

# Thriving or Simply Surviving? A Qualitative Exploration of STEM Community College Students' Transition to a Four-Year University

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## ABSTRACT

Community colleges expand access to higher education and play a key role in efforts to increase and diversify the future science, technology, engineering, and mathematics (STEM) workforce. While community colleges increase access to higher education and millions of students attend them for some portion of their education, the experiences of transfer students remain relatively understudied. Transferring during an academic journey can compound the barriers that students already face when pursuing a STEM degree. This study uses Schlossberg's model for analyzing human adaptation to transition to understand how STEM community college transfer students navigate and adapt to the 4-year university. Five semistructured focus groups were conducted with STEM community college transfer students attending an urban university. Analysis of the focus groups resulted in a new model: the amended model of adaptation to transfer transition, or AMATT, which illustrates various factors that played a role in STEM community college transfer students' adaptation a university. Analyses illuminated two broad pathways that students tend to diverge into during their transitions—thriving or simply surviving. This work provides a framework for understanding factors influencing the transfer process and ideally will inform institutions and students as they consider maximal transfer student success.

## INTRODUCTION

Estimates state that the United States will need an additional one million science, technology, engineering, and mathematics (STEM) professionals over the next decade to maintain relevance in these fields (President's Council of Advisors on Science and Technology [PCAST], 2012). An annual increase in the number of students who graduate with a STEM degree will be required to meet such demands. Of all students who enter a STEM degree program, less than 40% finish their degrees (PCAST, 2012); therefore, reducing attrition rates and retaining more students in STEM will be essential for reaching the projected number of STEM professionals needed.

Although often overlooked, community colleges are a critical component of undergraduate STEM education in the United States, and thus are key in mitigating the predicted shortage of STEM workers. Community colleges train a large portion of the current STEM workforce, as 44% of those who earn a STEM degree report attending a community college at some point (Hagedorn and Purnamasari, 2012). Community colleges have been recognized for their role in advancing students toward degree completion (Cohen and Brawer, 1989; Smith and Vellani, 1999; Hagedorn and Purnamasari, 2012; Ma and Baum, 2016), and as recently as the Fall of 2019, 34% of all undergraduate students in the United States were enrolled in community colleges (National Center for Education Statistics, 2019).

Community colleges increase access to education by offering convenient and cost-effective options for students, open admission, and many courses (Kasper 2003; Boggs, 2011). They enroll the most diverse student body in higher education in terms of

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demographic dimensions (Boggs, 2011), and they enroll a large proportion of minority, first-generation, low-income, and non-traditional age (23+ years) students (Ma and Baum, 2016). According to the American Association of Community Colleges, 28% of community college students are Hispanic, 13% are Black, 6% are Asian (AACC, 2021), 60% are women, 29% are first-generation college students, 56% receive financial aid, and the average student age is 27, (AACC, n.d.). Thus, community colleges will play a key role in the push to not only increase but also diversify the future STEM workforce (Briggs, 2017; Benish, 2018).

Community colleges increase access to higher education, with millions of students attending them for at least some portion of their higher education (Boggs, 2011). There are well-intended national calls to make the STEM transfer pathway more robust (National Research Council, 2012), yet the experiences of community college students remain surprisingly understudied (Schinske *et al.*, 2017)—particularly lacking is investigation into the transfer process itself. Some researchers state that students can face what is known as “transfer shock” as they transfer from 2- to 4-year universities (Cejda, 1997). Transfer shock refers to declines in academic success, such as a drop in grade point average upon transfer (Rhine *et al.*, 2000), and/or social factors, such as lacking a sense of belonging at the university (Strayhorn, 2018). These experiences can lead to a misalignment between student intentions and outcomes and present barriers to persistence. While 80% of students attending a community college intend to earn a bachelor’s degree, only 14% of students who start at a community college and transfer to a 4-year university earn a bachelor’s degree within 6 years (Jenkins and Fink, 2016). Thus, we need to focus on understanding factors that both inhibit and promote transfer student completion of a bachelor’s degree.

Transferring midway through an academic journey can compound the many barriers that students already face when pursuing a degree in STEM (Packard *et al.*, 2012), such as departmental and classroom culture, time to degree, and cost (National Academies of Sciences, Engineering, and Medicine, 2016). Barriers that impact community college transfer students during their transition can include a lack of information, poor advising, and varying degrees of preparedness (Hagedorn *et al.*, 2008). The community college environment can differ dramatically from a 4-year college environment when students transfer to more selective and/or large universities with bigger class sizes (Rhine *et al.*, 2000; Umbach *et al.*, 2019). Researchers looking at community college transfer students’ academic adjustment found that students who reported positive course learning experiences at the university are more likely to adjust, whereas those with a perceived negative stigma around being a transfer student are less likely to adjust (Laanan *et al.*, 2010). A study examining STEM transfer students found that social factors such as gender and student connections with faculty play an important role in the academic adjustment of transfer students, as do academic factors such as having a large number of transfer credit hours (Jackson and Laanan, 2015). Another study examining STEM transfer student experiences found that parent’s education level, interactions with faculty, and perception of the university influenced students’ academic adjustment (Lopez and Jones, 2017). There are clearly many factors that will impact how a transfer student adapts to the university post-transfer. Given that STEM fields are historically exclusionary, it

is critical to understand key supports for STEM transfer students, particularly those who come from marginalized, low socioeconomic, and/or groups otherwise underrepresented in science (Carter *et al.*, 2019; Berhe *et al.*, 2022).

Our work here centers on qualitatively understanding the various ways in which STEM transfer students navigated their transition to one 4-year, public research institution. Through focus groups, STEM students shared their experiences transferring to our university, allowing us to identify the academic and social factors that tended to positively and negatively impact their adaptations to the transition. The purpose of this work is to summarize the various obstacles and supports that STEM transfer students report grappling with in their transition from community college to a 4-year institution and ultimately encourage institutions to apply lessons learned to their transfer support structures and programs.

## THEORETICAL FRAMEWORK

### A Model for Analyzing Human Adaptation to Transition

To understand student adaptation to transfer, we used a model designed to understand how humans adapt to transitions (Schlossberg, 1981). The model—a model for analyzing human adaptation to transition, which we will refer to as “MAAT” (Figure 1)—aims to provide a tool for understanding differences in experiences among individuals going through a particular transition and has been used to examine various life transitions, such as career transitions for nurses (Wall *et al.*, 2018) and the transitions faced by athletes after concluding their athletic careers (Wylleman *et al.*, 2004). The MAAT proposes that the perception of the transition, characteristics of the pretransition and posttransition environment, and characteristics of the individual will influence if and how one moves from transition to adaptation.

### Transition

The MAAT defines “transition” as “an event or non-event resulting in a change in assumptions about oneself and the world, thus requiring a corresponding change in one’s behavior and relationships” (Schlossberg, 1981, p. 5). A non-event is described as the loss of an event that was expected to occur. Within this model, three major factors influence the individual’s adaptation to a transition: the perception of the transition, the characteristics of the pre- and posttransition environments, and the characteristics of the individual experiencing the transition (Schlossberg, 1981). The transition that we examined is the transition from a community college to a 4-year university.

### Perception of the Transition

According to the MAAT, most transitions can be understood through a common set of variables: affect, timing, and degree of stress (Schlossberg, 1981). Any change or transition, regardless of characteristics, involves some degree of stress, even if primarily positive or negative in affect. One might consider oneself “on-timing” or “off-timing” for the transition based on what is perceived to be the correct timing within a society for a major life event (Neugarten, 1976).

### Characteristics of the Pretransition and Posttransition Environments

Environment within the MAAT is described broadly and includes interpersonal support systems, institutional supports,

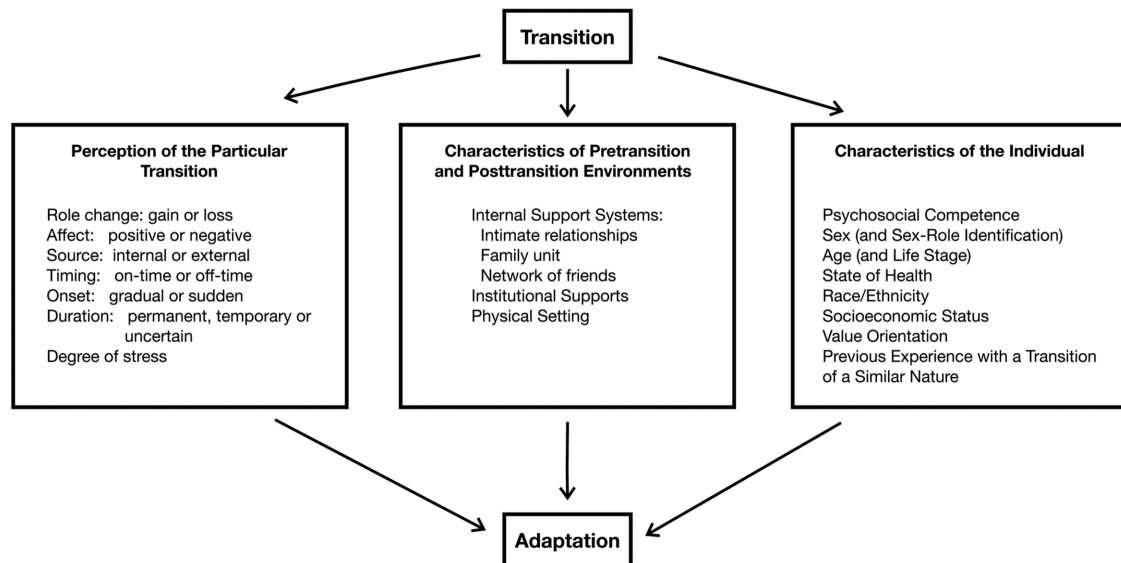


FIGURE 1. Redrawn from “A Model for Analyzing Human Adaptation to Transition” (Schlossberg, 1981).

and physical settings (Schlossberg, 1981). Interpersonal support systems are thought to be important for successful adaptation. Institutional supports describe any place that an individual can turn to for help throughout the transition. The factors of the physical setting involved in the transition can contribute to the stress or general well-being experienced by the individual, which may play a role in the individual’s ability to adapt to the particular transition.

### Characteristics of the Individual

The characteristics of the individual going through the transition will impact the individual’s ability to adapt to that particular transition (Schlossberg, 1981). Some important characteristics to consider include the life stage of the individual, social identities, being a member of an underrepresented group, and previous experiences with similar transitions. For undergraduate STEM students, additional characteristics may be important to consider, such as their self-efficacy, sense of belonging, and science identity (Estrada *et al.*, 2011; Strayhorn, 2018).

### Adaptation

The MAAT describes “adaptation” as “a process during which an individual moves from being totally preoccupied with the transition to integrating the transition into his or her life” (Schlossberg, 1981, p. 7). Understanding the experiences of community college transfer students during their transition and what impacts their ability to adapt may lead to new ways to support and retain these students.

## METHODS

### Recruitment

This study was conducted at a large public northwestern urban commuter university. Our university is classified by the Carnegie Classification of Institutions of Higher Education as high research activity with a 4-year, medium full-time, selective, high transfer-in undergraduate profile (Carnegie Classification of Institutions of Higher Education, n.d.). In the Spring of 2019, a survey

was sent to all declared STEM majors as part of a larger research study. The survey collected demographic data and was designed to measure student integration into science, STEM involvement, and sense of belonging (Shortlidge, E. E., Goodwin, E. C., Gray, M. J., & Estes, S. R., unpublished data). At the end of the survey, participants were asked various demographic questions and whether they would be interested in participating in a focus group to share more about their experiences as STEM students. Survey participants who indicated that they were willing to be contacted were emailed by a researcher to confirm interest and availability. We wanted to learn about the transfer student experience, so students were selected to participate in focus groups from the pool of volunteers based on their community college transfer status. This work is part of a larger, mixed-methods study on factors that support student belonging and retention in STEM, and students were also selected to participate based on whether or not they were a member of a STEM intervention program (SIP) on our campus. SIPs have been created nationwide to increase access to STEM fields and to ultimately improve student retention to graduation (Rincon and George-Jackson, 2016). SIPs often recruit and support students who are historically marginalized by STEM fields (Fagen and Labov, 2007), and approximately 10% of our university’s STEM students are involved with SIPs. This study was approved by the Portland State University Institutional Review Board (no. 174450).

### Focus Groups

We conducted five semistructured focus groups with STEM transfer students at the end of the Spring 2019 quarter. We used a semistructured focus group format, following a predetermined list of questions but allowing for a natural flow of conversation and follow-up questions as appropriate (Clifford *et al.*, 2016). Each focus group had one primary facilitator and a secondary facilitator. The primary facilitator was the same for each focus group.

We separated transfer student focus groups by SIP status. We did this for two reasons: 1) we were concerned that students

**TABLE 1. Demographics of study participants (self-identified by participants)**

| Group                                   | Number of participants | Average age    | Age 23+ | Female | BIPOC | First generation | CC transfer |
|-----------------------------------------|------------------------|----------------|---------|--------|-------|------------------|-------------|
| SIP participants (three focus groups)   | 17                     | 27 ( $\pm 6$ ) | 71%     | 65%    | 53%   | 41%              | 100%        |
| Non-SIP participants (two focus groups) | 16                     | 28 ( $\pm 4$ ) | 86%     | 50%    | 13%   | 44%              | 100%        |

who were not part of SIPs would not be comfortable discussing their experiences if they felt that the other students had disproportionately increased opportunities (Onwuegbuzie *et al.*, 2009); and 2) focus groups were conducted as part of a larger, mixed-methods study on STEM student retention and the role of SIPs. The intention of the present work is to better understand the holistic experience of STEM transfer students at our university. We felt that a collective research setting would present a unique perspective, differently nuanced than that of individual interviews, as focus groups allow participants to produce a collective discussion and understanding of a shared problem or experience (Wilkinson, 1998).

We (E.E.S., M.J.G.) iteratively developed the focus group questions in part to better understand the constructs intended to be measured by the survey instrument (e.g. science identity and sense of belonging; Shortlidge, E. E., Goodwin, E. C., Gray, M. J., & Estes, S. R., unpublished data), as well as to generally understand the students' transitions to our university (for a full list of questions, see Supplemental Material, Appendix 1). Each focus group lasted 1 hour, was held on campus, followed the predetermined script, took place within the same 2-week time period at the end of the academic year, and was audio- and video-recorded. Focus group participants were compensated with a \$25 gift card.

### Participants

A total of 33 community college transfer students participated in the five focus groups (ranging from two to 10 per group). Table 1 illustrates descriptive demographics of the focus group participants. We would like to point out a few things regarding our focus group sample that could limit the transferability of the data. Students at our university who identify as BIPOC students (Black, Indigenous and people of color) make up approximately 40% of the overall population. BIPOC students were thus over-represented (53%) in the focus groups that contained students who were part of SIPs compared with the university as a whole. On the other hand, BIPOC students were vastly underrepresented in our other, non-SIP focus groups. Many SIPs specifically recruit minoritized students to apply, or in the case of the National Science Foundation (NSF)-funded Louis Stokes Alliance of Minority Participation program, are designed specifically to support students minoritized in STEM. We recognize this discrepancy as a limitation of the generalizability of our results. Otherwise, the demographics of our sample do not vary significantly from our STEM population, except they are all transfer students—and transfer students comprise approximately 60% of our overall STEM population. It is also important to note that, while the demographics of our sample mostly align with our university's population, the average age of our students is older than that of many other universities (our mean student age is 26 years). This likely impacts the perceptions and experiences discussed by our participants; however, the age mean is in alignment with the broader transfer student population (AACC, n.d.). We did not disaggregate or analyze our results by demographic

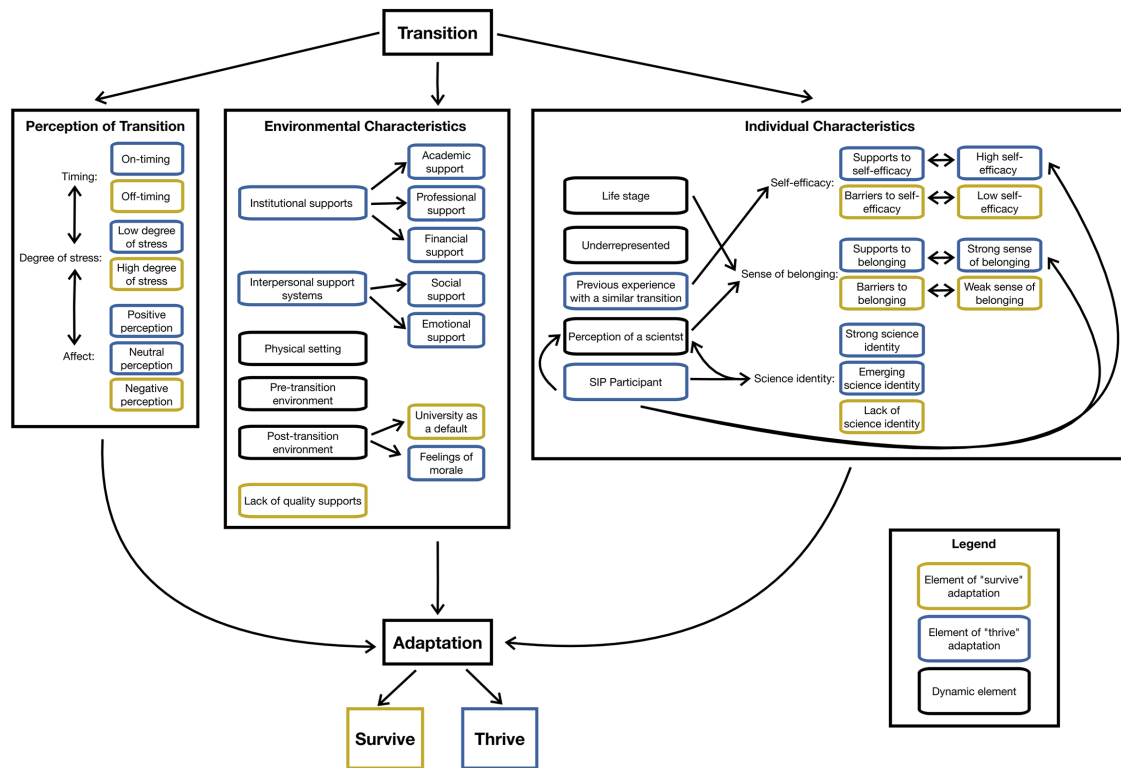
factors, as these were focus groups and not all students had a chance to, nor were they expected to, equally respond to each prompt as they would in an interview; therefore, such disaggregation would not appropriately represent the data.

### Qualitative Data Analysis

Each focus group was transcribed verbatim (Rev.com, San Francisco) and de-identified. Researchers (M.J.G., S.A.G., N.N.N., E.E.S.) read through a subset of the transcripts to identify overarching themes. The researchers also had access to the secondary facilitator's (M.J.G.) focus group notes. Three researchers (M.J.G., S.A.G., N.N.N.) then iteratively developed a codebook using multiple methods. We used inductive content analysis to derive themes and codes from the focus group participant responses that arose organically and were not necessarily anticipated (Patton, 1990; Saldana, 2015). We also used deductive content analysis to identify existing ideas within the data that related to integration into science, sense of belonging, and human adaptation to transition (Patton, 1990; Saldana, 2015). The codebook was iteratively developed by the research team (see Supplemental Material, Appendix 2). We used the final codebook to code two of the five transcripts to full consensus. One researcher (M.J.G.) then coded the remaining three focus group transcripts and conferred with the other researchers regarding any questions or instances where the appropriate code to apply was not entirely clear. As a research group, we then aligned the codes developed in our iterative analysis with the factors of the original transition model (MAAT; Figure 1). Our qualitative analysis revealed that we were well positioned to use our student data to expand the original model, as we could fully represent our students' experiences and tailor the model to the STEM transfer student experience. This expansion resulted in what we call the *amended* model of adaptation to transfer transition (AMATT; Figure 2).

For this study, we conducted focus groups in an effort to broadly understand the transfer experiences of STEM students at our university. Focus groups produce group-level data in addition to individual-level data (Hydén and Bülow, 2003) and have been recognized as a method whereby participants can produce a collective understanding of a phenomenon (Wilkinson, 1998). Due to the nature of focus groups, not every student answered every focus group question, nor was this expected (Parker and Titter, 2006). We are currently conducting individual interviews with transfer students, and the interview questions have been acutely informed by the focus group results reported here. Forthcoming reports of those interviews will add to the literature base by contributing individual, nuanced transfer stories.

We did not set out to gather levels of agreement with specific components of the AMATT, nor to specifically identify individual-level experiences, thus we do not quantify each category of response. Instead, we holistically analyzed the data, taking the individual and collective experiences into account so we could map student experiences by these factors. These data are meant



**FIGURE 2.** Amended model of adaptation to transfer transition, or AMATT. Black lines represent relationships between characteristics, blue boxes represent elements of thrive adaptation, yellow boxes represent elements of survive adaptation, and black boxes represent dynamic elements (elements that can contribute to either surviving or thriving, given the context).

to put forth an overview of the sorts of experiences that may occur during the transfer experience from a community college to a university.

## RESULTS

Our analysis expands upon Schlossberg's model to understand human adaptation to transition by keeping the existing elements within the model that were discussed by participants and adding emergent themes from our analysis, resulting in the AMATT (Figure 2). Community college transfer students participating in the study discussed many factors that impacted their adaptation to the transition to university. These factors can be described within the following categories: perception of the transition, environmental characteristics, and individual characteristics. In addition to these categories, participants also described what we deemed as being two divergent paths of adaptation: surviving and thriving. Our model also demonstrates which characteristics appeared to contribute to a "survive" adaptation and which characteristics appeared to contribute to a "thrive" adaptation and the potential relationships between characteristics (Figure 2). We describe each characteristic presented in the model and how it may have related to thriving or surviving. Typically, the most positive responses were contributors to students thriving in their transition, whereas commonplace or negative experiences contributed to surviving.

### Perception of Transition

According to Schlossberg's model of human adaptation to transition, most transitions can be represented by a common set

of variables that describe the perception of the transition (Schlossberg, 1981). The most common variables discussed by the focus group participants included timing, degree of stress, and affect (Figure 2).

**Timing.** One might consider oneself "on-timing" or "off-timing" for major life events based on what is perceived to be the "correct" timing within a society (Neugarten, 1976). This can be true for college students, who may have an internal perception of when is the correct time to start and finish their degrees and to be in college. Timing was discussed among focus group participants.

**On-Timing.** Few participants discussed feeling on-time within their degree program. One participant expressed excitement about the transition from the community college to the university, as it allowed the student to be in alignment with peers, while few others expressed that their age did not impact their perception of their experiences, suggesting that they did not feel off-time for their transition to the university (Table 2).

**Off-Timing.** Participants discussed feeling off-time across focus groups. Participants discussed how being a non-traditional age student impacted them emotionally, while others discussed how this impacted their educational experience (Table 2).

It is pertinent to note here that our university's average student age (undergraduate and graduate) is typically reported to be 26 or 27 years old. Although perhaps unique across some institutions of higher education, this non-traditional student age

**TABLE 2. Perceptions of the transition (illustrated by example quotes) were a major component of the AMATT**

| Perception       | Example quote(s)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Timing           | <p><b>On-timing</b></p> <p>“I guess I am a traditional college student, I’m 21 and a junior, so I was really excited to be like all the other people who graduated from high school with me and finally get to university. I was really excited to be done with community college.”</p> <p>“As far as being 22, age doesn’t define you, no matter when you finish or when you start.”</p> <p><b>Off-timing</b></p> <p>“It took five years for me to get to this point and minimum of like five to six more years of school in itself is pretty daunting. Speaking as an older student, I’ll be pushing nearly 50 by the time I get out of school, and that’s terrifying to me. I feel like if I would have done this a little bit younger it would have been more of a milestone, but now I feel like I’m just racing time.”</p> <p>“When I started college, I didn’t really have tools to be a student, because you know, I’m 26. And I spent nearly half my life out of school. I feel like I have to work harder to get less results, essentially.”</p> |
| Degree of stress | <p><b>Low degree of stress</b></p> <p>“I was really familiar with [the city] and so it was not hard at all to transition. I could definitely sense the intensity of classes step up, and I was glad that I had the tutoring center to help me out with that. But yeah, it wasn’t a challenge.”</p> <p>“It was probably harder to get started at the community college than to transfer. Transferring wasn’t as bad.”</p> <p><b>High degree of stress</b></p> <p>“There is all the anxiety of switching to university. It’s proper college. I don’t know if anybody else felt that way, but I felt I was going to real college now and everything was going to be harder.”</p> <p>“My transition was terrible. My first quarter, especially. It goes back to not being able to meet with my advisor in the geology department.”</p>                                                                                                                                                                                                                         |
| Affect           | <p><b>Positive perception of transition</b></p> <p>“I actually had a really positive experience in my transfer. I feel like I came in much more prepared than I had when I was in community college and just starting out there. And even with my advisor, I’ve had a positive experience”</p> <p><b>Neutral perception of transition</b></p> <p>“I guess the logistics of transferring were pretty easy, other than just when I first reached out to them to be like, ‘I think that I need to transfer to a university to get a bachelor’s degree. Am I correct?’ I guess reaching out to them was like, ‘I don’t know if I’m saying the right words and stuff.’ But other than [that] it kind of went smoothly.”</p> <p><b>Negative perception of transition</b></p> <p>“My [transition] was just scary, for one I have anxiety, so I’m terrified of everything. But being at [the university], this is the first time I had actually been in a lecture hall, or just been in a class of over 50 people.”</p>                                            |

is a prominent student group that we have a limited understanding of (Spitzer, 2000). The perception of timing held by these participants may have been impacted by the average age of students at our university.

**Degree of Stress.** Any transition, regardless of other characteristics, causes stress (George, 1993; Miller, 2016; Schlossberg, 1981). The level of stress caused by a transition impacts adaptation to that transition. Participants expressed experiencing what we categorized as being “low” degrees of stress or “high” degrees of stress throughout their transitions from community college to a 4-year university (Table 2). Each group discussed experiencing a high degree of stress more often than they discussed experiencing a low degree of stress.

**Affect.** Some transitions can generate positive feelings, while others generate negative feelings, but most transitions are likely to have both positive and negative affect (Schlossberg, 1981). Among the focus group participants, we found discussion of positive, neutral, and negative perceptions of the transition from a community college to a 4-year university, with negative perceptions of the transition itself being the most discussed by the participants (Table 2).

### Environmental Characteristics

In Schlossberg’s model of human adaptation to transition, environment is described broadly (Schlossberg, 1981). The original

model describes three aspects of the environment: institutional supports, interpersonal support systems, and the physical setting. In addition to these aspects, as depicted in the AMATT (Figure 2), our participants discussed the pretransition environment, posttransition environment, and a lack of quality supports within their environments.

**Institutional Supports.** Institutional support describes any formal or informal agency that an individual can turn to for help (Schlossberg, 1981). Institutional support has been recognized for the role that it plays in increasing undergraduate student persistence (Thomas, 2014; Toven-Lindsey *et al.*, 2015). Our participants discussed receiving academic support, professional support, and financial support (Table 3). The participants often described receiving academic support in the form of working with peers, while others reported positive or negative experiences with academic advising, particularly as it relates to transfer credits to degree. Professional support was often described in the form of help with research or internship placements, and some participants discussed receiving support with finding a job or getting career advice from a mentor. Financial support was discussed by participants as receiving scholarships or having the funds needed to purchase class materials; for other students, finances were the reason that they attended our relatively “low-cost” university.

**Interpersonal Support Systems.** Interpersonal support is thought to be essential to successful adaptation to transition

TABLE 3. Environmental characteristics (illustrated by example quotes) were a major component of the AMATT

| Characteristic                | Example quote(s)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|-------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Institutional supports        | <b>Academic support</b><br>“One thing that I must say that I really liked here is the advisors. [The university] already requires you to see an advisor in order to be able to continue to register to other classes, which is a good thing.”<br>“I finally get to [the university] and I had to arrange a bigger room because there were too many people that showed up to the study group, because they cared about getting a good grade, and they cared about actually learning the material, so that they’re prepared for the next class. I was super thrilled.”                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|                               | <b>Professional support</b><br>“My first term here we had an engineering class where they bring in a bunch of engineers and they just talk about what they do and have a chance for the class to ask questions. I really liked that.”<br>“I got a research opportunity over the summer last year, it was through [a SIP], which is another community that I am a part of.”                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                               | <b>Financial support</b><br>“I feel really lucky to have the [named SIP] scholarship because the financial help has helped out a lot. I don’t work now. Which is really, really nice, because I can just focus on going to school and doing research.”                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|                               | <b>Social support</b><br>“I actually have about six people that I was going to mention. Because we’re all pre-health, we’ve done the whole chemistry series together, the whole biology series together, and we’re going to all take the anatomy and physiology series together. Because of that as a group, I feel like that’s where I’m able to focus. Because we’re all taking the same class together”<br>“Having a PI and a professor who I work for here on campus and being able to go to him with my concerns and say, ‘Hey, I am struggling a lot with this right now,’ and having them reassure me with like, ‘Yeah, I remember when I went through school, this was hard and being an instructor of this class, it is very hard. You are not alone. And you are doing great.’ You just need to reassure yourself that you are good enough and you are doing great.”<br>“My older sister came here and she was a math major as well. That’s probably one of the reasons why my transferring wasn’t too difficult, because she was just finishing up her master’s when I was coming in.” |
| Interpersonal support systems | <b>Emotional support</b><br>“I had somebody that was in my friend group that was like ‘Oh yeah, I’ve taken organic chemistry before. Don’t worry, you’ll struggle and cry and get a C.’ Okay, so this is normal, this is a completely normal experience.”<br>“Having people around that you can talk to and say, ‘Hey, here’s all the things that I’m doing and it sucks and I feel I’m drowning.’ I know I’m going to do it, but it sucks and to have somebody go, ‘Yeah, that does suck. Honestly, I relate to you.’”                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Physical setting              | “I feel like I can relate to a lot of the students here at [the university]. I think that the demographics are good. I like that there is a different variety of people, I think that the campus is really pretty with all the trees and everything.”<br>“I grew up [outside of the city], so I was really familiar with [the city] and so it was not hard at all to transition.”<br>“I like [the city]. I’m happy to be here.”                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Pretransition environment     | “I was used to [the community college] where all my classes were just in this little area of campus. It was kind of a big campus, but I didn’t face any more than like a five-minute walk from one end of campus to the other.”<br>“I came from the little community college, so coming here is a bigger place.”<br>“When I was at [the community college], if there were a lot of events the teachers would make time. They would say, ‘Let’s all go down to the international students’ office and do something with them,’ or, ‘Let’s all go to this event.’ I felt a lot more involved because of that.”                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Posttransition environment    | <b>Default university</b><br>“My husband and I bought a house here. I don’t have other options. I am literally here because there is nothing else. If I could get an electrical engineering degree somewhere else in [the city], I would do that.”<br>“When I decided to go back to school, I happened to be living in [the city]. It was the only choice for me.”<br>“I grew up in [the city]. I’ve just lived here forever. It’s expensive to move.”<br><b>Feelings of morale</b><br>“I couldn’t really imagine going anywhere else. [The university] made the most sense for me to go to, but I am really happy here. I really like my instructors and I like the people I’m with. I like [the city]. I’m happy to be here.”<br>“I think that it is a good place for me because it’s pretty easy to commute to the school, and they make it pretty easy for transfer students.”                                                                                                                                                                                                                |
| Lack of quality supports      | “I could tell the difference between the kinds of students that were at the community college versus here, there’s a lot of young students who are freshman. They come in and they’ve just graduated from high school versus at [the community college], I have a really unconventional educational background, and I feel like there’re a lot more people who could relate to that and relate to me starting school later. It took me a while to be able to connect with people at [the university].”<br>“It’s just like, ‘Somebody struggle with me!’”<br>“I know a very frustrating thing for me is that, being in the biology department, there’s a lot of biology majors. Trying to get an appointment with your advisor, they’re scheduled a month out.”<br>“It’s especially difficult for me. I don’t have any financial support. And so, trying to balance the requirements of, ‘Oh, you need this many hours volunteering, this many hours shadowing, this many hours clinical experience,’ with working full time just to support myself, while also going to school full time.”        |

(Schlossberg, 1981). The focus group participants discussed receiving interpersonal support in the forms of social and emotional support (Table 3). A study examining undergraduate Latinx students found that social support was positively associated with adjustment to college (Alvan *et al.*, 1996). Emotional support has also been found to be important for undergraduate students' adjustment to college (Azmitia *et al.*, 2013). Participants discussed receiving social support from peers, faculty, and family. Participants discussed experiencing emotional support through receiving reassurance and encouragement, feeling comfortable in their environment, and being able to share honest experiences among peers.

**Physical Setting.** Physical setting encompasses factors such as weather and location that may contribute to stress, well-being, and general outlook, therefore playing a role in adaptation to the transition (Schlossberg, 1981). Participants considered the location of the university as well as physical aspects of the campus, such as the size or layout of the campus (Table 3).

**Pre- and Posttransition Environment.** Participants mentioned aspects of their community colleges (pretransition environment), including the size of the community college and their instructors (Table 3). Participants also discussed aspects of the 4-year university (posttransition environment; Table 3). Two main themes arose within the discussion of the posttransition environment: default university and feelings of morale. Many participants discussed feeling as if the university that they transferred to was their only option due to factors related to location or finances (default university). Feelings of morale describes the positive emotional response that comes with belonging to a group (Bollen and Hoyle, 1990). Some participants expressed positive feelings of morale toward the 4-year university.

**Lack of Quality Supports.** While some participants felt they received adequate support, others felt there was an overall lack of quality support in their transition. The lack of quality support category was broad and included social, emotional, academic, professional, and financial support (Table 3).

### Individual Characteristics

According to Schlossberg's model of human adaptation to transition, the third major determinant of adaptation to the transition is the individual experiencing the transition (Schlossberg, 1981). As depicted in the AMATT (Figure 2), a number of individual-level characteristics or attributes seemed to influence transfer student adaptation to being a STEM student at a 4-year university. The most salient characteristics among our participants included: life stage, being a member of an underrepresented group in STEM fields, previous experience with a similar transition, and being a member of a SIP (Table 4). The participants also explored their perceptions of what it means to be a scientist, have a science identity, their self-efficacy, and sense of belonging to their fields and/or the university (Table 4). There is evidence in the literature that these constructs are important characteristics for STEM students' persistence (Estrada *et al.*, 2011, 2018; Simon *et al.*, 2015; Rainey *et al.*, 2018; Strayhorn, 2018), and we wanted to explore what they mean to students in this study; the focus group questions were therefore designed in part to probe these topics.

Both the life stages of the participants and having identities that are considered underrepresented in STEM fields, such as being a first-generation college student (Engle and Tinto, 2008), influenced the perceptions held by the participants and impacted the experiences they had throughout their transitions (Table 4). Schlossberg's model suggests that those who have successfully adapted to a transition in the past will likely be able to adapt to another transition of a similar nature (Schlossberg, 1981). We found evidence of such adaptation among our participants, with some reminiscing on how the transition to the community college was more difficult than the transition to the university. The participants supported by a SIP often emphasized the impact that this organized support had on their experiences. Example quotes from students with each of these characteristics can be found in Table 4.

**Science Identity, Self-Efficacy, and Belonging.** The participants also discussed their perception of what it means to be a scientist, their science identity, self-efficacy, and sense of belonging (Table 4). Within the participants' perceptions of what makes someone "a scientist," two major themes arose—they tended to perceive scientists as having either intrinsic or extrinsic traits. Some participants viewed scientists as having intrinsic traits, such as curiosity and a drive to persist within research. Students also believed that scientists held extrinsic traits, such as having a specific appearance or being involved in the scientific process. The participants' perceptions of a scientist seemed to be related to and influenced by other individual characteristics, such as their own personal science identities or having a research experience (Figure 2). Students developing a science identity can be critical to persisting in STEM (Chemers *et al.*, 2011; Estrada *et al.*, 2011, 2018), and those who identify with a role are more likely to follow the norms associated with that role and then pursue a career within that role (Estrada *et al.*, 2011). The student participants could be roughly categorized into having a strong science identity, an emerging science identity, or lacking a science identity (Table 4).

The participants displayed varying levels of self-efficacy, or their belief in their personal ability to achieve their goals (Bandura, 1977), and what contributed to or hindered their self-efficacy. They talked of elements of having high self-efficacy, such as being very sure of their goals and how their abilities were reinforced through past successes. The participants also disclosed barriers to self-efficacy. This included being impacted by a lack of motivation, being unsure of their goals, having a lack of time due to their involvement in many things, and having a lack of community. Some participants displayed a high level of self-efficacy, while few participants displayed low levels of self-efficacy (Table 4).

Having a sense of belonging is also deemed as crucial for persistence in college (O'Keeffe, 2013; Strayhorn, 2018), in particular for STEM majors and specifically for students of marginalized groups (Rainey *et al.*, 2018). Participants' emotions ranged across the board on how they expressed having or not having a sense of belonging, and there were various factors that supported or hindered the feeling of belonging. They talked about belonging as it relates to both the university as a whole or to a group at the university. Examples of groups at the university include academic clubs, professional clubs, departments, multicultural centers, SIPs, or sports teams. Those with a strong

TABLE 4. Individual characteristics (illustrated by example quotes) were a major component of the AMATT

| Individual characteristic                     | Example quote(s)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|-----------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Age and life stage                            | "I'm 33. I feel a little bit like I'm kind of racing the time, not fully but like to a certain extent. I feel like I don't have a lot of room for error. I also have a child who's two years, and I'm married, so that kind of hinders where I can go to school or what internships I can take."                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Underrepresented in STEM fields               | <p>"I'm the first person in my family to go to college. None of the women in my family, well none of the men either, but especially the women, ever went to school."</p> <p>"I'm just a first-generation college student, so literally everything that has to do with college has been kind of on the rough side. I didn't know what those terms meant as far as like, what is a major? What's the difference between a bachelor's and a master's degree? What is a minor? And I didn't know anything about college."</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Previous experience with a similar transition | <p>"It was probably harder to get started at the community college than to transfer. Transferring wasn't as bad."</p> <p>"I didn't find [transferring] too bad. But maybe that's just because it was bad enough in community college, that it wasn't any worse by comparison."</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| SIP participant                               | <p>"Something that I would hate to imagine is this year without [the SIP], because they have been really helpful. Finances have actually been a huge part of this year but also having the group and the advisors [provided by the SIP]."</p> <p>"I feel part of the [SIP] community. I don't know about [the university] as a whole. I think for the most part I feel like I commute here, I attend classes, and then I have [the SIP]."</p> <p>"I just feel like I wanted to say that if it wasn't for being in the [SIP] I think I would have viewed [the university] completely different [sic]. I would have just been a little fish in a big pond and just like completely lost, so it has definitely changed my perspective. I feel more of a sense of belonging here at [the university]."</p>                                                                                                                                                                                                                                                                                                                                                                                                       |
| Perception of what it means to be a scientist | <p><b>Intrinsic traits</b></p> <p>"Anyone can be a scientist as long as they have the curiosity."</p> <p>"I think it's somebody who questions things. Somebody who wants to know more about the strangeness of a system or something they notice that's just odd and they just want to know more about it."</p> <p><b>Extrinsic traits</b></p> <p>"Lab coats and safety glasses."</p> <p>"I think about hypothesis testing, I'm going to create a hypothesis and then test it. And then re-evaluate it, and test it again."</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Science identity                              | <p><b>Strong science identity</b></p> <p>"I would say I'm a scientist because I always question how something is actually done and so I would go through the process of trying to figure it out and then just trying to go through the steps of allowing someone to understand exactly how something is done."</p> <p><b>Emerging science identity</b></p> <p>"For me, I think in a way yes, but sometimes I am just learning how to be a scientist, I wouldn't say I officially am yet. Because I still have a lot of ways to learn and improve to be one going forward. It is more like a training aspect of becoming something."</p> <p><b>Lack of science identity</b></p> <p>"I am a student who appreciates science. I don't know if that necessarily is enough for me to feel like a scientist, though."</p>                                                                                                                                                                                                                                                                                                                                                                                          |
| Self-efficacy                                 | <p><b>Supports to self-efficacy</b></p> <p>"I think I feel pretty determined and so I guess that is confidence in a way because I feel both determined to finish and there is nothing else that I would rather do. I feel pretty confident."</p> <p><b>Barriers to self-efficacy</b></p> <p>"I work full time and go to school full time, so I don't really have a lot of time to drop in for open hours, or really engage in some other resources that are here. I'm barely keeping up with homework."</p> <p><b>High self-efficacy</b></p> <p>"I know I'm going to do it without a doubt. It is what I have set out to do. I have basically thrown everything in my life at going through, getting the degree, getting a job in research, getting the graduate degree, then going into academic research and then teaching and doing research for life. That's the plan. I'm just doing it single-mindedly. There is no doubt for me that I will do it through blood, sweat and tears."</p> <p><b>Low self-efficacy</b></p> <p>"Honestly speaking, I don't feel very confident in my ability. I'm pre-med, and trying to get into medical school. I'm the first person in my family to go to college."</p> |
| Sense of belonging                            | <p><b>Supports to belonging and strong sense of belonging</b></p> <p>"I feel I am a part of the [university] community. I live on campus with my husband in the apartment housing, I work at [the university] as a lab attendant for the library labs, the IT labs, and I'm just here constantly, I feel very integrated into the community."</p> <p><b>Barriers to belonging and weak sense of belonging</b></p> <p>"I personally don't feel a sense of community. I'm not a city person at all. And I don't live anywhere near [the university]. I commute in and so basically, I just come to school and then I just sit around by myself to do all my schoolwork, go to class and then as soon as I'm done, I just go straight home."</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

sense of belonging attributed it to many factors, including having a physical space to go to with affinity groups, being highly involved within the campus, having a diverse community, and feeling comfortable in their environment. Other participants had a weak or completely lacking sense of belonging. The barriers to belonging included having to commute to the university, having little time for getting involved, and feeling a lack of connection to their peers (Table 4).

### Adaptation

Schlossberg's model defines adaptation as the process during which "an individual moves from being totally preoccupied with the transition to integrating the transition into their life" (Schlossberg, 1981, p. 7). Qualitatively, it became clear that although most students were adapting to the university, there were significant differences in *how* they were adapting. Participants presented evidence of adapting to the university after their transition from the community college in various ways. Some were absolute (thriving), others less so (surviving; Table 5).

## DISCUSSION

In this study, we aimed to holistically understand STEM community college students' transitions and adaptations to a 4-year university. Expanding upon Schlossberg's model for analyzing human adaptation to transition (MAAT) and listening to the perspectives of our STEM transfer students, we created the AMATT to illustrate how many different factors play a role in a STEM community college transfer students' adaptation to the transition. The AMATT includes characteristics that others have proposed as being important for STEM students' persistence to graduation, such as science identity, self-efficacy, and sense of belonging (Estrada *et al.*, 2011, 2018; Simon *et al.*, 2015; Rainey *et al.*, 2018; Strayhorn, 2018). Our model also indicates that there are two types of adaptation: surviving and thriving. We adapted Schlossberg's model to include these different levels of adaptation, categorized the characteristics of the transition experience as elements that contribute to a survive adaptation or a thrive adaptation, and outlined potential relationships among the characteristics in the AMATT (Figure 2).

### Transitioning to a Four-Year University Is Complex

While community colleges increase access to education and many students attend community college for at least some portion of their higher education experiences (Boggs, 2011), transitioning from a community college to a 4-year university can bring forth barriers to persistence (Hagedorn *et al.*, 2008). These barriers can lead to misalignment between students' intentions and outcomes. Our derived model demonstrates just how complex the transition experience can be, emphasizing the need to support such students throughout this journey. While our model is not representative of every characteristic that could impact adaptation to the transition, it demonstrates many characteristics that impacted our students' transfer experiences, including their perceptions of the transition, environmental characteristics, and individual characteristics.

The perception of the transition describes the student's attitudes toward the transition from a community college to a 4-year university. Very little work has been done on how community college students feel about having to transfer to a 4-year university or how these perceptions influence the transition

experience, but our model suggests that the perceptions of timing, degree of stress, and affect associated with the transition impact if and how a student adapts to the transition.

Environmental characteristics, such as institutional supports or physical settings involved in the transition process, were found to impact how a student adapted to the 4-year university. Prior research on community college students' transitions to a 4-year university found that the quality of academic advisement, access to financial aid, and social and cultural issues can impede a successful transition (Gard *et al.*, 2012). Our work complements those findings, in that having easy access to quality academic, financial, social, and emotional support seemed to buttress a thrive adaptation. Our model also demonstrates that the characteristics of the pretransition and posttransition environment influence adaptation. This is in alignment with prior research on community college transfer students, with one study finding that attending a large community college was positively associated with student success, but that a large university size was negatively related to transfer student persistence (Umbach *et al.*, 2019). Characteristics of the physical setting impacted adaptation, for example, one student discussed how a large classroom influenced the transition experience:

"Being at [the university], this is the first time I had actually been in a lecture hall, or just been in a class of over 50 people. And I remember my first class was organic chemistry, and that was down in one of the big lecture halls that seat like 500 people. And I just remember pretty much getting trampled on the way in, like I walked into the classroom and there was a flood of people coming after me. Every single class I had to fight for a seat in the front, just so I could see things. And that was just a culture shock. It was terrifying, knowing there are like 400 other people behind me, that could potentially squish me if they wanted to."

Individual characteristics impact adaptation to the transition. Others have shown that a transfer student's individual characteristics such as parent educational level (Lopez and Jones, 2017) and gender (Jackson and Laanan, 2015) can impact academic adjustment, with first-generation students and women students being less likely to adjust academically at the 4-year university. Our model reinforces this, demonstrating that many different individual characteristics such as life stage, being underrepresented or minoritized in STEM, having experience with a previous transition of a similar nature, and being a SIP participant can be impactful to adaptation (Table 4). Additional STEM-specific individual characteristics are discussed later. Further research is needed to understand how hidden identities or undiscussed social factors may impact STEM students' adaptation to the transition (Henning *et al.*, 2019; Cooper *et al.*, 2020). It is possible that certain factors did not come up in discussion due to the focus group setting and that tailored individual interviews and surveys could further unpack the salient individual factors.

This model could be used in future research to evaluate which characteristics are most impactful on the transition experience. It could also be expanded upon or adapted to reflect the experiences of students at other types of universities. Transferring from a community college should not hinder one's ability to persist to graduation, and developing a deeper understanding

**TABLE 5. The distinction between surviving and thriving (each type of adaptation illustrated by example quotes) was a major component of the AMATT**

| Adaptation | Example quote(s)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Survive    | <p>"I came from [a community college] after I had a long break. I graduated high school in 2005. I went to community college and college off and on for a decade before I finally went full bore and actually committed to getting a degree. At the community college, I had a solid group of people that I knew who were in all of my classes. And here you go to Gen Chem, you go to Organic Chemistry, you go to Physics, and in the standard intro to physics, you have 250 people in your class. There's no getting to know anybody because every time you get in there, the seats are moving, you're sitting next to new people."</p> <p>"I think that having been here for five years, I don't feel like I'm part of the community. And that's a long time to be at [the university] and not feel like you're not part of the community. I feel like departmental communities are very important, I also feel like, in the field that I'm studying, the vast majority of the classes are huge and you don't get office hours one on one. You've got office hours; you're in there with 5–10 other people. You don't get one-on-one attention and therefore you're not building that relationship to your professor, so that when you see them walking down campus, you might say, 'Hi,' but they probably don't remember you, because there's so many students to deal with."</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Thrive     | <p>"Going into these 300 and 400 level physics classes, and then seeing the classes super full, by at the end of the term there was probably only 10 of us and it is a required class. And then having the exams be a take home, I hadn't had an exam be a take home exam. I think I spent about 30 hours on it and thought, I need to change my major, I just spent 30 hours on a take home exam. So, it was nice to have the [SIP], have my [SIP] mentor, talk to them and hear their experiences about their classes and be like 'Oh, it is not just me. This is kind of like a normal thing.' And just talking to my classmates and realizing that they are feeling the same way. Yeah. It was a rough transition, but it was nice to have people to be able to talk to, otherwise I don't know that I would have made it through. I would have been like, I'm changing majors."</p> <p>"I would never speak to any of my professors. They don't care about me. I'm one person in a lecture hall of 300 kind of thing. I was very nervous about that. Knowing that I would have all of the [SIP peers] was very nice to know that I could come to you guys and be like, 'Hey, are you also dying or how is it going there?' I think probably a couple months after the fall term started, that sort of went away and it went back to, 'All right, cool. You can do this.'"</p> <p>"The transferring from [the community college] to [the university] was a really big jump. It was hard, but I did it. Yeah. It felt like I was dying the whole time, but I made it. Since I got into upper division, honestly, it's been a lot better than that first term. That first term was really hard and I think I've gotten a lot more used to it. I have a good system. I just went to my instructor's office hours all of the time. I just go talk to them when I'm confused about something."</p> |

of which characteristics contribute to a transition experience that supports a thrive adaptation will allow us to help students through that transition in meaningful ways.

### Adaptation: Thriving vs. Surviving

The AMATT highlights the many varied inputs involved in a community college students' adaptation to the transition. We saw a clear qualitative difference among our participants: some were thriving, while others were simply surviving. Students who had more alignment with the thrive adaptation seemed to have more supports in place, both academically and socially. Having more supports may provide a critical buffer, giving students something to lean on or someone to turn to when they face barriers to persistence. One student discussed how having communities within the university helped in getting through a particularly difficult course, while others discussed receiving academic support from faculty and their peers:

"I don't think I would have been able to survive my first year of organic chemistry had it not been for my [research group] or even the [SIP] alone, having a place where I can just let go and be myself and not be scared."

"I would always hear my math teacher say, 'If this office hour doesn't work for you, email me and I'll find another one that works for you.' Also, my classmates, I would form friendships with my classmates, too. We'd email and text about, 'Did you get this as the answer?' 'No, I didn't.' 'Well, then let's troubleshoot why we're getting two answers.'"

The students who were more aligned with characteristics of surviving expressed a lack of quality supports to lean upon. For example, one student explains a lack of social support, and another describes a lack of quality academic support:

"I'm 27, so much older than most people in my classes. I'm paired up with these students who are 18 and 19. My life experiences are just so different from theirs and I just don't feel like we have very much in common. And my first semester that was just very daunting."

"I just found out two days ago that I needed a prerequisite course that I could've taken this term if I was given the right information. And instead, I am passing up a job that pays very well for the summer so I can take one prerequisite course so that I don't get my graduation date delayed by a year."

Students who are simply surviving the adaptation to the university may be more vulnerable to barriers to persistence. They may also not be able to take advantage of opportunities that contribute to a thrive adaptation or that will help them succeed beyond college. One student discussed financial barriers to participation:

"I mean I'd love to be more involved and do more campus stuff but realistically that's not doable for my financial situation."

Further research is needed to better interrogate and understand the paths leading to survive and thrive adaptations and how these different ways of adapting impact students in the long run, to graduation and beyond.

## Adapting in STEM

While Schlossberg's model is useful in describing the general experience of adapting to a life transition, having a model for STEM community college transfer students' adaptation to the 4-year university allows for a deeper understanding of the characteristics impacting these students. Students pursuing a STEM degree already face many barriers, and transferring midway through this journey can compound these barriers (Packard *et al.*, 2012). Individual characteristics in our model that are fundamental to the STEM student experience—including their perceptions of scientists and their individual science identity, self-efficacy, and sense of belonging—have proven to be key elements to persistence in STEM fields (Estrada *et al.*, 2011; Estrada *et al.*, 2018; Rainey *et al.*, 2018; Simon *et al.*, 2015; Strayhorn, 2018). The students who expressed these factors more readily also appeared to be more closely aligned with a thrive adaptation. We believe that, if universities and community colleges alike can intentionally focus on bolstering the factors in the AMATT (Figure 2) that tend to lead to a thriving adaptation, more students may have the chance to persist to graduation posttransition.

## Leveraging Structured STEM Support Programs

Because we conducted and analyzed focus groups with community college transfer students both supported by SIPs and not supported by SIPs, we were able to clearly detect and begin to understand differences in their experiences. The experiences that SIP and non-SIP students discussed regarding their transitions and adaptations, were at times viscerally different between the groups. Understanding these differences may allow us to leverage the support provided by SIPs and find ways to facilitate thriving for more community college transfer students.

Both SIP and non-SIP participants revealed several negative transition experiences and that these experiences caused them a high degree of stress. This suggests that being part of a SIP does not necessarily eliminate “transfer shock” but instead may provide students with the tools to better cope with challenges experienced at the university and promote a quicker, more robust adaptation.

“I had a very rough transfer and I think just having the [SIP peers] that I can relate to has been nice and we have been together through all three terms. And then having [SIP mentors] as well, I don't know, it's kind of a reason to stay.”—SIP participant

SIP participants readily discussed positive environmental characteristics that aligned with the thrive adaptation, including institutional supports and interpersonal support systems, whereas more non-SIP participants were prone to explaining a lack of quality supports—in particular, a lack of social and emotional support. In fact, we did not code focus groups with SIP participants as discussing a lack of emotional support. SIP participants more frequently discussed having feelings of morale regarding the university. Conversely, non-SIP participants framed the university as their “default” option and noted that they did not have a choice regarding where they could attend. SIP participants also discussed their identities as a member of an SIP and how this supported the development of their science identity, sense of belonging, and self-efficacy. These factors

seemed to contribute to a thrive adaptation, whereas, non-SIP participants more often discussed that they did not always feel the need to belong to the university.

“I definitely think going through the [SIP program] really helped introduce me to all the resources that are available for me, both on campus and even outside of campus. Having this group, I call them my tribe, my tribe of people who are like minded that we can talk to outside of class and debrief. And they are just there for moral and emotional support. Which for me is the most important part. I get so tied up in my inferiority complex, like I'm not good enough, I don't belong here, I should just quit. It is just nice to have people who are in the same boat as you, who can tell you ‘No, you are doing fine.’”—SIP participant

“Being in the [SIP] has definitely opened up a lot of doors for me here at [the university]. It has also made me feel like a part of [the university]. Talking to some of my other classmates who aren't in a program like this, I feel like they kind of feel lost and don't have a drive and aren't doing as well. It's not that they aren't smart, it is just that they maybe lose their focus a little bit. So being in a [SIP] is really nice, because it helps to guide me and remind me of where I am headed.”—SIP participant

“I feel like feeling supported is more important to me than feeling like I'm in the community.”—Non-SIP participant

“Honestly, I don't care about free ice cream socials or whatever. I'm glad that it's there for other people who enjoy it but I'm not 18. I've already been through the workforce. I just want to get really good grades and then go get a good paycheck.”—Non-SIP participant

By examining the differences between students' experiences and affordances, we can begin to understand what types of support may facilitate a thrive adaptation for community college transfer students, even if they do not have specific programmatic support. It is critical to see these often ephemeral, yet impactful interventions as opportunities for learning, growth, and institutionalization of the aspects that appear to facilitate student success at individual institutions.

## Limitations

There are several limitations to our study in addition to the demographic representation discussed earlier (*Participants*). First, this study was not initially designed around the human adaptation to transitions theory, but instead this framework was deemed suitable during the data analysis stage after data collection occurred. Second, this study describes the collective experience of a subset of self-selecting students and therefore is not representative of all students at our university or other institutions. Third, while we intentionally designed the focus groups to separate SIP and non-SIP students, this may have led to SIP students sharing more, as they might have been familiar and comfortable with other participants due to their participation in the same programs; conversely, this may have also caused SIP participants to hold back from openly sharing their experiences if they were concerned about future interactions with other participants. Fourth, while we intentionally conducted focus groups to understand the collective transfer student experience,

we recognize that there are limitations to focus group data. Those limitations include that some students may not have spoken up due to the group dynamics or may not have answered every question posed by the facilitators (Parker and Titter, 2006). Finally, our research is not representative of students who did not adapt to the transition or students who left college, as they all were currently “adapting.” Studying an attrition group with the AMATT, thus identifying a new pathway of non-adaptation, could lead to key insights, such as when survive characteristics outweigh thrive characteristics to a student's detriment. Equipping the AMATT with such an additional pathway could be highly informative.

## CONCLUSION

STEM students transferring from a community college to a 4-year university face a complex transition wherein many characteristics will contribute to their ability or inability to adapt. This adaptation may also look different for students depending on any number of factors. While community college transfer students can cope with the transition to a university and survive, all students deserve to have access to the support that they need to thrive. Helping students adapt in a way that allows them to thrive may lead to better student retention and could help set students up for success beyond the university. This work centers and leverages the student voice to supplement a growing understanding of STEM community college students' pathways to the 4-year university and provides a model for practitioners who aim to better support the transfer student experience.

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