

Reflecting on 10 years of Centralized Engineering Student Diversity Initiatives (Experience)

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0. Abstract

The IDEA Engineering Student Center at the University of California San Diego's Jacobs School of Engineering was established in 2010 to focus on engineering student diversity and inclusion initiatives following a series of racially charged incidents affecting our campus' Black students. From its inception, the IDEA Center aimed to focus on 1) outreach, 2) recruitment and yield, 3) academic success and enrichment, and 4) retention and graduation for underrepresented minority (URM) students. Through the lens of nonprofit organizational lifecycles, the IDEA Center transitioned from Idea to Start-up to Growth during the past 10 years. The 2020-2021 academic year was pivotal for the Center for several reasons. First, it was the Center's 10-year anniversary and the beginning of a strategic planning process. Moreover, the Black Lives Matter movement reinvigorated attention to how the Center can support the success of Black students and other underrepresented groups in the Jacobs School of Engineering. These have pushed the Center to review and renew our work to ensure continued relevance and impact. Mirroring our shift through the Idea-Startup-Growth stages, our assessment and evaluation needs have also shifted. Over the past 10 years, the IDEA Center established and grew several programs with a focus on establishing theory-based academic success and retention programs and conducting assessment to establish early evidence of program impact and ensure smooth implementation. Now as we build towards becoming a Mature organization over the next several years, we are looking to establish ongoing systems for data collection and reporting to tell a cohesive story of impact in alignment with school-wide goals. This paper will discuss reflections and lessons learned from the development and growth of the IDEA Center, with a focus on the development of specific programs and considerations that remain for us to address in the future. We hope that this paper and presentation can inform other universities that may be trying to initiate, grow, or centralize student diversity initiatives within engineering schools or divisions.

1. Introduction

The IDEA Engineering Student Center at the University of California San Diego's Jacobs School of Engineering was established in 2010 to focus on engineering student diversity and inclusion initiatives following a series of racially charged incidents affecting our campus' Black students. IDEA is an acronym that stands for Inclusion, Diversity, Excellence, and Achievement. From its inception, the IDEA Center aimed to focus on 1) outreach, 2) recruitment and yield, 3) academic success and enrichment, and 4) retention and graduation for underrepresented minority (URM) students.

The 2020-2021 academic year was pivotal for the IDEA Center for several reasons. First, it was the Center's 10 year anniversary and the beginning of a strategic planning process. Moreover, the Black Lives Matter movement reinvigorated attention to how the Center can support the success of Black students and other underrepresented groups in the Jacobs School of Engineering. These have pushed the Center to review and renew our work to ensure continued relevance and impact.

This paper is an analysis of the IDEA Center's evolution through the lens of organizational lifecycles [1], [2] with specific attention towards 1) Strategy, 2) Programs, 3) Infrastructure and Capacity, and 4) Evaluation and Assessment at each stage of our lifecycle to date. Over the past 10 years the Center has moved through the Idea, Startup, and Growth stages, with current attention on how to become Mature organization that focuses on expanding impact. This analysis aims to highlight the importance of strategy in guiding program development as well as evaluation and assessment. Furthermore, it highlights the importance of building infrastructure and additional capacity to support a growing organization. The aim is to share our experience leading centralized engineering student diversity and inclusion programs for 10 years and to offer suggestions for how other universities can get started, grow, or increase the impact of their own student diversity and inclusion initiatives. This paper will discuss reflections and lessons learned from the development and growth of the IDEA Center and considerations that remain for us to address in the future.

2. Building organizational capacity at every stage

*"The entire premise of the lifecycle is based on the assumption that **to get where you want to go, you need first to know where you are.**"* [2]

The term "organization" can be interpreted loosely in this paper to include everything from schools to departments to small teams leading a program. Consider whether there is an organization (or organizations) at your institution that manages or coordinates engineering student diversity initiatives, including who is involved and what infrastructure and leadership support is currently in place to support the efforts. Organizational lifecycle is a helpful framework for developing any organization because it can help identify what types of support or activities may be needed [2]. As described by Susan Kenny Stevens in *Nonprofit Lifecycles: Stage-Based Wisdom for Nonprofit Capacity*, organizational lifecycle includes the following stages: Idea, Start-Up, Growth, Mature, Decline, Turnaround, and Terminal [1]. This paper describes our experience in the Idea through Growth stages and reflects on our journey towards the Mature stage. More information about each of these stages is described below to identify some of the common features, capacity building opportunities, and challenges of organizations in each of these stages, adapted for the higher education context.

Table 1: Organizational Life Cycle Stages - Start-up through Mature

Stage	Features	Capacity Building Opportunities	Challenges
Idea	<ul style="list-style-type: none"> -Organization and programs are not yet established 	<ul style="list-style-type: none"> -Identify unmet needs and verify with audiences -Develop a concept and plan -Create leadership/staffing plan -Develop a budget 	<ul style="list-style-type: none"> -Resistance -Lack of funding, expertise, or support
Start-Up	<ul style="list-style-type: none"> -Various small or simple programs initiated -Strong commitment to delivering services -Leaders may be directly involved in delivery -Agile and flexible -Informal systems and management structure -Begin gathering financial resources 	<ul style="list-style-type: none"> -Assess and begin to improve program quality -Increase staff capacity and skills -Begin to establish policies and systems -Expand funding sources -Expand awareness and branding 	<ul style="list-style-type: none"> -Focusing direction of activities -Sustaining initial enthusiasm
Growth	<ul style="list-style-type: none"> -Established programs -Demand may exceed capacity -Staff may specialize in different areas -Established relations with key funders, but more room for growth -Systems and operations still developing -Better promotional materials 	<ul style="list-style-type: none"> -Develop a strategic plan to clarify direction and integrate activities -Develop collaborations -Hire additional staff and adjust management to meet emerging needs -Further develop data systems and management to support tracking, assessment, and evaluation -Identify and track outcomes -Further develop business systems and management -Diversification of activities 	<ul style="list-style-type: none"> -Saying “no” to new opportunities -Overwhelmed with change -Inadequate systems and accountability
Mature	<ul style="list-style-type: none"> -Established and recognized programs that work well -Program and operational coordination through formal planning -Delegation of responsibilities with clear accountability structure -Systems, policies, and procedures in place -Standardized and efficient operations -More data management -Reliable and diverse funding streams -Marketing plan with professional image and promotional materials 	<ul style="list-style-type: none"> -Evaluate program impacts and share with the field -Review strategic plan and develop long-range program plan -Explore new program delivery models -Develop internal process for evaluating whether to pursue new opportunities -Leadership development -Increase professional development and personnel management -Review and develop long-range fundraising plan -Develop long-range marketing plan -Enhance marketing capacity 	<ul style="list-style-type: none"> -Lack of risk taking -Leadership and staff focusing too much on operations, at the cost of long-range planning -Conflict between old and new

*Adapted from Speakman Management Consulting [3].

**Note: The Decline, Turnaround, and Terminal stages are not included here since they are not addressed in this paper.

As shown in Table 1 above, organizations have different needs and may face different types of challenges at each of the stages described. The table identifies common opportunities to build organizational capacity at each stage. Reflecting on where an organization is in its lifecycle may help identify what is needed to move forward, including making requests for different types of resources, including staff, expertise, or new systems to support operations and assessment of programs.

As described by Brothers and Sherman in *Building Nonprofit Capacity: A Guide to Managing Change Through Organizational Lifecycles*, the TCC Group, a consulting firm that helps non-profit organizations increase their impact, has added organizational effectiveness to the field’s thinking about organizational lifecycle [2]. The TCC Group’s Lifecycle Pyramid maps phases contributing to organizational effectiveness, defined as “progress toward achieving mission,” to three stages of Susan Kenny Stevens’ lifecycle model. Table 2 shows the alignment of these phases, as described by Brothers and Sherman [2].

Table 2: Alignment of Lifecycle Phases and Stages

TCC Group Lifecycle Pyramid Phases	Susan Kenny Stevens Lifecycle Stages
Core Program Development	Start-Up
Infrastructure Development	Growth
Impact Expansion	Mature

To summarize the phases:

- During the first Core Program Development (Start-Up) phase, an organization focuses on developing a “program strategy” that reinforces the organization's mission [2].
- During the second Infrastructure Development (Growth) phase, organizations prioritize developing the infrastructure needed to sustain and grow core programs. This phase acknowledges that it is necessary to develop sufficient infrastructure, both operational and for evaluation and assessment, to support consistent delivery of impactful and high quality programs [2].
- Once organizations have built program and infrastructure capacity, the final Impact Expansion (Mature) phase focuses on identifying and sharing lessons learned in order to further benefit the organization's mission or the field [2].

These frameworks are useful tools for identifying what stage the organization may be in to determine relevant needs, goals, and capacity building opportunities.

3. Ensuring effective programs through design, implementation, and assessment

“Although program theory allows one to state that a program should work, success is not guaranteed. Once a theory-based program has been built and implemented the final step is to assess its effectiveness.” [4]

3.1 Logic models and program theory

Logic models are a useful tool throughout the entire cycle of developing, implementing, and refining programs [2], [4], [5]. As described by Russ-Eft and Preskill [5], a logic model depicts a program’s expected resources, activities, and short- and long-term intended outcomes [5]. It also identifies underlying assumptions in how the program is expected to work. While it may be ideal to begin with creating a logic model at the start of program development, a logic model can be created for an existing program at any time to clarify the program’s components and how they are believed to lead to intended outcomes. This can lead to program improvements for long-standing programs and help guide decision-making conversations about a program. This same process can be applied to developing a suite of programs that contribute to the same strategy or outcomes.

Pope, Finney, and Bare [4] make the case for articulating “program theory”, which can be incorporated into a logic model. They explain that while student affairs programs are often mapped to intended outcomes, the rationale for why or how the activities should lead to the intended outcomes may not be explicit. They further explain that a complete program theory requires explicating how the program leads to the intended outcomes based on theory from research literature that 1) links the program activities to intermediate (proximal) outcomes and 2) links the intermediate outcomes to the desired long-term (distal) outcome [4]. This is important for both program design as well as assessment because “program theory allows professionals to intentionally build programs that theoretically should ‘work’ and then use assessment in a confirmatory way to test this hypothesis” [4, p.7]. Following this, “subsequent outcomes assessment is needed...to formally evaluate program effectiveness” [4, p.7].

Moreover, the use of logic models and attention to theory are “critical to determining whether an intervention should be replicated, how, and under what conditions” [2, p.94]. Ensuring alignment between theory, program design and implementation, and assessment are essential for maximizing as well as demonstrating effectiveness and impact.

3.2 Evaluation and assessment

When it comes to evaluation and assessment, there are many entry points for different skill levels. There are some activities that can be taken on by program staff with some guidance and

others that require specific expertise. However, everybody can learn to think more like an evaluator. Some basics of evaluation and assessment are briefly described below:

- **Formative:** Conducted during the development or early implementation of a program for the purpose of improvement [5]. The essential questions are “What is working well?” and “What is not working well?”
- **Summative:** Conducted after a program is completed, stabilized, or believed to be working as intended. There are several types of summative evaluations including 1) Monitoring and Auditing, 2) Outcome Evaluation, 3) Impact Evaluation, and 4) Performance Measurement [5]. While each has a slightly different focus or approach, they ask the essential questions: “To what extent did the program meet its goals?” [5, p.22] and “What is recommended as a result of the findings?”
- **Implementation Fidelity:** Implementation fidelity, which may be incorporated throughout the assessment process and is an important part of summative studies, merits special attention because it is not frequently addressed in student affairs [6]. According to Gerstner and Finney, “Implementation fidelity examines the extent to which the planned student affairs program matches the implemented program” [6, p.16]. The essential questions are “Are students receiving the *planned* program?” [6, p.15], “Is the program being implemented as intended?”, and “How, if at all, has the implemented program drifted from the intended design?”

Different types of evaluation have different purposes and may be appropriate at different times during the life of a program. Since formative evaluation aids program development and improvement, it often occurs at the beginning of a program. However, formative evaluation can occur any time during a program to identify areas for improvement. Summative evaluation generally occurs later, after a program has been improved and is stable.

To aid with interpretation of findings, it is important to incorporate assessment of “implementation fidelity” into summative and outcomes studies. According to Gerstner and Finney, “Obtaining implementation fidelity data ensures the correct program is being evaluated rather than one distorted, possibly substantially, due to implementers drifting from the planned program” [6, p.25]. This is sometimes called a “process” or “implementation” study. Gerstner and Finney describe five components of implementation fidelity that can be evaluated for student affairs programs, including 1) program differentiation (“features of the program”), 2) adherence (“whether...the features...were implemented as planned”), 3) quality (“caliber of the delivered program features”), 4) exposure (“extent to which *all* participants...receive the *full* amount of the treatment”), and 5) responsiveness (“receptiveness of those exposed to the treatment”) [6, p.19]. Without information on whether the program was implemented as designed, it may be difficult to

interpret evaluation and assessment findings. For example, “It could be inferred that students are not meeting [an] objective as a function of the planned program. However, if the programming...is not implemented as planned, the outcome measure reveals nothing about the efficacy of the planned program, because the planned program was not administered” [6, p.16].

Together logic models, sound program theory, and assessment that attends to both implementation fidelity and outcomes are a suite of practices that support effective programs. An organization’s capacity to conduct these different activities may vary. These tools and questions can be used to determine when additional expertise may be needed to develop and assess theory-based student diversity initiatives and programs.

4. Our Experience

4.1 Idea Stage: Origin of the IDEA Engineering Student Center

“There is no organization, only an idea to form one.” [1]

In 2010, there was a sense of urgency within the School of Engineering. Low retention rates among underrepresented minority students were troubling. Moreover, a series of racist events occurred on the UC San Diego campus earlier that year that laid bare the need for changes to campus culture and additional support structure for Black students in particular. Students and faculty demanded and advocated for space and programming to build community and inclusive ideals among engineering students and to support the success of Black, Hispanic, and other underrepresented students.

In response, the existing engineering student services department was reimagined to become a new center with a revised mission and strategic plan that included promoting student diversity and inclusion by supporting diversity student organizations, providing mentoring opportunities for underrepresented students, and collaborating with campus offices to promote resources for underrepresented students. This vision and the initial programs of the new IDEA Engineering Student Center were shaped by the School of Engineering Dean, the new IDEA Center Director, the Diversity Advisory Council, and a Planning Committee of faculty, staff, and students tasked with developing the initial model for the Center.

Although the launch of the IDEA Center happened quickly, in less than one year, it did not happen spontaneously. UC San Diego had a long history of serving students from populations underrepresented in engineering. In the 1990’s UC San Diego had a Minority Engineering Program that provided community and mentorship to underrepresented students. The National Society of Black Engineers (NSBE), Society of Hispanic Professional Engineers (SHPE), and Society of Women Engineers (SWE) were also longtime, active chapters at UC San Diego. In addition, multiple diversity and inclusion initiatives began to develop across campus within a

few years of the IDEA Center, including the establishment of the Office of the Vice Chancellor for Equity, Diversity, and Inclusion and the Black Resource Center.

4.2 Start-up Stage: Early Activities

“An organization that is in the beginning phase of operation.” [1]

4.2.1 Strategy

The original pillars of the IDEA Engineering Student Center established by School leadership and the Center’s Planning Committee were 1) outreach and recruitment, 2) retention, and 3) research—with overall goals to increase enrollment, retention, and research participation for Black, Hispanic, Native American, and women students in the School of Engineering.

4.2.2 Programs

Connolly [7] describes the Start-Up phase as having a focus on core program development, where the organization focuses on introducing programs that reinforce the mission and vision, based on best practices. New efforts of the IDEA Center started small with a few core programs. The initial implementation of these main programs is described below.

IDEA Scholars & Summer Prep: The Center’s flagship IDEA Scholars program started in 2011 with a cohort of 22 first generation or underrepresented minority students. The goal of the IDEA Scholars program was to increase retention by promoting community and academic success among engineering students from diverse backgrounds through academic and professional enrichment. The Center leveraged existing resources as well as coordinated new ones. For example, IDEA Scholars participated in a pre-existing three-part Orientation to Engineering course, received quarterly advising from the Center, attended various Scholars events, were encouraged to get involved with engineering student organizations and outreach efforts, and were encouraged to take advantage of academic resources, including a study space managed by the Center. IDEA Scholars also participated in a 5-day Summer Prep residential program prior to their first fall quarter to build community and provide an extended orientation to prepare them for success in their first year. During this early phase of the program, the IDEA Center’s Faculty Director worked directly with students on early research inclusion by creating a smart solar farm project that would help build the freshmen year participants’ research skills and prepare them for future research experiences.

Jacobs Undergraduate Mentorship Program: To support student retention, a mentorship program was piloted in 2011 and co-run by graduate students and the IDEA Center. Undergraduate underclassmen were paired with upperclassmen, and those groups were matched with a graduate student. The graduate student mentors’ role was to impart advice and share their experiences with the undergraduate students through one-on-one meetings, occasional larger

meetings, and email. The program began with 28 graduate mentors and 117 undergraduate mentees.

Transfer Prep and Mentorship: To support transfer student success in their transition from community college, a summer prep program for transfer students, Transfer Prep, was started in 2012, with a focus on serving underrepresented minority and first generation students. The first cohort included 20 participants. Subsequently, a mentorship program for transfer students, Transfer Engineering Academic Mentorship (TEAM), was started in 2014.

Engineering Overnight Program: In 2013, the IDEA Center hosted the first Engineering Overnight Program for admitted engineering students, with the goal of increasing the yield of underrepresented engineering freshman students who accepted admission to UC San Diego. This program is an engineering specific track of a program coordinated with other units on campus.

4.2.3. Infrastructure & Capacity

The IDEA Center started with four staff: Director, Assistant Director/Retention Programs, Outreach Coordinator, and Student Life Coordinator. To some, four staff may seem like a large starting operation. However, there were several existing activities that the Center was responsible for coordinating, including supporting the School's engineering student organizations and coordinating existing school-wide student programs. After the Center's first year, a Faculty Director was added to the team to guide new academic initiatives of the Center.

4.2.4. Evaluation & Assessment

During the early years of the IDEA Center, measures of success focused on reporting activities conducted, numbers of students served, and the retention rate for IDEA Scholars. Formative improvements were made by the staff implementing the programs.

4.3. Growth Stage: Pilot and Formalize Additional Programs

"An organization whose services are established...but whose operations are not yet stabilized."
[1]

4.3.1. Strategy

In 2015 along with the IDEA Center's faculty advisory committee, the Center Director and Faculty Director led the development of the Student Success Initiative, a master plan for student excellence, diversity, and success. The plan included proposals for new and continuing activities to support undergraduate and graduate student success through community building, mentorship, and career development. In 2018, the IDEA Center staff and Associate Dean for Students prepared a subsequent strategic plan that laid out plans for the continuation of several activities

from the 2015 plan as well as establishing an undergraduate research program that would more explicitly address that component of student success.

4.3.2. Programs

Over the next five years, the IDEA Center grew participation in existing mentorship programs, Transfer Prep, and the Engineering Overnight program. Additionally, the Center launched the following new programs that were outlined in the Student Success Initiative:

Engineering Learning Communities (ELCs): The study space managed by the IDEA Center morphed into ELCs in 2016, which are cohort-based collaborative study groups for engineering students in “gateway” math, science, and engineering courses that are led by peer educators. Students reinforce learning and study skills through problem solving sessions and office hours throughout the quarter, while learning the value of collaborative study in engineering. Early assessment of the program found that participants 1) discovered new ideas and procedures for solving problems, 2) learned how to self-reflect on their study skills and habits, 3) gained self confidence in academic and non-academic domains, 4) learned through practicing and applying study strategies during the sessions, and 5) gained comfort in a peer-led, collaborative learning environment [8]. Today, ELCs are offered for six math courses, three chemistry courses, three physics courses, and three engineering courses and served more than 600 students last year.

Fundamentals of Engineering Applications Course (ENG 10): Originally inspired by the Wright State University Model for Engineering Mathematics Education [9] and influenced by the opening of UC San Diego’s EnVision Arts and Engineering Maker Studio, ENG 10 was launched in 2016 as a freshman-level engineering design elective course that features examples of math applications in engineering and an introduction to basic Python programming. Early assessment of the course documented student engagement in the engineering design process; in particular, analysis found that students reported implementing the Define, Design, Test, Assess, Retest, and Report steps of the design process during their hands-on projects (significant difference pre to post on a scale of 1 “did not use at all” to 5 “fully implemented”). Furthermore, the following were found to promote student learning: 1) the ability to distinguish the design process from other types of problem solving, 2) the importance of identifying and establishing a need, 3) understanding that design and the application of mathematics and science is an iterative process, and 4) the importance of a team when researching, gathering information, and generating multiple solutions [10]. The course is taken by participants in the Summer Engineering Institute, described below, as well as additional students throughout the academic year.

Summer Engineering Institute (SEI): In 2016, the week-long Freshman Summer Prep program that began in 2011 was transformed into a credit-bearing program occurring during summer session. Over the new 5-week program, students took a course from their major along with ENG

10, participated in workshops to learn about campus resources, and built community through regular social activities prior to their first quarter of the academic year. Early assessment of the program found that SEI 1) strengthened academic and social integration into engineering, 2) increased engineering knowledge and specific technical skill development, 3) provided comprehensive support within the engineering educational ecosystem of staff, educators, and students, and 4) allowed for ongoing monitoring and advising of participants [11]. While the program began only serving IDEA Scholars and ACES Scholars [Academic Community for Engineering Success], an NSF grant-funded program, the program expanded to include additional incoming engineering students. The biggest SEI cohort to date is 117 participants, with a total of 383 participants in the program between 2016 and 2019.

Growth of diversity student organizations: Since its inception, the IDEA Center has provided administrative, advising, and leadership development to the student-led boards of UC San Diego's NSBE, SHPE, and SWE student chapters. In 2016, the IDEA Center helped launch a student chapter of Out in Science, Technology, Engineering, and Mathematics (oSTEM), a national society for LGBTQA communities in STEM fields. Additional student chapters of diversity organizations now served by the IDEA Center include Women in Computing and, most recently, the Society of Asian Scientists and Engineers.

Academic Achievement Program: The Academic Achievement Program is a two-fold initiative that includes both a study skills course and a process for early academic intervention that is embedded into participating engineering courses. The "ENG 15: Engineer Your Success" course uses Raymond Landis's *Studying Engineering: A Road Map to a Rewarding Career* [12]. Early assessment of the pilot course found that students engaged in: 1) Short- and long-term goal setting, 2) acceptance of mistakes and mindset to change, 3) practicing proactive behavior, and 4) self-reflection [13]. In collaboration with faculty and teaching assistants, the goal of the course-embedded component of the program is to promote early intervention when students fall behind in a specific course. In order to accommodate broader implementation, the next phase of the program includes a handbook for faculty and teaching assistants with templates and suggested timelines to follow for identifying students who may benefit from early academic intervention, communicating with them, and referring them to relevant resources, which will be introduced to all departments through an orientation and follow-up communications.

Guided Engineering Apprenticeship in Research (GEAR): Launched in 2019, GEAR is a year-long research experience for early undergraduates that aims to provide a scaffolded experience to support the development of students' research self-efficacy, engineering identity, and sense of belonging and inclusion within the field--especially among underrepresented, first generation, and low-income students. The program is based on the NSF-funded Early Research Scholars Program in the Computer Science and Engineering Department [14]. Assessment of the pilot year of the GEAR program found that 1) participants gained research skills/knowledge in

ways that aligned with the program structure, 2) the program structure can help participants navigate the ups and downs of research confidence, 3) participants explored career and graduate school options through the program, and 4) the program shows promise for increasing participants' sense of belonging in engineering [15]. The program served 54 students through its first two cohorts.

4.3.3. Infrastructure and Capacity

While the IDEA Center continued to establish new core programs during this Growth stage period, it also focused on infrastructure development to sustain programs. The Student Success Initiative that guided the initiation of these programs included requests for several additional staff to support both the new proposed programs and additional evaluation efforts. IDEA Center leadership responsibilities were adjusted such that there was one manager focused on operations and program oversight and another focused on program development and assessment. A Center coordinator position was added to support administrative and financial activities of the Center. Two part-time program coordinators were added to support the ACES Scholars, Engineering Learning Communities, mentorship programs, and graduate student professional development. The other additional activities were absorbed into the responsibilities of existing staff, with a focus on streamlining activities so staff could work more efficiently.

While the 2015 Student Success Initiative included pre-college outreach, outreach has not remained a focus of the IDEA Center's work to date. As our other programs grew, there was insufficient staff capacity to continue supporting pre-college outreach and the decision was made by School and Center leadership to focus on yield of accepted students and the success of current students. As a result, the outreach coordinator position was converted to a program coordinator position that would support the student diversity organizations. Until additional resources for outreach are available, the IDEA Center continues to support the engineering student council and student diversity organizations as they host one-day high school outreach conferences.

4.3.4 Evaluation and Assessment

The development and assessment of these new programs were based on effective practices described in the literature. Following suit, the mixed methods internal assessments conducted to identify early evidence of impact focused on related outcomes described in the literature. As described in the program sections above, these early assessments helped us identify strengths of the programs related to student success. Additional measures of success continued to include activities conducted, number of students served, and the retention rate for IDEA Scholars. An area for growth is establishing plans for future assessment of these efforts, including implementation fidelity and processes for ongoing reporting of activities and outcome metrics that are aligned with logic models and program theory.

4.4. Mature Stage: How do we get there?

“An organization that is well established and operating smoothly.” [1]

“A fully actualized, mature organization should remain vital and increasingly improve the quality of its programs--so as to make significant progress in fulfilling the defined need for which it exists.” [7]

4.4.1. Strategy

In 2020-2021, the IDEA Engineering Student Center both celebrated its 10 year anniversary and embarked on its next strategic planning process. Given the extent of our programs and acknowledgement that intentional effort is needed to become a Mature organization, the Center engaged a strategic initiatives department on campus to facilitate key activities, including to conduct stakeholder interviews with campus leadership and partners as well as to facilitate planning sessions with faculty, staff, and students. The Center is in the process of finalizing our strategic plan.

We are also creating logic models for several of our programs to clarify the link between program strategies and intended outcomes, which helps us make decisions about program changes, identify improvements, and plan assessments. We have found logic models to be especially useful in analyzing assumptions about the expected impact of programs on go-to metrics like retention rates, graduation rates, or GPA. Many of our programs aim to foster intermediate outcomes like “sense of belonging” [17] - [19]. The process of creating a logic model requires discussing how to effectively foster a sense of belonging and how we understand its contributions to distal outcomes like retention.

A next step would be to create a center-level logic model, sometimes referred to as a theory of change [2], [20]. This process articulates the interactions between our programs and how they each contribute to our center-level goals. It also supports the development of a plan for assessing the collective impact of the IDEA Center across our portfolio of programs, rather than program-by-program. As mentioned previously, while creating logic models early can help with the initial development of programs or a center, the process is beneficial at any time, including times of reflection and planning.

When beginning a strategic planning or any other reflective process, enter with the awareness that planning and implementing changes to strategy, programs, or procedures requires time from leadership and staff that may not be readily available. Acknowledging this and carefully allocating time to engage in planning, analysis, and implementation of changes is essential to a successful process.

4.4.2. Programs

The IDEA Center has expanded to offer a wide menu of programs, many of which are well-established with operations running smoothly for several years. We no longer feel urgency to establish new programs of our own, however, we do discuss how to leverage our current programs to meet emerging needs. We are also viewed as a leader in the School for student programs, especially in terms of student diversity and inclusion, and join many conversations that involve new collaborations that could lead to additional initiatives or programs for engineering students.

We have learned that strategy needs to guide how we manage our growth. The IDEA Center has expanded tremendously over the years and we now have little room for growth in programs given our current staff capacity. Although we have limited capacity to take on additional activities, it can be challenging to say “no.” We are taking the opportunity through our strategic planning process to revisit what is core to our mission and aligns with school-wide strategies to help us manage growth and prioritize initiatives within our finite capacity. Additionally, we are looking across our offerings to identify overlaps and gaps in service and potentially adjust our offerings to more efficiently use resources or to fill gaps in service for certain engineering student populations.

4.4.3. Infrastructure and Capacity

Our staff now includes our Faculty Director plus seven professional staff (six FTE), including an operations director, strategic initiatives and assessment director, four program coordinators (three FTE), a center coordinator, and several student assistants who support marketing, events, logistics, and assessment. As mentioned above, this level of staffing is necessary to sustain our current array of offerings. This means that additional programs or initiatives would require adjusting our offerings and/or staffing. While this can be a challenging position to be in, we plan to rely on our strategic plan as a guide for making any adjustments.

To date, the growth of our programs has outpaced the growth of our evaluation and assessment capacity. We look forward to focusing on bringing those in line over the next few years. The School of Engineering recently hired a data analyst specializing in the creation of Tableau dashboards. This has opened new possibilities about easy access to the student success metrics we need. We work closely with the analyst to create dashboards that can be used for assessment across our programs. These efforts are described in more detail in the next section.

4.4.4. Evaluation and Assessment

Our current attention on evaluation and assessment overlaps substantially with strategy and infrastructure. According to the TCC Group model, the Growth stage focuses on Infrastructure

Development, while the Mature stage focuses on Impact Expansion [2]. While our evaluation and assessment to date has included assessment of program pilots and basic reporting on program numbers and student retention rates, we do not yet have sufficient systems for evaluation and assessment that allow us to report comprehensively on our impact, across programs, on an ongoing basis. Our strategic planning process is leading us to consider metrics that cross our portfolio of programs so that we can gain a more comprehensive picture of their collective impact, rather than only focusing on individual programs separately. We are working to build our data infrastructure to allow for both retrospective reporting on the impact of programs over recent years as well as ongoing reporting.

Once we build additional infrastructure for evaluation and assessment, more focus can be placed on questions of lessons learned and impact. We are making steps in this direction that will allow us to do retrospective reporting on a few programs, with a focus on the first several years of implementation. For example, we are working with the School's data analyst to create a participation and academic performance dashboard for the Engineering Learning Communities that will inform a report detailing the implementation and outcomes during the program's first five years. Additionally, we aim to develop more comprehensive plans and data collection for ongoing program assessment and reporting. For example, recent assessment of the Summer Engineering Institute focused on developing a program logic model and gathering more robust pre/post survey data [16]. Furthermore, we are developing an IRB-approved evaluation study to follow up with the first four cohorts of Summer Engineering Institute participants (to be conducted beginning Spring 2021).

Building data infrastructure and systems for ongoing data collection and reporting will bring us closer to being a Mature organization, by allowing us to tell a cohesive story of impact in alignment with our mission and strategies.

5. Lessons Learned

We hope that this paper and presentation can inform other universities that may be trying to initiate, grow, or centralize student diversity initiatives. The IDEA Engineering Student Center has learned the following lessons, which we hope can guide others:

5.1. Theory-based strategies

- Logic models are a useful tool for clarifying program theory and how the program works to achieve intended outcomes. This can be done at any point during a program, but is especially useful when the program is first developed, and can be revised as the program evolves.

- With theory in mind, create a cohesive strategic plan that identifies how each program contributes to the organization's mission. This is especially important when there are many diverse programs.

5.2. Strategy-aligned programs

- Strategic planning, reflection, and implementing changes require a significant amount of time from leadership and staff. Intentional allocation of time for these activities is essential to developing strategies, programs, and the organization itself.
- Use the organization's strategic plan to guide new program development and do early assessment to make program improvements and identify early evidence of impact.
- Start small where there is the greatest need. In our case, we started with mentoring programs and a high-touch program for a small cohort of underrepresented students. We based these programs on known effective practices from the literature for underrepresented students and took inspiration from existing programs in the field.
- Over time, expand the scope of smaller programs to increase the number of participants or make them more impactful. For example, we grew the size of the IDEA Scholars cohort, expanded Summer Prep to the Summer Engineering Institute, and transitioned our study center to the Engineering Learning Communities.

5.3. Strategy-aligned capacity building

- Staff and systems for management, operations, and data will need to grow in concert with programs. Based on organizational lifecycle stages, consider the corresponding needs and current barriers to growth. Requests for resources should be made to leadership in order to address these.
- Demonstrating impact requires growing expertise and capacity to do evaluation and assessment. Professional development should be leveraged to grow staff expertise, and student metrics should be used in all decision-making processes.
- A strategic plan should be written to help manage requests that exceed current capacity. This will help in saying "no" intentionally and focus on activities that are core to mission and strategy.

5.4. Strategy-aligned evaluation and assessment

- Strong program theory outlined using a logic model is an essential starting point for designing meaningful evaluation and assessment activities.
- Start formative. Ask "What's working and what's not working?" Work towards implementing the program consistently with fidelity based on the logic model.
- Consider ways to build evaluation and assessment capacity.

- In terms of building knowledge and expertise in how to conduct assessment, this may include professional development, partnering with experts on campus, hiring internal staff with expertise in evaluation and assessment, or working with a consultant.
- In terms of building data infrastructure, improve participation tracking and learn how to get regular access to the needed campus student metrics.
- Incorporate assessment of implementation fidelity to ensure programs are being implemented as intended and to support interpretation of findings.
- When it comes to assessing program impact, use logic models as a guide for identifying metrics that will show whether the program has been successful. Identify what data is accessible and find out how to gain access to other metrics as needed. Measuring the intermediate outcomes in logic models will likely require collecting types of information beyond retention rates and academic performance.

6. Conclusion

Since its inception, the IDEA Engineering Student Center at UC San Diego has aimed to support the success of engineering students from underrepresented groups. This past year has allowed the Center to reflect on where we came from, where we are now, and where we would like to be. Through a recent strategic planning process, efforts to enhance evaluation and assessment, and writing this paper, we have identified challenges and opportunities for continued development of the Center that will focus our efforts over the next few years as we strive to become a Mature organization that is well-positioned to expand the impact of engineering student diversity, inclusion, and success initiatives.

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