Summer Engineering Institute Report

2016

Outcomes from the 2016 Summer Engineering Institute: An Assessment Report

Summer engineering programs are critical elements of many comprehensive programs designed to increase the recruitment and retention of underrepresented undergraduate engineering students. Research findings indicate several junctures on the route to an engineering career where talented and college-admitted underrepresented groups are displaced. One such juncture includes the transition period between graduating from high school and entering into college. The following report examines the student learning outcomes from the 5-week Summer Engineering Institute, as well as the students' curricular and co-curricular experience throughout the duration of the 2016 program. The purpose of the report is to quantitatively and qualitatively understand how the program impacted the students' academic and social integration to the engineering field, the students' academic skill development, their personal and professional growth, and the students' sense of belonging to UC San Diego and the culture of engineering. A post-survey was disseminated to all 63-student participants (N=52) asking a series of questions that were aligned with the learning and program goals of the Institute. In addition, 24 student participants were interviewed and eight documents were examined, which included faculty reflection writings, course syllabi, and course observations. Four predominant themes emerged in the promotion of student success during the Institute which helped to ease the students' transition to undergraduate engineering education and college life by providing the academic and social resources, relevant knowledge, and skills they would need in their undergraduate careers.

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– SEI Participant

On behalf of the IDEA Engineering Student Center and the Jacobs School of Engineering, thank you for taking the time to read about the Summer Engineering Institute. It is one of the many impactful and valuable experiences that our new engineers enjoy once they become part of the Jacobs School. We look forward to engaging with you, learning about your perspectives, and hearing your ideas to make programs like this a lasting success at UC San Diego.

Sincerely,

Dr. Olivia Graeve
Director, IDEA Engineering Student Center
Professor of Mechanical and Aerospace Engineering
Director, Calibaja Center for Resilient Materials & Systems

Executive Summary

The Summer Engineering Institute is a key element of the Jacobs School of Engineering Student Success Initiative. The program is specifically structured to ease the academic and social adjustment to college life for incoming freshmen through academic coursework, peer and faculty mentoring, tutoring, academic and technical workshops, and the creation of a community of scholars. In general, summer engineering programs for underrepresented students, including first generation and low-income students, have existed on a national level for some years, demonstrating that they facilitate students' adjustment to college life (Ackerman, 1991), enhance students' social and academic support networks (Person & Christensen, 1996), improve academic performance (Ackerman, 1991) and increase retention rates (Ackerman, 1991; Reyes, Anderson-Rowland, & McCartney, 1998; Walpole, Simmerman, Mack, Mills, Scales, & Albano, 2008). Moreover, summer engineering programs are critical elements of many comprehensive programs designed to increase the recruitment and retention of underrepresented undergraduate engineering students (Gandara & Maxwell-Jolly, 1999; Hrabowski III & Maton, 2009; Walpole et al., 2008). Research findings indicate several junctures on the route to an engineering career where talented and

college-admitted underrepresented groups are displaced (Hrabowski III & Maton, 2009; Reyes et al., 1998). These junctures can and do occur at a range of time points, including the transition period between graduating from high school and entering into college.

Based on previous successful models, the IDEA Engineering Student Center developed a 5-week academic, summer residential program for admitted freshmen engineering students. The Institute seeks to ensure the success of well qualified, admitted engineering students whose prior preparation did not provide all the opportunities and skills needed for a successful engineering college experience. Our vision of success goes beyond simply graduating students: rather, we also aim for academic achievement; full participation in all programs and learning experiences the College has to offer; and assurance that graduates are well positioned for launching a professional career or pursuing additional studies. Students are introduced to strategies, skills, and processes that will help them become successful and productive engineering students. Furthermore, students have the opportunity to familiarize themselves with university and college services and resources, and meet and engage with engineering faculty, graduate and undergraduate students, and Jacobs School of Engineering staff. This report focuses on the 2016 Summer Engineering Institute students' experiences and the program's impact on students' academic and social integration to the engineering field, students' skill development and personal growth, and students' sense of belonging.

Evaluation Methodology

II.1. Quantitative Data

Description of the Survey Instrument: The 2016 Summer Engineering Institute survey instrument focused on students' ratings of their gains from the program in the following key areas: learning and classroom environment, instructor and peer interactions, confidence and skills developed as it relates to engineering coursework, relevancy and application of engineering coursework, information that students received from academic and technical workshops, specific program activities during the Institute, sense of belonging, the academic and social culture created by the Institute, the increase in students' understanding of college life from participation in the program, and the transferability of students' gains from the Institute to their subsequent life as UC San Diego undergraduate students. Survey respondents also provided demographic data and answered open-ended questions about the quality of the Summer Engineering Institute and

offered suggestions for improvement of the program. All quantitative items related to academic coursework, classroom environment, and social activities were rated on a 5-point scale with 5 = not applicable. Not all instructors had similar requirements and/or classroom activities, thus the option of an answer being "not applicable" was provided. Questions related to workshops and program activities that required all participants to attend, did not include a "not applicable".

Overall, all survey questions were aligned with one of the five major goals of the Summer Engineering Institute:

- Provide newly admitted students with academic preparation and support in first year engineering coursework.
- Build a diverse community of learners by providing a strong and supportive academic and social environment.
- Acclimate students to the norms and culture of scientific inquiry.
- Integrate students to the Jacobs School of Engineering and the UC San Diego community.
- Address progress toward degree.

Quantitative Data Analysis methods: The quantitative data was entered into the statistical software package SPSS where descriptive statistics were computed. Weighted averages and/or means have been reported for all of the rating items, and frequencies for some of the multiple-choice items. Tests of statistical significance, such as t-tests or one-way ANOVAs, were not conducted because the small sample sizes for the surveys precluded meaningful statistical analysis of group differences (Creswell, 2014). Write-in responses to the open-ended questions from the survey were entered into a spreadsheet and coded in SPSS. Each new idea raised in a response was given a unique code name. As these same ideas were raised by later respondents, a tally was added to an existing code reflecting that idea. At times the write-in answers were brief and represented a single category, but more frequently, responses contained ideas that fit under multiple categories, and these were coded separately (See Appendix A for survey instrument and individual question responses).

II.2. Qualitative Data

Description of the Qualitative Instrument: Assessment of the program utilized both individual interviews and faculty and Teaching Assistant documentation to explore the students' experiences during the Summer Engineering Institute. An interview protocol was developed which asked participants about opinions, values, knowledge, and feelings about their experience during the Summer Engineering Institute (See Appendix B). Qualitative data is important to

include in any type of assessment because unlike quantitative data, qualitative methods examine how people interpret and make sense of their experiences, and what meaning they attribute to them (Merriam and Tisdell, 2016). The meanings and beliefs the students attribute to their experiences during the Institute are a major part of what we seek to understand. The purpose of individual interviews is to allow the researcher to enter into the other person's perspective of a phenomenon. The strength of conducting interviews is that the researcher is able to focus on learning the meaning and interpretation that the participants hold about an experience, not the meaning that the researcher brings to the research or that writers express in the literature (Creswell, 2014; Maxwell, 2013). However, the limitations of conducting interviews are that it provides indirect information filtered through the views of interviewees and therefore, may bias responses. Therefore, faculty and instructor documentation, such as reflection writings, were used as a means of collecting data. It is important to triangulate data and incorporate both interviews and documentation data sources in the assessment process in order to address any biases, strengthen internal validity, and develop a more comprehensive understanding of the phenomenon and different dimensions of an experience.

Qualitative Analysis methods: There were a total of 24 individual participant interviews conducted and each interview was approximately one hour. In addition to interviews, eight documents were examined, which included faculty and Teaching Assistant reflection writings, course syllabi, and class learning objectives. Each interview transcript was transcribed and after each transcription, observational comments were made along the margins of the transcripts. All transcripts and documentation were imported into ATLAS.ti, a computer program used in qualitative data analysis. The purpose is to uncover and systematically analyze complex phenomena hidden in unstructured data such as in texts and in words/language. The goal of data analysis is to compare one unit of information with the next, looking for recurring regularities in the data (Merriam & Tisdell, 2016). Thus, through the use of coding, data was eventually consolidated and reduced, looking for regularities, and then constructing themes that capture some recurring patterns that cut across the data. Pattern coding helped to elaborate an evolving cognitive map, providing a more integrated schema for understanding incidents and interactions.

II.3. Demographic characteristics survey sample

Fifty-two students completed the Summer Engineering Institute survey. The survey was distributed the last week of the Institute to all 63-student participants. Because the Summer Engineering Institute is designed for incoming freshmen engineering students, all survey participants were freshmen engineering students. Out of the fifty-two survey respondents, 52% were male, 44% female, and 3.9% identified themselves as gender queer and/or gender non-conformity, as illustrated in **Figure 1.**

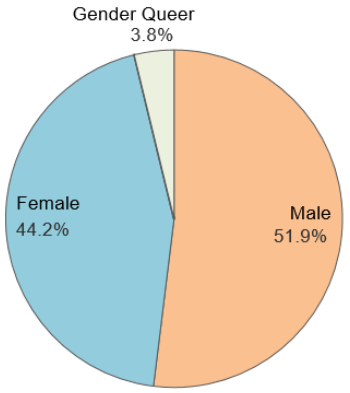

Figure 1. Gender distribution of survey respondents that participated in the 2016 Summer Engineering Institute

In terms of race and ethnicity, 7.7% identified as African American, 2% American Indian/Alaskan Native, 31% Asian American, 17.3% Caucasian, 3.9% Filipino/a, 9.7% Latino/a or other Spanish origin, 23% Mexican American and/or Chicano/a, and 5.8% as other, as illustrated in **Figure 2.**

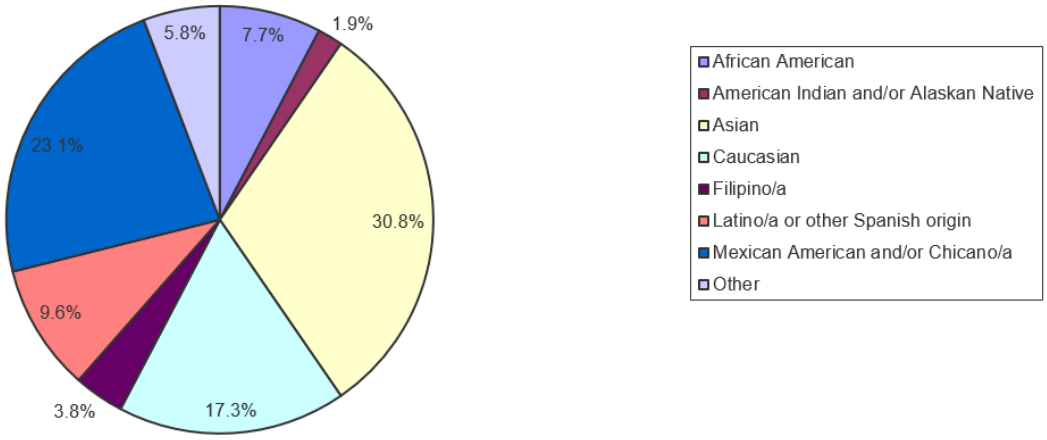

Figure 2. Ethnicity distribution of survey respondents that participated in the 2016 Summer Engineering Institute

In terms of engineering major, 17.3% were Bioengineering, 5.8% Chemical Engineering, 11.6% Electrical and Computing Engineering, 38.4% Mechanical and Aerospace Engineering, 5.8% NanoEngineering, and 21.1% Structural Engineering as illustrated in **Figure 3**. It is important to note that Computer Science and Engineering is not in the representative sample since no CSE student was part of the Institute. The CSE Department has their own summer program.

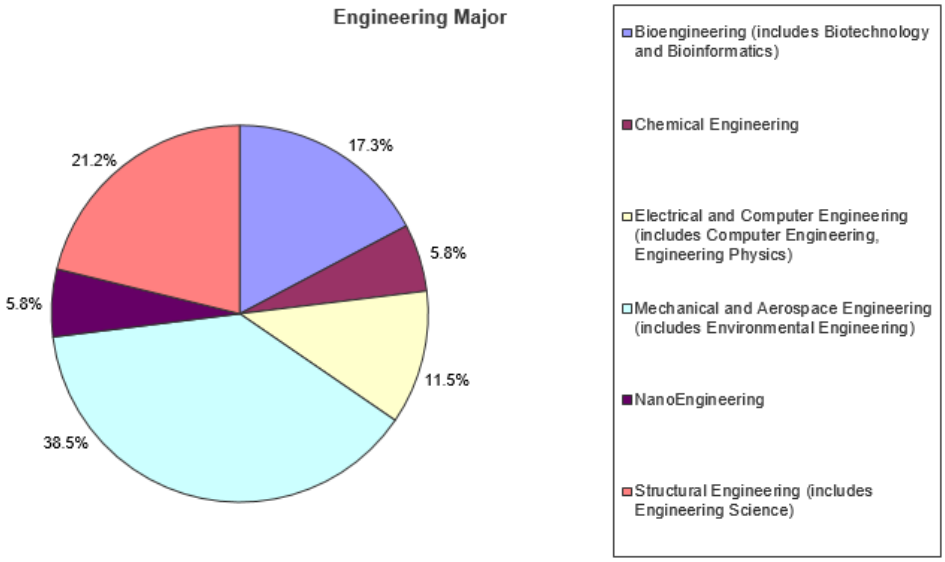

Figure 3. Engineering major distribution of survey that participated in the 2016 Summer Engineering Institute

Findings

There were predominantly four large findings and/or assertions that promoted engineering student success during the Summer Engineering Institute. The findings and themes were:

1) strengthened academic and social integration to engineering,
2) increased engineering knowledge and specific technical skill development,
3) comprehensive support within the engineering educational ecosystem, and
4) ongoing monitoring and advising that is inclusive of student's academic, personal/social, and cultural needs, thus creating an inclusive learning environment.

III.1. Academic and Social Integration

Key Themes III.1

- Reinforced students' motivation and confidence to succeed in engineering.
- Faculty observed a shift in the students' mindset in how they think and solve problems.
- Students developed a strong network of support from faculty

Students were asked the extent to which the Summer Engineering Institute increased their understanding of college/campus life, requirements of the engineering major and profession, and their confidence in succeeding and growing academically and socially within the context of engineering. When asked about what helped students the most in learning and getting acclimated to the engineering classroom, students rated the following on a 1-4 Likert scale (4 = Always): writing solutions to problems (3.6), checking solutions to problems with peers (3.75), and watching demonstrations (3.68).

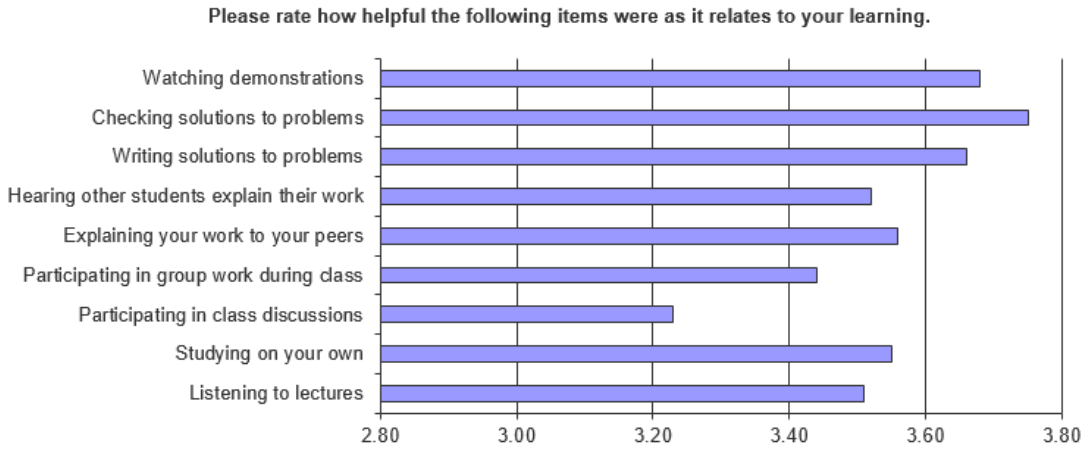

Figure 4. Q: Please rate how helpful the following items were as it relates to your learning.

Academic: Respondents were able to expand upon their answers through open-ended questions by asking: 1.) How did the coursework change the way you learned and 2.) How did the coursework change how you apply concepts? A mechanical and aerospace student responded, "I felt like the Institute turned me upside down in what I thought I knew and now I know better. I learned how to see problems in different ways, question things, and always look at something with a variety of lenses. It gave me a very strong foundation for fall and now that I am in fall classes, I literally apply everything I learned from the Institute and it is helping me a lot". In the semi-structured interviews, a structural engineering student stated, "I felt so confident because I was learning concepts related directly to my field that I had never seen or heard of. The academic resources were amazing and always available and it truly gave me the motivation to do well and excel. I didn't know anything about college or engineering to tell you the truth and people would just tell me to go into engineering because I was good at math. Boy, there is way

more to engineering than math and this program opened up my eyes and reinforced my confidence and commitment". An ECE student stated, "When I went home, my father told me, you have changed and I'm so proud of you. My dad is an engineer and for him to tell me I was now thinking like an engineer that really made me happy".

A few faculty from the Institute reiterated some of these statements in their reflection statements. "It was really amazing to see these students grow over a 5-week period. Many of them came in with really no foundation or background of what engineering was or really understanding certain fundamentals that require you to think differently. I really began to see the shift in thinking the 3rd week of the Institute and by the end of the Institute, I was happy to see them actually develop a really good mindset on how to think. I could tell that their thinking shifted just by the type of questions they would ask".

Social: When asked to rate their awareness of UC San Diego campus resources and the Jacobs School of Engineering resources, students rated their awareness of campus resources around a 2.68 (1-3 scale), with Campus Tutoring and Counseling and Psychological Services being the two key offices. In terms of Jacobs School resources, students were at a 2.9 (1-3 scale) in regards to Jacobs School of Engineering resources, especially in terms of undergraduate research opportunities, student life, and the IDEA Engineering Student Center. Academic advising was a little lower with a mean of 2.43. In terms of fellow engineering peer participants and residential peer facilitators, respondents reported the following as most helpful in their social transition: engineering residential peer facilitators (3.8 on a 1-4 scale; 4 = very satisfied), the opportunity to interact and develop relationships with fellow engineering peers (3.8), working with engineering students from their major (3.7), and developing a strong network of support (3.7). When students were given the opportunity on the survey to write-in an additional response about peers and social interactions, statements included: "It was extremely helpful to have RAs who were upperclassmen engineering students and knew engineering and the programs very well. They had all experienced what we experienced and they helped with our morale and our ability to do the work. They reinforced the message to work hard and they made themselves readily available"; "The program would not have been the same without having upperclassmen engineering students you could talk to. They were honest and open with what to expect and I

guess you can say they prepared us informally. They provided very useful information and got us acclimated to the university and to engineering". In terms of social activities, students found them to be fun and engaging (3.6 on a 1-4 scale). The only recommendation a few students had was to make the activities optional or spread them out over time and have less of them. On the open-ended survey question, some respondents stated that some classes required more work and more hours to execute the homework and they would have liked extra time on the weekends to devote to the assignments that took a lot of time (or at least have the option of doing so).

When asked to rate how the students felt about the sense of community of the program, they felt the Jacobs School of Engineering provided a welcoming and supportive environment (3.8 on a 1-4 Likert scale), developed strong relationships (3.8), and felt supported by the faculty and instructional staff (3.7). In individual interviews, the theme of "academic and social support" was brought up by all 24-interview participants. As a chemical engineering students stated, "the faculty and support staff did not let you fail. They constantly met with you, would offer you extra office hours, would have you work together, and meet together. It really created a community for me and I felt I was never alone. The class environment transferred to outside of the classroom because we would do things together, work together on projects or assignments, and it really helped me feel part of something". A NanoEngineering student stated, "The Institute created a culture of achievement or success for me because there was so much positive reinforcement and really positive acknowledgements. Even outside of the classroom, when we worked together on problems or assignments, we truly helped one another out and would challenge each other in a good way. We also held everyone accountable….meaning when someone did not show up to tutoring or office hours, we followed up with them. We all wanted each other to do well and realized we were in this together". Another student stated, "This sense of community transferred over to fall. We all still see one another, have class together, study together, and even go to office hours together every week. An instructor asked me where I learned this behavior and I told him through the Summer Engineering Institute. He told me to keep the behavior, it works!" Faculty also stated in their reflections that students began to come to their office hours collectively and they saw the camaraderie. Three faculty instructors stated that the Institute participants still come to see them during fall quarter and seek out their advice and mentorship.

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III.2. Engineering Knowledge & Specific Skill Development

Key Themes III.2

- Students learned "how to learn" in engineering.
- Increased students' ability to integrate and apply concepts in an engineering context.
- Strengthened students' critical thinking and problem-solving skills.

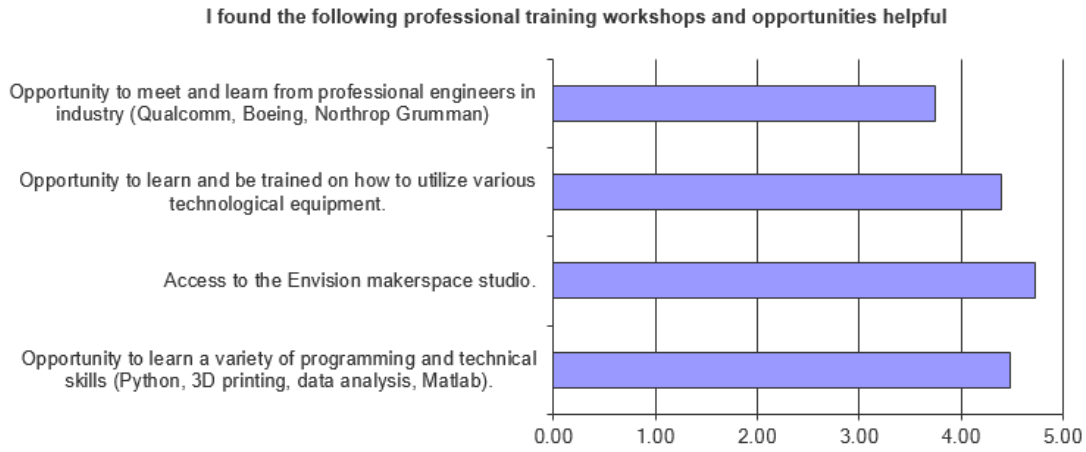

Figure 5. Q: I found the following professional training workshops and opportunities helpful.

On a 1-4 Likert scale, students were asked to rate their knowledge and/or skills gained from the Summer Engineering Institute. Overall, the respondents stated that they has a better appreciation of engineering and what it does and can do (3.7) and more of a positive attitude about learning engineering. Specifically, students ranked working with others on a team, solving problems from multiple angles and viewpoints, coding and actually understanding data analysis, as the highest contribution in terms of knowledge and skill development (above a 3.5). In the open-ended comments, students stated that actually seeing how engineering is applied and really understanding how to analyze a problem or data was the most important skill they learned, in addition to creating effective teams to work with. Inadvertently, this gave students a better appreciation of engineering. A number of students stated that the hands-on approach in ENG 10 really helped them learn and understand concepts versus memorizing them. Survey respondents, in **Figure 5**, rated the ability to learn and be trained at the Envision Makerspace studio (4.7) and the opportunity to learn a variety of technical and programming skills via the (4.5) extremely helpful in their learning (question was rated on 1-5 scale; 5 = strongly agree).

In the individual interviews, the theme of integration and seeing a concept through its entirety emerged, as it relates to engineering knowledge and the development of skills. "Learning engineering is like learning how to learn. It requires critical thinking and application of previous knowledge to answer and solve problems". "The coursework showed me that listening to lectures is not sufficient enough to gain the full potential of the course. One must actually know how things work and how to apply it. I look at things now from an engineering perspective, not as a passive learner but as an active one". An ECE student stated, "I entered the Institute thinking I had a good understanding of engineering and ECE and I was completely wrong. The coursework was very cumulative in the sense that what you are learning in the first week of classes, you will need to know how to apply it at the end of the fourth and fifth week of classes. I saw myself applying miniscule skills that we learned early in the program and applying them all the way to the end of the program".

When asked how the engineering coursework changed the way the student learned, students said "I have learned to focus on concepts more than the details, so that later I can have a strong foundation to implement concepts". Another student stated in his semi- structured interview, "Learning every detail of an equation to do something isn't as important as understanding how it works, or conceptually why it does what it does. I've learned to focus more on concepts, and when presented with a problem, to try to think of the concepts that will get me there. Now that I'm taking classes in fall, this process of learning has helped me tremendously in my current classes. I know for a fact I would have never learned this important skill had I not been part of the Institute. We had small classes and faculty, TAs, and tutors that really spent time teaching us that skill set and I can say we are all very appreciative of that. We all talk about that now that we are in fall classes". "In engineering 10, I was able to apply all the mathematics I had been doing in my past education, saw how functions turned into 3D graphs, and what math is really like in the real world. I never thought I would develop such a love and appreciation for this. I had no one in my family who could talk to me about engineering and it felt so foreign to me and I was really scared to enter this field. However, I get it now. I understand how cool and important engineering is and most of all, it made me apply the work into concrete ideas rather than keeping everything abstract and vague" (first year NanoEngineering student).

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When reviewing the faculty and TA reflection notes, eight instructors made a statement related to the "development of an engineering mindset". Five instructors used terms and/or statements

such as, “I saw how students began to change their thought process throughout the five weeks. Being able to work with students in a small class allowed me the time to really work with students on this important skill”. Other faculty stated “the students were really eager and it was really nice to see them make connections across concepts so quickly. I noticed that all of my students went to every office hours and tutoring sessions and I believe this comprehensive support really taught them well. You could see that their demeanor changed in such a positive way. It was funny because each week, they seemed happier and more confident in their ability”. Lastly, a few faculty stated that the technical workshops helped reinforce some of the concepts they were teaching in class. “Being trained in multiple programming platforms and knowing how to use various equipment really taught students the importance of really thinking solutions through. You don’t just use a fancy technical tool to use it. They began to understand the decision-making process of solving a solution, and the importance of efficiency and resources. Quite impressive for entering freshmen”.

Key Themes III.3

- Strengthened students’ appreciation and understanding of engineering culture and the ways of learning.
- Students realized the importance of interacting and talking with faculty on a regular basis.
- Strengthened the students’ ability to incorporate diverse viewpoints when developing engineering solutions and the ability to work effectively on a team.

III.3. Support within the Engineering Educational Ecosystem

Several survey questions (Appendix A: Questions 5, 12, 13, and 15) asked respondents about their satisfaction and experiences as it relates to faculty/peer interactions, awareness of engineering and educational resources, and social support during the Summer Engineering Institute. In terms of satisfaction with instructor, TA, and tutor interactions, students rated interacting with faculty and instructional staff outside of class (3.8 on 4.0 Likert scale), as well as working with Institute peers outside of class (3.6 on a 4.0 Likert scale), as a very satisfying experience. On a number of the open-ended survey questions (Questions 7, 8, and 9), students reported “the program opened my mind to asking and accepting academic help with fellow engineers. It was the first time I realized that I needed help outside textbooks and websites and the importance of seeking a network. I was able to collaborate on coursework which increased the support and learning”. “I learned the importance to ask questions during tutoring and instructional office hours and to interact and work together with classmates. I would have never done this before. Being able to talk one on one with a faculty or TA or tutor helped me communicate what I knew, thought I knew, and ask questions”. Another student stated that “learning just does not take place in the classroom. It was helpful to talk with the instructional

staff outside of class and discuss homework problems with peers. It also allowed me to understand college and engineering culture. Now that I'm in fall quarter, I can honestly say I would have been completely lost had I not attended the Institute and I'm positive that I probably would not have learned important things, like working with others and building a support team, without the program".

Individual interviews generated the similar theme of the Institute creating an educational support system that has transferred over to the academic year. "I think in high school, you are so used to working and competing with others and you only see your teacher as a person who delivers the content and the information you are supposed to learn. The Engineering Institute opened my eyes to the fact that yes, the instructor teaches you content for the course. However, now you have to continuously take that content and use it in different ways and you really have to work with engineering classmates to come to some possible conclusions. Even the fact that there are more than one conclusions…this is something you are never taught in high school" (first year structural engineering student). A mechanical aerospace student stated, "As a first generation Latina, I was really never taught to question faculty, parents, or anyone in authority. Culturally, my mom would always tell me to obey and do what I was told. I also didn't have any Latina engineering role models. However, being surrounded by diverse engineers, including Latina engineers, one who was my T.A., really inspired me. I looked to her as a mentor and even today, every other week, we have coffee and talk about my schoolwork and experiences. It was the first time I felt I was surrounded by diverse, smart engineering students who were in it together and we were all striving to do well, but, we never knocked one another down. It was such a positive environment because both inside and outside of class, everyone was supportive and working together". Other interview participants credited the engineering residential peer facilitators for being supportive. "They were upperclassmen engineering students who could relate to us and always made themselves available. They showed us around campus and told us about helpful resources and spoke about their own experiences. They were fun and relatable and always open to hearing you out".

"The Engineering Institute opened my eyes to the fact that you have to use the content in different ways to come to multiple conclusions and work with others"
-SEI Participant

Faculty and TAs also spoke about the benefits of a support system. "A few days out of the week, I had office hours at the dormitory for the students. I had never been to the residential hall and was at first a little hesitant. However, I realized how this program was also creating a learning

community. I had students meeting with me continuously and they would come together and ask me really great questions. They would then stick around just to talk. I think this is of such great value because it allows you to really learn about whom your students are and also, it illustrates to them that you are accessible. That you are not some faculty or instructor who is removed and/or stagnant in their office". Another instructor stated, "I was able to host group office hours because the students would come together and visit me. I found this beneficial because we discussed concepts as a group and I could see that the students were learning together and really interested in each other's success". An undergraduate tutor stated in her journal, "I wish I had this type of experience when I first entered here. Taking courses during the five weeks really teaches you time management, the value of utilizing your campus and educational resources, and most of all, building a community of peers before you enter in fall. I continue to see some of the students from the Institute now, in fall quarter, and they seem to be applying what they learned from the summer. They still go to office hours together and many of them continue to visit their instructors and TAs from the summer. This is great because they obtain mentorship from engineers whom they know and developed a relationship with".

Key Themes III.4

- Increased students' knowledge of the engineering design process and the ability to apply the process in solving engineering problems.
- Students learned the value of instructor feedback for optimal learning.
- Increased students' continued utilization of UC San Diego and Jacobs' School academic support services.

III.4. Continual Academic Monitoring and Advising

Although no survey question asked specifically about academic monitoring and advising, it is important to mention the following finding and theme since each individual interviewee spoke about this concept being important to them. Furthermore, instructional staff also mentioned this as an important practice they implemented during the summer program. All the individual interviewees mentioned the fact that each week, they received a progress update of where they were at in a class. The progress update was often times provided by the course T.A. and tutors. As a few students stated, "the progress update was more like a helpful feedback tool. They didn't focus on the current grade or points you had earned. Instead, they would give you specific feedback on how to do things better, what concepts you needed to learn that perhaps you as an individual needed help on, and more importantly, resources and guidelines on what to do in order to improve yourself and your work". As another student explained "it was a continual message that told me I was doing well but also, gave me helpful strategies on how to improve and it really showed me that people cared. It was not about the grade but instead, the

importance of me actually learning. I did well in the summer engineering courses and this little incentive really pushed me along the way to do better". In addition, students felt that the feedback provided them with an educational plan or as one student stated, an "educational journey". "When the TAs and tutors followed up with me on a regular basis, I quickly realized that this was a hard, yet rewarding journey. Basically, the engineering courses I was taking now were the foundation and I better have a strong foundation and make sure I'm solid before moving forward. This helped me to realize that the principles I was learning now would be seen and used later on. I appreciated the instructional staff checking in on a regular basis".

A number of instructors, TAs and tutors, especially for ENG 10, stated that they wanted to create an atmosphere of success and the message of "you can succeed". As an ENG 10 T.A. stated, "We felt that students notice if you care about them and our way of showing that we cared about their success was to give them constructive feedback and showcase what they were doing well and how to do even better. In the end, we hoped this helped and incentivized students to believe in themselves". Another T.A. stated, "I was a first generation Latina student many years ago and now that I'm a T.A. for the Institute and teaching students, I know what type of messages they may or may not receive as they pursue their education. These messages are both positive and negative and I still receive those similar messages, even at the graduate level.

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-ENG 10 Faculty

However, I want to instill in these students the importance of confidence and resiliency and really help them overcome some of the academic, social, and mental barriers they may face. Engineering is not easy but I want to show them how rewarding it is and be able to illustrate to them how engineering truly does solve problems we face in our communities. I know when I was shown the relevancy of engineering to my own community, I fell in love with it. I hope to motivate students in the same way".

Program Recommendations

Students were also asked on the survey and on the interview protocol about advice and feedback for improving the Summer Engineering Institute. Only fifteen students responded to this question

with specific feedback and advice. There was a lack of consensus on how to improve the program but regardless, it is important to address the voices that did provide their opinions. Two students reported keeping the daily academic and technical workshops to 1 hour versus 1.5 hours. Each respondent stated that after being in class the entire morning, attending a 1.5-hour professional workshop was tiring. However, all the students did state the workshop topics were important and relevant. Nevertheless, adjusting to a rigorous academic schedule and the development of one's time management skills are important factors when scheduling workshops and program events.

In addition to the daily workshops, students had a variety of research seminars four days a week. The purpose of the research seminars was to expose engineering students to scientific and cutting-edge research, showcase the skills students acquire from engaging in a research experience, as well as expose students to the importance of inter and multi-disciplinary research and its relevancy in solving global problems. All fifteen students provided feedback on the research seminars. All respondents stated that although they think research is important, often times, they found the presentations by faculty too technical and beyond comprehension, with the exception of a few presentations. Students did find the research seminars valuable when they were more interactive and also, when an undergraduate student presented the research studies versus a faculty. There were several comments made about being inspired by the student researcher and seeing themselves being able to present research and contribute to scientific knowledge. However, often times, it was the faculty doing a general presentation of their research and it was hard to understand the importance and relevancy of what they were doing, due to not understanding the advanced technical terms and concepts in the presentation. Respondents recommended that research seminars should be scheduled only once or twice a week and all of the research seminars should be presented by someone who can present at a level the students can understand and appreciate. Lastly, in terms of social activities, ten of the fifteen respondents who provided overall program feedback stated that although the social activities were fun, they would recommend that activities be optional and/or not required. Students who reported feedback on social activities stated that on some weekends, they felt stressed and would have rather worked on homework assignments, labs, or studying for quizzes. It is important to note that two students stated that now that they are in fall quarter, retroactively looking back, they

knew they could have managed their time better on the weekends and thus, could have managed attending social activities and completing course requirements. Nevertheless, a few of the students who suggested optional weekend activities stated that some of the classes, namely Structural Engineering 1, required more work than some of the other engineering courses. Therefore, they would have appreciated extra time on the weekends to work on assignments.

Conclusion

Overall, students were extremely positive about their Summer Engineering Institute experience, particularly their interactions with instructional staff and a sense of an academic network fostered by the program. Almost all students were “satisfied” or “very satisfied” with both the academic and social aspects of the program. Students made the greatest gains in personal and affective areas, such as confidence in their ability, enthusiasm and motivation for the field of engineering. Furthermore, three important gains were found to be extremely valuable for Institute participants. These three gains are directly aligned to research on student success in engineering, especially for underrepresented students. Three practices in engineering that underrepresented students find particularly encouraging are: the quality of faculty and peer interaction, addressing the relevancy of science to social issues, and being recognized as a scientist when participating in a class and/or research environment (Chang, Sharkness, Hurtado, & Newman, 2014; Hurtado, Newman, Tran, & Chang, 2010; Johnson, 2011). Overall, students made tremendous gains in their understanding of how engineering is applied and developed a learning mind-set that is directly applicable to the scientific and technical field. Through reflection, students believe that the Summer Engineering Institute program will continue to have a long-term impact on their success in engineering. Students formed a strong academic and social network and began to create a community of scholars. In sum, the Summer Engineering Institute helped to ease students’ transition to undergraduate engineering education and college life by providing the academic and social resources, relevant knowledge, and skills they would need in their undergraduate careers.

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Appendix A

Q1. How do you describe your gender?

	Responses	
Male	51.92%	27
Female	44.23%	23
Trans Male/Trans Man	0.00%	0
Trans Female/Trans Woman	0.00%	0
Gender Queer/Gender Non-Conformity	3.85%	2
Total		52

Q2. Race and Ethnicity?

	Responses	
African American	7.69%	4
American Indian and/or Alaskan Native	1.92%	1
Asian	30.77%	16
Caucasian	17.31%	9
Filipino/a	3.85%	2
Latino/a or other Spanish origin	9.62%	5
Mexican American and/or Chicano/a	23.08%	12
Other	5.77%	3
Total		52

Q3. Engineering Major

	Responses	
Bioengineering (includes Biotechnology and Bioinformatics)	17.31%	9
Chemical Engineering	5.77%	3
Electrical and Computer Engineering (includes Computer Engineering, Engineering Physics)	11.54%	6
Mechanical and Aerospace Engineering (includes Environmental Engineering)	38.46%	20
NanoEngineering	5.77%	3
Structural Engineering (includes Engineering Science)	21.15%	11
Total		52

Q4. Please rate how helpful the following items were as it relates to your learning.

	Never	Sometimes	Often	Always	Not applicable	Weighted Average
Listening to lectures	0.00%	13.33%	22.22%	64.44%	0.00%	3.51
Studying on your own	0.00%	9.09%	27.27%	63.64%	0.00%	3.55
Participating in class discussions	2.27%	15.91%	38.64%	43.18%	0.00%	3.23
Participating in group work during class	0.00%	8.89%	40.00%	48.89%	2.22%	3.44
Explaining your work to your peers	0.00%	4.44%	35.56%	60.00%	0.00%	3.56
Hearing other students explain their work	0.00%	6.82%	34.09%	59.09%	0.00%	3.52
Writing solutions to problems	0.00%	4.55%	27.27%	65.91%	2.27%	3.66
Checking solutions to problems	0.00%	4.55%	18.18%	75.00%	2.27%	3.75
Watching demonstrations	0.00%	4.55%	22.73%	72.73%	0.00%	3.68

Q5. Please rate your satisfaction with the following items about Instructor/TA/Tutor interaction and peer interaction.

	Very Dissatisfied	Dissatisfied	Satisfied	Very Satisfied	Not Applicable	Weighted Average
Interacting with the Instructor/TA/tutor during class	2.22%	0.00%	44.44%	53.33%	0.00%	3.49
Interacting with the Instructor/TA/tutor outside of class (office hours, tutoring)	2.27%	0.00%	25.00%	65.91%	6.82%	3.75
Working with your peers during class	2.27%	2.27%	38.64%	54.55%	2.27%	3.52
Working with your peers outside of class	2.27%	2.27%	27.27%	68.18%	0.00%	3.61
Number of in-class discussions	2.27%	6.82%	52.27%	34.09%	4.55%	3.32
Number of group assignments or projects	2.27%	4.55%	45.45%	43.18%	4.55%	3.43
Number of out-of-class discussions with peers	2.27%	4.55%	47.73%	40.91%	4.55%	3.41

Q6. Please rate your agreement on the following statements related to the type of gains, if any, you made from the Summer Engineering Institute.

	Strongly Disagree	Disagree	Agree	Strongly Agree	Not applicable	Weighted Average
Confidence in your academic ability	0.00%	13.33%	51.11%	35.56%	0.00%	3.22
Comfort in working with complex engineering problems	0.00%	4.65%	69.77%	23.26%	2.33%	3.23
Positive attitude about learning engineering	0.00%	2.33%	32.56%	60.47%	4.65%	3.67
Ability to organize your time and academic requirements	0.00%	6.98%	32.56%	60.47%	0.00%	3.53
A better appreciation of engineering	0.00%	2.33%	32.56%	62.79%	2.33%	3.65

Comfortable communicating engineering problems and solutions	0.00%	9.30%	51.16%	39.53%	0.00%	3.30
Persistence in solving problems	0.00%	2.38%	42.86%	47.62%	7.14%	3.60
Willingness to seek help from others	0.00%	4.65%	30.23%	62.79%	2.33%	3.63
Ability to work with others	0.00%	0.00%	34.88%	62.79%	2.33%	3.67
Appreciation of different perspectives	0.00%	0.00%	44.19%	53.49%	2.33%	3.58
Ability to stretch your own thinking	0.00%	2.33%	41.86%	53.49%	2.33%	3.56

Q7. Please provide comments on how the coursework offered during the Summer Engineering Institute changed the way you learn, if at all? If there was no change, why?

#	Responses
1	The coursework changed my learning from teaching the other students around me who were struggling with the material to asking help from TA's who had already gone through the course and understood the material inside and out.
2	The course work during the summer engineering institute challenged my way of thinking and made me evaluate myself. I was able to learn more through the coursework that was provided.
3	The coursework offered helped me learn what study habits I need to work on.
4	The courses showed me mainly how to use a computer and its useful applications for engineering
5	The work in the Summer ENG Institute was the first time I felt like I really needed to seek help outside of a few textbooks and websites. The program opened my mind to asking and accepting academic help.
6	Learning engineering is like learning how to learn. It requires critical thinking and application of previous knowledge to answer and solve problems. It was also beneficial to work in groups and build friendships.
7	For each course there are tutoring time and office hour, by attending those courses I learned the importance to ask questions during the tutoring hour and the importance to interact with classmates and ask classmates for help for the class content.
8	The Summer ENG Institute did not change the way I learn because I am used to taking notes on paper and have done so to understand all the coursework during the Summer ENG Institute.
9	Before I came to the Summer ENG Institute I would have never asked for help, or gone to tutoring. This was something that I felt was an absolute last resort, and even then I did not really speak up and ask for help when I needed to. This program has forced me to get out of my comfort zone and talk, and ask for help when I need it.
10	I was able to collaborate on coursework a lot more during the institute than ever before. This has made me a lot more comfortable with seeking for help.

11	I learned that there was a need to crunch in as much time as I could into studying on my free time, if I had any. The academic workshops were decent, but the research seminars tended to be tiring, seeing that we went almost immediately to them after having eating lunch. We did not receive enough time for us to be able to truly relax so that we could get back to work with a "refreshed" attitude.
12	The coursework offered during the Summer ENG Institute has showed me that listening to lectures is not sufficient enough to gain the full potential of the class. One must study outside of class or discuss the homework problems with their peers to learn more.
13	Studied more frequently-- less time spent cramming. More time spent helping peers (which, in turn, helped me understand the material better).
14	I realized the importance of managing my time.
15	The course work gave me a good idea of how my major courses will be. In addition, the little amount of time we had and amount of time consuming work we did conditioned us to create a schedule.
16	There was no change, since I know my own preference of how to study.
17	I learned that collaborating with peers can be very beneficial.
18	The hands-on approach of the Eng. 10 class was very helpful to understanding the concepts discussed in class. Also, throughout the program I have made an effort to have better time management, which seems to be working.
19	I've never needed to ask for help before because I was comfortable with all the classes I had taken, but coding was completely foreign. SEI got me asking for help more often to facilitate learning.
20	It has made me more interested in going to office hours for all college courses.
21	I have learned to ask more questions. ENG 10 in particular has encouraged me to ask questions if I am curious, and talking to TA's has helped me learn through discussion rather than just using a textbook, which may not have all the information I'm looking for.
22	The coursework offered during the Summer Engineering Institute has very much prepared me for the workload that I am expecting in the incoming years. I realize that it will be an accumulation of hard work, persistence, and time- management. I definitely have built up the start of the habit of taking time to study and prioritize my homework. The Summer Engineering Institute has definitely provided the right mindset for when I continue learning in the fall.
23	I am more organized with my study hour and learned to use the out of class resources, such as TA hours, more as the course went along.
24	I had difficulty with the coursework but because of that, I attended office hours unlike college classes that I had taken before and began asking more questions, allowing me to further expand my knowledge and changed my way of learning.
25	The way I learn changed in the way that I must now ask for help for every question on my assignments; I now do not understand when the professor lectures, I must always have clarity from the TA and tutors because I cannot learn by myself anymore and a lecture is not enough to understand anything anymore.
26	I have to learn how to study in a different way than I did in high school. Studying for matlab and programming is different than studying for other classes. There was not too much of a change because the classes were fast paced and I didn't have enough time to develop my study habits effectively.

27	For ENG 10, the coursework was a mixture of coding in Python, learning mathematics, and applying skills towards our project. I use to always be a visual learner -- almost similar to the idea of "learning by following", but ENG 10 made me focus on learning by experimenting.
28	The SEI changed the way that I would study in that when I'm stuck I can go to those around me because in engineering there are so many bright people that I can learn tools from even when just in the dorms. In some ways the coursework made me sharpen my work smarter skills, I learned that even in these brand new subjects there are ways to maximize work output while keeping hard labor to a minimum.
29	The coursework offered during SEI definitely helped me get a good feel for the fast-paced classes in college. It certainly got me to work much quicker and more efficiently by seeking others for help.
30	I did a lot more of my homework in advance to ensure I would have time to do other things. My time management skill overall improved because prioritizing my classes first became very important to learning the subject at hand.
31	I learnt to learn with groups of people, explaining things to each other. And I learnt self-study outside the classroom.
32	My departmental class offered an extremely hands-on approach that enhanced my knowledge of things gone over during lectures.
33	It helped me transition towards a more collaborative type of education, which is pretty imperative towards engineering. Or rather, any science. The course allowed us to broaden our minds to more open ideas.
34	The pace of which they go through lectures is extremely fast and not what I am used to so I learned the more conceptual concepts through the hands-on projects more than from the slides.
35	The institute made me prioritize time since there was very little time to do complete projects/labs (there were always a lot of mandatory activities).
36	The coursework offered during the summer Eng. institute changed the way I learn because I had little to no time to study and do homework.
37	It showed me that the learning done in college is very different from that in high school.
38	Since the beginning of the institute, I have taken a more hands-on approach to learning, whether it be with labs or projects. This helped me experience learning rather than try to memorize things out of a book.
39	The coursework offered during this Summer Engineering institute made me comfortable with asking for help. In addition, working with others is very helpful to fully understand the concepts.
40	It made me look at things from an engineering perspective rather than just the math we were doing.
41	The coursework and the way that the classes were structured changed the way I was learning in that I no longer was learning 'alone' but rather had a group of other students, professors, and TAs to reach out to if I ever needed the help. It changed my learning from individual learning to collaborative group learning.
42	With all of the tools that we were provided and learned how to use, the way I learned definitely changed. These tools help to clarify understanding and have helped me to learn better.
43	I learned to manage my time better.
44	It allowed me to interact with others when trying to complete my coursework.

45	The coursework was helpful, and it improved my study habits and allowed me to understand college culture.

Q8. Please provide comments on how the coursework changed the way you APPLY what you learned, if at all?

#	Responses
1	Learning has now become something to be tested in order to be internalized.
2	I learned to check my code more carefully because I tend to make the simplest mistakes with ends up making a huge mess.
3	Now that I have a deeper understansing on computer programming I connect the involvement of computer programming to life.
4	I am now able to use my coding and programming to create solutions to problems
5	The coursework is very cumulative, as in you need what you learned in the first week of class to complete an assignment on the fourth week. I saw myself applying miniscule skills that we learned early in the program even at the very end.
6	The coursework calls for a different approach then a typical class and seems to push our thinking on subjects more than a traditional class which is a very valuable skill.
7	By doing the python lab I practiced by myself how to apply what I learned into real problem solving process. And for the SE lad, I learned not only how to collect data, but also how to use computer as a tool to analyze the data and present the data in the way I want.
8	I now enjoy applying my knowledge in big group projects, although I have always been applying my knowledge in some way, whether it is in homework or in teaching others.
9	The coursework given has led to me discussing what we have learned in order to get a better understanding. I feel that I have gotten a little better at explaining my thinking.
10	I don't really understand this question.
11	I have begun to wonder more about how things work (e.g. websites) rather than simply using them without an inquiry on how they function.
12	I directly applied the lectures given to the homework.
13	Eh.
14	Bringing them in more practical use.
15	The coursework makes you think about the solution, rather than simply memorizing it.
16	It changed the way I thought how I can apply my knowledge, since I did not believe I had so much knowledge before.
17	Now, I can think about real-world problems in the form of codes.
18	I wouldn't necessarily say that the coursework changed the way I apply what I learn, but it definitely gave me an opportunity to apply what I learned.

19	My classes before were always number crunching or how things worked in theory, but SEI facilitated a very hands on experience in application of skills, especially the ENG 10 projects.
20	It has made the things that I am learning more applicable to my future career.
21	I have learned to focus on concepts more than the details, so that later I can have a strong foundation to implement concepts. Learning every detail of an equation to do something isn't as important as understanding how it works, or conceptually why it does what it does. I've learned to focus more on concepts, and when presented with a problem, to try to think of the concepts that will get me there.
22	Applying what I have learned has been exercised throughout the homework and the problems there can be applied to real-life situations. It has made me think and consider how I can do so now.
23	I am more focused on why things happens rather than what happens. Rather than just memorizing, I stress on understanding the material more.
24	The coursework was more relevant to what I wanted to amount to in the future.
25	In MATLAB, I applied all the mathematics I have been doing in my past education years but in a coding sense. In ENG10, I saw how functions turned into 3D graphs through python. I saw what math is really like in the real world.
26	learned how to apply math in engineering mostly through Eng. 10, not so much in the other class
27	From coding to circuiting a breadboard, I learned what was right and what was wrong by testing it out instead of someone providing the "right way" to do something.
28	I can't say how the coursework changed the way I apply what I learned however what I have learned is new and I'm able to use skills I generally wouldn't need to tap into. It allowed me to flex some computer strengths and logic strengths that were more than often not being used.
29	The coding I've learned will definitely help me down the line.
30	I understood what was being taught in my programming classes and when it came to the ENG 10 project, I was able to understand how to format the code to help the group out. Programming is more apparent than I thought it would be, and actually understanding what everything did helped me use it in a real life issue instead of just doing homework problems.
31	I can now apply what I learnt in class to compute into computer program.
32	Most of the class used direct application of what was learned immediately after it was taught.
33	It made me curious, accustomed to questioning formulas or digging into the theory behind a single engineering application rather than just doing it. It felt like I was prepared for a higher-education train of thought.
34	This is the first time I've had labs that were this hands-on so I had to integrate the concepts taught to us as well in applying them in coding such as Python.
35	ECE 5 allowed me to apply what I learned in a hands-on manner, which was different from learning theory.
36	Yes it changed because now I got to learn then apply what I learned on python.
37	It made me think about how interconnected everything is and how there are limitless possibilities to the application.

38	I learned that engineering is much more broad and interdisciplinary than I had originally thought. Since I have been here, I have worked with people from a variety of majors other than my own.
39	Within this coursework, we learned to apply mathematics into a computer programming language, python.
40	It made me apply the work we did to concrete ideas rather than keeping everything abstract and vague.
41	A strong connection as to how to apply what I learned has not yet been made, but I can at least see now the application of concepts to real world issues. The true challenge is how to execute them.
42	Being in the Maker Studio showed me that I can apply what I learned in class to what I will do in the field. Working on our final projects has been a combination of hard work and applying our acquired knowledge and it has been very interesting and challenging.
43	I learned how to apply math in engineering in ENG 10.
44	Understanding the course makes the application of what you learned easier to do.
45	I learned to apply my knowledge rather than repeat memorized work onto a piece of paper.

Q9. Please provide any additional comments about your coursework during the Summer Engineering Institute

#	Responses
1	I saw the coursework as a sneak peek into what the course-load will be during the rest of the year, and it was very eye-opening.
2	The course week seemed well adjusted. The only thing that would make homework easier is if we had a little more time to dedicate to homework.
3	In the maker space I learned how to manipulate those equipments and they are really helpful in completing my project. Also for most of the coursework, I will not be able to finish without the help of my classmates and TA, so I learned that my classmates and TA and also OH are really important resource that I can rely on.
4	The coursework consisted of a great amount of coding, which was a bit overwhelming, especially for those who have never coded before.
5	I would like to reiterate that although the classes were helpful, I feel as if we did not have enough time in between our workload in order to study, work on homework, and get enough sleep.
6	It was most definitely challenging but it was an amazing experience and beneficial or engineering students. It gets their feet wet before actually diving in the fall quarter.
7	I would request more time for coursework and less activities.
8	I really enjoyed my Structural engineering class and meeting all the people in the program. I made many friends during these five weeks.
9	I wish we had more time to discuss about the 3d graph section, in class. It was a broad topic and we had few discussion compared to the depth of the homework related to that.
10	The coursework was a level of difficulty that I could not handle when I first saw it. I have never seen such course work before and it is difficult simply adapting to it.
11	Too many workshops and seminars that weren't relevant to us.

12	I think my course work was a nice stepping stone and transition into college. It wasn't too much where I was stressed all the time, but it was bearable. I also learned how to balance my time for myself and work with a schedule that was best for me.
13	This Institute and the coursework provided I feel has been very helpful in preparing me to be successful in my studies to be an engineer.
14	The research seminars and workshops really had no impact on my learning or anything at all. The mandatory RA activities were also a nuisance when we had labs and homework due to the next day. Without these three things, my grade would have probably been higher in the courses.

Q10. I found the following professional training workshops and opportunities helpful

	Strongly Disagree	Disagree	Somewhat Agree	Agree	Strongly Agree	Weighted Average
Opportunity to learn a variety of programming and technical skills (Python, 3D printing, data analysis, Matlab)	2.22%	0.00%	8.89%	24.44%	64.44%	4.49
Access to the Envision Makerspace studio	0.00%	2.22%	2.22%	15.56%	80.00%	4.73
Opportunity to learn and be trained on how to utilize various technological equipment	0.00%	2.27%	13.64%	27.27%	56.82%	4.39
Opportunity to meet and learn from professional engineers in industry (Qualcomm, Boeing, Northrop Grumman)	2.27%	4.55%	31.82%	38.64%	22.73%	3.75

Q11. Please rate your awareness about the following UC San Diego campus resources.

	Lack of Awareness	Somewhat Aware	Very Aware	Weighted Average
Career Center	4.55%	59.09%	36.36%	2.32
Undergraduate Research Programs (Academic Enrichment Program)	0.00%	43.18%	56.82%	2.57
Campus Tutoring	0.00%	31.82%	68.18%	2.68
Counseling and Psychological Services	2.27%	27.27%	70.45%	2.68

Q12. Please rate your awareness of resources within the Jacobs School of Engineering

	Lack of Awareness	Somewhat Aware	Very Aware	Weighted Average
IDEA Student Center (IDEA Scholars, Tutoring, Mentoring Programs, etc.)	0.00%	11.11%	88.89%	2.89
Engineering Research Opportunities	2.27%	40.91%	56.82%	2.55
Engineering Student Organizations/Student Life	4.55%	38.64%	56.82%	2.52
Jacobs School Academic Advising	6.82%	43.18%	50.00%	2.43

Q13. Please rate your satisfaction with the following statements about social activities

	Very Dissatisfied	Dissatisfied	Satisfied	Very Satisfied	Not Applicable	Weighted Average
The Residential Peer Facilitators were helpful	0.00%	2.22%	8.89%	88.89%	0.00%	3.87
The evening/weekend social activities were fun and engaging	2.22%	4.44%	24.44%	68.89%	0.00%	3.60
Knowing other students in my engineering major	0.00%	6.82%	13.64%	79.55%	0.00%	3.73
Developing a strong network of people that support me	0.00%	0.00%	22.73%	77.27%	0.00%	3.77
Opportunity to develop relationships and friendships with students outside of class	0.00%	0.00%	13.64%	86.36%	0.00%	3.86

Q14. Feel free to provide any additional feedback/comments about social activities.

#	Responses
1	The social activities were always a relaxing way to get my mind off anything that may have been a burden.
2	Andres was the peer facilitator for our particular suite and he was very helpful in guiding us as friends and as an academic advisor. He was very relatable and I appreciated his presence.
3	I really like those activities and I can really feel how they will be helpful to my upcoming college life. Really thankful to those RAs and the one who came up with those activities.
4	Too long and too late at night.

5	The social activities were extremely fun but some classes required more hours to execute the homework; therefore, activities should not have to be mandatory or plan less activities and spread them out. The workshops and seminars was helpful, but having them every day was a bit much.
6	Maybe more planning could have made students more willing to participate in events as the program went on.
7	I enjoyed the activities.
8	The only reason I am somewhat dissatisfied with getting to know other students in my major is that I was one of the two Bioinformatics students, which is not necessarily the program's fault. However, I regret not being able to go to all the program's activities due to scheduling issues, and wish I had been given a more planned-out schedule so that I could see meet more of the students inside and outside of class (for example, many workshops and seminars I could not go to due to scheduling conflicts).
9	UCSD is not socially dead. There are fun opportunities, but classes are so time consuming that it is hard to time find to have fun.
10	The social activities were a great way to get everyone together and a great way to de-stress. It was always very appreciated.
11	I completely understand the attempt to create a fast-paced atmosphere similar to what fall quarter will be like, but some of the mandatory events should have been planned more efficiently or could have been excluded completely especially if students have different priorities like SEs have labs due at 9pm while no other major has to do so. (i.e. spending 30 minutes to decorate a brown bag that could have been handed out in the last minutes of a workshop, collected, and put up in the 1st floor instead of what happened)
12	Though they got in the way of work, they really helped make bonds.

Q15. Please rate your agreement with the following statements about being connected or feeling like you belonged during the Summer Engineering Institute.

	Strongly Disagree	Disagree	Agree	Strongly Agree	Not Applicable	Weighted Average
I felt like I was an essential or important part of the Jacobs School of Engineering	0.00%	4.44%	60.00%	33.33%	2.22%	3.33
I felt comfortable and relaxed on campus	0.00%	0.00%	38.64%	61.36%	0.00%	3.61
I felt like the Jacobs School of Engineering environment was welcoming and supportive	0.00%	0.00%	25.00%	75.00%	0.00%	3.75
I identify strongly as a student at Jacobs School of Engineering	0.00%	2.27%	27.27%	68.18%	2.27%	3.70

I felt like I was accepted for whom I am when I was on campus	0.00%	0.00%	34.09%	65.91%	0.00%	3.66
I felt supported by the engineering faculty and staff who were part of the Institute	0.00%	0.00%	29.55%	70.45%	0.00%	3.70
I felt that I made great relationships during the Institute	0.00%	0.00%	20.45%	79.55%	0.00%	3.80
I felt connected and supported during the Summer Engineering Institute	0.00%	0.00%	29.55%	70.45%	0.00%	3.70
I felt like the Summer Engineering Institute addressed my educational needs	0.00%	4.55%	36.36%	59.09%	0.00%	3.55

Q16. Feel free to provide any additional comments and/or feedback about the Summer Engineering Institute.

#	Responses
1	SEI was an amazing and unique opportunity. I'm glad that I registered for it because I will cherish the friendships that I've made here.
2	I am profoundly appreciative that the Jacobs School of Engineering allowed me to be part of the
3	Oh God I love this program, it's one of my best summer.
4	Please plan ahead the rules of the Summer Engineering Institute. I am 100% sure that in the agreements section of the application there was no mention that we could not go off campus expect with parent approval, nor that we were going to be treated like minors.
5	More information prior to the program would've helped prepare me. I was completely unaware of the off campus and other rules before I got here. Being 18+ and independent, the various restrictions just felt awkward and unnecessary. Having more bonding activities with the other students would have been nice too. Overall this program was great and incredibly useful, thank you.
6	I absolutely recommend this program to any engineering student that will join UCSD in the future. Yes it may take time out someone's Summer, but being here still felt like summer. It is a great transition from summer vibes to school vibes. If I can do it all over again, I would.
7	Please allow more time for students to study or do their work instead of making events mandatory.
8	Thank you so much!
9	I would definitely recommend this program to other incoming engineering students.

10	Thank you for this amazing opportunity! The peer facilitators were incredible at being open to talking to everyone and were very supportive.
11	It was a wonderful opportunity and a nice preview of what my next 4 years in UCSD might look like. Although the class moves fast, I think I have learned a lot. It was very convenient that we are introduced to the engineering department and the classes we are taking will count to our major at the same time. Last but not the least, it was a free and a valuable opportunity, so I'm not complaining! :)
12	I am very grateful to have been a part of the Summer Engineering Institute.
13	I loved it, great opportunity to get ahead, well organized but a little restricting. I'd do it all over again.
14	This program was an amazing experience. I got to meet a whole lot of people and made so many friends. I'd definitely recommend this to anyone going into engineering at UCSD.
15	The entire Institute was great, though the research seminars should be divided by majors to ensure they are applicable to the students attending them.
16	Research seminars that did not pertain my major were not that interesting. It would be more useful to make seminars that are related to my major mandatory, and keep all else optional.
17	Research seminars not pertaining to our interest/major seemed unnecessary. The ones I found pertaining to my major or goals I found very helpful; however, the ones not pertaining to my major (I'm a bioengineer, so the SE research group or ECE research group) were not very helpful and I didn't find engaging. Maybe a way to fix this would be to have individual majors go to individual research seminars, and then other people have the option if they are interested. Making it mandatory for all students though seemed a waste of time when we didn't have any interest in the topic. It is also not fair to the presenter if half of the group is forced to be there but not engaged in what they are saying
18	The program was amazing as a whole. On the academic side, I got a small head start on my classes. Socially, I made bonds with almost everyone in the program.

Appendix B

I. Introduction (Purpose, Line of Inquiry, Confidentiality, Reciprocity, Consent, Permission to Record):

Good morning (afternoon). My name is Michelle Ferret. Thank you for coming and agreeing to participate in the study. I value your time and appreciate your willingness to answer some of my questions. The interview should take no longer than an hour. Please keep in mind there are no right or wrong or desirable or undesirable answers. I would like you to feel comfortable with saying what you really think and how you really feel.

Before we start, I would like to provide you with the purpose of the interview. I am interested in learning about how your experiences were during and throughout the Summer Engineering Institute and what type of suggestions you have for the program.

I want to assure you that all your comments will remain confidential. Your identifying information will be kept in a password, protected database and will be assigned an arbitrary identification number. I will be compiling a report, which will contain all students' comments and observations made without any reference to individuals. Pseudonyms will be used to protect the students' confidentiality. Furthermore, none of the data collected will be utilized for future purposes beyond the scope of assessing the Summer Engineering Institute. Your insight and experiences are invaluable and I am humbled to listen and learn from you. At this time, do you have any questions for me?

If I have your permission, I will be tape-recording our conversation. The purpose of recording is to include your comments and perspectives accurately, and at the same time, carry on an attentive conversation with you. Do I have your permission to record our conversation?

II. Set the Stage (Developing Rapport and Priming the Mind, Demographic items (e.g. position, role, etc.)

I'd like to start by asking you some background questions about you.

- How did you become interested in the Summer Engineering Institute?
  - Explain the type of academic and professional experiences you have had in the Engineering field, prior to the Summer Engineering Institute?
- How did you decide you wanted to pursue an undergraduate degree in Engineering?
  - Can you walk me through your decision making process?
- What steps (processes) did you take to prepare for an undergraduate degree in Engineering?
  - How did you acquire the knowledge about college engineering programs? (Knowledge)
  - What do you believe were the main types of support you received in the process? (Opinion & Values)

III. Core Interview Questions

Now I'd like to ask you some questions about your transitional experiences to the summer Engineering Institute.

- What are some reasons you chose to attend the Summer Engineering Institute at UC San Diego?
  - What type of expectations (if any) did you have of the Summer Engineering Institute?

- How would you describe your experience during the Summer Engineering Institute? (Academically & socially)?
    - What is your opinion of the classes? (Opinion & Values)
    - What do you believe are some of the strengths of the Summer Engineering Institute?
    - What do you believe are some of the weaknesses of the Summer Engineering Institute? (Opinion & Values)

Now we're going to switch gears and talk about the type of engagement and interactions you had with engineering faculty, TAs, and tutors. I am interested in how you interpret and perceive these interactions.

- Describe the type of interactions you encountered with faculty in the Summer Engineering Institute?
    - What do you think about these interactions? (Opinion and Values)
    - Suppose I accompanied you to a class or faculty/lab meeting, what would it be like? (Hypothetical)

- Can you provide me with an example of the type of conversations you had with engineering faculty?
    - How did you feel about these conversations? (Feeling)

- Describe your relationship(s) with peers in the Summer Engineering Institute.
    - What is your opinion of these relationships? (Opinion and Values)

- How would you describe your interactions with the Residential Peer Facilitators?
    - What social/weekend programs were most enjoyable?
    - What social/weekend programs were least enjoyable?
    - What recommendation, in any, would you provide to future Residential Peer Facilitators?

IV. Closing Question (Anything else to add)

At this time, I would like to ask you if there is anything you would like to add to our conversation today that may be relevant and important to the future design and implementation of the Summer Engineering Institute.

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