

Becoming CORE: The Story of a Community-Based Informal STEM Program

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Abstract: The Community Outreach, Retention, and Engagement (CORE) program is a community-based, informal STEM program designed for multicultural students and families in the Twin Cities area. We aim to build a more inclusive STEM field systemically, and our goal is for students to engage in STEM long-term through pursuing their own STEM pathway. We designed a culturally-relevant and holistic program, and we implement our programming with the FACE of CORE – Family engagement, Academic support and social-emotional learning, College and career readiness, and Exposure to the STEM ecosystem through hands-on experiences. In less than two years, we have used systems of reflection and feedback to increase our participation and improve the quality of our programming, both of which positively impact CORE students and families.

Introduction

The Community Outreach, Retention, and Engagement (CORE) program is a community-based, informal STEM program housed within the Office for Equity and Diversity at the University of Minnesota. The CORE program provides free high-quality STEM programming for multicultural students and families in the Twin Cities area. Students join CORE in middle school and continue until the end of high school with the cohort model. Our goal for this paper is to tell the story of how we *became* CORE within our first two years by building on the structure and goals of previous versions of our program, adapting the model to meet our current needs, and embodying the newest version of the program to successfully serve our students and families. The process of *becoming* CORE began in spring 2021, when Audrey Breland was hired as the Program Director and immediately started bringing the program model to life. She built relationships with local schools, recruited students from partner schools, and connected with university faculty to provide STEM programming, all of which propelled us into a successful first year of programming in 2021-2022.

Our second year (2022-2023) of programming was facilitated by seven members of Team CORE. CORE is led by our program director and supported by the leadership team (Seth Thompson and Keisha Varma). CORE is enacted on-the-ground by four graduate assistants (Marisa Peczuh, Delina Brown-Jackson, Nawal Maxamed, and Otit Mayo), each of whom take responsibility for one primary area of programming – STEM engagements, event logistics and CORE Crew, family communication, and media and marketing, respectively. Our program serves 126 students in grades 6-9 of diverse races and ethnicities – 95 Black, African, or African American; 11 Asian or Asian American; 7 Hispanic or Latino/a; 1 American Indian or Alaskan Native; 9 white; and 3 families who elected not to respond. In our two years as a team, we have continued to build from our program's foundation, reflected on our first and second years, and improved in our programming. We have aligned our objectives, design, and implementation, and we aim to share our model and best practices with others working in informal STEM settings.

Objectives

The overarching objective of CORE is to shift the culture of STEM at a systems-level to be more equitable and inclusive for multicultural students and families. Although our program welcomes all students, our program is designed for multicultural students. We consider students who identify as African American, Hispanic/Latino, Asian American and Pacific Islander, Native American, Hmong, Somali, and/or multiracial as multicultural. We focus on multicultural students because they are woefully underrepresented in STEM fields (National Center for Science and Engineering Statistics, 2021), not for lack of interest in pursuing STEM, but because of the historical practices that have systematically excluded these students (McGee, 2020). Our objective is to reimagine how STEM fields themselves, which have been white-normed over centuries of development (McGee, 2020), can serve the needs of an increasingly diverse population (Honey et al., 2020). Our first system of focus is at the university level. We collaborate with many STEM faculty and departments within our programming, and we work with these

groups to reimagine how STEM at the university can further engage in the community and be culturally relevant. Ultimately, we aim to create a more equitable university STEM ecosystem through these partnerships.

At the program level, we have two further objectives. As an informal STEM program, our goal is to promote students' retention and engagement in STEM to contribute to a more diverse STEM field in the future. Specifically, we aim for students to graduate from high school, matriculate, and be retained in college in a STEM or STEM-adjacent field, and develop STEM career aspirations (Chen, 2013; Chittum et al., 2017). Within this objective, there are many possible pathways, such as choosing a STEM field, type of college (two- or four-year), and career. We empower students and families with information, opportunities, support, and agency to meet their individual goals within the general discipline of STEM.

Design

The CORE program is designed to move beyond a single focus on STEM by creating STEM experiences that are community-based, culturally relevant, and holistic. We collaborate with school principals, STEM educators, and family liaisons to learn about our partners' and families' needs, and we adapt our program accordingly. We are culturally relevant by valuing and integrating aspects of students' cultures into our programming (National Academies of Sciences, Engineering, and Medicine, 2015; Simpkins et al., 2017). We take a holistic approach by acknowledging that students' participation in STEM goes beyond interest in STEM to include other aspects of students' lives socially and emotionally (National Academies of Sciences, Engineering, and Medicine, 2015). Then, we work with STEM partners (e.g., faculty, departments, institutes) across the university to provide scaffolded STEM programming over seven years through our CORExperience model, which was developed by our program director to reflect the longitudinal experiences of CORE students. We recruit students in grades 6-8 to begin as CORExplorers, where students are exposed to a wide range of STEM majors and fields to foster interest. As students continue to participate in CORE, they become CORE Scholars in grades 9-12, where they narrow their interests and receive more intentional opportunities for college preparation and career readiness. Throughout this time, all students participate in hands-on STEM engagements, career pathways exploration, mentorship, and social-emotional learning. The design of our program promotes continuous exposure to new STEM experiences while also allowing students to develop individual passions.

Implementation

The FACE of CORE

While CORE generally aims to implement community-based STEM programming, our program director created the FACE of CORE to represent the pillars of our programming and focus our implementation – *F*amily engagement, *A*cademic support and social-emotional learning, *C*ollege and career readiness, and *E*xposure to the STEM ecosystem through hands-on experiences. First, we intentionally include families in our programming as key contributors in students' lives and participation in STEM (Sha et al., 2016). Our definition of family is broad, and we encourage students to bring important adult figures to events if their parents are unable to attend. For example, many of our students are accompanied by their school's family liaison. During events, students participate in activities alongside their family members, allowing them to learn and grow together. Our family engagement is culturally-relevant. We communicate in multiple modalities (i.e., text and email) and languages (i.e., Somali and English) when necessary. We also send a monthly newsletter to share additional information about CORE, review past and upcoming events, and provide conversation starters.

Second, CORE focuses on academic support and social-emotional learning in two main ways. We recruit undergraduate and graduate students to our CORE Crew, who serve as mentors to our CORE students (Afghani et al., 2013), in both paid and volunteer capacities. These students provide hands-on support at events, assist with STEM activities, and talk with students and families about their experiences. We also foster social-emotional learning through intentional programming to build students' self-efficacy, resilience and perseverance, goal setting, and positive identity within STEM (Jagers et al., 2019). Students have learned about stories of challenge and success (Lin-Siegler et al., 2016) as experienced by scientists of color, and students participated in an activity where they made a collage about their lives in ten years – a time when they will likely be obtaining their first higher education degree and considering career pathways.

Third, we offer college preparation and career readiness information for students and families. CORE Crew members share about their college and STEM experiences through Lunch and Learn Panels or Mentor Mingling at our events. These are powerful opportunities for students to learn about real student stories as well as gain access to informal mentoring. Undergraduate students are also likely to benefit from these experiences, such as developing life skills (Afghani et al., 2013). We also ask our STEM partners (to be discussed in the next paragraph) to illustrate their STEM stories by sharing about their personal and professional pathways from high

school to their current role. This provides students with additional vocabulary and knowledge about the steps necessary to reach their STEM-related goals.

Finally, we provide students exposure to STEM at the university through engaging and hands-on learning experiences (National Academies of Sciences, Engineering, and Medicine, 2015). We have created a coordinated STEM ecosystem, composed of CORE collaborations and partnerships with existing STEM programs, to deliver an unparalleled scope of STEM programming for CORE students. We developed a K-12 STEM Opportunity Repository to document all STEM departments, institutes, outreach efforts, student groups, and more at the university to further connect this ecosystem. We have embraced that CORE is an asset to other STEM programs at the university, and we make new partnerships by reaching out to groups from the repository, describing our “asks,” and offering partners “takeaways” that will contribute to their goals. Through meetings with these partners, we build strong, grassroots collaborations and plan for ways that the STEM partners can facilitate STEM engagements at our events. When working with STEM partners for a specific event, we provide feedback pre- and post-event based on our experiences, which provides them with the confidence to facilitate high-quality programming for our students and families. Therefore, CORE acts as a liaison to ensure that multicultural students and families know about the university’s STEM programs and are supported in identifying, enrolling, and fully participating in them, whether at CORE events or beyond. This model avoids creating another set of exploration experiences for students in a saturated STEM ecosystem at the university. Instead, we focus on coordinating and enhancing the programming that already exists by crossing boundaries and building bridges. By partnering with these existing programs, CORE can focus on investing additional resources into academic support, social-emotional learning, and college and career readiness.

CORE programming

CORE’s Family Engagement Programming implements the FACE of CORE through monthly events, including Fall and Spring Kickoffs, Saturday Scholars, Individual Growth Plan (IGP) conferences, and field trips. First, our Kickoff Events are like STEM fairs, where students and families visit booths and participate in various STEM activities. Second, Saturday Scholars are our signature events for four hours on two Saturday mornings each semester. Students participate in STEM activities, social-emotional learning lessons, and Lunch and Learn sessions, providing a holistic experience throughout the day. IGP conferences are individual meetings between students and the program staff to check-in, discuss personal strengths and weaknesses, and create intentional college and career plans. We also facilitate at least one field trip a year, where students are able to experience STEM outside of a classroom setting. Our typical programming occurs on campus, and during field trips, students are able to experience STEM in new settings off campus. In an effort to make the program accessible and culturally relevant, not only are these events free, we also provide meals, parking vouchers, and transportation. We have also implemented the CORE Roadshow as an effort for CORE to reach a greater number of students in the Twin Cities and to continue bridging schools and the university. During the CORE Roadshow, CORE plans STEM engagement opportunities with partner schools, and CORE STEM partners visit the schools in ways that meet each school’s individual needs.

Lessons learned

In less than two years of programming, CORE has enhanced our programming in a number of ways. We have learned from the success of our program and also remain flexible for continuous opportunities for improvement. We use internal and external feedback to adjust our programming to further *become CORE* and meet the needs of our students and families. First, as a team, we debrief every event using a DNA Analysis, where we describe our *Distinguishing practices, Needs, and Action* steps. This routine allows us to share successes and challenges during our events, and we are able to make practice-based decisions at a fast pace to implement enhanced practices at subsequent events. Second, we use feedback from our students and families via sCORE Cards. Our sCORE Cards include questions about what students learned and enjoyed about the event, and families can rank their experiences from 1-5 on the FACE of CORE. With these responses, we are able to better understand the experiences of our students and families and adapt to programming according to their feedback.

Using these systems for improvement, we have found that our greatest success and challenge is the growth of the program, particularly in the number of students and families. First, we have realized the difficulties of coordinating events for a large group of people, but we have been able to think of creative logistical solutions (i.e., having rotating stations) and implement specific practices with STEM partners (i.e., meeting more frequently) to position STEM engagements for success. Second, providing individualized support for students requires significant time and effort. Therefore, we have shifted our focus to creating differentiated and personalized experiences, particularly for students in grades 10-12, beyond STEM via “More CORE.” Students in each of these cohorts will be paired with Team CORE and CORE Crew members that will remain consistent

throughout the year, allowing for a more relationship-based approach. Additionally, we will design a curriculum focused on Academic support, social-emotional learning, College preparation, and career readiness to prepare students in achieving their individual goals.

Relevance for others

We have highlighted many aspects of CORE's unique approach, and we believe certain components of the model could be useful for practitioners providing informal STEM programming for multicultural students and families. First, our partnership model, both at the local and university level, is one in which other programs could adopt. We have worked collaboratively with partner schools to meet their needs and improve our programming, which ultimately supports students across settings (National Academies of Sciences, Engineering, and Medicine, 2015). We have also bridged existing resources at the university, which allows for collaboration across the university and exposes students to a wide range of experiences. Second, we redefine STEM at both systems and local levels. We are changing the culture of STEM at the university by focusing on cultural relevance and inclusion, rather than simply recruitment. We have also developed a STEM program that is holistic by acknowledging students' academic, social, and emotional needs to ultimately support their long-term pathways in college and careers.

Our purpose in writing this paper was to describe how we have *become CORE* in two years of programming. Our objectives and design have served as a foundation, and we have implemented adaptable practices to meet the needs of our partners and best serve our students. We look forward to serving many more multicultural students and families in our local area and supporting them in participating in a more equitable and inclusive STEM field in the future.

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