Journal of STEM Teacher Education

Volume 55 | Issue 1 Article 2

November 2020

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Daniel Choi
CSU Fullerton, dchoi@fullerton.edu

Antoinette S. Linton
CSU Fullerton

Journal of STEM Teacher Education
2020, Vol. 55, No. 1, 1-15

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Daniel Choi
California State University, Fullerton

Antoinette S. Linton
California State University, Fullerton

ABSTRACT

The focus of study is to examine the impact that The Orange County Teacher Pathway Partnership (OC-TPP) at CSU Fullerton has had on participants' (community college transfer students) skills and experiences gained in each of the program years from years 2015-2018. Students who participated in the STEM Institute gained pre-professional skills and teaching experience through various activities in the program. Students remained on the teacher pathway because the program allowed them to break out of their comfort zones, build social connections, and adjust to various groups of people. Attending the program increased college student confidence in content knowledge and content-based pedagogy, through their university-based experience. In addition, participants gained technical skills in science and teaching through professional exposure

Keyword: Pre-service STEM

At about the time The Center for American Progress released their "America's Leaky Pipeline for Teachers of Color" Report in 2014, the Orange County Teacher Pathway Partnership (OC-TPP) was awarded funding to fix and grow its existing regional level teacher pipeline- and even extend it out to recruit younger (community college) students into it. The OC-TPP, as a University-Community College Partnership program developed out of the work of Science Teacher Education instructors and staff at California State University Fullerton (CSUF), has established a teacher pipeline by building an academic program that would stretch across multiple institutions and would become the pathway towards admission into a teacher education program. From the beginning, the goal of the pathway was to expand the quantity and diversity of the teacher workforce, build a school-to-career bridge and address barriers to employment. Although the pathway represents advancement through the steps toward their academic goals, it also represents a persistence goal, so that students of color do not "leak out of the system" (Amad & Boser, 2014, p. 7) at multiple junctures in the teacher preparation pipeline (Mitchell et al., 2000). The extent to which the OC-TPP has successfully introduced Science Education pedagogy and classroom teaching experience to students at such an early stage of the pipeline, through its STEM Summer Institutes, is the focus of this study.

Recruitment and retention of highly qualified teachers educational leaders concerned that there will be a severe teacher shortage: "the state could easily face `very severe shortages' of teachers...It takes a long time for the pipeline to recover...Prompt action is needed to prepare new teachers and avert a significant loss of educational quality" (Freedberg, 2013, p.11). As economic growth and social well-being have come to depend more on STEM fields, educators need to effectively prepare students to enter and lead in STEM-related industries. A study funded by the National Science Foundation found that many teachers felt unprepared to teach math and science and are not confident that they can provide effective math or science instruction to a diverse group of learners (Epstein & Miller, 2011). Therefore, OC-TPP has worked to change how aspiring teachers feel towards math and science. To this end, the program provided extensive pre-service professional development, work experience, and externship opportunities- emphasizing effective inquiry-based math and science instruction, as well as integrating math and science skills development into the teacher Pathway.

This partnership program also was born out of the well-documented need in the literature of the actual transfer journey of students from the two-year to the four-year institutions- to reach a STEM Teacher Education program. A study by the Carnegie Foundation found that, "The high number of inexperienced teachers in public school classrooms is a largely unrecognized problem that undermines school stability, slows educational reform, and hurts student achievement" (Headden, 2014, p. 18). Math and science classes in high-minority schools are often taught by under-prepared teachers, impacting student achievement (National Science Foundation, 2014; Rice, 2010). The OC-TPP model (a 4 year/ 2-year partnership model) has engaged students in pedagogical training and work experience while they are in community college, preparing them to be effective paraprofessionals in school environments, and provide field experiences in pre-service teaching programs. By the time these future educators earn their credentials and enter the profession, they will have years of experience in working with students, applying reform pedagogical practices, and honing their skills. This type of experience is valuable also for addressing the on-going need of "creating and sustaining effective partnerships between two-year and four-year institutions," which was one of the greatest challenges, according to the Summit on Community Colleges in the Evolving STEM Education Landscape (National Research Council and National Academy of Engineering, 2012). This partnership also addresses the well-known transition problem students face due to poor articulation between the 2 year and 4-year institutions. According to a recent study, 14% of transfer students had less than 10% of their credits accepted, and only 58% of transfer students had more than 90% of their credits accepted. As expected, as the percentage of credits transferred increased, the likelihood of attaining a bachelor's degree also increased (Monaghan & Attewell, 2014). Furthermore, co-curricular programming has been known to positively support students' self-perceptions of competence, and serve as a form of support for transition, persistence, and attainment of a degree, particularly for underrepresented students (Gandara and Maxwell-Jolly, 1999; Hurtado et al., 2009; Mabrouk & Peters, 2000). Another barrier that this program has worked to overcome is the "disjointed and confusing articulation agreements that can negatively impact transfer rates, and in STEM fields specifically, distinguishing between prerequisite courses for STEM majors and those offering technical skills for other majors is confusing" (Tornatzky et al., 2006). Addressing these barriers is a priority in this partnership program because transferring is a formidable barrier to four-year undergraduate completion. Therefore, reducing institutional barriers between two- and four-year colleges is necessary to increase STEM degree attainment rates and path to a career in STEM teaching (Melguizo & Dowd, 2009). Besides addressing

negative barriers, this program partnership is built on evidence that STEM-related work experience has related to increased persistence "if the students decide their major coincides with their career interest (Jaeger et al., 2008).

The OC-TPP Program Background

The OC-TPP role in the Pathway is unique because it brings partners together to build out such an early stage of the teacher pipeline- which seldom amounts to more than information sessions on pursuing a teaching career and/or service-learning opportunities working with young children. Typically, it is not until students earn their bachelor's degree and are admitted into a Post-baccalaureate teacher education program that they receive the training and work-based experience needed for the classroom. OC-TPP provides intensive, introductory-level STEM teacher training during the Summer Institute, roughly 3-4 years before students would normally have access to this level of pre-service teacher training. Therefore, it seems the most fitting description of this work with community college students, is to call it, *Early Pre-service*. The partnership structure of the Pathway outlined in Figure 1 (below) specifies the educational progression students make through the partner institutions toward becoming a teacher. The Pathway articulates the CA credentialing program, the unique experiences and expectations students face at each stage, barriers and supports to timely advancement through the stages, and the expanded institutional capacity at key points in the Pathway. Dual enrollment is a key factor for the traditional education Pathway, and articulation agreements were instrumental for a fluid progression from community college to CSUF within the Pathway.

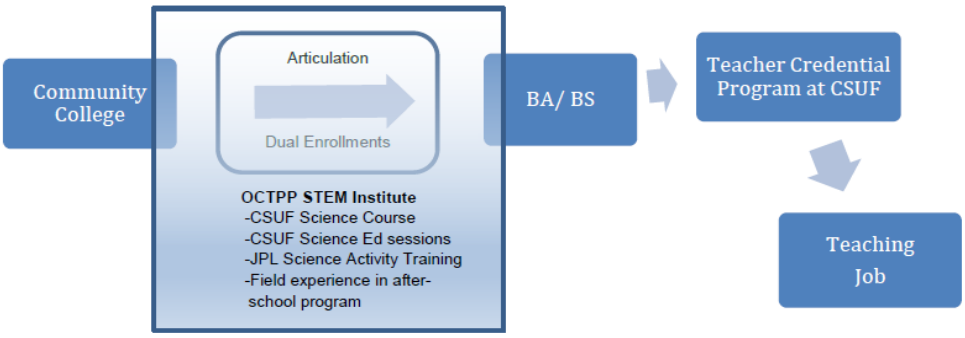

Figure 1. OC-TPP Pathway

What makes OC-TPP possible is the partnership. Since the beginning, Santiago Canyon, Santa Ana, and Fullerton Colleges have partnered with CSUF to build out this Pathway. The three community colleges have a long-standing partnership with California State University, Fullerton's Teacher Education Programs, and have worked with CSUF on curriculum development, articulation, and numerous Pathway and transition projects that have increased student interest and readiness for college pre-service teaching programs. All three community colleges are founding members and co-facilitators of the Regional Teacher Education Council in partnership with CSUF's College of Education.

Additional partnerships with community organizations, including The Jet Propulsion Laboratory (JPL) education division, and Anaheim Achieves/YMCA (AA), have enhanced enrichment activities and experiences for post-secondary pre-service teacher students. They recognize the need for better-prepared teachers in science and math, so they extended their pre-service and in-service curriculum and STEM experiential learning to the project. Anaheim Achieves, a local after-school program tied to YMCA, has played a key role in providing classroom environments for trained certificated teachers to deliver innovative Science lessons for the Enrichment portion of the on-going after-school program schedule. A partnership with CSU Fullerton has been mutually beneficial in preparing future STEM educators in the OC-TPP to work effectively with school-aged children, many of whom are underrepresented and disadvantaged, while also providing our after-school program with trained volunteers to provide our youth with tutoring and mentoring services.

At the foundation of OC-TPP is the deep commitment to work-based learning. Specific to the teaching profession, this means students are introduced to teacher preparation much earlier than usual- before one is admitted into a pre-service, post-baccalaureate teacher credential program. It is, therefore, nothing less than Early Pre-Service learning, and therefore, pathway students, even at the community college level, can connect to the profession well before the typical post-baccalaureate student. It is also through OC-TPP that students may start earning credit towards certificates permitting them to work at an After-School program.

At the Community College Level, the goal is the completion of the Associate Degree and CSU Transfer requirements. CSUF and the three community colleges have a long and successful tradition of collaboration around the transfer and preparation of teachers. The Community Colleges support students in balancing cohort-specific classroom experiences and completing specific courses he/she needs. The educational pathway leads participants to complete the general education and major requirements for the Associate of Arts degree that will lead to transfer to CSUF. All three community colleges on their own have well-established teacher preparation pathways, including AA degrees in Elementary Education (Pre-Professional) that are fully articulated with CSUF and prepare students to enter CSUF as Child Adolescent Studies, Liberal Studies, or Human Services majors. Each student participant has worked extensively with the members of their local community college campus staff to develop and monitor a detailed plan to achieve both their short- and long-term educational goals. Project participants would then be ready to transfer to CSUF within a two-year period, though some may need more time to complete an AA degree and transfer requirements.

Inside the OC-TPP Program

The OC-TPP Summer STEM Institute is designed as an immersive summer program for community college students who spend a summer at the university to get them familiar with the university campus. In particular, students in the Institute:

- Enroll in the General Education Science course at CSUF through dual enrollment, while participating in the STEM Institute at the university.
- Receive training in thematic-based STEM lessons by Science Teacher Education Faculty Member and Education staff from JPL.
- Receive firsthand experiences with effectively working with students one-on-one and in small groups.

The Institute is a 7-week summer program. While many universities offer a summer stem program, very few offer an Institute dedicated to the goal of introducing community college students to STEM education (or teaching). To this end, the Institute delivers a unique, *early pre-service* learning experience that includes, introduction to science pedagogy (that involves problem setting experiences and engineering design) and structured dialogue about high impact practices for tackling college and university academic challenges.

The Institute is structured into four blocks that include the summer Biology/Geology/Chemistry coursework block, Science for Educators, JPL/NASA Problem Setting block, and Project-Based Enactment block. Each of the blocks is described in more detail below:

Science Coursework. Students will enroll in a dual enrollment in CSUF's Science for Educators courses in Biology, Earth Science or Physical Science. Students will be supported through the rigor of these university courses by involved faculty, dedicated tutors and organized study sessions that are part of the institute activities. The Science for Educators courses taught by university faculty in our College of Natural Sciences and Math the students take 4 days a week, 3 hours a day for 7 weeks (what is typically a whole semester long).

Applied Pedagogies in Science. Another component of the STEM Institute, the purpose of the weekly session, led by the CSUF Science Education Faculty member, is to engage Institute students in inquiry-based pedagogical knowledge and skills. Inquiry for the program is defined as a multidisciplinary student lead activity, where students ask driving questions that show critical thinking and application of skills to pursue explanations of phenomena. On a broader level, students are also introduced to basic facets of lesson planning, classroom observation, and assessment strategies.

Project-Based Learning with JPL. Field-Based Practices will be facilitated by the JPL faculty. These were sessions held once a week in the afternoon. Two JPL Education Specialists facilitated the problem setting process for students, using NASA education projects so they could bring field-based problems into the K-12 classroom. Students then designed lessons around these projects while incorporating the knowledge gained from the Science coursework and Applied Pedagogies sessions. Students worked to practice their lessons week-to-week to deliver them to actual elementary school-aged students in the Anaheim Achieves After-school program.

Work-based/ Classroom-Based Teaching Experience. The OC-TPP students delivered their project-based lessons in the field at one of our after-school provider sites- Anaheim YMCA. OC-TPP students taught five prepared lessons from their Applied Pedagogy session, which involved engaging students in small groups or one-on-one while learning through lesson planning and learning to apply classroom management skills. The experience was also designed to help students identify learning goals based on the Next Generation Science Standards. A broad range of activities was then planned, practiced, and then finally implemented.

At the end of this experience, students walk away with experiences that would otherwise await them much later, and with less knowledge, at their early stage, about how to keep advancing toward a career as a fully credentialed teacher.

Method

Central to the research design of this study is our focus on developing a foundational understanding of OC-TPP candidates experiences as part of their engagement and participation in a STEM teacher education program that is distinguished by the vast offering of teacher education experiences, fieldwork opportunities, academic and personal advising services in a supportive educational context. This approach and selection of data sources resemble what is collected and analyzed in the vast majority of STEM Education studies (Brown, 2012). More specifically, such studies in STEM were focused on describing the processes of practicing teachers and the experiences of teachers in professional development programs (Rose, 2007; Brown, 2012). The research focus of this project is three-fold. The research questions driving this study were the following:

1. In what ways did participating in the OC-TPP summer institute impact the participants' understanding of teacher practice as defined by the planning, enactment of a lesson, and interpretation and translation of student learning outcomes.
2. In what ways did the OC-TPP summer institute impact candidates' ability to facilitate learning for elementary children?
3. In what ways did participating in the OC-TPP summer institute mentorship impact the participants' ability to learn teaching?

Data and Instruments

The current study utilized a mixed-methods approach, capturing three years of data from both quantitative and qualitative measures. Students enrolled in TPP Summer STEM Institutes took self-reported surveys and participated in focus groups.

The Institute participants were between the ages of 17-24, who have struggled with multiple at-risk factors, and who had struggled academically in the past. Many of the program students have very limited adult and peer interaction and support, and even less counseling and mentoring.

This study relied on online surveys via Qualtrics, an online-based survey program, which uses both open-ended and closed-ended questions to collect participant survey data. Data collected from surveys include demographic information (e.g., age, gender, race, education level, etc.), participants' interest, interest in STEM education, overall knowledge about careers in education, as well as suggestions for program improvement. Most questions included Likert-scale questions based on a four-point scale, from Strongly Disagree to Strongly Agree.

In addition to collecting survey data, students were interviewed and recorded for a five-minute-long promotional video to share about the quality of their experience in the Summer STEM institute.

Focus groups were also conducted during the 2017 summer programs to capture additional insight into students' experiences and perceptions of the program. Focus groups were conducted for community college students regarding program experience. The focus groups included 4 participants each year and were conducted for community college institutes. Students were asked to discuss what motivated them to join the program, their level of involvement in the program, and how the program has affected their knowledge of STEM teaching. Participants also offered suggestions for program improvement.

The following is a summary of the instruments administered to community college students 2015- 2017.

Table 1
Summary of instruments used by TPP

Summer Year	Program	Pre- and Post-Surveys	Promotional Videos	Pre-Focus Groups	Post-Focus Groups
2015	College	✓	✓		
2016	College	✓	✓		
2017	College	✓		✓	✓

Procedures

Surveys were administered to all students who were enrolled in each of the Summer STEM Institutes during 2015, 2016, and 2017 summers. Surveys and two focus groups were administered to all students after completion of the program.

Analysis Methods

First, quantitative survey data were analyzed first. Descriptive and mean comparison analyses were performed on quantitative data gathered from surveys. The analyses explored frequencies, valid percentages, sample sizes, and score distributions. Graphs were created to visually represent descriptive comparisons between groups and item responses. Tables were also used to help summarize and explain responses.

The analysis of qualitative data included making meaning of interviews and focus groups. Qualitative data collected through focus groups and promotional videos continued to highlight student's positive experiences from participating in the Summer STEM program in the years 2015-2017. The focus group audio recordings and notes were carefully reviewed for emergent themes using an open coding system. This required a review of the audio recordings several times and used interview notes. The analysis process involved looking for patterns, inductively coming to provisional conclusions through direct interpretation and/ or categorical aggregation (Stake,1995). Two general strategies for analyzing the data included: "relying on theoretical propositions and "thinking about rival interpretations" (Yin, 2003, p. 114).

Findings

The following results consist of cumulative data representing an aggregation of findings across all three years (2015, 2016, & 2017) of data. Quantitative survey data were analyzed to complement the findings of the qualitative data, which appear first in Table 2 below. For the quantitative analysis, descriptive and mean comparison analyses were performed on data gathered from pre and post surveys. Table 2 below starts by summarizing the four emergent themes drawn out from qualitative data.

The themes above indicated that the Summer STEM Institute provided a supportive environment for students. Students reported academic, professional, peer, and faculty support as examples of what keeps them on the pathway. Therefore, the findings below are organized according to each of these themes:

Table 2
Emergent Themes: What College Students Gained from Summer STEM Institute

Themes	Descriptions
Science Course engaged students and improved students' content competency	Students were taught by engaged faculty and augmented by dedicated tutors that were part of the institute's support services.
The curriculum introduces skills to prepare students to plan and teach Science Lessons	The curriculum gives students introductory-level content-based pedagogy skills normally introduced in a postbaccalaureate pre-service program.
Students engage in work-based learning by teaching a prepared lesson in a real classroom of actual students	TPP program partnered with the After-School program- which allowed trained TPP students to teach a weekly Science lesson to their students. Through this experience, TPP students gain experience and skills that better qualify them for jobs/internships.
Feedback from experienced teachers aids students' improving their skills	Faculty/staff give students the necessary feedback, which helps their early development as teachers.

Finding 1: Science Course engaged students and improved students' content competency

The TPP students participated in a 7-week daily Summer Science course at CSUF. Students were enrolled in one of three courses: Biology, Chemistry, or Geology. The science course increased participants' learning and understanding of the course content through course components that focused on an activity-based and active learning approach to teach science. No less than 92% of participants reported that lab activities, structured discussions, group work, and active learning in the classroom helped participants have a better understanding of the science content than from the time they started in the summer program (Fig. 2).

Analysis of Focus Group data supported the above findings. While in the program, students were able to observe and identify the ways faculty helped to build their interest in learning science. Students described the teaching strategies the instructors utilized in the program as effective in their learning experience. The feedback from participants illustrated the long-term impact of the program for a student pursuing a career in teaching. One student noted, "Their strategies are amazing and very engaging, and with my professor she knows how to make things fun and knows how to engage us and make us understand with real life experiences and I feel like I can take that into field and for children to understand from their own experience." The students shared an appreciation of the teacher's presentation of the material because it allowed them to enjoy learning about science. Another student added, "he gave us explanations and visuals with his hands and using people to show it that's what I like about him because he explains into different ways of teaching." When instructors were teaching using a strategic method, students were better able to understand the content and helped increase interest in what they were learning.

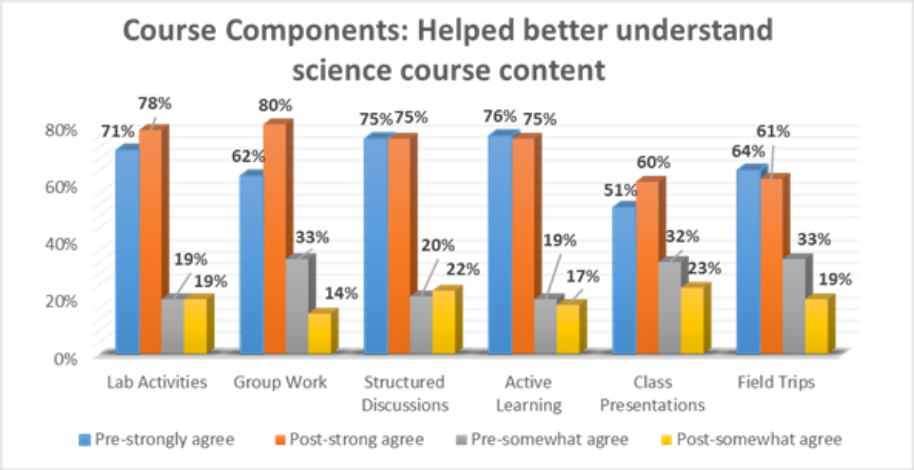

Figure 2. Survey Results on Student Experience with Science Courses

Finding 2: Curriculum introduces skills to prepare students to plan and teach Science Lessons

Intuitively, the numerous benefits of partnering with a Science Education faculty member who also possesses deep expertise in the Next Generation Science Standards seemed like a "win-win." Fortunately, the analysis of both qualitative and quantitative data supported the value this faculty member would bring to the program.

One student explained the benefits of the weekly Applied Pedagogy sessions with the Science Education faculty member, saying: "[the program] helped me gain experience on the field, with lesson planning, classroom management skills, get familiar with being able to teach kids, or deliver lesson plans with other group members." Again, without this program, these community college students probably would not be introduced to such skills and experiences for another 3-4 years (before transferring and then earning their Bachelors' degree and then after being admitted into a postbaccalaureate University-based Teacher Education program. Another student added, "[the program] lets you experience what teaching is about and what tools you need to be a leader too." To support these findings, students attending the 2015 to 2017 Summer STEM Institutes responded to survey questions on knowledge of teaching and classroom management techniques (N=90; see Table 3):

In addition to these benefits, students expressed their gratitude in being able to gain this knowledge as a community college student. They stated, "I acquired so much knowledge on teacher pedagogy, which was awesome because that is something you usually don't learn until your teaching credential, and I was lucky enough to learn that as a community college student." This is an example of how the program supports persistence at an early stage of the teacher pathway; and, at this early stage, are some of the same experiences that post-baccalaureate students would have when admitted into a credential program.

Table 3

Skills and Experiences Gained from Applied Pedagogy Sessions across 2015 and 2017 years of program implementation

I have used the following in my work with students: (1=Never, 5=Always)	Mean (M)	Standard Deviation
Student led activities.	4.04	1.438
Show critical thinking by asking questions.	4.26	.801
Lesson planning.	4.13	.497
Show application of skills to explain phenomena.	4.03	.664
Enact an activity.	4.28	.657
Reflect on teaching outcome and make necessary changes for the next activity	4.22	.627

By participating in the Summer STEM program, students were given a rare and exclusive experience participating in weekly sessions with an educator from JPL. Their expertise from having developed the activities themselves provided a perspective on teaching that included strategies AND preemptively troubleshooting problems that may occur when delivering the lessons. Having been teachers themselves, they also reinforced effective classroom practices. A student shared, "I learned how to teach science lessons that were incorporated from the JPL/NASA program, including how to manage the classroom [while teaching the activity] and also deal with attention-getters." Students attending the 2015 to 2017 Summer STEM Institutes responded to survey items on their learning from the JPL/NASA sessions (N=90; see Table 4):

Table 4

Benefits Learning from JPL educators across 2015 and 2017 years of program implementation

The following is true for me: (1=Strongly disagree, 5=Strongly agree)	Mean (M)	Standard Deviation
I have learned science concepts through hands-on experience, demonstration, and projects.	4.83	.740
Enacting science-based projects have helped me understand science.	4.79	.983
I have applied and connected science to how it is used in the field.	4.70	.917

I feel prepared to teach science to elementary students.	4.60	.989

Based on these results, the students, on average, strongly agree that their JPL/NASA sessions positively added to their early growth in understanding and applying key concepts in STEM education- from beginning to end of the program.

Finding 3: Professional skills grant students additional opportunities

As an integral part of the OC-TPP STEM Institute experience is for students to train for employment in a specific school-based classroom environment. In the Institute, the required teaching experiences were programmed in as part of the summer schedule of the Anaheim Achieves/ YMCA. Given the specific instruction, training and practice that had occurred in the other parts of the program, it is in this authentic, field-based environment that students gain early experiences in the profession. Although much of students' attention was spent on preparing for delivering instruction effectively, they were also asked to reflect on what they learned through this experience. Table 5 below represents this learning.

Table 5
Growth in Understanding and Applying STEM Education across 2015 and 2017 years of program implementation

Please state your level of confidence for the following questions: (1=Not confident, 4=Very confident)	Mean (M)	Standard Deviation
I have an understanding of basic science concepts.	3.65	1.08
I can integrate my knowledge of science concepts in the real-world.	3.57	.749
I will do well in the Summer STEM Institute science course (Biology, Chemistry, and Geology).	3.44	.464
I can teach basic science concepts.	3.55	.765
I can manage a classroom of elementary students.	3.57	.276

Based on these results, the students, on average, have significantly increased their level of confidence for the following statements after attending the program: I have an understanding of basic science concepts, I can integrate my knowledge of science concepts in the real world, I can teach basic science concepts, and I can manage a classroom of elementary students, $p<.05$. However, there was no significant difference in the statement I will do well in the Summer STEM Institute science course Biology, Chemistry, Geology), before and after attending the program.

The other participants who were unsure of a teaching career shared, "This program [TPP] helped me realize that I do want to pursue a career in education." One of the students who reported wanting a teaching career stated, "[the TPP program] helped me open my eyes, give me the experience I needed in order to pursue other advances in the career." A student also shared an incident during the program that impacted her decision to become a teacher. They shared, "These two little girls came up to me, and they were like…we are going to miss you and that was the moment where I was like… yeah…no…I'm meant to do this…it made me more excited for the future." In joining the program, not only have students been exposed to teaching, but they were given a chance to reflect on their professional goals.

Finding 4: Feedback from experienced teachers aids students' improving their skills

Not only did OC-TPP students gain experience in the profession. They also received supervised feedback on their teaching performances. In the last two years of the program, in-service teachers were hired to observe and provide valuable, coaching-style feedback to participants. The students found criticism and overall feedback to be beneficial for their learning development during the program. A student shared, "[I] learned about leadership during the lesson. As a group, we identified what each member needed to work on." Additionally, a student expressed the feedback to be helpful as they stated, "there was always someone there who has done the activities that can direct me to the right path and give me constructive criticism, which was really helpful." This feedback allowed students to discover their areas of improvement, which further supported their learning.

To support these findings, students during the 2015 to 2017 Summer STEM Institutes responded to fieldwork observation feedback after the completion of the program (Post: N=90; see Table 6):

Table 6
Benefits of Master Teachers' Observation Feedback on Lessons across 2015 and 2017 years of program implementation

Questions (1=Strongly disagree, 5=Strongly agree)	Mean (M)	Standard Deviation
The Master Teachers provided meaningful feedback about my teaching.	4.20	1.326
The feedback provided helped me improve my lesson planning every week.	4.33	1.161
The feedback provided allowed me to better prepared to facilitate an activity to elementary students.	4.34	1.210
The feedback provided helped me strengthen my classroom management skills.	4.37	1.166

The feedback provided will help me in my future work with students.	4.43	1.142

Based on these results, the students, on average, agree (4=agree) that Master Teachers provided meaningful feedback, feedback provided helped improve lesson planning, feedback provided allowed better preparation to facilitate activities to elementary students, feedback provided helped strengthen my classroom management skills, feedback provided will help future work with students.

Conclusions and Implications

After several years of implementation, the Teacher Partnership Pathways (TPP) has established an early pre-service teacher education model introducing underrepresented students to future careers in Science, Technology, Engineering, and Math (STEM) education.

Throughout the STEM Institute, students gained pre-professional skills and teaching experience through various activities in the program. The program also implemented visits to, and lessons from, the Jet Propulsion Laboratory (JPL). Through the years of offering the STEM summer Institutes, college students reported that JPL helped them learn numerous science concepts and how to teach science to elementary school children. Attending the program increased college student confidence in demonstrating science projects. In addition, college students gained professional, personal, and academic support from the program. They also report their ability to speak to school personnel, the benefits of tutoring, resume building, and how this experience has supported their futures. The community college students showed positive responses and reported being comfortable and less prepared after attending the institute.

To date, the educational pathway/timeline is not obvious to an incoming student, particularly transfer students, because many California universities do not often provide opportunities for early entry into a teacher pathway at a pre-undergraduate, pre-transfer level. In fact, many California universities do not offer undergraduate degrees in education because students must prove subject matter competency in order to enter a teacher preparation program, thus majoring in the subject they wish to teach is recommended. Once students do find the appropriate pathway, they are often not connected to schools or colleges of education until their senior year of college, when they begin taking pre-requisite courses for the teacher preparation programs. If students are not able to find a pathway to teaching earlier in their educational experiences, they may spend more time completing preparation programs and, worse case, be more likely to change their career goals altogether.

The OC-TPP program has given students the opportunity to explore the teaching profession and pursue an undergraduate degree by way of early exposure to teacher preparation curriculum, fieldwork experiences in public P-12 schools, and mentorship from experienced teachers. This program was designed to prepare students for a mindset to be college-ready, but also career-ready, which was aimed at increasing higher transfer rates, degree completion rates, and enrollment into teacher preparation programs among participants.

We believe that developing “locally-grown” educators will benefit generations to come as our teachers tend to originate from and stay in the communities in our region, those we are most dedicated to serve. Building upon partnerships between CSUF, Santiago Canyon College, Santa

Ana College, Fullerton College, and P-12 school districts with a large percentage of underrepresented students allows us to encourage students who come from diverse backgrounds to pursue a career in teaching and provides the supports needed to retain them.

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Author

Daniel Choi
Associate Professor
California State University, Fullerton, Department of Educational Leadership
Email: dchoi@fullerton.edu

Antoinette S. Linton
Assistant Professor
California State University, Fullerton, Department of Secondary Education
Email: alinton@fullerton.edu