



# **WIP - Creating, Living & Sustaining Partnerships between Community Colleges and B.S.-Granting Colleges of Engineering: Theory, Tools & Practices**

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## Introduction

This work-in-progress poster identifies and describes tools and practices for creating, living, and sustaining partnerships between community colleges and B.S.-granting colleges of engineering and computer science by drawing from our experiences in a multi-institutional partnership funded via an NSF S-STEM ENGAGE (Engineering Neighbors: Gaining Access, Growing Engineers) program designed to support pre-transfer, low-income, academically talented engineering and computer science students where participating institutions include two California Community Colleges – Allan Hancock College and Cuesta College – that are highly-ranked Hispanic-Serving Institutions and a predominantly white College of Engineering at California Polytechnic State University (Cal Poly) in the California State University system.<sup>1</sup> More broadly, the partnership was established to strengthen the transfer pathway between the university and the community colleges, while supporting individual transfer students.

The ENGAGE Project Team is strongly motivated to engage in this collaboration and project by our commitments to racial, educational, and transfer student equity, as discussed in more detail below. In addition, from a state and broader national perspective, increasing access to and success for community college transfer students in STEM disciplines is necessary to meet U.S. and California workforce needs [1, 2]. California currently faces a “2025 skills gap” in technical fields that exists, in large part, due to under-participation of Latinx, first generation, and low-income students in STEM education and professions [1, 3, 4, 5, 6]. As estimated by the Public Policy Institute of California [7], there is a projected 2030 gap between the number of jobs that will require a bachelor’s degree in 2030 in California vs. the number of people in California with bachelor’s degrees [7]. Efforts to increase retention and persistence are key – a 2010 study by the Institute for Higher Education Leadership and Policy found that six years after enrolling at a community college in California, “70% of degree-seeking students had not completed a certificate or degree, and had not transferred to a university ... Most had dropped out; only 15% of the non-completers were still enrolled” [8]. Non-completion and non-transfer was even higher for Black students (75%) and Latinx students (80%). A 2017 report by the Campaign for College Opportunity entitled, “The Transfer Maze: The High Cost to Students and the State of California” identified that a) only 25% of community college students intending to transfer do so within 5 years of enrollment; b) that California community college students transferring to the California State University system take an average of 7 years to complete their bachelor’s degree

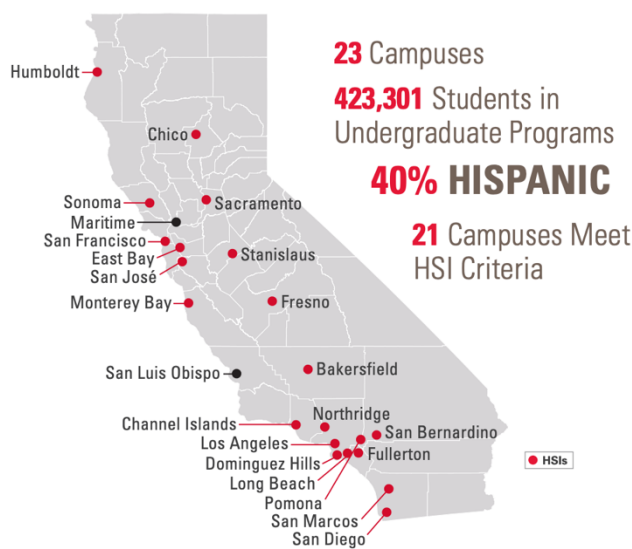
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<sup>1</sup> At Cal Poly, the College of Engineering includes majors in Computer Engineering, Computer Science, and Software Engineering, as well as Aerospace Engineering, Biomedical Engineering, Civil Engineering, Electrical Engineering, Environmental Engineering, General Engineering, Industrial Engineering, Manufacturing Engineering, Materials Engineering and Mechanical Engineering. ENGAGE is inclusive of all College of Engineering majors, as well as the Architectural Engineering major in the College of Architecture & Environmental Design, the BioResource & Agricultural Engineering major in the College of Food & Environmental Sciences, and the Liberal Arts and Engineering Studies major, open to internal transfers only and collaboratively run by the College of Liberal Arts and the College of Engineering.

post-transfer; and c) transfer students pay an additional \$36,000-\$38,000 compared to their peers who began their education in the University of California or California State University system [9]. Increasing access to and success for community college transfer students in STEM disciplines is critical for California and the nation [6, 10, 11] and enhanced partnerships between community colleges and B.S.-granting institutions are necessary [12].

To meet this demand, within California and the nation, there is increasing attention to the implementation of ADTs or Associate Degrees for Transfer in the Arts (AA-T) and Sciences (AS-T) to address these workforce and equity gaps. In California, SB 1440: The Student Transfer Achievement Reform (STAR) Act (2010) initiated many of the current collaborations between California Community Colleges and the California University System [13]. ADTs have a positive impact – 48% of students completing an ADT who then transfer to the California State University system to earn a B.A. graduate within 2 years post-transfer, compared to a 27% graduation rate for those students enrolled in B.A. programs who do not earn an ADT [9]. However, while the B.S.-granting institution that is part of the partnership described in this paper is in the California State University system, comparatively very little progress has been made at Cal Poly in terms of the development of ADTs. Cal Poly only has 7 ADT programs in place: Chemistry, Environmental Science, Music, Philosophy, Political Science, and Theater Arts. This is compared to 26 ADTs at the other established comprehensive polytechnic university in the California State University system [14] and a total of over 40 distinct ADTs available throughout the 23-campus system [15] and over 45 existing Templates for Approved Transfer Model Curriculum [16].

The comparative lack of ADTs at Cal Poly demonstrates the relative de-prioritization of California community college transfer success at the institution – at least to date.<sup>2</sup> This is an important part of the context of the partnership between its College of Engineering and the two Community Colleges – Allan Hancock College and Cuesta College – that is described in this paper. This de-prioritization is reflected as well in enrollment numbers – Cal Poly’s student body is approximately 15% transfer students compared to 30% across the California University System [15]. Cal Poly is also only one of two CSUs that is not a U.S. Department of Education-recognized Hispanic Serving Institution.<sup>3</sup> In addition, it is important to note that Transfer Model Curricula



<sup>2</sup> Cal Poly has currently identified increasing the numbers and success of community college transfer students as a priority. To this end, Cal Poly is one of thirty institutions participating in the inaugural Aspen-AAC&U Intensive: Transfer Student Success and Equity Program organized by the Aspen Institute College Excellence Program (Aspen) and the American Association of State Colleges & Universities (AASCU) Division of Academic Innovation [17].

<sup>3</sup> Hispanic-Serving Institutions (HSI) are defined under the Higher Education Act (HEA) as colleges or universities where at least 25 percent of the undergraduate, full-time enrollment is Hispanic; and at least half of the institution’s

and ADTs do not exist for majors in the Cal Poly College of Engineering as these majors cannot be completed, post-transfer, in 60 semester units or less and therefore fall outside the purview of SB 1440.<sup>4</sup>

### **NSF S-STEM Project Goals: ENGAGE**

This S-STEM Project entitled, ENGAGE – Engineering Neighbors: Gaining Access, Growing Engineers – was awarded as a multi-institution consortia project with a start date of 10/1/2018. Over 60% of the total funding awarded is allocated to student scholarships. The three goals of this S-STEM Project are:

1. Increase the retention, student success, transfer, and graduation of low-income academically talented students with demonstrated financial need who begin their engineering/computer science education at Allan Hancock College or Cuesta College, transfer to Cal Poly, are retained in and graduate with a B.S. degree, and enter the STEM workforce or graduate program
2. Advance understanding of strategies that affect recruitment, retention, transfer, student success, academic/career pathways, degree attainment, and entry to the STEM workforce or graduate programs, with a specific emphasis on low-income academically talented students with demonstrated financial need who begin their engineering/computer science education at a community college prior to transfer to a B.S.-granting institution
3. Contribute to the implementation and effective evidence-based curricular and co-curricular activities for low-income academically talented students with demonstrated financial need who begin their engineering/computer science education at a community college prior to transfer to a B.S.-granting institution

Recruitment for the first cohort of students occurred in Spring 2019, and scholarships were awarded starting in the 2019-20 academic year. The ENGAGE Program model is two years of scholarship support at Allan Hancock or Cuesta, followed by 2-3 years of additional scholarship support post-transfer to Cal Poly (if the student is admitted, matriculates and is retained in an engineering or computer science major).

The original model (Table 1) was to recruit two cohorts of 25 students each at Allan Hancock and Cuesta, supporting a total of 100 students for two years each at the partner community colleges and then an estimated 65 students at Cal Poly for two to three years each.

The impacts of the COVID-19 pandemic have impacted both recruitment and retention efforts, as well as student progress-to-degree. We responded by adding recruitment periods, as follows:

- Cohort 1: Spring 2019 recruitment, Fall 2019 start
- Cohort 2: Spring 2020 recruitment, Fall 2020 start

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degree-seeking students must be low-income.

<sup>4</sup> The exception to this statement is the Computer Science major in the Cal Poly College of Engineering as a TMC does exist for Computer Science [20] and ADTs are in place at 16 campuses in the California University System [18]. Computer Science at Cal Poly is also different from other majors in the College of Engineering, as the total units for the degree are 180 compared to a range for the other majors between 191 to 202 units.

- Cohort 2.5: Fall 2020 recruitment, Spring 2021 start
- Cohort 3: Spring 2021 recruitment, Fall 2021 start
- Cohort 4: Recruitment is underway at Allan Hancock College for a Fall 2022 start

Table 1: Cohort and Scholarship Model

	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25
Cohort 1	AHC Cuesta  <i>Calculus 1 &amp; 2</i>	AHC Cuesta  <i>Calculus 3 &amp; 4</i>	Cal Poly	Cal Poly	Cal Poly (if needed)	
Cohort 2		AHC Cuesta  <i>Calculus 1 &amp; 2</i>	AHC Cuesta  <i>Calculus 3 &amp; 4</i>	Cal Poly	Cal Poly	Cal Poly (if needed)

In addition to adding recruitment periods, we opened the program to students who had already started the 2-year Calculus sequence at Allan Hancock or Cuesta. Recruitment and retention numbers through Fall 2021 are provided in Table 2.

Table 2: Recruitment & Retention through Fall 2021

	<b>Term Start</b>	<b>Original Cohort Size (AHC &amp; Cuesta combined)</b>	<b>Active at AHC or Cuesta as of Fall 2021</b>	<b>Transferred to Cal Poly as of Fall 2021</b>	<b>Transferred to another B.S.-granting campus as of Fall 2021</b>
<b>Cohort 1</b>	Fall 2019	44	10	15	4
<b>Cohort 2</b>	Fall 2020	37	18	10	3
<b>Cohort 2.5</b>	Spring 2021	11	8	1	0
<b>Cohort 3</b>	Fall 2021	10	10	0	0
	Total	102	46	26	7

## About the Partner Institutions

The three partner institutions are located in San Luis Obispo and northern Santa Barbara counties. Our shared goal is to **increase access** to high quality engineering and computer science education for academically talented low-income students with demonstrated financial need from San Luis Obispo and Northern Santa Barbara counties.

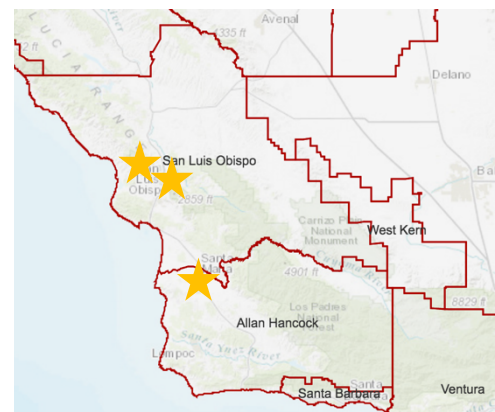


Figure 1: CA Community College Districts

- *Allan Hancock College*
  - One of 116 California community colleges and an Hispanic-Serving Institution (HSI) (over 46% of students are Latinx), with an enrollment of approximately 11,500 students per year – 30% of whom are full-time students and 89% of whom are enrolled in credit-granting programs at its main campus in Santa Maria and campuses in Lompoc, Santa Ynez Valley and at Vandenberg Space Force Base. More than 90% of students are from the Allan Hancock service area [19]. Approximately 50% of students are female and at least 30% are first generation.
  - Allan Hancock serves a 3,200 square mile area with a total population of 300,000. As noted in its 2016 Self-Evaluation report, “Allan Hancock’s service area contains many middle or low-income households, due in part to the migrant labor population in the agriculture industry. The estimated median household income in northern Santa Barbara County is \$51,620. Approximately 32% of households have an income of less than \$34,999. The majority of district residents have completed no more than a high school education; less than one fourth of the population possesses a college degree.” Data from the 2020 Census shows that Santa Maria, the city that is the location of the Allan Hancock main campus, has a population of 109,707 and is 76% Latinx, with 14.5% of residents classified as living in poverty. The median household income in this city is \$63,341 with a per capita income of \$20,907.
  - Allan Hancock has a comprehensive engineering program that includes Statics, Dynamics, Circuits, Graphics, Strength of Materials, Materials, Computer Science. In 2019-20, 178 unduplicated students were enrolled in pathway to transfer in engineering, 57% of whom were Latinx.
  - While offering a comprehensive engineering program, Allan Hancock College has only one full-time engineering faculty member, who is the Co-PI for this project. At Allan Hancock, Computer Science and Engineering majors are in separate divisions.
  - The ENGAGE Program is the third S-STEM award for Allan Hancock College. In addition to NSF funding experience, Allan Hancock had also received prior Department of Education competitive funding prior to the start of ENGAGE.

- *Cuesta College*
  - One of 116 California community colleges and an HSI (over 30% of students are Latinx) with an enrollment of approximately 10,000 students per year in credit-granting programs at its main campus near San Luis Obispo city and campuses in Northern and Southern San Luis Obispo County. Unlike Allan Hancock College, Cuesta College has historically served a large percentage of students (50%) outside of its service area. However, as noted in its 2011-16 master plan, this is shifting due to changing educational needs/populations in the county.
  - San Luis Obispo County is 3,616 square miles, with a 2020 estimated population of 282,424 that is 22.9% Latinx [20]. Within San Luis Obispo County, the median household income is \$73,518, with a per capita income of \$37,233 and 10.6% of residents classified as living in poverty. Approximately 23% of San Luis Obispo County residents are Latinx.
  - Cuesta College also has a comprehensive engineering program that includes Statics, Dynamics, Circuits, Graphics, Strength of Materials, Materials, Surveying, Programming, and Manufacturing. Many of its courses are offering online. Some of the students enrolled in engineering or computer science at Cuesta are simultaneously enrolled at Cal Poly.
  - While offering a comprehensive engineering program, Cuesta College has only one full-time engineering faculty member, who is the Co-PI for this project. At Cuesta College, Computer Science and Engineering majors are in separate divisions.
  - The ENGAGE Program is the first S-STEM award for Cuesta College, and the first NSF award of this scale.
  
- *Cal Poly*
  - Cal Poly is located in San Luis Obispo County, along with Cuesta College.
  - Part of the 23-campus California State University system and one of only five comprehensive polytechnic universities in the nation, Cal Poly is a highly selective, predominantly white (53.1%), predominantly undergraduate institution committed to a Learn by Doing pedagogy. For fiscal years 2020-2022, Cal Poly has been recognized as an Asian American, Native American, Pacific Islander Serving Institution (AANAPISI) by the Department of Education via a waiver of the “needy student” requirement for Minority Serving Institution (MSI) recognition, given that Pell grant students make-up only 16% of the student body.
  - Cal Poly’s College of Engineering (CENG) (selection rate: 27.5% for first-time students; 15.4% for transfers) is ranked as the 7th best undergraduate program (at U.S. universities that do not offer doctorates) and the top-ranked public (non-military) engineering program by *U.S. News and World Report* [21]. The 2021 incoming class in CENG was 1,595 students, including 216 transfer students (13.5%). In 2020, Cal Poly awarded the 21st most B.S. degrees in engineering (1,458); the 25<sup>th</sup> most to students categorized by ASEE as “underrepresented minorities” (214); and the 14<sup>th</sup> most to women (419) [22]. CENG offers 13 undergraduate majors and 10 M.S. programs. In Fall 2020, CENG had a faculty headcount of 293, with an FTE of 208.4.
  - At the university overall, 8.4% of incoming Fall 2021 students were from the California Central Coast, compared to 25.5% from the San Francisco Bay area, 20.4% from the Los Angeles area and 78.3% from California overall [23].

## **ENGAGE Partnership Commitments: How We Create, Live & Sustain this Partnership**

As evident from the descriptions of the partner institutions provided above, significant differences exist between the partner institutions. Differences include size and resources; student matriculation demographics and service/recruitment areas; faculty workload; and prior grant funding experience. Throughout the S-STEM proposal preparation process, award negotiation, and grant implementation period, we have been conscious of the need to explicitly and intentionally recognize the expertise and assets of each participating individual and institution challenging the dynamic in which community colleges are, too often, viewed through a “deficit cognitive frame” [25] by B.S.-granting institutions in similar collaborations.

This commitment to each other is aligned with the design of the ENGAGE Program, which utilizes a mentoring and advising approach that we call, “Strengths from a Social Justice Perspective in Engineering and Computer Science as Context” [29]. This new approach to mentoring builds on and extends other assets-based approaches. While some colleges and universities have introduced strengths-based mentoring that challenge a “deficit cognitive frame” [25], many of these frameworks, like the CliftonStrengths model, continue to ignore the specific historical and institutional contexts of inequality that contribute to student non-retention. In our mentoring approach – “strengths training from a social justice perspective in engineering and computer science” – mentors and mentees engage in training activities focused on power, privilege and oppression, alongside Critical Race theory frameworks [24, 26]. These activities are designed to encourage mentors and mentees to critically examine their social and professional positionality as it intersects with their social and cultural identities to explore and critically examine how engineering and computer science education cultures (e.g., deficit mindsets, rigor) is contributing to student non-success [27].

Second, together we are fully committed to equity-mindedness – described by Bensimon, Dowd & Witham (2016) [28] as an approach that is “color-conscious”; recognizes “that beliefs, expectations, and practices assumed to be neutral can have outcomes that are racially disadvantageous”; takes institutional “responsibility for the elimination of inequality”; and is “[a]ware that while racism is not always overt, racialized patterns nevertheless permeate policies and practices in higher education institutions.” Third, the goal of our work together is to “address root causes” rather than just “manage symptoms” [26, 29] of the highly stratified and oppressive worlds in which we live, learn, and work.

As part of these three partnership commitments in the project, we have also explicitly identified as a three-institution project team that a priority for institutional change efforts connected to the ENGAGE Program is change in the policies and practices of Cal Poly.

### **Tools and Practices for Creating, Living & Sustaining Our Partnerships**

*Envisioning & Planning:* This project was proposed three times (September 2015; March 2017; March 2018) and awarded in the third round of submission (2018). The project team (as currently constructed across the three institutions) participated in the envisioning and planning process for the 2<sup>nd</sup> and 3<sup>rd</sup> submissions. This process began with a series of meetings in Fall



2016, in which the project team identified shared hopes for the project (Figure 2) and collaboratively created a map of our understanding of barriers that impact the ability for these shared hopes to be achieved (Figure 3). The “shared hopes” model is drawn from Don Maruska’s 2003 book, *How Great Decisions Get Made: 10 Easy Steps for Reaching Agreement on Even the Toughest Issues* [30] and is designed to challenge a scarcity mindset or fear-based approach to decision-making. As part of envisioning and planning for the ENGAGE Program, the group utilized the shared hopes (as well as shared understanding of barriers) to identify ENGAGE Program goals, design, and policies.

*Program Implementation:* While it does not necessarily sound radical, we have identified that one of the keys to our collaboration and successful implementation is a regular meeting schedule. The ENGAGE Program project team – comprised of faculty and staff from the three institutions and our external evaluator – meets every two weeks for 80-90 minutes. For us, meeting regularly means that we do not just engage with each other when there are problems – which is a pattern some of us have experienced in other collaborations. Instead, engaging with each other is a normal part of project implementation. Prior to the COVID-19 pandemic, we also rotated the meeting “host institution” across the three partners and integrated pre-COVID Zoom use to ensure that we did not unintentionally “center” the B.S.-granting institution.

Meetings typically include time for ongoing relationship-building amongst members of the project team; updates from the three campuses; planning for and/or evaluation of ENGAGE-wide network and/or campus-specific events; and “work time.” By “work time,” we mean that we are intentionally making time in the meeting for 1) exploration, processing and analysis of data; 2) brainstorming or idea generation, typically in breakout rooms or independently; 3) share-out to identify similarities and differences; and 4) decision-making in the meeting. Meeting “work time” is critical to our project, as we are committed to making decisions together and because we are located at three different institutions, our meetings are often the only time we are in conversation with each other. Again, what some of us have experienced in other collaborations across institutions is that it sometimes seems as if decisions are made in the hallways of one institution and then shared with the broader group. That is not our model.

Meeting “work time” is also critical given the real differences that exist amongst the partner institutions in terms of time and personnel attached to this project. At community colleges in California, it is typical that there is one full-time tenure-line faculty member who teaches engineering courses and is responsible for the engineering curricula. The PIs at the community college partners are this single faculty member for their campuses and play a central role not only for ENGAGE Program students but all engineering students at their institutions. In contrast, Cal Poly had 293 faculty in the College of Engineering in Fall 2020. In the ENGAGE Program, we have recognized that there are therefore real differences in “out-of-meeting time” that project team members have to “prep” for our discussions (alongside their regular direct engagement with ENGAGE students). To reduce the impact of this inequity, we build “prep time” into our meetings.

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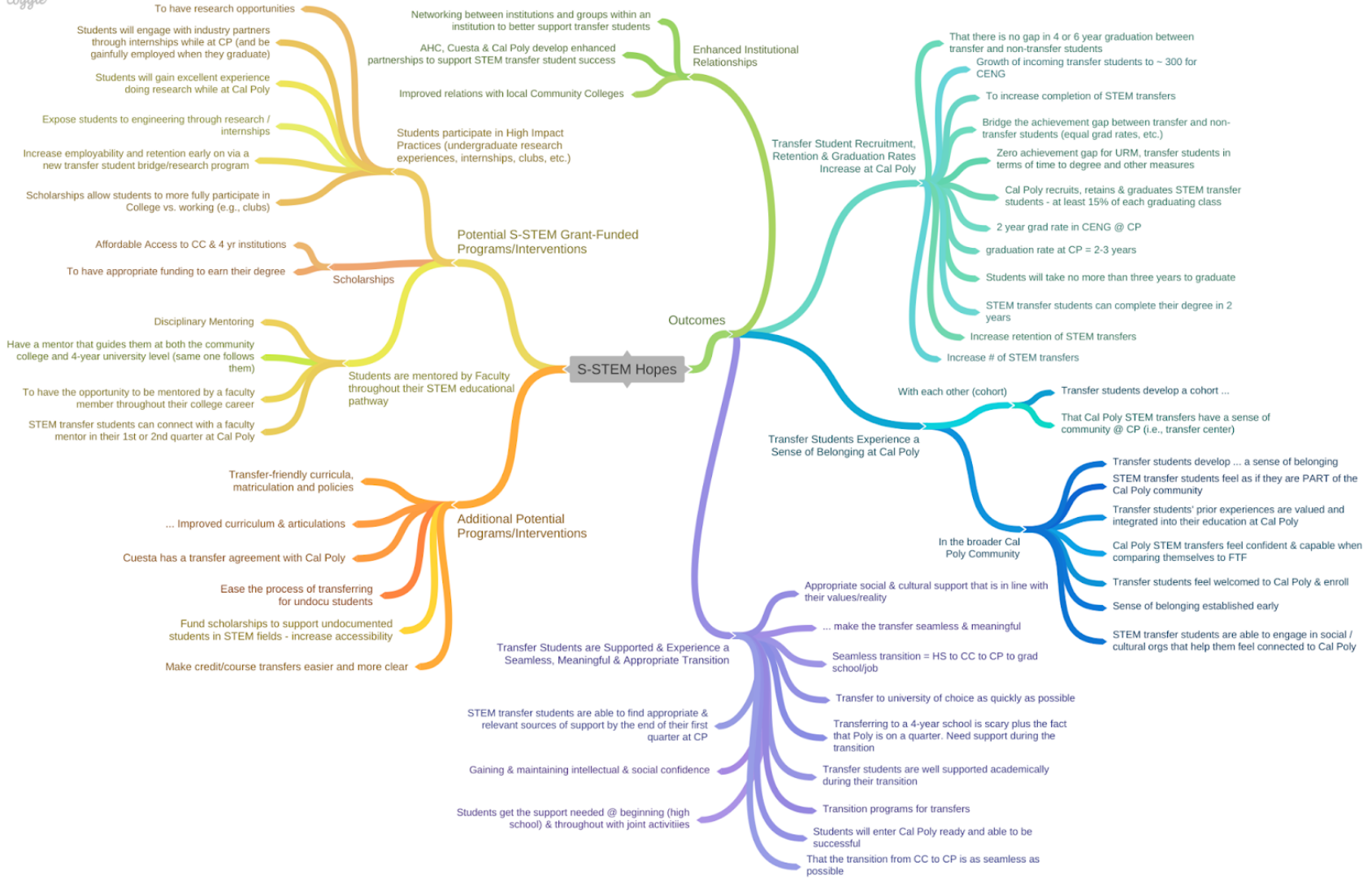


Figure 2: Shared Hopes (Fall 2016)

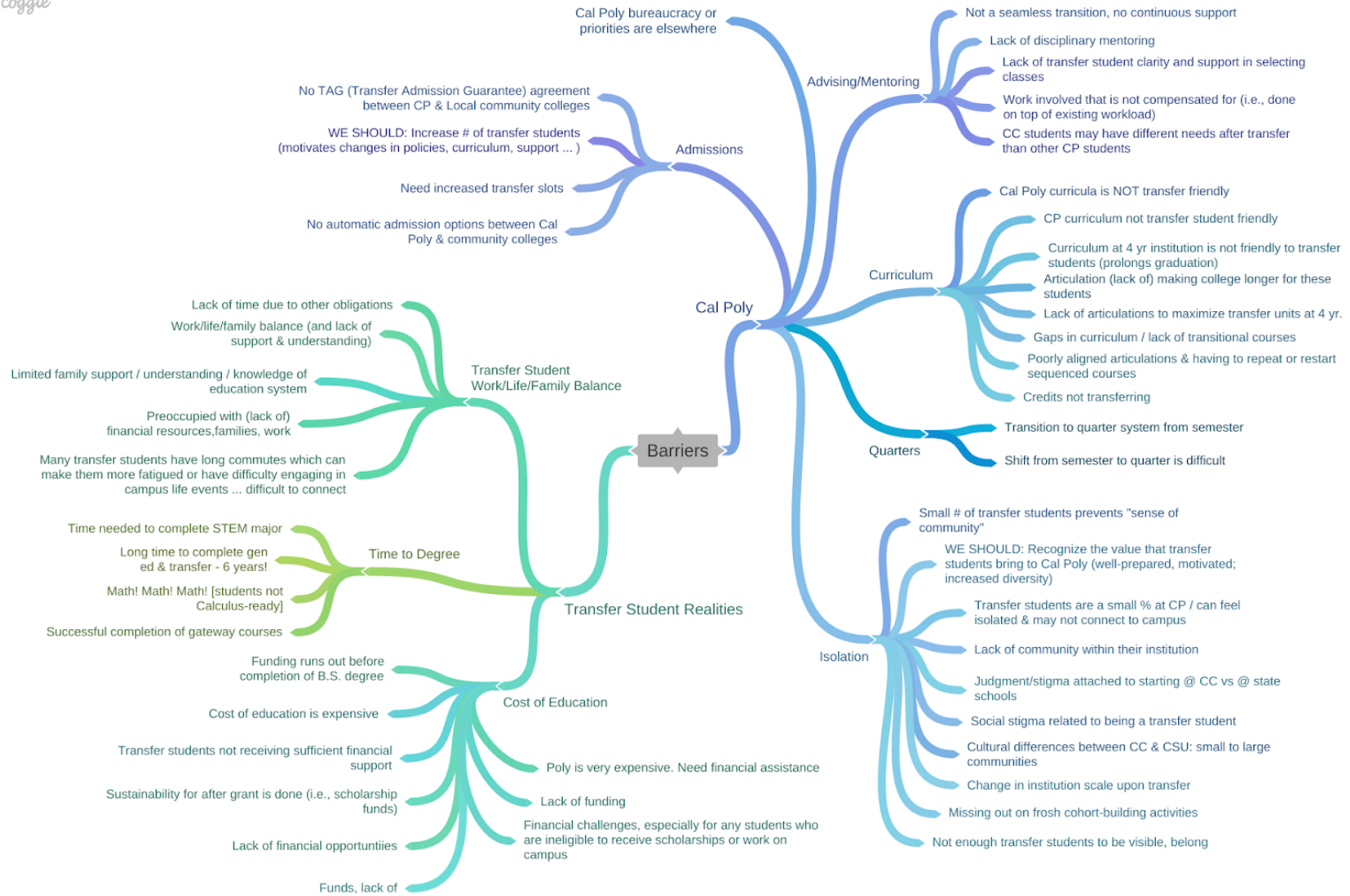


Figure 3: Barriers (Fall 2016)

Finally, we want to highlight that our approach to ENGAGE program implementation – which includes spending significant time together – has been transformative for many members of the Cal Poly team. Many regularly report that they bring the knowledge gained from our collaboration and partnership into other related spheres of their work (e.g., review of transfer admission criteria, C-ID criteria, etc.).

*Institutional Change:* Our collaboration has been aided by a tool developed by the Community College Research Center at Teachers College and the Aspen Institute, Essential Transfer Practice (ETP). Cal Poly and the two community college partners are using the tool to first document a baseline or current state and then track changes over time to transfer practices. This includes activities and policies both within each institution and between the institutions. This tool has provided opportunities to see areas of inequities and institutional barriers that would have remained invisible without this collaboration and the ETP tool. It also provides an opportunity to engage individuals and units not represented by our project team in the process and provides a framework for communication and planning at the program and institutional levels.

## **Conclusion**

Our external evaluator (co-author, Eva Schiorring) regularly describes this collaboration as “life-giving.” Our hope in sharing this work-in-progress paper is to generate dialogue and reflection about strategies, tools, and experiences of collaboration between B.S.-granting institutions and community colleges. We are also eager to learn from others as we continue to explore how we can build the commitments of the ENGAGE Program partnership into institutional relations that go beyond the strong individual and programmatic ties that members of the project team have developed with each other.

## **Acknowledgements**

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