to utilize their labs and that was an amazing experience.”
 - “In the future I would like to see more interactive research/field days.”
 - “Offering more hands-on experiential learning opportunities, such as internships or shadowing experiences, could further enrich students' exploration of alternative career paths.”