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Mentoring and Advising Students in an S-STEM Project: Strengths Training from a Social Justice Perspective in Engineering & Computer Science as Context – Initial Implementation

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Introduction

This work-in-progress paper/poster describes the development and initial implementation of a new approach to mentoring and advising students that we call "strengths training from a social justice perspective in engineering and computer science as context."

This approach to mentoring and advising is part of a larger California-based Multi-Institutional S-STEM project called "Engineering Neighbors: Gaining Access, Growing Engineers" (ENGAGE, NSF DUE 1834128, 1834154). ENGAGE is designed to increase the number of low-income, academically talented students with demonstrated financial need who begin their engineering education at two Hispanic-Serving California Community Colleges; transfer to a highly-selective, predominantly white public institution; and then are retained in and graduate with a B.S. degree in engineering, and enter the STEM workforce or graduate program. The broader project also seeks to transform our institutions and the relationships between them to prioritize transfer student success via the utilization of the Essential Transfer Practices framework created by the Community College Research Center at Teachers College and the Aspen Institute [1]. The identified Essential Transfer Practices are designed to strengthen the implementation of practices that 1) make transfer student success a priority; 2) create clear programmatic pathways with aligned high-quality instruction; and 3) provide tailored transfer student advising to create sustainable change.

As part of describing the development and initial implementation of this new model of mentoring and advising, this work-in-progress paper/poster shares information about student and faculty workshops and ongoing grant-related activities and support systems for mentors and mentees. Preliminary results related to student experiences and outcomes utilizing the "strengths training from a social justice perspective in engineering and computer science as context" framework during COVID-19 are included. The approach to ongoing research focused on the intersections of strengths, social identity, context, and social networks as related to this model of mentoring and advising is introduced.

For the purposes of this poster/paper, we utilize the following general definitions of mentoring and advising:

- The U.S.-based national organization MENTOR: The National Mentoring Partnership defines mentoring as something that, "takes place between young persons (i.e., mentees) and older or more experienced persons (i.e., mentors) who are acting in a non-professional helping capacity to provide relationship-based support that benefits one or more areas of the mentee's development" [2].
- The U.S.-based national organization NACADA: The Global Community for Academic Advising notes that, "Academic advising, based in the teaching and learning mission of higher education, is a series of intentional interactions with a curriculum, a pedagogy, and a set of student learning outcomes. Academic advising synthesizes and contextualizes

students' educational experiences within the frameworks of their aspirations, abilities and lives to extend learning beyond campus boundaries and timeframes" [3].

We recognize that mentoring and advising are not the same. However, we note that the model described in this paper/poster is designed to be utilized in both mentoring and advising contexts for this S-STEM program. Future research will further distinguish between the utilization and impacts of this model in mentoring and advising contexts within this California-based Multi-Institutional S-STEM project.

Community College Transfer to B.S.-Granting Institutions

Increasing access to and success for community college transfer students in STEM disciplines is necessary to meet national and California workforce needs [4, 5]. 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 [4, 6, 7, 78]. 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" [9]. Non-completion and non-transfer was even higher for Black students (75%) and Latinx students (80%). Increasing access to and success for community college transfer students in STEM disciplines is critical for California and the nation [10, 11] and enhanced partnerships between community colleges and B.S.-granting institutions are necessary [12].

Following transfer, students often experience a severe dip in academic performance experienced by community college students after transfer – described by Hills [13] as "transfer shock." More recent research has increased understandings of the transition experience. In 1998, Laanan proposed the concept of "transfer student capital": "the complex transfer process and experiences of students from community colleges who transfer to 4-year institutions" [14]. This model suggests that "community college students have opportunities to accumulate different forms of capital while at the community college" [15]. Moser [16, 17] expanded Laanan's model to analyze the impact of six components of the community college (CC) experience on student success at the new institution: 1) academic counseling experiences; 2) learning/study skills at the CC; 3) informal contact with faculty at the community college; 4) formal collaboration with faculty at the CC; 5) financial knowledge at the CC; and 6) motivation and self-efficacy (Figure 1). Higher transfer student capital is a

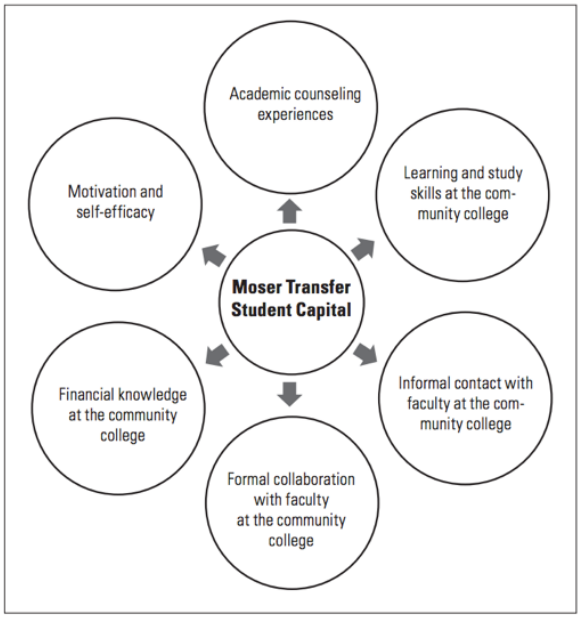

Figure 1: Student Transfer Capital (Moser, 2014)

predictor of post-transfer GPA, ability to cope with problems proactively, and higher levels of student satisfaction with academics and advising [17].

Problems with Existing Efforts to Prevent & Address Transfer Shock

Too often, however, efforts to grow "transfer student capital" at the community college and efforts to respond to "transfer shock" at the transfer institution are premised on the idea that community college students have deficits that must be addressed [18]. As Rendón, Nora, and Kanagala [19] add, "For decades, higher education's work to support student success has been built on a grand narrative in which underserved and underrepresented students from low-income backgrounds are portrayed as 'high risk', 'high maintenance', 'underprepared', or 'culturally deprived'. Absent from this deficit-based narrative are asset-based views about the cultural wealth that students employ to transcend their socioeconomic circumstances and to excel in education." Community cultural wealth is defined by Yosso [20] as the "array of knowledge, skills, abilities and contacts possessed and utilized by Communities of Color to survive and resist macro and micro-forms of oppression,", and includes aspirational, linguistic, familial, social, navigational, and resistant capital.

A second problem with many efforts to grow "transfer student capital" and respond to "transfer shock" is that "intervention programs" limit their scope to changing the pre-transfer and post-transfer students rather than changing the institutions [21], ignoring institutional actors, practices and policies. As Bensimon [21] notes,

> institutional actors, as a consequence of their beliefs, expectations, values, and practices, create or perpetuate unequal outcomes and that the possibility for reversing inequalities depends on individual learning that holds the potential for bringing about self-change. That is, individuals—the ways in which they teach, think students learn, and connect with students, and the assumptions they make about students based on their race or ethnicity—can create the problem of unequal outcomes. Such individuals, if placed in situations where they learn the ways in which their own thinking creates or accentuates inequities, can also learn new ways of thinking that are more equity minded. Individually and collectively, campus members can be the creators of the conditions that result in unequal or equitable outcomes.

When institutional actors adopt what Bensimon calls an "equity cognitive frame" rather than a "deficit cognitive frame," they understand themselves and the institution as accountable for student success.

Strengths-Based Mentoring/Advising

Some colleges and universities have introduced the concept of strengths-based mentoring/ advising to challenge a "deficit cognitive frame" [21] in mentor/mentee relationships "in which underserved and underrepresented students from low-income backgrounds are portrayed as 'high risk', 'high maintenance', 'underprepared', or 'culturally deprived'" [19]. Gallup's CliftonStrengths for Students (formerly called StrengthsQuest) is a commonly adopted assets-based approach. Gallup indicates that the organization is currently working with over 600

colleges and universities. Research by Gallup and others shows that the integration of CliftonStrengths has a demonstrated correlation with student retention and well-being [22].

Rooted in positive psychology [23, 24], CliftonStrengths for Students is an online assessment that identifies individuals' top five themes of talent, or Signature Strengths. These patterns of thoughts, feelings and behaviors can be developed into strengths by intentional investment in time practicing, developing skills, and building knowledge [25, 26]. The assessment results are designed to enable individuals to identify and begin to understand the value in the ways and capacities for thinking, feeling and behaving that feel natural to them. Neuroscience research [27] suggests that because new synaptic connections are most likely to occur in areas that are most developed, we are more likely to grow our areas of greatest strength – what Gallup calls our Signature Strengths [28]. As such, strengths-based development strategies and interventions involve bringing awareness as well as increased and intentional use of signature strengths [25, 26, 29].

The CliftonStrengths model organizes strengths in four areas: executing strengths ("knowing how to make things happen", influencing strengths ("know how to take charge, speak up, and make sure the team is heard"), relationship building strengths ("the ability to build strong relationships that can hold a team together and make the team greater than the sum of its parts"), and strategic thinking strengths ("help teams consider what could be; absorb and analyze information that can inform better decisions").

- **Executing**: Achiever, Arranger, Belief, Consistency, Deliberative, Discipline, Focus, Responsibility, Restorative
- **Influencing**: Activator, Command, Communication, Competition, Maximizer, Self-Assurance, Significance, Woo
- **Relationship-Building**: Adaptability, Connectedness, Developer, Empathy, Harmony, Includer, Individualization, Positivity, Relator
- **Strategic Thinking**: Analytical, Context, Futuristic, Ideation, Input, Intellection, Learner, Strategic

As summarized by Louis [30], strengths-based approaches have been used in a variety of ways to support student success, including in orientation programs [31, 32, 33], academic advising [34, 35], and in first-year programming [36, 37, 38, 39, 40]. As a whole, research indicates that strengths-based practices are correlated with statistically significant increases in college student retention and academic performance and positively associated with self-efficacy and engagement on campus [41].

A Strengths Approach is Not Enough

Many implementations of assets-based approaches – including the CliftonStrengths for Students model – continue to ignore the specific historical and institutional contexts of inequality that contribute to student non-retention. While some scholars suggest that strengths-based assessments and the strengths they assess are universal across cultures [28, 24], others stress the importance of not diminishing differences that exist due to various aspects of social and cultural identity [42, 43]. Due to our unique combinations of intersecting social and cultural identities,

we can define, value, and express our strengths differently [43]. The filters through which we create meaning are formed by the intersectional nature of our experiences [44], and the meaning we create ultimately shapes our behaviors.

In addition, strengths-based and other assets-focused models of mentoring in engineering and computer science – even those that integrate a social justice perspective – often ignore the ways in which engineering and computing disciplinary cultures, themselves, assume that students are "in deficit" – particularly those from groups that are underrepresented and, in some cases, are explicitly designed to identify these "deficit students" and weed them out [45].

Strengths Training from a Social Justice Perspective <u>in</u> Engineering and Computer Science as Context

In contrast, our implementation utilizes a "social justice perspective of strengths-based educational work" [46] in which mentors and mentees engage in activities focused on power, privilege, and oppression – and Critical Race Theory frameworks [20, 47] to make visible and challenge educational inequities – to critically examine the intersections of their strengths with their social and cultural identities and collaboratively examine higher educational institutions and engineering and computer science disciplinary cultures as contributing to student non-success.

In our program, S-STEM students as well as their faculty and staff advisors and mentors are introduced, trained and supported in the "strengths from a social justice perspective in engineering and computer science" approach. For students, the first year "training" occurs as follows:

Semester 1	1. Introduction to Strengths from a Social Justice Perspective (2 hours) 2. Exploring the Intersection of Strengths, Identity & Context (2 hours) 3. Strengths: Engineering & Computer Science as Context (2 hours)
Semester 2 & 3	1. Strengths during the COVID-19 Pandemic (2 hours)

In addition, monthly events about a range of topics (from check-ins to mock interviews) regularly utilize the "strengths from a social justice perspective in engineering and computer science as context" approach. Our goal is for all student mentoring and advising to also interweave this framework. Students are matched with two mentors during their first two years in the S-STEM program: one from their community college and one from the B.S.-granting institution partner. Mentors and advisors are introduced to the model via a 2-hour kick-off training and supported to develop their expertise and comfort in this area via 4-5 "faculty/staff only sessions" during the academic year.

For us, this new model for mentoring and advising is summarized via four statements that we regularly share with students:

What We Say	**Why We Say It**
1. We believe in you & know that you belong	Many students have shared – including via surveys, interviews, and focus groups conducted by the external evaluator – that they do not feel as if they deserve to be part of this S-STEM

in the ENGAGE program!	Scholarship & Mentoring Program. Some students also continue to have questions about whether or not they can actually become an engineer or computer scientist. We believe, that in part, these doubts and questions are connected to the endemic deficit thinking that permeates our institutions and selves.
2. We know that you all have unique "Top 5" strengths and we know that all of these strengths are great for engineering and computer science.	There is often an assumption that there is only "one type of person" who will be able to succeed in engineering and computer science. Using the CliftonStrengths, for example, many people might identify strengths like achiever, analytical, competition, discipline, and/or learner as hallmarks of this "one type of person" who will be a good engineer or computer scientist. Other characteristics often associated with this "one type of person" are things like being rational, objective, "naturally good" at math, or only interested in technology. However, in our S-STEM Program, we know that there are many different ways to be awesome engineers and computer scientists. We know, for example, that CliftonStrengths in communication, context, empathy, and input are necessary components of successful design teams. We also know that a more diverse engineering and computing profession contributes directly to more creative and more innovative solutions to address the world's challenges. Thus, our perspective in this S-STEM Program is that we can increase the number of people in as well the diversity of the engineering and computer science workforce and do better engineering and better computer science if we expand our notions of the "types of people" who can be good engineers and computer scientists.
3. We know that people from all groups – including all races and ethnicities and all genders and sexualities – can be awesome engineers and computer scientists.	Many groups of people are currently underrepresented in engineering and computer science education and related workforces in the United States. Our assumption is that these patterns of underrepresentation – or disproportionate representation relative to a group's representation in the overall population – are not the result of innate, natural or biological differences between genders, races, ethnicities, sexualities, etc. Rather, we operate on the assumption that these patterns of underrepresentation result from and provide evidence of systemic inequities in the U.S., including but not limited to inequitable PreK-12 and higher education opportunities and experiences. These inequities then may contribute to shaping student interest in, aptitudes for, and experiences in engineering and computer science education and workforce pathways. Importantly, our attention to patterns of underrepresentation and the factors that produce those patterns does not mean that we think, for example, that all Latinx students are the same and have

	the same experiences. Rather, we are doing work to individualize our mentoring and advising of our S-STEM students (including by paying attention to and engaging with their individual "Top 5" strengths, and how their strengths intersect with, shape, and are shaped by their social identities) while, at the same time, recognizing that the experiences of some of our S-STEM students may be shaped now and/or in the future by the systemic inequities that produce these patterns of underrepresentation in the engineering and computer science workforce.
4. Let's work together to support your success!	We say this because we believe that together we can support individual ENGAGE students to succeed and, simultaneously, create changes in engineering and computer science education to improve inclusion and equity for all current and future students.

Initial Student Results – Strengths from a Social Justice Perspective <u>in</u> Engineering and Computer Science as Context during the COVID-19 Pandemic

Like other students, those participating in our S-STEM program report significantly higher levels of stress during the COVID-19 pandemic. Surveys and interviews by the external evaluator have identified increases in student stress in the areas of: housing security, food security, financial security, health, academics, transfer, having balance in their lives, and other areas. In a Fall 2020 survey, students were asked to rate their level of stress before the COVID-19 disruption and after the COVID-19 disruption. Twenty-six students responded. Before the COVID-19 disruption, 8 students reported feeling "extremely high levels of stress" about one of the stressors they were asked to rate in a survey. After the COVID-19 disruption, there were 40 reports of "extremely high levels of stress."

In the Fall 2020 survey, students were also asked, "since the disruption, how important has Strength Training been for helping you manage academically?" The majority of students who responded identified a positive impact:

- 7: extremely high impact
- 15: some impact
- 4: no impact

Example student comments about the ways in which they have utilized their strengths during the COVID-19 pandemic include:

- "I have definitely used my number 1 responsibility strength to be responsible about my classes and spending enough time to get good grades."
- "I have had to use Analytical and Intellection to make the necessary changes to study habits as I am now on my distraction-filled desktop at all times."
- "One of my strength[s] is input. I'm the kind that cannot study until the dishes are done and the salt is in the right position. I need the right environment. Knowing this, I started out with COVID by setting up a designated study area that is only mine."
- "Adaptability, one of my strengths, has allowed me to accept the situation and work with what has happened."

- "I have adapted and modified my life to use connectedness in new ways. I am able to talk and reach out to others by other means rather than face to face during these times by the use of technology such as zoom."

Ongoing Research: Strengths, Social Identity, and Social Networks

Surveys and interviews by the external evaluator have not explicitly asked students to reflect on the "strengths from a social justice perspective in engineering and computer science as context" model of mentoring and advising – instead, the evaluator has focused, to date, on questions related to strengths, in general. Research is currently underway led by Co-PI Almeida that is focused on the intersections of strengths, social identity, context, and social networks. Almeida is utilizing social network analysis [48], survey methods, and qualitative interviewing to advance understanding of how NSF S-STEM ENGAGE activities focused on student personal development via "strengths training from a social justice perspective in engineering and computer science as context" contribute to a) growth of student social networks and b) increase in student resilience, confidence, sense of community, and sense of belonging. In addition, this research investigates whether growth in these areas is related to increased student retention, pre-transfer success, transfer, and post-transfer success.

(Work-in-Progress) Conclusion

Data collection and analysis is ongoing, and will expand to include more surveys, interviews, and/or focus groups with ENGAGE mentors and advisors alongside ongoing engagement with student participants. In addition, some S-STEM program students will transfer from their Hispanic-Serving California Community College to predominantly white B.S.-granting institutions in Fall 2021 (including but not limited to the PWI collaborator on this grant-funded project). We are particularly interested in the ways in which the "strengths training from a social justice perspective in engineering and computer science as context" serves a resource for students as they make this transition.

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