

Understanding Undergraduate Engineering Students' Pandemic Experiences

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Abstract

In this paper, we explore the lived pandemic experiences of civil and mechanical engineering students participating in a S-STEM scholarship program during the 2020-2021 academic year. The program, launched in 2020, is designed to facilitate the transfer of students from a community college to an urban-serving research university co-located in a Midwestern city. Findings reveal how the pandemic both challenged students and illuminated resiliency and sources of on- and off-campus support. A description of how findings have informed program goals and implementation is offered.

Introduction

Our S-STEM program, The Kansas City Urban Renewal Engineering (KCURE) scholarship program, launched in fall 2020 during the COVID-19 pandemic. The pandemic shaped (and continues to shape) the educational and personal experiences of our S-STEM participants (who we refer to as KCURE Fellows). In this effort, we use Schlossberg's Transition theory (Anderson et al. 2012; Schlossberg et al., 1995) as a theoretical and analytical lens to systemically explore the following research question: What were KCURE Fellows' lived pandemic experiences during fall 2020 and spring 2021, the first two operational semesters of the KCURE program? We then describe how we have used findings to inform and modify our program's goals and ongoing implementation to better address KCURE Fellows' emergent needs within the context of their engineering degree programs.

Contextual Background

The KCURE scholarship program links two Kansas City area higher education institutions: Metropolitan Community College (MCC) and the University of Missouri-Kansas City (UMKC). Program objectives are twofold: (1) increase the number of low-income, meritorious MCC transfer students who transfer to and graduate from the UMKC Civil and Mechanical Engineering (CME) degree program, and (2) instill within the UMKC CME department a culture that facilitates the full participation of low-income, meritorious MCC transfer students. The KCURE scholarship program is slated to provide 176 annual scholarships between 2020 and 2025 to an estimated 56 students; students are selected based on financial need and academic merit. Each scholarship includes a tuition award of \$1000/year while at MCC, and \$7000/year while at UMKC.

Literature Review: Students' Pandemic Experiences

Since the onset of the COVID-19 pandemic and the emergency transition to remote learning, many studies have been conducted hoping to capture its impact on STEM student learning and well-being. Consistently, these studies have highlighted student challenges including: deterioration in mental health and concerns about physical health (Chierichetti, 2020; Palmer et al., 2021), difficulty balancing school, work, and home responsibility/home-learning environment distractions (Selco & Habbak, 2021), poor workspace conditions/lack of a physical

space for learning (Thanawala et al., 2022), difficulty accessing internet/technology and other technical problems (Asgari et al., 2021), lack of real-time interaction or decreased connection with professors and peers (Baltá-Salvador, 2021), difficulty staying motivated and focused (Asgari et al., 2021; Means & Neisler, 2020), and experiencing financial strain due to delayed graduation, the loss of a job or internship, loss of income, or changes in healthcare access (Chierichetti, 2020). Studies have also examined STEM students' perceptions of benefits of remote/online learning. Selco and Habbak (2021) and Thanawala et al. (2022) found that these perceptions of benefits include saving time/money by not having to commute, learning to quickly adapt, and better time management and scheduling flexibility.

Conceptual Framing

As noted above, the COVID-19 pandemic represents a global health crisis causing an abrupt disruption from everyday routines (Tasso, Sahin, & Roman, 2021); as such, it aligns with the definition of the term 'transition' offered by Schlossberg et al. (1995): "Any event ... that results in changed relationships, routines, assumptions, and roles" (p. 33). In general, unanticipated transitions require the quick creation of new behavioral patterns, while unwelcomed unanticipated transitions cause confusion, anxiety, and frustration (Goodman, 2017). Schlossberg et al. (1995) identified four variables that influence an individual's transitional experience: Situation, Self, Support, and Strategies. In this study, Situation refers to KCURE Fellows' transition from their pre-pandemic to pandemic lived experiences; Self refers to perceived impact of pandemic on self; Support includes social, academic, familial, and any other on- or off-campus supportive resources; and Strategies refer to KCURE Fellows' use of their available supports to maintain engineering degree progress.

Method

In fall 2020 we accepted 11 students into the KCURE program and in spring 2021 we accepted two students. In total, during our first programmatic year, we accepted 13 students. All MCC KCURE Fellows were in their sophomore year, while all UMKC KCURE Fellows had just transferred from MCC and were beginning their junior year at UMKC. Additional demographic characteristics are depicted in Table 1.

Table 1.

Pseudonym	Semester Started	Institution	Gender	Ethnicity	Age at Program Entry
Theresa*	F 2020	MCC	F	Latinx	19
Cary	F 2020	MCC	F	White	31
Jonathan*	F 2020	MCC	M	White	19
Javon	F 2020	MCC	M	Black	24
Lenard	F 2020	MCC	M	Black	19
Roland*	Sp 2021	MCC	M	Black	30
Opal*	F 2020	UMKC	F	White	37
Judy*	F 2020	UMKC	F	White	32

Hope	F 2020	UMKC	F	White	18
Eve*	F 2020	UMKC	F	White	28
Jack*	F 2020	UMKC	M	White	20
Tom*	F 2020	UMKC	M	White	18
Peter*	Sp 2021	UMKC	M	White	30

*Retained in KCURE program through fall semester 2021

As part of the program intake protocol, we interviewed KCURE Fellows about their previous and ongoing pandemic experiences as it pertained to their educational (e.g., “Before COVID-19, what did you think the upcoming school year would be like?”; “What do you now anticipate this school year will be like for you?”) and personal (e.g., “What has your daily life been like during COVID-19?”; “Tell me about your family’s experience during COVID-19”) experiences. Nine (of 13; 69%) were retained through the fall 2021 semester and were re-interviewed at the beginning of the fall 2021 semester. Questions paralleled earlier previous ones regarding the ongoing pandemic experiences as reflected within educational and personal arenas.

We applied Schlossberg’s Transition Theory (Anderson et al., 2012; Schlossberg et al., 1995) to group KCURE Fellows’ longitudinal interview data into four categories: Situation, (transition into pandemic), Self (pandemic’s impact on self), Support (i.e., on- and off-campus support resources) and Strategies (i.e., KCURE Fellows’ use of their available supports to maintain engineering degree progress).

Findings

Analysis of data coded within these four categories revealed several *themes*. Analysis of responses coded ‘**Situation**’ revealed that in March 2020, all 13 KCURE Fellows reported experiencing a rapid descent into *online academic isolation*: “All my classes are online, so I wake up, get on the computer, and stay on it until I go to bed.” *Family strains* were financial: “My dad works at the plant; he now has reduced hours. That’s a good chunk from our family budget”, health-related: “We constantly have scares in my family. Someone coughs and we freak out” and even space-related: “I moved out recently, but I was living with my parents and siblings in 2020. They didn’t understand that it was still a classroom in my room.” *Covid impact concerns* were expressed in 2020 and included: “I’m scared I might not get the class material as well as if I had attended in person”; “I couldn’t get an internship in summer 2020; many were cancelled.”

Despite the situation, data coded as ‘**Self**’ revealed students’ *resiliency*: “Last year was definitely challenging, but also rewarding” and *adaptation*: I saved time and money. Just to have that extra time for sleep, study, personal life is nice and I miss it – not going to lie.” **Strategies** included several examples of *student-initiated study groups*: “I set up a GroupMe group of classmates to bound ideas back and forth”; “I used Discord; Discord was where a lot of kids could go in and help each other out”; “I have a study group that it was nice. I had never even thought of Zoom as a study group tool before.” Finally, ‘**Support**’ was evidenced by use of *S-STEM project resources*: “The KCURE Zoom meetings that we’ve had [have helped]; I really like our support system. There are several teachers and different people letting us know we’re going to be okay, and that this is just part of being an engineer.”

Discussion and Application of Findings

STEM students, like most students, have educationally and personally struggled during the pandemic, and the KCURE Fellows have certainly bore witness to these struggles. However, KCURE Fellows have also shown tremendous resilience, which will serve them well as they advance in their educational and professional paths.

We have and will continue to apply interview findings in the following ways:

- (1) Establish and grow a peer mentoring network so that KCURE Fellows more advanced in the program can mentor those entering the program; ideally this network would blossom into an active self-sustaining professional network that exists long after KCURE Fellows graduate from UMKC.
- (2) Document the resiliency KCURE Fellows have shown during the pandemic and publicize it to both Fellows and their on- and off-campus community stakeholders; plans are underway to expand the project website (<https://sites.google.com/view/kcure/home>) to include this material.

Additionally, both interview results and KCURE team members' experiences have emphasized these realities:

- (3) KCURE Fellows have needed and continue to need much more 'hands on' mentoring from team personnel than previously anticipated. Our data analyses revealed that the dominant strategy KCURE Fellows used to cope with the unanticipated transition was to seek or create support systems. To do this, they turned primarily to their peers and the KCURE team personnel. Thus, while our original project plans included efforts to change the culture of the UMC CME department, the focus has, by necessity, become continual monitoring of KCURE Fellows to bolster retainment. However, perhaps a start to changing the department culture around MCC transfer students is to highlight that these students have persisted and were as successful as native (non-transfer) CME students. The KCURE Team will begin making regular reports to the CME faculty at department meetings to convey this message.
- (4) MCC and UMKC engineering programs are less well connected than previously known. Advisors and other front-line transfer experts at each institution have experienced turnover; working relationships must be re-established as part of our effort to identify and remove barriers to transfer for engineering students. At this time, we have identified MCC advisors at each of the five MCC campuses who are most likely to work with engineering transfer students; we will bring them together with their UMKC advising counterparts.

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