

DRL: Empowering High School Counselors to Advance Career Counseling in Engineering

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Introduction

There are many people in the lives of today's youth who influence their potential career pathways. Attention is often paid to family, friends, and teachers [1], while overlooking important resources such as school counselors. School counselors play a critical role in shaping students' academic and career pathways, particularly in STEM fields like engineering [2]. However, pre-service counseling education coursework typically lacks content focused on engineering career counseling strategies and pathways. There are also very few in-service professional learning (PL) opportunities designed specifically for school counselors. Hence counselors' knowledge and dispositions about engineering can act as a barrier limiting their impact on future engineering talent [3], [4]. The lack of specific training for school counselors about engineering perpetuates misconceptions about what engineers do and who can pursue a career in engineering [5], [6]. This oversight discounts the unique role school counselors play in student career development.

This project is designed to address this gap through the implementation of a year-long PL program specifically for school counselors in high school settings. Drawing from counseling, education, and engineering disciplines, the program aims to enhance counselors' efficacy, dispositions, and practices of engineering career counseling with an eye toward advancing engineering career counseling. This paper leverages data from the project's first cohort of school counselors to explore the following research question: How does participation in a year-long professional learning experience influence counselors' dispositions and behaviors related to engineering career advising?

Research Design

This study uses an exploratory research design. In the first year, we recruited a cohort of 10 counselors across the United States representing diverse schools, locations, school types, and backgrounds. The program kicked off with a 1.5-day, in-person Engineering Summit for Counselors, which engaged participants in hands-on engineering design activities, structured reflection, and facilitated discussions focused on engineering pathways, engineering identity, and pervasive stereotypes about who can be an engineer. Following the in-person summit, counselors participated in monthly hour-long professional learning community (PLC) sessions over Zoom.

We collected multiple sets of qualitative data to examine shifts in counselors' dispositions. Before the summit, counselors participated in a pre-focus group to share their perceptions of engineering. At the summit, counselors participated in a second focus group to share shifts in dispositions and provide programmatic feedback. At the summit, we also collected artifacts from counselors' activities. Each monthly PLC session was recorded and served as a source for analysis of counselors' dispositions. Data were analyzed using open coding and constant comparison [7].

Findings

Three major themes emerged from the first year of implementation. First, counselors reported a *growing understanding of engineering and its accessibility*. Second, counselors highlighted significant *professional and personal growth through community*. Finally, the program cultivated *counselor agency and advocacy*, with participants beginning to take intentional steps to expand engineering advising and navigate system-level challenges in their schools.

Growing Understanding of Engineering and Its Accessibility: Counselors described how participation in the program broadened their understanding of engineering and who it is for. Several participants talked about rethinking which students they picture when they imagine future engineers. Their PLC conversations signaled a shift from seeing engineering as reserved for a narrow group of ‘mathematically gifted’ students to recognizing the importance of representation and widening the circle of who is encouraged to pursue engineering. One participant stated, “I think for me it's just how do I educate adults, professionals?” pointing to a growing awareness that challenging stereotypes about who can be an engineer also requires engaging teachers, families, and colleagues. At the same time, counselors gained more concrete knowledge of engineering pathways and requirements, which in turn made the field feel more navigable for them and their students. One participant explained how they now use advising tools more strategically: “These are the type of sheets that we use. I like to make sure we go through some of the base requirements... down here is all the layers and layers of engineering courses.” Another described digging into the nuances of different engineering options so students could make more informed choices: “I started looking, and I'm like, I'm like, what's the difference between this engineering and this engineering?” These comments suggest that counselors were moving from a vague sense of STEM toward a more informed understanding of engineering programs and entry points.

Professional and Personal Growth Through Community: Counselors emphasized that their learning was deeply shaped by being part of a broader community of practice. Many described the PLC and summit as spaces to build relationships with universities, industry partners, and other counselors. The community also supported building networks that affirm and protect marginalized students. One counselor described having “a space to be able to go and build those connections” with trusted people who understand the experiences of minoritized students. Others spoke about community as a buffer in restrictive political climates. Alongside professional collaboration, counselors also described personal growth that emerged through sharing struggles and strategies with one another. Several used the PLC space to rethink their own work habits and boundaries. One counselor reflected, “I used to be the yes kind of person in the beginning of my career, and now I'm like...” learning to say no. A third described an “invitation to rethink and reimagine how we spend our days and nights.” These reflections show how the community offered not only technical knowledge about engineering, but also emotional support and a space to reimagine sustainable, values-aligned counseling practice.

Emerging Counselor Agency and Advocacy: The program also cultivated a stronger sense of agency as counselors began to name and navigate system-level barriers. Participants were candid

about the constraints they face in their schools and the chilling effects of policies and politics. Yet rather than stopping at frustration, counselors increasingly framed themselves as actors who could push for change both at the individual and system levels. During PLC sessions, participants often described acting as advocates at the individual student level, particularly when they recognized stereotype threat at work. One participant recalled “a senior in particular who is taking an AP calc” and appeared to be self-sabotaging, because “she's Latina Mexican, and she actually got to UC Davis recently.” Another described a student who “wanted to drop AP calc in spring because [of] getting a D.” Rather than simply accepting these decisions, counselors talked about going back to these students, encouraging them to persist, and reframing one low grade as not the end of an engineering future. Agency also manifested in how counselors positioned themselves with colleagues and the broader system. For example, one participant discussed change, stating, “I need to reframe how I talk to students about these high-stakes [courses]... and work with my instructors to be like, ‘We need to rethink this.’” Overall, by the end of the year, counselors began to see themselves not only as implementers of existing systems, but as partners who can question practices, advocate for more inclusive messaging, and collaborate with teachers to adjust how engineering-related opportunities are framed.

Discussion

Findings from this work provide insights into school counseling training toward broadening participation in engineering. First, as school counselors rarely receive training related to engineering careers as a part of their preservice training programs, they enter the field with limited knowledge [2], [6]. This can lead to narrow thinking about the field of engineering along with who might be best suited for engineering careers. While these preconceived notions can impact school counseling practice (e.g., limit how school counselors might identify and support students for engineering careers), our counselor participants noted that the PL program helped them to rethink and challenge their previous knowledge. This change is important as beliefs determine actions to develop more comprehensive activities, including leadership and advocacy to support a more accessible school environment [8], [9], [10].

This shift is particularly important for minoritized students, as school counselors can engage students, their families, and their community through the lens of empowerment and recognition to form a comprehensive network of support for their postsecondary success [11], [12]. As such, school counselors’ own knowledge about engineering careers, pathways, and the unique needs of historically underrepresented students is critical in ensuring that *all* students receive the appropriate supports that are tailored to their needs [13, 14]. Participation in the PLC supported school counselors’ professional growth, including emotional support and networking with fellow members and with university partners. These networks allowed for greater resource sharing to support their direct student services around engineering career guidance and collective strategizing to engage in leadership and advocacy to address system-level barriers. Overall, this work identifies

an important gap in the engineering pipeline: high school counselors. Counselors can be critical levers in expanding the future engineering workforce. They need to be empowered to spur meaningful change at the practice level.

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