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Tales from Two Cross Segmental Collaborative Initiatives: Leveraging Collective Impact for Improving Undergraduate STEM Education

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Tales from Two Cross Segmental Collaborative Initiatives: Leveraging Collective Impact for Improving Undergraduate STEM Education

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Introduction

In a world where science and technology play an increasingly important role in people's lives, an equitable and high-quality science education is paramount to the sustainment and advancement of countries and their citizens. For decades, the United States has called for capacity building in science education to increase the nation's competitiveness in scientific and technological innovation (NASEM, 2021). In recent years, there has been widespread interest in increasing the number of students completing bachelor's degrees in science, technology, engineering, and mathematics (STEM) disciplines as part of the effort to reach the nation's innovation potential (PCAST, 2021).

In the United States, students start their STEM higher education at both two-year and four-year colleges. Two-year colleges serve nearly half of college students and play an important role in providing access to higher education. Many students in two-year colleges transfer to four-year universities to complete their bachelor's degree, so building stronger connections between two-year and four-year colleges is imperative for supporting students as they pursue their STEM degrees. Since the transferring process involves students navigating different types of higher education institutions, facilitating curricular and pedagogical collaboration between two- and four-year institutions can help scaffold the transfer process and lead to more students completing their bachelor's degrees in STEM disciplines.

Effective cross institutional collaboration benefits from utilizing theoretical frameworks to guide organizational management and achieve social change. One popular framework for facilitation collaboration between different types of organizations is the Collective Impact (CI) model (Kania & Kramer, 2011). Collaborative initiatives can achieve greater social change when they work towards satisfying the conditions of Collective Impact. In this report, we will present two multi-year collaborative initiatives that shared important features with the CI model where the evaluation of these two initiatives produced interesting discussion points for adapting the CI model for collaborative networks between higher education institutions. In describing two different collaboration initiatives in higher education, we hope to present a reflection on how different stakeholders can navigate the phases of implementing Collective Impact.

Background: Collective Impact as a Framework for Collaboration

The importance and complexity of collaboration has been well documented in existing research literature. Stevenson and Mitchell (2003) categorized the ways in which collaboration has been situated within the existing research literature as (1) a strategy, (2) an organizational structure, or (3) as a set of intermediate outcomes. When used as a strategy, collaboration is considered practically rather than conceptually, and can have varying degrees of formalization (Labonte, Woodard, Chad, & Laverack, 2002). When implemented as an organizational structure, collaboration tended to create a new entity that can enhance the capacity of the partnering organizations to achieve desired outcomes through coordination, planning, resource allocation, delegation, and accountability. In a study of 28 coalitions, Hays, Hays, Deville, and Mulhall (2000) found that strong leadership, diversity in membership, ongoing assessment and strategic planning are key factors for successful implementation of collaborative organizational structure. When collaboration is considered as a set of intermediate outcomes, researchers tended to evaluate evidence for increasing levels of interaction between organizations and other indicators of coalition success (Bess, Speer, & Perkins, 2012). With the varied roles that collaboration may serve in initiatives that aims to affect social change, frameworks for

collaboration have also evolved to integrate the various ways in which collaboration can be situated.

One framework for collaboration that integrate collaboration's roles as strategy, organizational structure, and intermediate outcome is Collective Impact. Analyzing the successful experiences of two collaborative initiatives, Strive and Shape Up Somerville, Kania and Kramer (2011) distilled their insights into five conditions for collective impact: (1) a common agenda, (2) shared measurement, (3) mutually reinforcing activities, (4) continuous communication, and (5) backbone support. Collective Impact framework posits that when these five conditions are present, collaborative initiatives can more easily gain momentum and achieve large-scale change. Characterized by the commitment of stakeholders from different sectors to a common agenda for addressing social issues, Collective Impact has become increasingly popular as a framework for collaborative initiatives that aim to prioritize more collective approaches to solve social problems over individual agendas (Kania & Kramer, 2011).

Detailing the implementation of collective impact further, Hanelybrown, Kania, and Kramer (2012) outlined the necessary precursors for collective impact and the temporal phases of implementation. Sufficient financial resources, a broad sense of urgency, as well as influential leaders who can communicate the importance of the collaborative initiative without dictating its actualization were described as essential preconditions for collective impact (Hanelybrown, et al., 2012). Hanelybrown, Kania, and Kramer (2012) stressed that collective impact "is not just a fancy name for collaboration, but represents a fundamentally different, more disciplined and higher performing approach to achieving large-scale social impact" (p.2). The process of implementing collective impact was described as consisting of three phases: (1) initiate action, (2) organize for impact, and (3) sustain action and impact.

The evolution of Collective Impact has been documented as consisting of three phases (Weaver & Cabaj, 2018). The 1.0 phase referred to prototypical CI initiatives that emerged prior to the formalization of the framework. Kania and Kramer's seminal article marked the beginning of the 2.0 phase of Collective Impact. In recent years, scholars and organizers focusing on grassroot movement building further developed the Collective Impact framework to shift from a managerial paradigm to a movement building paradigm. Each of the five conditions of the original Collective Impact framework was reworked to reflect this shift, producing a new version of the framework termed Collective Impact 3.0 (Weaver & Cabaj, 2018). Common agenda is reworked to community inspiration; shared measurement is reworked to strategic learning; mutually reinforcing activities is reworked to high leverage activities; continuous communication is reworked to inclusive community engagement; and lastly, backbone support structure is reworked to container for change (Weaver & Cabaj, 2018). As a movement building paradigm, Collective Impact 3.0 emphasize reforming and transforming systems where improvement alone cannot accomplish the desired changes.

Although the applications of the CI model in higher education initiatives are rare, collaborative initiatives are common and many efforts can benefit from the CI framework. In this report, we set out to describe two initiatives that brought together two-year colleges (2YC) and four-year institutions (4YI) to facilitate a collaborative effort to improve undergraduate STEM instruction through the implementation of evidence-based teaching practices such as active learning strategies. We will present the stories of how the two initiatives moved towards achieving collective impact through the three phases of implementation and share our reflective

framework on conceptualizing collective impact in STEM higher education that is detail oriented while retaining the original framework's flexibility.

Collaborative initiatives bringing together two- and four-year higher education institutions.

As mentioned above, we will discuss two higher education collaborative initiatives that aim to leverage the strength of the collective to build capacity for undergraduate STEM education. The first program was an early concept grant for exploratory research (EAGER program), designed to explore the strategy of two- and four-year institution partnerships for implementing active learning strategies at two-year Hispanic serving institutions in southern California. The second program was larger in scale, designed to build a biology education intersegmental collaborative (BEIC program) that connects two- and four-year institutions across U.S.

EAGER program

The EAGER program was situated in a two-county region of California that composes the entirety of the international border between California and Mexico. There are ten public 2YCs within this region, all of which are designated Hispanic-Serving Institutions. Among a host of criteria, such institutions serve an undergraduate, full-time enrolled student population that comprises at least 25% who identify as Hispanic, and at least 50% who receive federal financial assistance (U.S. Department of Education, 2021).

Phase I: Initiate Action

The leadership team consisted of four science faculty. Since the EAGER program was aimed to build capacity at 2YCs, 2YC faculty community's involvement in the leadership team was imperative. The principal investigator (PI) of the program was a chemistry faculty member from one of the ten 2YCs from which faculty participants were recruited. Two co-PIs (one from biology and one from chemistry) were from the 4YI from which graduate student participants were recruited, and one co-PI who was an engineering faculty member from a 4YI outside of California. Engineering and science education graduate students working with the 4YI faculty on the project leadership team also provided support in the establishment of the *backbone organization*.

Because the formation leadership team was initiated through the development of a grant, the *common agenda* was established as part of the grant development process. We designed the EAGER program with the *common agenda* to more broadly transform science education at 2YCs through the embedment of active-learning pedagogy within science courses. The planned strategy to achieve this *common agenda* was the establishment of collaborative partnerships between 2YC faculty members and 4YI graduate students. The leadership team planned *mutually reinforcing activities* for faculty and graduate student partners such as joint professional development workshops and set up channels for *continuous communication* using online platforms such as Slack.

Phase II: Organize for Impact

Recruitment for participants began in Fall 2017. The participants of EAGER program included a total of 18 2YC science faculty members recruited from the ten community colleges and ten graduate students enrolled in science doctoral programs at a 4YI (with emerging HSI status) within commuting distance of all but one of the colleges. The leadership team's process of organizing faculty and graduate student partnerships was informed by a multitude of factors. The central consideration was buildings structures that can facilitate mutually reinforcing activities as program participants work together toward achieving the *common agenda*.

The program kicked off with the Course Design Studio (CDS). Taking place at the 4YI that served as the *backbone organization* and facilitated by personnel from the Center for Teaching and Learning, the CDS was an intensive, three-day workshop that reviewed and engaged participants in activities related to the backward design model. All program participants, including both 2YC faculty members and graduate students, engaged in *mutually reinforcing activities* during the workshops. Faculty participants attended the CDS with a course they intended to re-design. They were paired with graduate student partners and worked together for three days consisted of developing student-centered course learning outcomes (day 1), becoming familiar with different assessment tools and approaches to measure and evaluate learning outcomes (day 2), and planning for the integration of active-learning strategies in the classroom (day 3).
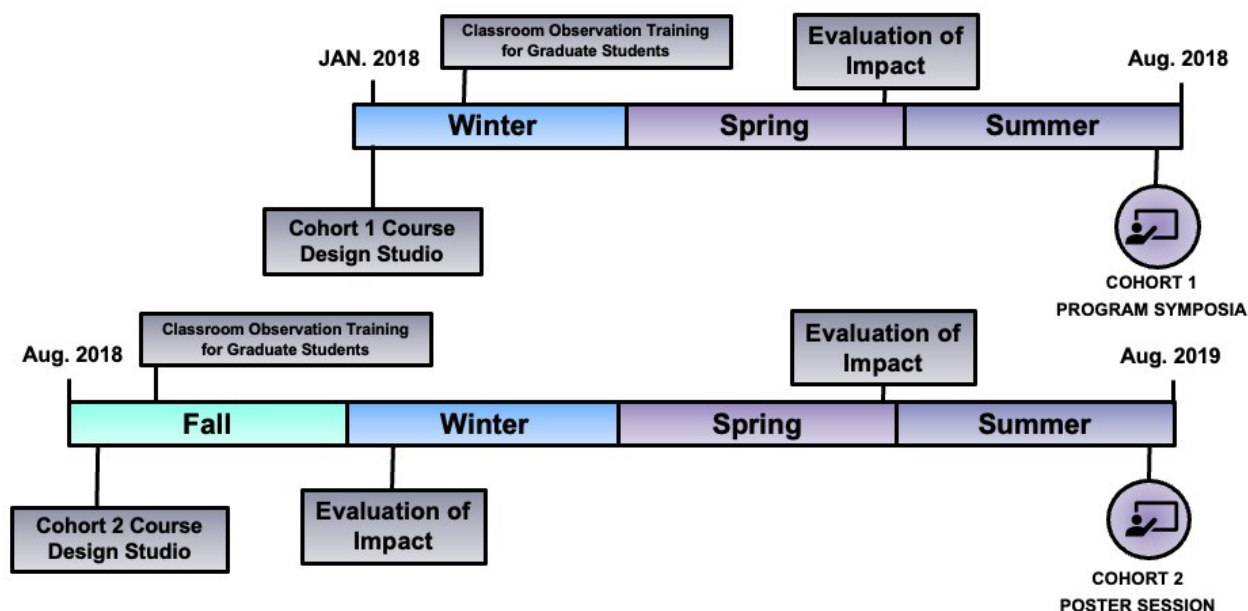

Figure 1. Timeline for EAGER program. Image created by Madison Edwards.

In addition to the CDS workshop, graduate student partners received training on how to conduct classroom observations and provide meaningful feedback to support teaching improvement. This observation training was also provided through the 4YI's Center for Teaching and Learning. The CDS and the classroom observation training take advantage of the synergistic effect of *mutually reinforcing activities* and help establish *shared measurements* for formative feedback on teaching. The CDS informed the classroom observation on where to focus during observations, and the classroom observation provided valuable feedback for faculty when they implement their redesigned course module.

Phase III: Sustain Action and Impact

Throughout the year-long partnership, program participants collaborated with one another to redesign 2YC faculty members' courses, implement active-learning strategies. and evaluate the impact of these interventions. Each cohort's year-long collaboration culminated in a symposium, where each partnership presented a poster on their effort to improve undergraduate STEM education. The *backbone organization*, the 4YI, hosted the symposium on their campus. In addition to the program participants and facilitators, the CDS education specialists also attended the event. In the table below, we present the two cohorts of partners and their partnership goals.

Table 1. EAGER program participant institutions

Cohort	Partnership Goal	Faculty Institution	Graduate Student Institution
2017 - 2018	Promoting Engagement and Learning in Non-Majors Introductory Biology Classes	Southwestern College	University of California San Diego
	Plickers and IFAT in Organic Chemistry	Palomar College	
	Getting Active in Electricity and Magnetism	San Diego Miramar College	
	Redesigning a Course in Analytical Chemistry	Southwestern College	
	Active Learning in a Fundamentals of Chemistry Course	Palomar College	
	Active Learning in an Allied Health Chemistry Course	San Diego Miramar College	
	Active Learning in a Non-Majors Botany Class	Palomar College	
	Active Learning in General Chemistry at an HIS	Southwestern College	
2018 - 2019	Flipped-Classroom Approach to Teaching Electricity and Magnetism	San Diego Mesa College	
	Active Learning Strategies in Mechanics Course	Grossmont College	
	Active Learning in Anatomy Courses	Southwestern College	
	Incorporating Art into Undergraduate Introductory Geology	Imperial Valley College	
	Active Learning in Undergraduate Introductory Geology	San Diego City College	
	Active Learning Strategies to Improve Performance on Stoichiomeric Calculations in General Chemistry	MiraCosta College	

To evaluate and reflect on the EAGER program, we gathered data on how participating 2YC faculty members and graduate students experienced their partnerships and the program. We also gathered information on the active-learning strategies that each partnership implemented to share with all program participants to sustain their innovative efforts beyond the conclusion of the program.

In addition to the leadership team's effort to support 2YC faculty and sustain their impact, graduate student partners also continued their work at 2YCs. Many graduate student partners had *continuous communication* with their faculty partners beyond the conclusion of the EAGER program, collaborating on new classroom innovations and presenting their findings at conferences. Some graduate student partners became instructors at their faculty partner's institution, sustaining and deepening their impact on undergraduate STEM education at 2YCs.

Table 2. CI framework in EAGER program

CI Component	EAGER Program Components
Common Agenda/ Shared Aspiration	Building capacity at 2Y-HSIs through creating partnerships between 2Y-HSI faculty and STEM graduate student to implement active learning strategies through course redesign
Shared Measurement/ Strategic Learning System	Faculty and graduate student partners met to discuss the course that they want to redesign and the strategies to implement change. Student surveys are used to measure the learning gains and student attitudes on redesigned course modules.
Mutually Reinforcing Activities/ High Leverage Activities	Faculty and graduate student redesign a course module together. 2Y-HSI faculty receive support from graduate student in course redesign. Graduate students receive mentorship about the 2Y-HSI professoriate. Some graduate students entered the 2Y-HSI professoriate after completing the program.
Continuous Communication/ Authentic Community Engagement	Faculty and graduate student met regularly either in person or online to discuss the redesigned module and student evaluations. Cohort meetings were held twice each semester to communicate with other participants.
Backbone Organization/ Containers for Change	Faculty for both 2Y and 4Y institutions form the leadership team to recruit and support participants. A network of 4Y institution and 2Y-HSIs formed as the container of change. Backbone support for each cohort were structured for one year.

BEIC initiative

The EAGER program showed the effectiveness of partnership for implementing pedagogical and curricular change, but the scale of the program was limited to a two-county region in southern California. The Biology Education Intersegmental Collaborative (BEIC) initiative leveraged the strategy of two- and four-year institution partnership for impact on a greater scale. The BEIC initiative aims to improve community college and transfer student outcomes by facilitating the formation of faculty learning communities (FLC) comprised of faculty from two- and four- year institutions. Faculty participants work to collaboratively and

iteratively develop evidence-based teaching practices, assess their effectiveness, and share their experiences and disseminate their findings through biology education publications, conference presentations, and the BEIC website.

Phase I: Initiate Action

During the initiate action phase, the leadership team was formed with education leaders from a 4YI, a 2YC, and a science center. With science educators from two- and four-year colleges as well as informal science education, the leadership team had built connections between the different types of science education institutions to provide strong *backbone support* to program participants.

The formation of the BEIC leadership team was also through the development of a grant, so the *common agenda* was established part of a grant development process. The *common agenda* of the BEIC initiative focused on increasing implementation of evidence-based practices in Biology courses or programs to improve student outcomes across multiple-segments of higher education institutions (2YCs and 4YIs). To reach this goal, the leadership team planned to form faculty learning communities comprised of educators representing a variety of institution types.

Phase II: Organize for Impact

During the organize for impact phase, the leadership team designed the program structure and started recruiting participants. The leadership team recruited collaborative teams of 2-year and 4-years educators. Participation of educators from Primarily Undergraduate Institutions (PUIs) and Minority Serving Institutions (MSIs) was encouraged. Educators were primarily faculty but can also include graduate students, post-docs, and instructors. FLCs consisted of 3-6 educators from at least two neighboring institutions (at least one 2-year and one 4-year). Within each cohort, faculty participants formed FLCs based on their geographical location.

Each BEIC FLC was led by a faculty mentor with expertise in both evidence-based teaching practices and education research. To ensure *continuous communication* between mentors and participants, mentors met remotely once a month with their BEIC team and participated in the Summer Institute with their FLC. Mentors will receive a small stipend for their participation, travel costs for BEIC-associated events, and authorship on the resulting publications created by their team.

The central structure of the BEIC initiative centered around the forming and sustaining FLCs. The figure below illustrates the structure of FLC activities. *Backbone support* for each FLC was structured for two years. After the formation of FLCs, participants and mentors joined the Summer Institute hosted at one of the *backbone support* organizations. The Summer Institute served as a kick-off platform for participants to engage in *mutually reinforcing activities* such as developing evidence-based teaching practices that aligned with the *common agenda*, collaborating with fellow educators to build biology education research projects, and planning for dissemination of their research findings at biology education research conferences.
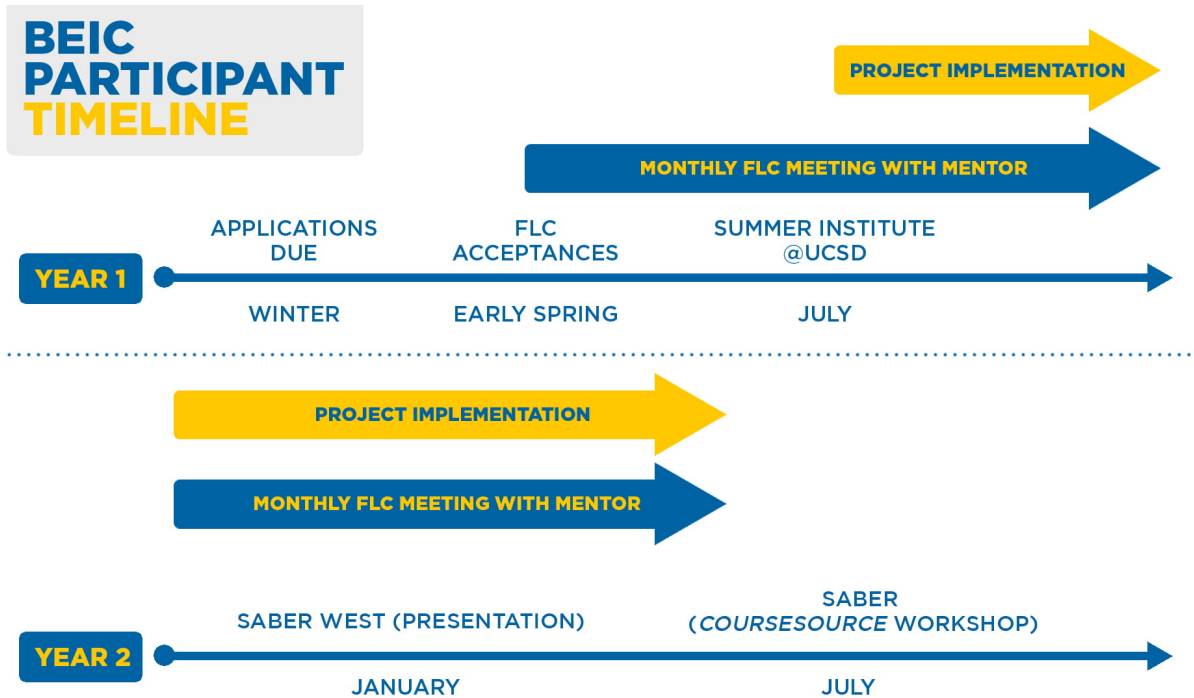
Figure 2. BEIC Timeline. Image created by UC Irvine Office of the Vice Provost of Teaching and Learning Communications.

Phase III: Sustain Action and Impact

To sustain the impact of the program, existing FLCs received continued support and more FLCs were formed to scale the impact of the BEIC initiative. Currently, a total of four cohorts of fellows have participated in the program. In the table below, we present the four cohorts to highlight the broad participation of educators from higher education institutions nation-wide.

Table 3. BEIC participating institutions

Cohort	State	FLC Goal	Participant Insititutions	Mentor Institution
2020-2021	Washington	Creation and assessment of a values-affirmation intervention	Clark College	Pima Community College (2YC)
			Washington State University Vancouver	
	California	Implementation and assessment of two-stage exams in Human Anatomy Courses	Orange Coast College	Saint Mary's College of Maryland
			University of California, Irvine	
	California	Creation and assessment of online modules designed to improve student's study skills and metacognition	University of California, Davis	Utah Valley University
			Butte College	
	Alabama	Creation and assessment of a module focused on the opioid crisis to enhance student engagement with and understanding of scientific concepts	Tuskegee University	University of Colorado Boulder
			Wallace Community College Selma	
2021-2022	California	Investigating instructional, mentoring, and assessment approaches to better support student outcomes	University of California, San Diego	Texas State University
			San Diego City College	
	Missouri	Faculty learning community around curriculum mapping and alignment with cross-campus representatives	St. Louis Community College	Washington State University
			University of Missouri St. Louis	
2022-2023	California	Implementing evidence-based teaching practices to improve scientific literacy	University of California Los Angeles	Chapman University
			Mt. San Antonio College	
	New York	Co-development of an urban agriculture course-based undergraduate research experience.	Brooklyn College	Adelphi University
			LaGuardia Community College	
2023-2024	Maryland	Assessing the impact of a genomics miniCURE on student attitudes towards data science	Clovis Community College	University of California, San Diego
			Notre Dame of Maryland University	
			Carnegie Institution	
	Iowa	Creation of an interdisciplinary, cross-campus student learning community to build sense of belonging and science motivation	North Iowa Area Community College	Virginia Commonwealth University
			Iowa State University	
	Illinois	Collaborative design of a plant biology certificate program	University of Illinois Urbana-Champaign	University of California, Irvine
			Southwest Illinois College	
			Ranken Technical College	

Efforts to sustain and broaden the impact of the BEIC initiative has led to stronger bonds between different types of institutions that shared the *common agenda* of improving undergraduate STEM education. One strategy of how the BEIC initiative sustained action and impact is recruiting past participants to serve as mentors for new cohorts. One faculty participant in the BEIC initiative in the 2020-2021 cohort later joined the BEIC program again as a faculty mentor for the 2023-2024 cohort, leveraging the expertise developed during the program to support new participants.

Table 4. CI framework in BEIC program

CI Component	BEIC Program Components
Common Agenda/ Shared Aspiration	The BEIC initiative aims to improve community college and transfer student outcomes by facilitating the formation of faculty learning communities (FLC) comprised of faculty from two- and four- year institutions.

Shared Measurement/ Strategic Learning System	Faculty partners in each FLC established their own specific goals that align with the common agenda. They also established shared measurements for all institutions within each FLC to evaluate the outcome of the FLCs.
Mutually Reinforcing Activities/ High Leverage Activities	The Summer Institute served as a kick-off platform for participants to engage in mutually reinforcing activities such as developing evidence-based teaching practices, collaborating with fellow educators, and planning for dissemination of their research findings at biology education research conferences.
Continuous Communication/ Authentic Community Engagement	To ensure continuous communication between mentors and participants, mentors met remotely once a month with their BEIC team and participated in the Summer Institute with their FLC.
Backbone Organization/ Containers for Change	The leadership team facilitated forming and sustaining FLCs. After the formation of FLCs, participants and mentors joined the Summer Institute hosted at one of the backbone support organizations. Backbone support for each FLC was structured for two years.

Recommendations: Thinking with Collective Impact Framework

We found that in the context of cross institutional collaboration in STEM higher education, Collective Impact appears to have the potential to be a useful framework for organizing change efforts. Insights from the two initiatives described above produced a way of thinking about Collective Impact initiatives that provides a detail-oriented framing without sacrificing the flexibility allowed in the framework. As we discussed earlier, Collective Impact scholars have further developed the framework to shift from a top-down model for corporate initiatives to a model for grassroot community movement building. In the context of STEM higher education, the top-down managerial paradigm of Collective Impact 2.0 can be valuable as higher education initiatives are often organized through grants that are developed by a small team of principal investigators. On the other hand, the critical perspective on Collective Impact that focused on the grassroot movement building is also valuable as the success of higher education initiatives hinge on a robust community of faculty. Therefore, we attempted to find middle ground between the two models and adapt them to the specific context of higher education. In the tables below, we provide a set of questions for higher education professionals and evaluators of collective impact to consider as they embark on their journey towards social change.

Table 2. Collective Impact Reflection Tool

Conditions of CI	Structure	Strategy	Community	Outcomes
Common Agenda / Community Inspiration	How was the cross-institutional collaboration structured for the common agenda?	How did the current current state of the problem inform the common agenda?	How were the community members included in the formulation of the common agenda?	How did the collaborators' baseline evaluations inform the formulation of common agenda?
	What were the structures created as part of the common agenda?	How were boundaries established to make the common agenda explicit?	How did the collaborators engage with the community as they implement the common agenda?	How did the collaborators leverage evaluation data to align and adjust their common agenda?
	How were the created structures put to work and maintained as the initiative achieve its common agenda?	How were the strategies for sustaining the changes alined with the common agenda?	How did the collaborators in the initative continue to follow up with the community and sustain change?	How did the collaborators analyze and disseminate their evaluation of the impact of their common agenda?
Shared Measurement / Strategic Learning	How were the evaluation personnels identified to establish shared measurement?	How did the landscape of the initiative mapped for establishing shared measurement?	How did evaluation personnels take the community's concern into the shared measurement?	How did the baseline analysis of the initative inform the formulation of the shared measurements?
	What were the instruments created for assessing the shared measurements?	How did strategies for evaluation alined with shared measurements?	How did the community participate in the assessment of shared measurements?	How were the approaches to evaluation aligned with shared measurements?
	How were the instruments refined and validated to improve the assessment of shared measurements?	How did the strategies for evaluation sustained to create coherent long-term shared measurement?	How were the results from shared measurement leveraged to advocate for the community?	How were the shared measurements tracked and communicated to sustain change?
Mutually Reinforcing Activities / High Leverage Activities	What infrastructures were planned for coordinating mutually reinforcing activities?	How was the landscape of the initiative mapped to coordinate mutually reinforcing activities?	How did community imput inform the planned mutually reinforcing activities?	How did the baseline analysis of the initative inform the planning of mutually reinforcing activities?
	What were the structures created to coordinate mutually reinforcing activities?	How did the collaborators strategize and coordinate mutually reinforcing activities that align with their goals?	How did the community participate in the muturally reinforcing activities?	What were the metrics and indicators established for evaluating the cohesion of mutually reinforcing activities?
	How did the created structure sustain muturally reinforcing activities?	How did the collaborators carry out and adjust their mutually reinforcing activities to align with their goals??	How did the mutually reinforcing activities contribute to long-term community advocacy?	How were the indicators for cohesion tracked and reported to sustain and improve the mutually reinforcing activities?
Continuous Communication / Inclusive Community Engagement	What are the planned infrastructure that support the continous communication between collaborators?	How did the landscape of the initiative mapped for creating channels of continuous communication?	How did the initiative plan for continuous communication with the community?	How did the initiative use baseline analysis to inform the establishment of channels for continuous communication?
	What were the roles, structures, and processes created to serve as channels for continuous communication?	How did the collaborators organize the channels for continuous communication?	How did the collaborators maintain continuous communication with the community?	How were the effectiveness and efficiency of continous communication evaluated for improvement?
	How were the channels for continuous communication sustained?	How did the collaborators adjust their communication to sustain change?	How were the continous communication with the community sustained for long-term advocacy?	How were the indicators for communication effeciency and effectiveness tracked and reported to sustain improvement?
Backbone Support / Container for Change	What were the insitutional connections that formed with the estabilishment of the leadership team?	How did the leadership team establish their strategy for implementing change?	How did the leadership team reach out to the community for representation?	How did the baseline analysis of the target social change inform the formation of the leadership team?
	What were the leadership structure created to support collaborators?	How did the leadership team create processes for collaborators to engage in strategic learning?	How did the community members participate in the leadership of the initiative?	How did the leadership team support the establishment of metrics and indicators for evaluation and improvement?
	How did the leadership team refine the leadership structure to sustain collaborative efforts?	How did the leadership sustain and (re)align processes for collaborators to engage in strategic learning?	How did the leadership team sustain their connection with the community?	How did the leadership team track and comminicate the evaluation results to sustain change?

Table 2 above was designed to be detail oriented and provide a matrix of reflective questions that can help scaffold the complex process of implementing Collective Impact. The reflective questions are organized along the five conditions of Collective Impact, the four components for successful implementation of Collective Impact, and the three phases of implementing Collective Impact. These questions are not meant to be a rigid checklist, but a toolkit for thinking about the intersection between Collective Impact framework and the specific context in which the framework can be applied. As Collective Impact framework continue to gain popularity among higher education practitioners, we hope to support others in their effort to leverage the power in the collective to achieve change.

Discussion

The purpose of this report was to explore the value of Collective Impact to organize change efforts focused on improving undergraduate STEM education. Collective Impact is particularly useful for organizing change efforts across two- and four-year institutions. Two-year colleges serve nearly half of college students in the U.S., and many students in two-year colleges transfer to four-year universities to complete their bachelor's degree. Building stronger connections between two-year and four-year colleges with Collective Impact as a guiding framework can help scaffold the transfer process and lead to more students completing their bachelor's degrees in STEM disciplines. Moreover, engaging with Collective Impact 3.0 is imperative for movement building across 2YCs. The two programs described in this article positioned 4YIs as backbone support for 2YCs, which may create power dynamics that hinders equitable collaboration between partners. Collective Impact 3.0 shifted from designating backbone support organizations to mapping containers of change. Future work in fostering partnership between 2YCs and 4YIs can benefit from engaging with Collective Impact 3.0 to center 2YCs in higher education curriculum and pedagogy reform efforts.

We reflected on two collaborative initiatives adapting the five conditions of Collective Impact to fit the undergraduate STEM education context. By reflecting on our experiences, we join other scholars in refining the collective impact approach to organizational change in the undergraduate STEM education context. While we are focused on creating change within our context, we hope that our efforts and learnings can help inform others on similar journeys. The high-level ideas in this manuscript (e.g., the tables in the recommendation section) could be used as a starting point by other organizations seeking to improve STEM education in college context.

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