WIP: College of Engineering Summer Transfer Student Jump Start

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As a former transfer student and beneficiary of a great deal of invaluable mentorship throughout his life, Stephen participates in multiple mentoring and advising programs. While many of these are focused on transfer students, he is interested in improving the lived experience of all students. His door is always open if you ever need advice, someone to just listen to you, or just want to chat!

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Introduction

This Work in Progress paper will describe the Transfer Student Summer Jump Start Program, which was designed to give engineering transfer students at California Polytechnic State University in San Luis Obispo a soft landing into their life at a public university in a small college town. "Transfer Shock" is a known phenomenon where many transfer students experience a temporary dip in their grades during their first few terms post transfer [1]. Just as transfer students can take a myriad of academic paths, their reasons for experiencing the shock may come from multiple different factors: institutional, academic, and social [2, 3].

Institutional shocks New transfer students face navigating a new institution with new processes (for enrollment, financial aid, housing, etc.). They must quickly identify new places to go for support to navigate the differences between systems.

Academic Once in classes, new transfer students face potential differences in pacing, expectations, and misalignment between tools, especially in an engineering context, such as common software tools, lab equipment, etc.

Social Many four-year schools can overly focus on helping First Time, First Year (FTFY) students create community, while leaving new transfer students to navigate a new social setting alone, often leaving them to enter a social environment where friendships are already established.

Recognizing the issues faced by students entering university, prior studies have shown the effectiveness of "summer bridge programs" (SBP) at helping to alleviate some of these issues [4, 5]. Many such programs have been targeted towards those transitioning from high school to college. These programs typically are residential, last several weeks, and focus on improving student academic performance, adapting to a new environment, and improving retention in programs [4].

As a part of the California State University System, one of the largest and most diverse University systems, our primarily undergraduate institution has responded to a Statewide call to increase transfer pathways to provide students with expanded opportunities to earn an engineering degree. As an institution that is deeply rooted in hands-on learning, we have found that transfer students can face inequitable challenges in junior level courses due to limited hands-on lab experience at most community colleges. Another challenge for first year transfers students is the largely residential focus of our campus situated in a small college town. This creates tensions for new transfers in terms of logistics of finding housing and adjusting to the cultures of the local area. While our campus has been historically a primarily White institution, currently we are an emerging Hispanic Serving Institution with the transfer student population in the college of engineering comprised of a more ethnically diverse student body than the FTFY students. Providing support for students to increase their engineering skills and adjust to campus life has

been a primary focus of the program.

To help ease the transition by addressing the three issues discussed above, Cal Poly's College of Engineering created the Summer Transfer Student Jump Start as a bridge program to help orient and prepare new transfer students to our institution. This program, which has been running for three summers, brings small groups of Mechanical Engineering (ME) and Computer Science (CS) students to campus for an early summer coursework experience. In this program, students enroll in an orientation course, major specific course(s), and participate in a weekly hour-long mentoring session. Led by instructional faculty who are passionate about supporting transfer students, this program focuses on providing transfer students with a supportive on-ramp into their engineering degree program.

Program Design

This paper describes the third iteration and largest iteration of the College of Engineering Summer Transfer Student Jump start program. This version consisted of four major components: bringing the students to campus and providing housing during the summer session before their first regular term; attending weekly mentorship meetings; taking an orientation course; and taking a major specific course or set of courses.

The program served 14 Mechanical Engineering (ME) and 23 Computer Science (CS) students. The mentorship meetings were held jointly with all students from both majors attending together and mentored by one faculty member from ME and one from CS. These instructors also taught the orientation (covering general life in the major) and workshop (covering specific hard skills required in the major) courses for their respective groups of students. The final major-specific course was taught by instructors not directly in the program.

Student Selection and Funding

All incoming transfer students from the two majors were sent an invitation to attend the Jump Start program. All participating students were offered a scholarship to fully cover attendance costs. Due to budget constraints, there were limited financial aid scholarships to cover housing for those with need.

Overall, the total cost for the program was $\sim \$70,000$ to support the 37 students. Of this, $\sim \$28,000$ was used to cover the total tuition costs for the students for the summer, $\sim \$34,000$ for student housing costs, a $\sim \$3,000$ stipend for each of the faculty mentors, and $\sim \$2,000$ for the student events. The instructors and TAs for the normal courses were compensated using the university's standard summer teaching assignment appointment. The funding for the project was raised by the Advancement team in the Dean's office, with contributions coming from industry and alumni partners with the College of Engineering.

Transfer Jump Start Mentoring

The weekly mentoring sessions were designed with three primary goals in mind. First, to give the students information that would help them thrive in an unfamiliar town. Many of them are coming from large population centers which are very different from our small town. Additionally, this is

the first time for many of them to live away from home. Second, to encourage cohort formation. Many students struggle without support networks and experience feelings of loneliness and isolation. While there are programs in-place to help address this for First Time, First Year (FTFY) students, few of these programs include transfer students. Thus, one of our goals was to introduce the transfer students to each other early and encourage them to form support and study networks. Finally, we wanted the students to be introduced to faculty members that are passionate about transfer student success. This not only shows students that faculty at this institution care about them generally, but also gives them a specific person to seek out for advice and assistance in the future. Holding the mentoring sessions jointly was also a way for students to meet other engineering students outside of their direct major to form more diverse groups.

The mentoring sessions were scheduled once a week in the morning for the five weeks of the term. Refreshments were served during the mentoring sessions to foster a more welcoming and casual environment. We also held a bonus session during the students registration period to ensure that all students were able to register for a full course load for the coming term. A description of the sessions follows.

Meet the Chairs Welcome, introductions, ice breakers, Q&A with department chairs. Coffee and pastries

SLO Life How to survive and thrive in a small, remote town. Best places to shop; ways to stay aware of and involved in the campus community; activities and bucket list items; restaurant reviews from an overly opinionated instructor when it comes to food. Ice cream from the campus creamery. (Note that due to instructor illness, this was actually moved to week 4).

Registration Cafe Bonus session outside the normal time to get together to register for classes. Ensure that everyone gets what they need, help with making last minute adjustments. Donuts from a local shop

Got Help? Resources to go to for help with school work, food and housing resources, mental health resources. Introduced the importance of wellness. Mixed nuts and granola and juices

Club Kids Tour of club and lab spaces, discussions of various clubs related to the majors that students may be interested in joining. On the move touring facilities, so no food : (

We are Family Dinner together at local restaurant. Discussions of various aspects that students liked and disliked about the program.

Courses

Due to the differences in programs, the exact structure of the courses taken between the ME and CS students differed slightly. ME students took a discrete orientation course for transfer students and two required courses that are not offered at community colleges, thus making them ready to start third-year courses. The orientation course met for two hours once per week.

There is not a transfer specific introductory sequence for CS, as students come in with more credit for lower division courses. A CS orientation course also did not exist before this program. Thus, CS students took an orientation and workshop course created for this program and a required upper division course. The CS orientation and workshop course met for two hours, twice per week. One day was orientation topics, modeled after the ME orientation course. The other day was Workshop topics, with some spill over of workshop / assignment topics if there was left over

time during the orientation days.

Orientation

The orientation course was designed to introduce students to the campus resources, their major, figuring out their path to graduation, and emphasizing the importance of ethics and justice, diversity, equity, and inclusion in engineering.

Academic Advising General academic advising on courses with a primary focus on the importance of each student planning out their flowcharts for their individual path to graduation given the uniqueness of incoming transfer credit for each student; a discussion on concentrations in the major; senior projects; and how to get involved in research

Peer Review Flowcharts and Career Panel After students completed their flowcharts, they were prepared for more in depth discussion on flowcharts that FTFY students typically learn via word of mouth, including: which classes to avoid taking concurrently due to workload issues; issues around terms offered for particular courses, etc. Peer review and discussion of their flowcharts. Finally, an overview and discussion on potential career paths within the disciplines.

Career Services and Resume Workshop Presentation from campus Career Services on the various services they offer, including resume reviews, interview prep, professional clothing services, etc. Resume workshop on what to include in your resume, how to structure it, common interview formats, etc.

Engineering Ethics Importance of ethics in engineering, case studies of famous examples where ethics were ignored, future areas of concern, etc. Importance of diversity, equity, and inclusion in Engineering, examples of historic examples of issues caused by the lack thereof.

Exchange Programs and Engineering Student Services Overview of exchange programs and services offered by Engineering Student Services (formerly the Engineering Advising Center), including advising, multicultural engineering program, tutoring, etc.

Additional Courses: Mechanical Engineering Students

As many of the lower division courses that FTFY Mechanical Engineering students take do not exist at community colleges, the core introductory sequence differs slightly between the mechanical engineering FTFY students and the transfer students. To meet the FTFY sequence, transfer students take a mechanical engineering orientation course and either a compressed version of the FTFY drawing/CAD courses or an intermediate CAD course if they have met the requirement. In addition, all Jump Start mechanical engineering students took a course in Design Thinking as this is not offered at any community college and is a prerequisite for the third-year design courses.

Additional Courses: Computer Science Students

Most transfer students come in with credit for the entire introductory programming sequence at our institution, which means they are often placed into an upper division technical course in their first term. While transfer students tend to show great mastery of the important concepts from the introductory courses, there are differences in the technology and sometimes even basic terminology used across the field. For example, 9 students came in with experience only in C++

and 14 came in with only experience in Java. At our institution the first two courses introductory courses are in Python while the third is in Java. Thus, instructors of future courses often have the assumption that all students in the course are familiar with these languages. This can take the form of assignments using those languages without introduction, or using those languages as examples to compare against when learning a new language. This typically leaves transfer students to figure out a new programming language on their own while being lost during lecture, behind on assignments, and furthers the feeling that they are outsiders. Similarly, students come in with a variety of backgrounds in terms of the platforms and systems used. Upper division courses often assume at least a base level of familiarity with tools such as the Unix command line, SSH, and source control tools.

This mismatch in transfer students' knowledge and instruction expectation can often lead to instructor frustration with transfer students and comments such as "transfer students don't learn anything in their community college courses." Such comments will further alienate students. However, students often know the concepts, but perhaps not the tools or terminology used. Thus, the workshop was explicitly discussed as a normalization course to even out some of the differences between the courses taken at other institutions and the first year courses offered at ours. We consciously did not use terms such as "catch-up" or similar.

Workshop Topics Included:

1. Introduction to Python and Unix based Tooling
2. Session canceled due to overlapped with University Transfer Days
3. Refresher on Recursion; File System Manipulation and File IO
4. Software Design Philosophy and Demonstration
5. Debugging and Testing Strategies; Open QA

An Introduction to Java session was originally planned but dropped due to an overlap between the course time and a University wide transfer student event. This was chosen to be dropped as several students had prior experience in Java and a small amount of instructor bias against that session.

Housing

The Jump Start students had the option to live in the student dorms for the duration of the program. While we were not able to control housing placement, the majority of Jump Start students were housed on the same set of floors, furthering community building. Given that the campus is sparsely populated over the summer, having students housed together helped with assignments and furthered their ability to socialize, which was fantastic for cohort formation.

Early Results and Discussion

As this is a work in progress, the results reported primarily come from student entry and exit surveys, anecdotal commentary from the instructors on the courses, and observations of the students general adjustment to campus in the Fall term. Longer term examination of student success in follow on courses is future work.

Reasons for Attending

To understand why the students chose to participate in the Jump Start program, we asked the students to select from a series of reasons in the entry survey. The results from this are seen in Figure 1. Students appeared to be most interested in the various community connections the program offered, getting early access to campus and campus resources, and the financial incentives of the program to get ahead in coursework. We will use this information to help in recruiting efforts for future iterations.

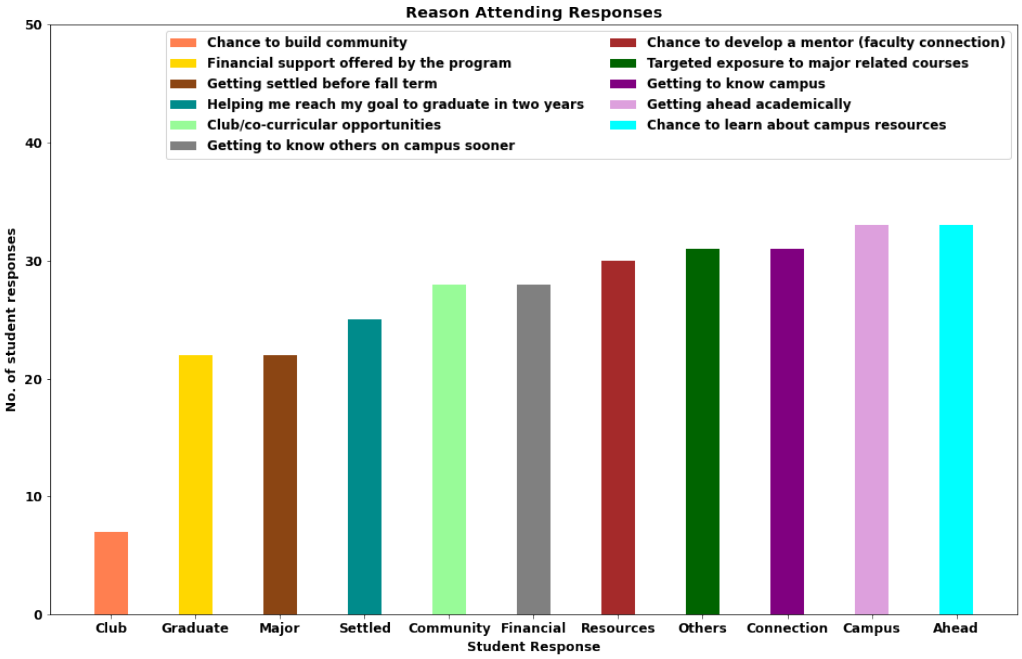

Figure 1: Student responses about why they chose to participate in the Jump Start program.

Entry and Exit Survey Results

To understand student experience in the Jump Start program, we asked in the pre and post survey how students felt in terms of their sense of belonging. The responses were overall very positive on a five point likert scale from “Strongly Disagree” (S.Disagree) to “Strongly Agree” (S.Agree) for the following questions: Q2: As a College of Engineering transfer student, at this time…

1. I feel that I belong to the institution’s College of Engineering community
2. I feel connected to my major’s community
3. I feel accepted
4. I feel at ease
5. I trust my instructor to support my learning in engineering
6. I feel prepared for my engineering major courses at this institution

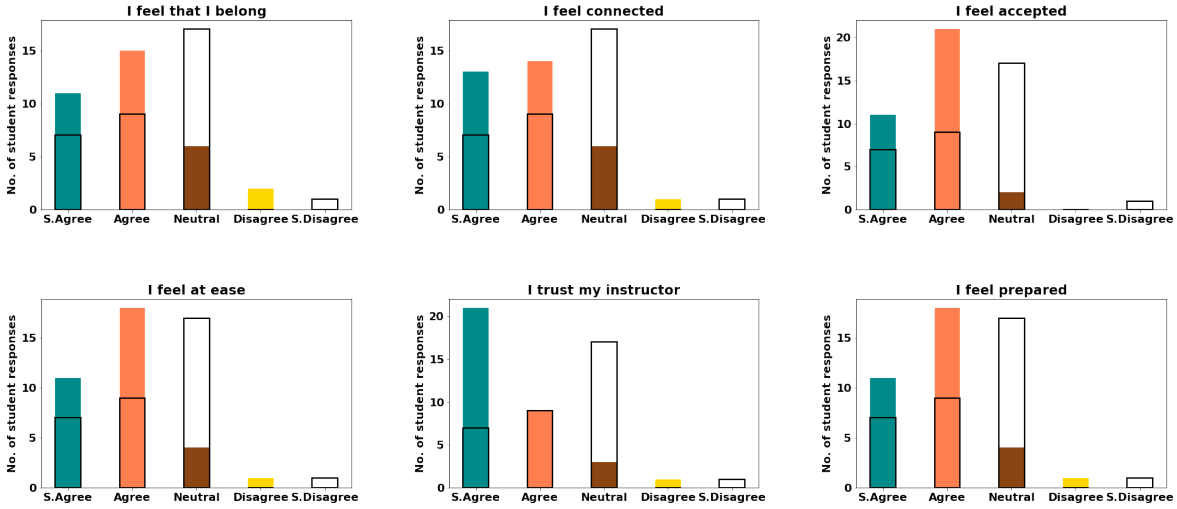

Figure 2: Charts showing student responses to the 6 questions from Q2. The pre survey results are shown in the black outline, the with post survey results shown in the colored bars. The Jump Start program showed a major positive shift across all 6 questions.

Figure 2 shows the pre and post program student responses to Q2, with the pre survey results being shown with the black outline and the post survey responses being shown as the colored bars. The survey shows a major positive shift away from "Strongly Disagree" and "Neutral" across all questions. Additionally, more than half of the student comments for the orientation course specifically mentioned that they were glad they joined the Jump Start program, with many saying they have a fear as to what their introduction to the school would have been like if they entered campus for the first time during the Fall term.

To understand student's perceptions about the coursework in the summer program in the post survey we asked students to select from a drop down describing the outcomes from their courses. Specifically, "Q1: The courses I participated in" with (count)

1. Helped me be prepared for the Fall quarter (32)
2. Increased my confidence in attending this institution (34)
3. Showed me what my department will be like (31)
4. Allowed me to make friends in my department (32)
5. Allowed me to get to know instructors (32)

Overall, the students report positive experience across the board, with 100% of the students reporting an increased confidence in attending our institution. In informal conversations since the course, the students have continued to express their gratitude for the course in preparing them for their first full term.

We also wanted to measure students sense of the workload for the summer program. Their responses showed a strong sense that the workload was appropriate, with 2 students saying there wasn't enough work, 3 saying there was too much, and 30 saying the workload was just right.

Instructor Commentary and Discussion

The overall impression from the instructors for the program was that it was successful and wonderfully rewarding. While there is likely a great deal of selection bias given that it was a set of transfer students that were willing to participate in this program, the overall results were fantastic. The students were highly interactive and engaged, asked lots of great questions, and formed a close community very quickly. Both during and after the summer term, they offered lots of great opinions on things that worked well for them in the program and things they would love to see added. They appeared as excited and motivated for the program's continued success as the faculty.

While we are excited to see quantitative results from the program comparing the overall academic success of this group of students against both past groups as well as current students that did not participate in the program, the success of the program appears clear. Students report that the combination of a less hectic term to acclimate in conjunction with a supportive faculty member made the transition significantly easier for them. We hope to see lasting benefits from the students involved as well as their peers.

Additionally, given that the students planned their courses together, they have maintained their cohort through the first term and the start of their second term. Groups of Jump Start students are seen walking to and from classes together, studying together in departmental areas, and have visited office hours for the summer instructors even though they are not in our classes. They also have continued to seek advice, mentoring, and class scheduling help. One worry was that they would not integrate other transfer students that did not take part in the program; however, they have been great leaders at helping others as well, often bringing other transfer students to the Jump Start mentors for assistance. One of the Jump Start students has even become a peer mentor in the department's tutoring center.

Finally, we would expect Jump Start programs could likely be implemented for FTFY students that face challenges similar to those faced by transfer students, such as first generation and underrepresented minority students given both our experiences and those reported by other summer bridge programs [4, 5]. Students from these groups often face similar sets of difficulties adjusting to college life in the same way that transfer students do. This is especially true given that transfer students tend to come from these groups at much higher rates than FTFY students. While we do not have the demographic data available yet for the Jump Start program, transfer students for the incoming University wide cohort were 24.9% first-generation compared to 15.4% for FTFY students and 38.6% were from underrepresented groups compared to 29.3% for FTFY students.

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