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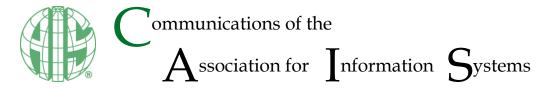Follow this and additional works at: https://aisel.aisnet.org/cais

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Abstract:

Increasing the enrollment of women, minority, and other underrepresented populations in undergraduate information systems and computing programs is an important social issue. We explore ways of attracting and retaining community college transfer students—an important source of underrepresented students—by examining their sensemaking efforts as they transition to four-year universities. We conducted a qualitative study to test sensemaking theory and develop recommendations for retaining community college transfer students in undergraduate information systems, computer science, and computer engineering programs.

Keywords: IS Education, IT Workforce, Community College Transition, Sensemaking, Underrepresented Populations.

1 Introduction

Demand for graduates in information systems, computer science, and computer engineering (IS/CS/CE) rises every year. Employment opportunities are expected to grow 22 percent in software development, 25 percent in computer systems analysis, and 37 percent in information security analysis between 2012 and 2022 (U.S. Bureau of Labor Statistics, 2015). While a two-fold increase in undergraduate IS/CS/CE programs since 2009 has partially met this demand (Zweben & Bizot, 2016), "alarming projections of shortages…of skilled IT workers" remain (Windeler & Riemenschneider, 2016, p. 157).

One answer to these shortages lies in increasing how many individuals from underrepresented populations enroll in such programs (Granger, Dick, Luftman, Van Slyke, & Watson, 2007; Windeler & Riemenschneider, 2016). Increasing IT workforce diversity has additional benefits for organizations as well, such as "enhanced abilities to perform tasks, greater creativity, and better decisions and outcomes" (Klawe, Whitney, & Simard, 2009, p. 68). Yet, despite this opportunity, the percentage of IS/CS/CE bachelor degrees awarded to underrepresented populations has remained largely static. For example, bachelor degrees awarded in 2009 vis-à-vis 2015 increased only from 13.4 to 16.4 percent for women and 11.3 to 15.5 percent for non-Asian minorities (Zweben, 2011; Zweben & Bizot, 2016).

Community colleges provide a potential solution because they serve as "an educational pipeline for underrepresented minorities entering the higher education system" (Mattis & Sislin, 2005, p. 5). However, difficulties in the community college to university (CCU) transition—often referred to collectively as "transfer shock" (Townsend, 1995; Laanan, 1996)—create roadblocks for transfer students and, in turn, thwart attempts to increase the number and diversity of IS/CS/CE graduates. Consequently, transfer shock has become an object of considerable research. For example, studies indicate community college students are less likely to attain a bachelor's degree than those who enter universities in their freshman year. Alfonso (2006) suggests the community college experience may engender lower expectations of achieving a bachelor's degree as compared to the first two-year experience at four-year institutions.

Understanding transition difficulties may shed light on ways to increase the number of IS/CS/CE graduates. While CCU transition research has focused largely on personal characteristics such as gender, ethnicity, and GPA, few studies have investigated how transfer students actually go about the transition process. Townsend and Wilson (2006) note that "Future research could also pinpoint more precisely students' efforts to integrate themselves socially and academically" (p. 451) and add that student fit in a new university is "a complex matter that depends on the student's entering characteristics, the nature of the institution, and the student's amount and kinds of interactions within the institution, as well as the student's desired goals and outcomes of college attendance" (p. 454). This paucity of research is problematic because, if IS/CS/CE faculty and advisors do not appreciate how their students understand the CCU transition, they may make recommendations that do not address students' problems or fail to make those that do. Incorrectly advising students does not help to effectively retain these students and wastes faculty time and effort.

In this study, we address this problem by investigating how students "make sense" of the CCU transition. Following related research in underrepresented populations (e.g., Craig, 2015; Trauth, 2013), we ground our research in theory—particularly sensemaking theory (e.g., Weick, 1995). Longitudinal interviews of community college transfer students provided our primary source of data.

The paper proceeds as follows. In Section 2, we discuss our implementation of the Broadening Participation in Computing Program (BPC), a National Science Foundation (NSF)-funded program designed to attract underrepresented populations into IS/CS/CE programs. Our study builds on the BPC program by examining the retention and performance of BPC students in university-level IS/CS/CE programs. In Section 3, we review the sensemaking literature to explore the sensemaking approach to this topic. In Section 4, we describe our research methodology. In Section 5, we discuss our findings and practical implications. Finally, in Section 6, we conclude the paper.

2 The Broadening Participation in Computing (BPC) Program

Our implementation of the BPC program was based on an assessment by the program team, a group of information systems, computer science, and related faculty who were interested in the need to increase recruitment and retention rates in their respective degree programs. Attracting and retaining female and minority students was an important program goal. The program team developed the BPC program after several years of planning and grant development. On receiving a National Science Foundation (NSF) grant, the program team offered BPC summer programs to freshman community college students in 2010, 2011,

and 2012. The courses were offered at the main campus of a large university—herein called "State University"—located in the southeastern United States. Each summer program lasted about one month and comprised two daily, university-level, one-credit-hour courses: a morning iPhone/iPod Touch programming course and an afternoon course on leadership experience in computing. The latter course covered a variety of topics, including computing careers, leadership, teamwork, time management, study skills, and computing degree requirements. Students attended only one BPC summer program.

About 60 students, 54 of whom were community college students, participated in the BPC program over its three-year lifespan. Twenty-five of those community college (CC) students transferred to State University. Table 1 displays the academic performance statistics for those 25 students.

Table 1. Academic Performance Statistics for BPC Program Students Who Transferred to State University

Graduated from State University	Major (number of students)	Average CC GPA[1]	Final State University GPA[1,2]	Difference between average State University and CC GPAs	Avg. semesters attended at State University after BPC program[1,3]
Yes	IS (5)	3.24 (0.72)	2.86 (0.26)	-0.38	8.0 (3.2)
	CS/CE (6)	3.06 (0.23)	2.82 (0.36)	-0.24	6.3 (1.8)
	Other (5)	3.32 (0.66)	2.99 (0.50)	-0.33	8.4 (1.5)
No	IS (0)	NA	NA	NA	NA
	CS/CE (5)	2.47 (0.64)	1.65 (0.47)	-0.82	3.4 (2.8)
	Other (4)	3.01 (0.46)	1.67 (0.24)	-1.34	5.5 (3.3)

[1] Standard deviation displayed in parentheses.
[2] Does not include grades from transferred community college coursework.
[3] Includes summer sessions.

Though not by design, the BPC program team developed the program in a manner that followed various steps from the stages of concern about innovation framework and the concern based adoption model (CBAM) (e.g., Hall, George, & Rutherford, 1997; Anderson, 1997)[1]. For example, the team knew about the need to increase recruitment and retention rates for all IS/CS/CE students but particularly for minority students. The team then developed a plan to manage a NSF-funded initiative to attract minority and other students. The team collaborated not only among themselves as they developed their multi-discipline program but also with senior personnel from three community colleges. Consequence efforts (i.e., actions based on concerns about the impact of change) are evidenced in two ways. First, follow-up qualitative research explored the challenges the community college transfer students encountered and addressed as they transitioned to university life. Second, the team now reports on the results of that research in order to improve future educational programs.

Thus, the stages of concern about innovation framework may provide a potential roadmap for other IS/CS/CE programs that seek to improve their recruitment and retention efforts. Other CBAM concepts (e.g., levels of use and innovation configurations; Anderson, 1997) may also prove helpful in such efforts.

3 Theoretical Framework

Life is without meaning. You bring the meaning to it. The meaning of life is whatever you ascribe it to be.
(Joseph Campbell)[2]

"Sensemaking", notes Weick (1995), "is well named because, literally, it means the making of sense" (p. 4). It entails a variety of cognitive processes, including structuring the unknown, "placing stimuli into some sort of framework" (p. 4), and attributing meaning to events. Organizational sensemaking applies to the CCU transition for several reasons. First, the CCU transition occurs in an organizational environment. New members (i.e., transfer students) come to understand their new environments and exhibit key membership characteristics (e.g., students have rights and responsibilities, particularly regarding obedience to university rules and regulations) (Masterson & Stamper, 2003). Second, sensemaking helps explain "influence processes that serve to create and legitimate the meaning of the change" (Gioia, Thomas, Clark, &

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[1] We thank an anonymous reviewer for this observation.
[2] This and other quotes by Joseph Campbell about the "hero's journey" come from Osbon (1991).

Chittipeddi, 1994, p. 364). Researchers have used sensemaking to study a variety of changes, including ongoing changes in mental frameworks, how individuals influence and are influenced by their environments, and even identity construction (Seligman, 2006). Effective sensemaking facilitates change efforts by providing positive cues to organization members and other stakeholders (Maitlis & Christianson, 2014).

We used Weick's (1995) seven sensemaking properties (Table 2) as a lens to better understand transfer students' cognitive, affective, and conative patterns during the transition process. To the best of our knowledge, researchers have not applied the sensemaking approach to study the CCU transition to IS/CS/CE university programs. Specifically, we address the following research question (RQ):

RQ: What specific sensemaking properties do community college students exhibit as they transition from community college to university environments?

Table 2. Weick's (1995) Sensemaking Properties

Property	Definition
Identity construction	"Seeking and maintaining a positive cognitive and affective state about the self" (p. 20).
Social	Acknowledges that "sensemaking is never solitary because what a person does internally is contingent on others" (p. 40).
Ongoing situations	"The ways in which people chop moments out of continuous flows and extract cues from those moments" (p. 43).
Enacting sensible environments	"Preserve[s] the fact that…people often produce part of the environment they face (Pondy & Mitroff, 1979, p. 17)" (p. 30).
Retrospection	"Derives from Schutz's (1967) analysis of 'meaningful lived experience.' The key word in that phrase, *lived*, is stated in the past tense to capture the reality that people can know what they are doing only after they have done it" (p. 24).
Extracted cues	"Simple, familiar structures that are seeds from which people develop a larger sense of what may be occurring" (p. 50).
Plausibilities	Explanations that are driven by speed and reasonableness rather than accuracy.

3.1 Research Methodology

3.1.1 Study Sample

We collected longitudinal data using theoretical (i.e., purposive) rather than random sampling (Corbin & Strauss, 2008). The sample comprised 22 interviews from 13 community college transfer students, seven of whom participated in the BPC program. Table 2 displays the demographic and GPA data about our sample.

Table 3. Sample Demographic Data

Item	Counts and other statistics			
Majors	IS/CS/CE, 8; accounting, 2; biological sciences, 1; international business, 1; risk management, 1.			
Gender	Male, 10; female, 3.			
Ethnicity	African-American, 1; Asian-American, 1; White, 10; multi-ethnic/multi-racial, 1.			
Average transfer GPA[1]	3.05 (0.55)			
GPA by semester				
Item	**Time of interview**			
	First semester	**Second semester**	**Third semester**	**Fourth semester**
Sample size	10	7	4	1
University GPA[1]	3.05 (0.55)	2.60 (0.53)	2.42 (0.56)	2.87 (0.00)
[1] Standard deviation displayed in parentheses.				

Interviews typically lasted between 45 minutes to an hour. We planned to interview transfer students in each semester of their junior and senior years[3] (i.e., four sample points for each study participant). However, as with many longitudinal studies, subject attrition was a problem (Table 3). While small, the sample provided sufficient evidence to make important theoretical and practical contributions about the CCU transition.

3.1.2   Interview Methodology

With few exceptions, the first interviews occurred in October or early November of the first semester of students' junior year. We followed several interview guidelines from the literature. At the beginning of each interview, we asked each student to review a shuffled set of index cards that each listed one environment/dimension cell from Flaga's (2006) framework of the CCU transition (Table 4). The student then ranked the cards by importance and discussed the corresponding topics. We used open-ended questions and "thinking aloud" techniques (Ericsson & Simon, 1993, p. 78) to encourage richer descriptions of students' transition experiences. By using these index cards, we could better focus our interview questions on Flaga's (2006) transition framework and mitigate "leading questions" about the subject's sensemaking efforts.

We asked students to explain their feelings and perspectives with specific examples. We provided feedback to ensure we (the interviewers) understood what the student meant (Browne & Rogich, 2001). We recorded, transcribed, and proofread all interviews (Krippendorff, 2004).

Table 4. Flaga's (2006) Framework of Community College to University Transition

Term	Definition
Environment	
Academic	"[Includes] interaction in class, with faculty (both in and out of the classroom), with study groups, advisors, and seeking information on career opportunities" (p. 6).
Social	"[Includes] formal and informal interactions with other students outside of the classroom through student organizations, parties, residence halls, apartment complexes, common areas on campus, and other contacts" (p. 6).
Physical	"Encompasses not only the bricks and mortar of the university, but also the structure in which campus services and departments are organized, campus logistics, overall campus culture, student finances, and parking" (p. 6).
Dimensions	
Learning Resources	"The variety of tools that the student utilized in order to gain information and learn about the campus environment and academic system" (p. 6). Learning resources can be *formal* or *informal* or involve *initiative.* Formal learning resources: "a part of the official structure of [the university], and [includes] orientation, faculty, student affairs professionals, and advisors" (p. 6). Informal learning resources: "[include] individuals who knew a great deal about [the university], such as friends and alumni" (p. 6). Initiative: "the gathering of information on their own [i.e., by the student]" (p. 6).
Connecting	"The development of relationships with others in the academic, social, and physical environments" (p. 6).
Familiarity	Involves not only information internalization, but more importantly "a stronger sense [of] being comfortable with the environment" (p. 9).
Negotiating	Adjusting "behavior and surroundings as necessary in order to be successful within the academic, social, and physical environments" (p. 8).
Integrating	"A developmental change resulting from the students' relation to the three environments" (p. 8) and "can lead to a shift in perception or identity" (p. 9).

We used a coding dictionary (Appendix A) based on Weick's (1995) seven properties of sensemaking to analyze the transcripts. Our working definition of success included positive statements of academic

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[3] For readers unfamiliar with these terms, freshman refers to a first-year student, sophomore to a second-year student, junior to a third-year student, and senior to a fourth-year student. The students entered State University as juniors given their two years of study in community college. We retain the American-centric terms over country-neutral ones since they formed part of how our students conceived of their situation.

achievement, satisfaction, academic and social fit (Berger & Malaney, 2001), and positive social identification and self-image (Flaga, 2006). Following Weick's (1995) statement that the identity construction property "is represented by all statements that include the words *I*, *me*, *mine*, and *myself*" (p. 20, italics in original), we added keywords and synonyms for the other six properties to the dictionary.

We made coding decisions with the aid of a decision tree (Appendix B) based on Weick (1995), the decision tree modeling literature (e.g., Tversky, 1972; Gladwin, 1989; Woodside, Ko, & Huan, 2012), and our judgments and experiences while analyzing the interview data. While researchers have advocated and used decision trees to represent individual and group sensemaking (e.g., Soulier & Caussanel, 2009; Woodside et al., 2012; Woodside & Baxter, 2013), to the best of our knowledge, they have not used them to document the coding and testing decisions that they make as they analyze qualitative data. Our decision tree complements our dictionary by providing insights into how we matched coded qualitative data to our shared interpretations of Weick's (1995) seven sensemaking properties.

We used Atlas.ti to code data into recording/coding and context units (i.e., "units that are distinguished for separate description, transcription, recording, or coding" and "units of textual matter that set limits on the information to be considered in the description of recording units"; Krippendorff, 2013, pp. 100, 101, respectively). Context units contained sufficient information to provide meaningful details. For example, Ajzen and Fishbein's (1980) behavioral elements of action, target, context, and time provided a useful guide for demarcating many context units.

Table 5. Data "Thickness": Coding Counts by Subject, Semester, and Sensemaking Property

Subject	Semester	Identity construction	Social	Ongoing situations	Enacting sensible environments	Retrospection	Extracted cues	Plausibilities	Total
A	1	2	1	2	12	3	0	1	21
B	1	4	3	2	11	2	2	1	25
	2	1	6	3	4	3	3	1	21
	3	2	0	4	1	3	1	0	11
	4	0	4	0	3	1	1	1	10
C[a]	2	3	5	2	2	4	3	0	19
	3	5	0	1	2	0	1	0	9
D[a]	2	4	2	5	2	3	2	0	18
E	1	4	6	6	8	7	6	4	41
	2	6	6	6	2	5	1	0	26
	3	1	0	2	4	0	0	1	8
F	1	5	4	14	7	5	1	5	41
	2	5	0	1	3	6	1	0	16
	3	3	2	1	5	5	0	0	16
G	1	1	2	4	5	5	2	0	19
H[a]	2	7	2	2	0	8	3	0	22
I	1	1	3	3	5	5	2	5	24
J	1	3	3	2	2	1	0	0	11
K	1	1	1	5	3	1	0	1	12
L	1	4	0	5	4	3	2	3	21
M	1	1	0	1	1	0	1	0	4
	2	2	0	1	2	2	0	2	9
Total	--	65	50	72	88	72	32	25	404

[a] Subjects' first interviews occurred during their second semester at State University.

We enhanced the validity of our research in several ways. First, we employed multiple rounds of comparing coder judgments, isolating and resolving differences, and improving the dictionary and decision tree in our

coder-training program. We used interrater reliability (IRR) during these rounds to identify problematic coding practices. At the end of training, we achieved a strong level of interrater reliability as measured by Krippendorff's alpha (i.e., 0.81) using the KALPHA macro (Hayes & Krippendorff, 2007) in IBM SPSS Statistics version 24. Second, we assessed the thickness of our data set (Geertz, 1973) and found that sensemaking efforts were sufficiently spread across all subjects (see Table 5 above). Participants provided rich descriptions of their experiences. They sometimes became emotional as they related their frustrations in adapting to their new environments, their fears of failure, and their joy and pride at successfully working through this difficult process. Third, we employed respondent validation by sending a penultimate draft of the manuscript to a subject who we had interviewed three times. That subject stated the draft was a "fair representation of experiences and insights" of the CCU transition.

4   Sensemaking Activities in the CCU Transition

4.1   Sensemaking in the First University Semester

Follow your bliss. The heroic life is living the individual *adventure. There is no security in following the call to adventure.* (Joseph Campbell)

4.1.1   Ongoing Situations

A number of students seemed to be trapped in "vu jàdé", which Weick (1993) describes as "the opposite of déjà vu: I've never been here before, I have no idea where I am, and I have no idea who can help me" (p. 633). Some portrayed their first semester in terms of "thrownness"[4] (i.e., Heidegger's concept that "we are thrown into the position of having to take responsibility for ourselves, to ground our respective being-in-the-world, yet we are not responsible for being in this position"; Dahlstrom, 2013, p. 212). Student B, in fact, explicitly described his transition as being "thrown up in the air, I didn't know what was going to happen". Thrownness involved many situations (e.g., being surrounded by strangers or lost on a large campus), but perhaps the most problematic involved the speed, rigor, and workload of university courses. Many attributed these latter difficulties to inadequate preparation at their community college. Student F complained she "didn't really get the basics" in her business statistics course. Student H criticized his community college for taking "a 'leave no child behind' approach…. They generally don't finish all the material they were intending to cover during the semester.". Student E described the ramifications in one of his university classes:

> *[University faculty] already expect you to know stuff from the [prerequisite] course, but the previous course taught at the community college never taught that part. So, now, I'm just at a loss. I don't know what to do. I'm going to have to teach myself like, maybe half a semester's worth of work that…the teacher at the community college didn't teach.*

Strained relationships with university faculty often compounded these challenges. Student L, for example, described an incident in which he asked his calculus instructor for help regarding trigonometric identities. The student stated the faculty's response was, "Well, you should go back and take trig again". Student L then told the interviewer that this advice would cost him another semester of coursework. He then told the interviewer that all he needed was "a handout that helps them work through those problems". He concluded that "it gets kind of discouraging". His last statement suggests that faculty may unwittingly create strains in student relationships that might, in turn, induce unforeseen negative conative attitudes in their students.

Students elaborated on the affective aspects of faculty relationships as well. Student K remarked: "I want to be able to talk to my professors, and I guess, feel comfortable with them. I don't want to feel like they're way up here and I'm, like, way down here and, uh, unapproachable.". Student F's retrospections suggest a different affective relationship, one of fear:

> *Faculty. Well, [sigh], well, I talk to all my teachers on a one-on-one basis because I feel like I should talk to them if I need help.... At first I was kind of [pause] I guess, scared to just go to them. Because it's kind of intimidating because the teachers—I don't know. They're not, they're not mean, or, or, or they're not unapproachable. It's just—you're not used to the teachers, I guess.*

Large class sizes (e.g., of 200 or more students), which the students had not experienced in community college, compounded their difficulties in getting to know their professors. Like several other students, student

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[4] "Thrownness" is often spelled "throwness" in the literature. We use the former, more popular spelling.

B's largest community college classes had only about 30 students. Being thrown into large classes created a number of roadblocks as student A described:

> Some of the classes are so big that you can't actually go to the teacher and get something done. You have to go to them, and then go to the TA, and then sometimes, once you get to the TA, you have to go back to the teacher and that, this, I don't know [frustrated pause]. That really—it's troublesome at times.

Student C echoed these feelings in describing why it was more difficult to connect with university faculty:

> At community college, you can just go to your teacher anytime, or it's easier to connect with them because they don't have as many students…. And you see them. You see them around campus even when they're not in class. But here, you have to really go to their office during their office hours…. All my teachers do email back pretty quickly, but since they have so much more to do, you don't have that closer connection that you did at community college.

In spite of the challenges, two students showed progress in developing faculty relationships that semester. Student F described a change in her perspective on the affective quality of her relationships with faculty over time: "Once you talk to them, they're great". The change was also reflected in a greater appreciation of the value of the seriousness in both her new faculty and the overall university culture. When asked how she felt about the increased seriousness, student F reflected on the motivational effects of her feelings:

> Seriousness? Yes, it's important, because it's my life. It's my career. But, I don't think it's a bad thing because if you're not serious about it, then you're not going to do well. So, I appreciate the seriousness. I just wish I ought to have taken it more seriously in community college.

Student B showed similar signs of progress. For him, seriousness transcended to other aspects of university academics (in particular, attending classes and using State University's learning management system (LMS)). He had some experience with the LMS at his community college, but it was not widely used or fully implemented. Consequently, he did not fully appreciate the importance of monitoring State University's LMS. Based on his experiences at his community college, he thought "it was more for [the instructor] and not so much for us". He also thought that "it was just kind of a 'nice to look at it' type of thing and so, I didn't really think it was that useful". He described several related mistakes in using the LMS in one of his classes:

> I ended up missing the Tuesday class, uh, two times in a row, and it wasn't very good because it was during [an archrival] football week. So I looked on [the LMS], I emailed my teacher, did the right thing as far as being responsible for missing your things. I wasn't aware that I had a test coming up the day that I was returning until 2:00 am the night before when I was studying for another test that was on the same day.

He concluded his story with several "lessons learned", including the observations that LMS usage was "definitely more intensive" at the university and that "I'm always having to check those at least once every other day". He also showed candor and honesty when relating this story, which additionally evidences his movement toward a successful transition.

4.1.2   Identity Construction

The difficulties the students faced often made them question not only their readiness for university life but their identity as university vis-à-vis community college students. Student B acknowledged he was "feeling like sort of a freshman" even though he attended the BPC program two summers previously. While he did feel like a university student, he may not have felt like the right *type* of university student. He felt he shared many of the same challenges that freshman did, such as "They're new to campus. They don't know about a whole lot of things.".

Like student B, others described themselves in ways that reflected a more profound concern; were they *really* university students or *still* community college students? Student E, who also attended the BPC program, initially described himself in the interview as a university student, but, later on in the interview, admitted "I still kind of think of myself as a community college student". Student F, who did not attend the BPC program and was not a computing or IS major, experienced a traumatic shock. She had been "very active" in extracurricular activities at her community college—a member of fifteen organizations—and had a part-time job. In addition to all these activities, she was able to maintain a solid A-level grade point average. At State University, however, she was having a tough time earning acceptable grades and had to curtail almost all her extracurricular activities. She said: "In fact that bothers me because I'm used to being active,

but I don't really have the time". This change, framed in her emotional ongoing situation, also took a toll on her self-image as a university student. She explained: "When I made those bad grades, I wasn't used to that, so I couldn't shake that off and progress". She added that the toll was "pretty constant…[though] just not every day". It appeared that this pressure also negatively affected her self-image as an aspiring business professional:

> So, of course, at community college you do well in all your [major] classes and you love it. But here, you're questioning, do I really want to do this? If I'm not happy now doing it, is this something I want to do for the rest of my life? And that's definitely something I'm stressed about, because you don't want to do something just because you're halfway through it when you're not happy.

In short, the students were liminal creatures "suspended between the facts of their present social position and the promise…of their economic future" (Halttunen, 1982, p. 29). Making sense of this new environment and its attendant difficulties often led the students to question whether they had the background and character to achieve their educational aspirations. This self-examination helped set the stage for later sensemaking efforts in their second and third semesters at State University.

4.1.3 Enacting Sensible and Social Environments

The students' descriptions of isolation and conflicted self-identity often differed from how they described their social relations. The comments sometimes reflected the general social atmosphere, such as when student G noticed "people studying outside" (i.e., an extracted cue) that helped him "just get absorbed into [the university] environment". Others noted that friends from community college helped them make sense of their surroundings. Students A and B had attended the BPC program previously and, thus, had an important social network to draw on at the start of their first full semester at State University. Student A noted that the BPC program was "probably the most helpful thing so far I've experienced" and that the most beneficial part of that program was "the group of people we had there". Student A also talked about his roommate who was a community college transfer student with "similar background experiences" and a member of the same college. Student B preferred working by himself but acknowledged the importance of friends from community college who were also in his classes in noting that "[W]e just help each other out". Similarly, student E and his friends enacted a social environment that helped create learning opportunities. He explained how he rectified the problem of learning about material not covered in their community college courses: "me and my friends [i.e., his social network] just kind of either try to read the book or go on YouTube since there's some pretty good tutorials". Indeed, they preferred the Internet's digital media "because they're usually straight to the point" and they could access sufficient content to teach themselves "maybe half a semester's worth of work".

We identified the value of strong social networks in identity construction in those students who did not have such a network. Shyness, introversion, loneliness, and other negative affective feelings compounded this ongoing thrownness. Student K—who admitted being "really shy"—found herself "out of my comfort zone with such a large school and away from family". She said:

> High school was easy because you're with the same people all the time. When you go to college, you're in different majors, you're in different classes, so it's not as easy to form friendships. In community college…. I still was in my hometown, so I still had all my high school friends, but coming here, you don't have that. You don't have your friends from high school, you don't have your family…. I mean, everybody is really friendly. That's not the problem at all. It's just kind of getting past my own [shyness].

While social networks often provided the students with opportunities for enacting the university environment (e.g., through informal study groups and information exchange), they did not always find it easy to take advantage of such opportunities. For example, student F had friends from her community college at State University, but she felt asking them for help was an imposition. Such feelings, in turn, had both positive and negative conative effects. On the one hand, negative conative effects resulted from her understanding that her friends were "just as busy as I am" and did not "have time just to sit down and say, 'Well, this is how you do this, this, this'". On the other hand, her understanding had positive conative effects in that it motivated her to read the chapters by herself. Yet, in spite of these positive conative effects, student F was stymied in her studying due to her CC experience: "sometimes I just don't get it because I haven't had the basics [at my community college]".

4.1.4   Retrospection

All students engaged in retrospection during their first interview. Student B reflected on the folly of missing classes and the wisdom of directing more attention to the LMS. Student G's comparing his past experience (i.e., "back there [at community college] we didn't have anything as technical writing") to his subsequent realization about "the importance that technical writing really has to offer to [computer] engineering students like us" represents retrospection well. However, perhaps the most poignant example—one of critical importance to the study—came from student F. She began by describing her difficulties in coping with the stress of transition:

> **Student F**: *Like some people just—instead of worrying about it, they'll just go off to a party, or something. But me, I'll just keep trying to get it to the point where, maybe, it's—I'm doing too much.*

> **Interviewer**: *How well do you think you're adapting, or managing your stress?*

> **Student F**: *Um, not as, not as good as I should. But I think it'll get better. But now, I'm not managing it well. I know school is supposed to be stressful, but not to the point where it overwhelms you.*

> **Interviewer**: *Are there any resources out that might help you with stress?*

> **Student F**: *I think so. It's the, um, the university—is it called counseling services, I believe? I have a little brochure about it, but I haven't had the time to just go and talk to them.*

> **Interviewer**: *Yeah. You've been stressed so much you don't have time to go…*

> **Student F**: *[smiling] I don't have time to go talk about it.*

At this point, the interviewer realized that the student needed help and that her personal needs superseded those of the research project. The interviewer then modified the research design by employing an action research approach to solve the student's immediate practical problems while simultaneously contributing to the project's scientific goals (Rapoport, 1970). The interviewer and student F then discussed options and university counseling resources. From a sensemaking position, the student had engaged in retrospection prior to the interview. She realized she was not managing stress well and needed help. Moreover, she realized she had to change. She formulated plausible solutions by obtaining the brochure from counseling services. These outcomes were all positive because they constituted a plausible understanding that could direct her from the unacceptable status quo to an improved university experience.

We later realized during our coding and analysis that our action research approach employed *sensegiving* (i.e., "the process of attempting to influence the sensemaking and meaning construction of others toward a preferred redefinition of organizational reality"; Gioia & Chittipeddi, 1991, p. 442). Moreover, the sensegiving tool facilitated the interviewer's efforts to assess the situation and offer some advice about the university's "organizational reality" (Gioia & Chittipeddi, 1991:442). This insight also provided a means to tie our research results to practice.

4.1.5   Summary of the First Semester

Weick's (1995) seven sensemaking properties provided a lens to view the students' developing understanding of the CCU transition. All the students were identifying problems and developing plausible solutions. Moreover, they described their sensemaking efforts in terms that paralleled Campbell's (1990) triad of honesty, trust, and self-respect. Their descriptions also suggest their sensemaking efforts were associated with cognition, affect, and conation. However, several students appeared to fixate on certain problems for which they saw no plausible solutions. We examined this fixation in the interviews from the second semester.

4.2   Sensemaking in the Second Semester

> *The very cave you are afraid to enter turns out to be the source of what you are looking for. The damned thing in the cave that was so dreaded has become the center.* (Joseph Campbell)

During their second interviews, students discussed ways in which they had not only made sense of their new university environments but also used those understandings to enact that environment. However, these sensemaking efforts did not always direct students towards resolutions to the challenges they confronted.

4.2.1   Ongoing Situations

Some students described sensemaking efforts that we interpreted as a forward path in the ongoing transition process. In some cases, a resolution of past problems and a focus on new ones evidenced this positivity. Student B described some adjustments he made as his classes got harder and their workloads increased: "I've been having a small amount of difficulty [in determining] how much time I want to put toward one class as I do toward another". He also felt "a little more stressed" than in his first semester because he had "a lot more things that are always constantly due". He also had to adjust his study habits to accommodate course schedule changes.

Student F continued to build and adjust her plausible understandings from the first semester. Although she did not go to the counseling center after the first semester's interview, she did attend other workshops on leadership and financial planning, topics she regarded as "helping now, personally". Moreover, she stated "those things aren't going to be usually available at a community college". She also changed the tone of her interview in that she framed her experience almost as advice rather than as an explanation (e.g., by using phrases such as "you have to"). When asked if she had anything to say about State University's academic environment, she replied that it did have academic achievement resources but students had to be motivated to use them (e.g., "You just have to take the initiative"). She also appreciated the students who worked at the help center and the comforting affective environment they engendered as opposed to the one that faculty—perhaps unintentionally—engendered:

> A professor can be intimidating when they're standing over you telling you this or that. But when you have someone your age that's helping you and kind of your peers, I think you feel a little more comfortable…. It's not as intimidating.

Student E, on the other hand, was still recovering from a "rough" first semester and trying to cope with the rigor and content of his university courses. In the first semester, he attributed his problems to differences in course content coverage between the community college and university. In the second semester, however, his plausible explanation of the "rigor" problem shifted to university faculty's poor quality: "There's some [State University] instructors that really like the subject, but honestly, I don't know if they—not to be insulting, but if they know how to teach it well". For student E, this combination of an instructor's "being really enthusiastic about the subject" and "not being able to teach it well" produced lectures that were sometimes "off-the-wall or something incredibly difficult".

Like other students, student E created plausible (but not necessarily accurate) explanations for his circumstances in the university environment. Unlike those of other students, student E's plausible explanations prioritized his self-identity over a successful transition. Unlike those of other interviewees, his retrospections portrayed community college as the better environment. In particular, he felt community colleges had better teachers and more practical courses. In short, he projected a positive self-image (i.e., identity construction) by attributing his problems to university faculty and course design rather than to himself. Student E's story contrasts sharply with student F's. She wished that community college teachers were harder on their students in order to better prepare them for university coursework. It also contrasts with student B's admission of freshman-like behavior and his attempts to change his ways. Student E's interview then turned to how he might motivate himself to improve his academic performance.

> **Interviewer**: Now that you're in this environment, what are you going to do?
>
> **Student E**: Just try adjusting as best I can.
>
> **Interviewer**: How do you think you might do that?
>
> **Student E**: Uh, [pause] I'm not too sure. It's just I have to pull through, that's all I can do.
>
> **Interviewer**: There's nothing that you could do as far as changing your behavior?
>
> **Student E**: I guess it's with my personality. If I don't think it's interesting, or like pertains to my interests, then I just won't—like I can't learn it. So like with, uh, all the theoretical classes, it's an instant, "I don't see the point of this. Why should I learn it?". So it's—I guess, it's just that it's hard to change habits like that.

Student E was definitely sensemaking. He generated plausible explanations for his current predicament (e.g., teachers cannot teach, he cannot change). However, he displayed an inability to direct sensemaking in a positive, problem-solving direction. For example, he expressed reluctant and even negative conative

attitudes toward plausible solutions (e.g., "I have to pull through, that's all I can do."; "Why should I learn it?"). He added the following justification for such attitudes:

> If I try to put all of my priority into those theoretical classes, all the classes that I'd actually do well in would take a huge drop. Then my GPA would probably shoot down more. So, I just try to pay attention to those classes as much as I need to, and then put the rest of my attention where I can actually do well so it's minimal damage.

Unfortunately, his sensemaking efforts constrained opportunities for a more effective transition in two ways. First, unlike student F's solution that offered a potential escape from her unacceptable situation, student E's story simply circled him back to the status quo rather to a better horizon. It appears similar to Weick's (1993) analysis of the Mann Gulch fire in which "people were unable to negotiate strangeness" and "[f]rameworks and meanings destroyed rather than constructed one another" (p. 645). Second, student E's relationships with faculty did not appear to embody the trust, honesty, and communication patterns that one needs for sensemaking in group and organizational environments (Campbell, 1990; Ginnett, 1993; Weick, 1993).

As a result, the interviewer again employed sensegiving in an action research approach to help the student improve his faculty relationships. The interviewer tried to avoid personal criticisms and instead opted for more palatable advice. For example, he suggested the student should 1) meet with professors before the start of classes to demonstrate his seriousness about improving his academic performance and 2) emphasize that his problems lay with course content, not the professors. Student E agreed and said "I'll try that next semester when I can".

4.2.2 Identity Construction and Retrospection

Ongoing situations in the second semester appeared to concern identity constructions that were more contextualized to the university environment. For example, student F described how she began to think of herself not only as a university student rather than as a community college student but also as something more (see Appendix C). She engaged in retrospection to make sense of herself in this new, more rigorous environment. She put a positive spin on her predicament and noted that, in the end, it made her a better person. Her candor and honesty regarding her admission of failure lends credence to her story. Student D's experience during her first semester, while somewhat different, ended with similar result:

> That time I was very different. I didn't really have to worry. I never really had much to worry about. So after this past semester, it was just a big blow. But...I think that semester was very important because it really helped me adjust and know what I needed to expect for the next time. That helped a lot, being comfortable with my surroundings at that point. I was never trying [my first] semester.

Retrospective assessments of faculty relationships indicated improvement for many students. Several remarked favorably about university faculty. Students C and H noted university faculty were "a lot more dedicated" and "much, much more attentive", respectively, than those at their community colleges. Student D was impressed that his instructor for a large auditorium class knew him "on a name-to-name basis". On the other hand, some students still had difficulties with faculty relationships. Student H had problems contacting instructors outside of class much more so than during the BPC program. Other students offered nuanced, plausible explanations in their retrospective stories. Student M admitted that his difficulties arose because "I stay inside a shell" and faculty's inaccessibility was "all in my head". Even student E—who had complained that his community college instructors were better than those at State University—confessed, "I guess it's probably just—well, mostly just me" when he was asked what the university could do to help him with his coursework.

4.2.3 Summary of the Second Semester

The students displayed a range of efforts to make sense of and bring meaning to their university lives. Students B and E struggled with identity construction. Student B faced a focused "either-or" battle as he confronted the duality of his feelings of liminality: was he a freshman or a junior? Student F struggled with the deeper meanings of her self-identity: was she "just" a university student or something more? Unlike the internal struggles of the other students, student E confronted an external foe: how to slay the dragon of theory-based classes? He, like student M, began to grasp the internal nature of his problematic affective and conative relationships with faculty.

In contrast to results from the first semester that highlight the value of a generalizable sensemaking approach to gauging students' progress through the CCU transition, results from the second semester suggest that the students engaged in distinct individual struggles (Trauth, Quesenberry, & Morgan, 2004) in which they dealt with the transition in their own individual ways. This variation is important because it underlies the significance of understanding the unique, individual nature of each student's heroic journey (Campbell, 2008) through the CCU transition.

4.3   Sensemaking in the Third Semester

It is by going down into the abyss that we recover the treasures of life. Where you stumble, there lies your treasure. (Joseph Campbell)

During their third interviews, three of the four remaining students discussed ways in which they had not only made sense of their new university environments but had acted on those sensemaking efforts in ways that helped them realize their transition to the university. All three recounted the successes they had achieved in the transition albeit in varying degrees across a variety of topics.

4.3.1   Ongoing Situations

Three of the four students who gave interviews in their third semesters reported that things went better in that semester. Student B had an A average, while students E and F had a B average. Student E finally appeared to be heading in a positive direction. When asked if he felt comfortable, he replied, "Yeah". When asked, "Do you think of yourself as a Bulldog now?" (i.e., the university mascot), he replied, "Yeah, pretty much". He also mentioned he was looking for internships and had signed up for the university's study-abroad program. The interviewer then inquired about his progress with theory classes. He said he was "still having a problem" with them but added:

> So I have to really, really try to understand it. It's way over my head [moves hand across top of head]. Yeah, I mean, uh, like some of my major classes are kind of theoretical, but they can be applied in real-world situations so that I can understand that a little easier. Just as long as I can apply it then I can understand it.

His understanding that his theoretical classes "can be applied to real world situations" and that he had to "really, really try" appear to be significant cognitive and conative milestones for him even though they were not a complete breakthrough.

Student B seemed to be transitioning faster because he faced more mundane challenges. He perhaps experienced this advantage due to the BPC program. He had just moved off campus before the third semester at the university and was coping with the demands of commuting. Student F had made substantial progress. When asked how things had been going, she replied, "It has been good!". Her descriptions changed from begrudging acceptance in the second semester to relaxed contentment in the third:

> **Student F**: *Last semester I still felt disconnected a little bit. But this semester is just—I feel comfortable, at ease. You know how you can go somewhere and you just feel like you're there, but you're really not there? But this semester, I can just come in [to the classroom building] and I just feel at ease, at peace, and I enjoy it.*
>
> **Interviewer**: *Did you NOT enjoy it before, or is it just something that…?*
>
> **Student F**: *It was more routine for me…. I knew I had to be there, but it really wasn't enjoyable for me. I just did it because I knew I had to do it. But when it's something [that] interests you, you enjoy it more.*

The fourth student, whose GPA had fallen to a D, was less forthcoming in the interview. One potential trouble spot was the student's preference for online academic resources rather than lecture material. The student then explained that teachers used "really long, drawn-out sentences to describe something", whereas online videos "get straight to the point and that's all you need to know". The student offered other personal details that helped explain the declining performance, but we omit them in order to protect the student's identity.

4.3.2   Identity Construction in Social Environments

You find the jewel, and it draws you off… The goal is to bring the jewel back to the world. (Joseph Campbell)

A particularly interesting finding in the third semester was that two of the students began to give back to others. These patterns contrasted with their feelings of isolation and loneliness in the first and second semesters. For example, in his second semester, student B spent quite a bit of time seeking help in group study sessions. In the third semester, however, he felt like he could better contribute to group projects. For example, student B relayed the following story about his efforts to resolve some difficulties the group was having with a particular group member:

> [The other group member] appeared very tired, so we told him just go on home…. And then we started going through his code. None of it was documented and we didn't know what was going on there. Some people were talking about just throwing it out and I was like, "Well, you know I've taken reverse engineering; surely, I could figure this out". So, I went through there for, I don't know, about an hour and then I just documented all his code. And everybody was like, "I don't know how you did that, but fantastic! You probably just saved us a lot of time!".

Student F had a somewhat similar experience. She signed up for an internship and described a closer identification with State University. When asked "Do you feel like a Bulldog?", she replied:

> I do. At first, I just—[pause] I didn't. But I feel like I'm a part of State [University]…. I feel like I'm a Bulldog. But when I first got here, I was like, "I'm just one out of a number" or "I'm just here". But [now] I know that I'm a part of something.

Student F also mentioned at the end of the interview that she was tutoring a transfer student:

> She actually went to community college and she transferred this semester…. I told her to make sure she always puts her classwork first and if I can help her steer away from something that I did, then that will help her in the long run as well…. She doesn't have to go through what I went through.

5 Discussion

Our research suggests that sensemaking and sensegiving represent useful approaches to mitigating CCU transition problems because they provide a *general* lens through which faculty and advisors can better understand each student's *individual* journey through the CCU transition. In short, the sensemaking lens appears to be a generalizable tool even though the view is not. Student B, for example, seemed to have benefited well from the BPC program by getting an early jump on the transition process. He identified himself as a university student in the first semester, but his stories about missing classes and not paying attention to test dates led to questions about what *type* of university student he was (i.e., freshman or junior?). Identity constructions by students E and F, on the other hand, revolved around the question of *whether or not* they really were university students, an interpretation that their stories of alienation and feeling like community college students evidence. Student E, who appeared to have benefited less from our BPC program, had to overcome his resistance to change. Like student F, he said he often thought of himself more as a community college student than as a university student.

Our results suggest that sensemaking and sensegiving represent useful frameworks for understanding and mentoring transfer students during their CCU transition. Moreover, they provide a means for explaining why business and science students (e.g., information systems and computer science students, respectively), experience significantly higher levels of transfer shock and greater declines in mean GPA than students in other disciplines (Cejda, 1997; Carlan & Byxbe, 2000; Jackson & Laanan, 2015). We discuss these frameworks in Sections 5.1 and 5.2.

5.1 Sensemaking as a Framework for Understanding CCU Transitions

We observed many commonalities across students' sensemaking experiences. Perhaps our most surprising finding is that transfer students do not so commonly share the "common knowledge" about university life that faculty and advisors accept. While it seems reasonable to expect transfer students to know that they must work harder in university courses, monitor their course content delivery websites, become involved in study groups, attend all classes, ask questions of their professors and teaching assistants, and meet other expectations in a university's rigorous academic environment, our results suggest that transfer students often do not know about these accelerated demands. Indeed, many transfer students explained their naiveté resulted from their "laid-back" community college experiences.

Nonetheless, several positive patterns arose from our study. The first positive pattern involved forward- rather than backward-looking perspectives. Forward-looking perspectives included positive cognitive, affective, and conative attitudes, such as trying to solve problems and challenges encountered during transition or looking forward to opportunities such as internships and volunteering. Backward-looking perspectives, such nostalgic recollections to better times in community colleges (e.g., "laid-back" teachers), tended to come from students who had difficulties adjusting to university life. Some students had a mixed perspective. Student E accepted—somewhat reluctantly—the importance of theoretical classes and even broadened his goals to include a study abroad in Japan—something that his community college did not offer. Our results suggest that students who displayed forward-looking perspectives transitioned sooner than those who did not, though both types of students could find the transition difficult.

The second positive pattern concerned enactment. Students who transitioned quicker *did* things: they *walked* around campus to learn the environment, *talked* to friends to discover learning resources, *participated* in study groups, *joined* clubs to expand their social and academic networks, *enrolled* in unique opportunities (e.g., study abroad), *visited* the university's website long before arriving at campus, and "*plowed it out*" to give project groups direction and "[*make*] it all work out" (student B). Action appeared strongly linked to more successful transitions. These associations between constructing an identity and enacting sensible environments not only provide ideas for how universities can support community college transfer students but also support theoretical relationships between these properties that Weick (1995) presents.

The third positive pattern concerned how students confronted feelings of liminality. That is, new arrivals to the university often asked themselves such questions as "Am I a junior or a freshman?", "Am I a university student or a community college student?", or "Do I belong at a university or somewhere else?". Our data suggests these feelings of alienation and/or inadequacy tended to subside in the second or third semester as the students integrated into the university's academic environment. However, this assessment comes from a sample pool of students who remained enrolled in the university and does not include those who left. Thus, our study does not provide evidence of how feelings of alienation may have influenced individuals' decisions to leave the university. Accordingly, we need more research to provide fuller descriptions of the relationships between sensemaking and unsuccessful CCU transitions.

The fourth positive pattern concerned the individuality of each student's transition path. Our results suggest that sensemaking, the "hero's journey" motif, and sensegiving represent useful tools that may help retain CCU transfer students in particular and promote underrepresented student populations in general. Sensemaking provides a tool for examining student transitions, the "hero's journey" motif a means for interpreting changes in a student's sensemaking over time, and sensegiving a way for faculty and advisors to facilitate a student's CCU transition.

5.2   Sensegiving as a Framework for Mentoring Community College Transfer Students

Gioia and Chittipeddi (1991, p. 442) define sensegiving as "the process of attempting to influence the sensemaking and meaning construction of others toward a preferred redefinition of organizational reality". An important finding in our research concerns how transfer students' use of sensemaking properties during the CCU transition can provide university faculty and advisors with important clues into how they can mold their own sensegiving mentoring of transfer students. However, the variety of the above results suggest a "one-size-fits-all" approach to sensegiving may not be appropriate—a conclusion that parallel's Quesenberry and Trauth's (2012) study of career anchors of women in the IT workforce (p. 469).

Despite the variety of sensemaking efforts, some patterns arose that can inform sensegiving efforts. Consistent with sensemaking theory, many of the lessons learned were typically associated with action and, thus, represented in our interviews as verbs (e.g., they *joined* clubs and *enrolled* in unique opportunities). Moreover, such actions were often tied to multiple sensemaking properties. In the paragraphs that follow, we explore the associations between sensemaking's lessons learned and sensegiving's organizational realities.

As we discuss above, we learned that the students did not commonly possess what often passes as "common knowledge" (e.g., do not miss class, find study groups, check the LMS regularly, and learn but do not memorize). Implementing this advice must be framed in the "organizational reality" of limited academic resources (especially faculty time). To do so, faculty might incorporate common knowledge in typical

academic activities. For example, they can highlight the importance of checking the LMS every day and getting an early start on large projects when going over the syllabus on the first day of class.

Incorporating other lessons learned into academic programs would involve more difficulty and/or resources. An important organizational reality is that many university faculty are judged primarily on research and secondarily on teaching. Service work such as supporting CCU transfer students comes in a distant third place. Accordingly, we temper the following recommendations in ways that try to make them sustainable. Those recommendations that require a fair amount of work may better suit institutions that seek to increase their IS undergraduate populations. For example, colleges and IS/CS/CE departments that financially and operationally focus on increasing low undergraduate enrollments could develop summer "IT career camps" (e.g., Downey, Bartczak, Young, & England, 2016) or BPC programs that specifically target transfer students in their freshman or sophomore years. The use of such camps concurs with Koch, Van Slyke, Watson, Wells, and Wilson's (2010) recommendation that such events can be a "key attraction strategy…to increase non-IS majors' awareness of the opportunities in the IS field" (p. 488). Indeed, many of the BPC students remarked on the usefulness of the BPC program. Comments include "[BPC] was probably the most helpful thing so far that I've experienced as far as what's helped me to adjust to things here", "I knew where everything was, so, I definitely felt more comfortable when I got here after the BPC program", and "Really, if I wouldn't have come to the [BPC] program, I wouldn't be at State [University], I can assure you of that".

First, summer course topics related to sensemaking could include career opportunities and professionalism (i.e., identity construction), which would also address the organizational reality of providing qualified graduates to employers and other stakeholders. An important topic would be a "to-do" list of activities (i.e., enactments) that would positively shape students' academic, social, and physical environments. Such activities include exploring campus, visiting important academic resources, and "hanging out" with classmates to share experiences and build trust. Such programs can help students develop interest in both the IS field and in their particular university.

Second, other recommendations concern activities that universities could conduct during regular semesters and pre-existing events. Our results suggest that activities that help transfer students construct a university identity are particularly important. Note that this recommendation does not represent a "cookie-cutter" approach to creating a homogeneous student population. Instead, by participating in such activities, students can create their own individual identity that promotes "a positive cognitive and affective state about the self" and helps them "perceive [themselves] as competent and efficacious" and "sense and experience coherence and continuity" (Erez & Earley, 1993, p. 28). Such efforts can also address organizational realities of building a strong culture that a university can parlay into a supportive alumni population. In addition to the career opportunities and professionalism topics that we mention above, identity-construction activities could include social events tied to university identities (e.g., pre-game tailgate parties). This finding concurs with Koch et al.'s (2010) suggested best practice of using "social events to make IS fun" (p. 488) to increase enrollments and retention. Students or staff members could handle part of the workload for such activities to minimize the expenditure of limited faculty resources. Faculty's primary responsibility would involve dropping in on the event—which is especially easy for faculty members who enjoy sports—and chat with students.

Third, universities could provide avenues through which transfer students can build social relationships with students and faculty. Several students commented about their reluctance to "barge in" on friendship circles of non-transfer students. One way to overcome such hurdles is supporting recruitment efforts in IS-oriented clubs (e.g., local chapters of the Association for Information Systems). The social value of department-sponsored events was mentioned by several students. When asked about the department's tailgating parties, student A reflected on its "welcoming feeling" and that it made him feel "more at home". When asked if these activities "make you feel like a Bulldog [the university mascot]", student A replied, "Yeah, [laughs], it does! You know, it's hard to stay here and not feel like one.".

Fourth, universities could have faculty talk straightforwardly about CCU transition difficulties with students and particularly about feelings of thrownness. Again, IS departments must deal with the organizational reality of limited resources, so leveraging existing programs (e.g., pre-existing orientation programs for community college transfer students) represents one way to sidestep this constraint. Senior students who transferred from community colleges can also provide a credible source of advice (i.e., retrospection) as they reflect on and discuss their transition experiences during orientation. We identified several potential topics for such discussions in our data, such as 1) not being the A- or B-grade students they were in community college, 2) difficulties in establishing social networks, 3) feeling lost on a large campus, and 4) feeling confused, unsure, uneasy, intimidated, and/or at times overwhelmed (i.e., they exhibit thrownness).

Most importantly though, speakers must address how they made sense of these situations, how they motivated themselves to act in positive ways, and what they did to resolve their problems. Faculty and advisors can expand on instances of thrownness as well. For example, many issues of thrownness concern the increased university workload. Advisors and orientation leaders can highlight this point during "open house" events in which they can explain that university classes are not only much harder than those in community colleges but often must be held in large lecture classes to keep costs down. Our data also showed that students who transferred from small community colleges—some of which may have had only one or two buildings and much smaller classes—commonly exhibited thrownness. Such students are often uncomfortable with—or even intimidated by—such differences.

One should not consider the above recommendations as silver bullets. For example, sensemaking theory cautions that talking about feelings of thrownness can generate multiple interpretations and representations of a problematic situation, which can, in turn, complicate the creation of objective analyses. In such cases, action becomes an important means of mitigating thrownness because it allows students to learn about and positively affect both the situation and the student involved. Faculty and staff can leverage these sensemaking findings to suggest relevant actions that may help students begin the process of "making sense" of their new home.

5.3   Limitations and Future Research

Like all research, our investigation has limitations. A larger sample size would be preferable. We had limited data about subject attrition. For example, our sensemaking data comprised transfer students who remained enrolled at the university but did not contain much evidence of unsuccessful sensemaking (e.g., as with transfer students who withdrew from the university). Accordingly, we need more research that provides fuller descriptions of the relationships between unsuccessful sensemaking and the CCU transition. Nonetheless, our results provide important contributions to theory and practice and directions toward future IS/CS/CE education research.

Our decision tree, while innovative, requires further research. In a general sense, the decision tree documents the lessons we learned as we coded portions of the data, identified and resolved discrepancies, modified rules in the tree, and then experimented with the revised tree as we applied it to our work. Such experiments became the "concrete experience" of a subsequent round of learning. Thus, our work reflects the experiential learning cycle of concrete experience, reflective observation, abstract conceptualization, and active experimentation (Dewey, 1910; Kolb & Kolb, 2005).

We believe our decision tree provides several advantages. First, it documents the lessons we learned from analyzing the interview transcripts. By creating a record of past lessons learned, the decision tree helped provide consistency in future coding efforts by detailing how we coded data and resolved differences. Thus, the decision tree helped improve both the reliability and efficiency of coding. Second, the decision tree complements our dictionary in Appendix A because it helps readers better understand how we coded our qualitative data and the tradeoffs we made while classifying interview transcripts in the sensemaking framework. Third, readers who better understand our coding method can critique our work in a more informed way. In turn, such critiques can contribute to future transition and methodological research.

An important area of future research concerns the unique needs of IS/CS/CE students. Indeed, previous research has found that business, mathematics, and science students experience more "transfer shock" than students in other majors. Researchers have measured transfer shock by changes in community college and university GPA (e.g., -0.342 in business, -0.246 in mathematics and science, and +0.268 in fine arts and humanities, Cejda, 1997; -0.54 in business, -0.55 in science and technology, and -0.34 in liberal arts, Carlan & Byxbe, 2000). However, the results in Table 1 show that the IS/CS/CE transfer students in the BPC program experienced about the same average declines in GPA as other transfer students in that program. Our qualitative data do not explain why our findings differ from those of other research; on the contrary, they suggest that IS/CS/CE students may experience sensemaking in similar ways to students from other disciplines (e.g., insufficient or incomplete coverage of course material in CC classes or more distant relationships with major faculty). We need more research that examines the unique needs of IS/CS/CE transfer students.

One fruitful area of research could incorporate sensegiving into educational theory. Indeed, student F's remarks in Section 4.3.2 are reminiscent of some stages of the concerns based adoption model (CBAM) that we describe in Section 2. For example, student F described how her experiences helped her mentor other students (e.g., the "management" and "consequence" stages of CBAM; Anderson, 1997). Students,

instructors, and educational professionals can use CBAM as a roadmap to frame their sensegiving efforts in a "theory and methodology for studying the process of educational change" (Anderson, 1997, p. 331). In turn, such efforts may guide future work at improving the CCU transition and, thus, help meet educational goals such as increasing enrollments and graduation rates of IS/CS/CE students. These similarities between sensemaking and CBAM suggest that future research could employ multiple reference disciplines.

Future researchers must also be prepared to address the ethical dilemma of when to assist students who have trouble navigating their CCU transition. We academics sometimes face this dilemma when our research role requires a "dispassionate assessment" (Straub & Burton-Jones, 2007, p. 227) but our educational role requires "mentoring, supporting, and motivating" a student (Peltier, Drago, & Schibrowsky, 2003, p. 265). A researcher should err in favor of the student for many reasons, but perhaps the most salient one concerns principles of ethical conduct of human research (e.g., National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research, 1978).

6   Conclusions

Community colleges constitute a valuable source of underrepresented populations for increasing university-level IS/CS/CE graduates. Programs such as the BPC program can help inform and recruit underrepresented populations about the long-term opportunities of computing careers. However, like other research on underrepresented populations in IT, our findings suggest recruitment alone does not suffice without a corresponding emphasis on retention (Trauth et al., 2004).

Increasing graduation rates of IS/CS/CE transfer students involves more than just academics. One also needs to prepare students for the social, emotional, cognitive, and motivational challenges they will face during transition. Sensemaking and sensegiving provide practical tools for assessing and mentoring students through their CCU transition. Helping students through the transition can increase the number of IS/CS/CE baccalaureate graduates, which, in turn, can help meet society's long-term objectives of increasing the size and diversity of our future IT workforce.

Acknowledgments

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Appendix A: Coding Dictionary

Weick (1995, p. 18) notes the seven sensemaking properties are a "rough guideline for inquiry". He advises that "This listing is more like an observer's manual or a set of raw materials for disciplined imagination (Weick, 1989) than it is a tacit set of propositions to be refined and tested" (p. 18).

Weick (1995) notes that each property "is a self-contained set of research questions that relates to the other six" (p. 18) and that "all seven can be represented crudely as a sequence (people concerned with identity in the context of others engage ongoing events from which they extract cues and make plausible sense retrospectively, all the while enacting more or less order into those ongoing events)" (p. 18).

1. **Identity construction**
    a. From Weick's (1995) "recipe": "Identity: the recipe is a question about who I am as indicated by discovery of how and what I think" (p. 61).
    b. Keywords: *I*, *me*, *mine*, *myself*, "some sort of self-feeling, such as pride or mortification," "shame" (Weick, 1995, p. 22).
    c. Self-presentation
        i. "Seeking and maintaining a positive cognitive and affective state about the self" (p. 20)
        ii. "'A general orientation to situations that maintain esteem and consistency of one's self-conceptions'" (Ring & Van de Ven, 1989, p. 180, from Weick, 1995, p. 22)
    d. Redefining oneself (as a "Bulldog")

2. **Retrospection**
    a. From Weick's (1995) "recipe": "Retrospect: To learn what I think, I look back over what I said earlier" (p. 61).
    b. Keywords: past tense verbs (i.e., what the subject has lived) such as realized, remember; nouns linked to memory; conjunctions that link past and current events such as because (see also plausibilities), so, since, why, but, then, that is what [caused something]; when, before, now, and even where (if it relates to past locations corresponding to different time periods) can indicate retrospective comparisons of past and current events or understandings.
    c. "'Meaningful lived experience'" (Schutz 1967, from Weick 1995, p. 24) with emphasis on the past tense, lived.

        i. The notions of "meaningful lived experience" implies retrospection; that is, using past ("lived") experiences to make sense of the ongoing present (i.e., it is "meaningful" to the present). Weick (1995): "Investigators need not adopt pragmatism to use the idea of retrospective sensemaking. Any perspective can be inserted into the here and now as long as its effects on remembering are traced through to answer the questions of why people make the sense they do of their ongoing activity" (p. 28), which suggests that retrospection will often be tied to ongoing sensemaking.

        ii. The meaning of a *past* memory is influenced by the context of the *current* conversation. Thus, an interviewer's question can be a significant part of the subject's sensemaking because it frames the interpretation of past events.

        iii. Retrospection vs. plausibility: retrospection is identifiable when the subject **explicitly** draws on past experience to make sense of the here and now. Plausibility does not explicitly exhibit the use of past experience. Plausibility can be either forward- or backward-looking, but retrospection is typically backward-looking.

    d. Attention

        i. Weick (1995): "Readers may object that their experience seldom has this quality of continual flow. Instead, experience as we know it exists in the form of distinct events. But the only way we get this impression is by stepping outside the stream

of experience and direction attention to. And it is only possible to direct attention to what exists, that is, what has already passed" (p. 25).

    e.   Reflecting (Dewey, 1910)

        i.   Reflecting about equivocality, not uncertainty or lack of information (Synthesis of "many possible meanings"; Weick 1995, p. 27)

        ii.   Reflecting about confusion, not ignorance (Synthesis of "many possible meanings"; Weick 1995, p. 27)

        iii.   "Sensemaking in everyday life involves relatively short time spans between act and reflection, which means that people are mindful of only a handful of projects at the time they look back over what has just happened. Both tendencies work against the likelihood that distortions will be substantial" (Weick, 1995, p. 29).

3.   Enacting sensible environments

    a.   From Weick's (1995) "recipe": "Enactment: I create the object to be seen and inspected when I say or do something" (p. 61).

    b.   Keywords: action verbs; try is equivocal—see #3.b.ii below, while see and other verbs suggest extracted cues when indicating observation (rather than understanding; e.g., "I see what you're saying").

        i.   Look for Ajzen and Fishbein's (1980) behavioral elements (i.e., action [verbs that specify the general term "enacting"], target, context, and time).

        ii.   Be careful with the verb "try". It can infer both action and plausibility (e.g., "I'm trying to enact a plausible solution"). In such a case, use two separate voting items: one highlighting the verb, one highlighting the object/solution.

    c.   Enactment "preserve[s] the fact that…people often produce part of the environment they face (Pondy & Mitroff, 1979, p. 17)" (Weick, 1995, p. 30).

        i.   "People created their own environments and these environments then constrained their actions" "there is not some kind of monolithic, singular, fixed environment that exists detached from and external to these people. **They act, and in doing so create the materials that become the constraints and opportunities they face** [bold emphasis added]" (Weick, 1995, p. 31).

        ii.   "There is no result of process but only a moment in process' (Follett, 1924, p. 60)" (Weick, 1995, p. 33).

        iii.   "'Confronting the activity of environment'" (from Follett, 1924, p. 12, in Weick 1995, p. 33.

    d.   Bracketing: "When people bracket, they act as if there is something out there to be discovered" (Weick, 1995, p. 35).

    e.   Punctuating: "To cope with pure duration, people create breaks in the stream and impose categories on those portions that are set apart" (Weick, 1995, p. 35). "When people punctuate their own living into stories, they impose a formal coherence on what is otherwise a flowing soup" (Weick, 1995, p. 128).

4.   Social

    a.   From Weick's (1995) "recipe": "Social: What I say and single out and conclude are determined by who socialized me and how I was socialized, as well as by the audience I anticipate will audit the conclusions I reach" (p. 62).

    b.   Keywords: us, we, our, people, everyone, everybody, anyone, friends, group, team, social.

    c.   "Sensemaking is never solitary because what a person does internally is contingent on others. Even monologues and one-way communications presume an audience. And the monologue changes as the audience changes" (Weick, 1995, p. 40).

     d. "To understand sensemaking is to pay more attention to sufficient cues for coordination such as a generalized other, prototypes, stereotypes, and roles" (Weick, 1995, p. 42).

5. Ongoing

     a. From Weick's (1995) "recipe": "Ongoing: My talking is spread across time, competes for attention with other ongoing projects, and is reflected on after it is finished, which means my interests may already have changed" (p. 62).

     b. Keywords: thrown into, unsure, not sure, confused, tense; phrases such as "I don't know"; emotions such as sad, happy, or words describing unease such as intimidated or overwhelmed.

     c. "To understand sensemaking is to be sensitive to the ways in which people chop moments out of continuous flows and extract cues from those moments" (Weick, 1995, p. 43).

     d. "Thrownness": "people find themselves thrown into ongoing situations and have to make do if they want to make sense of what is happening" (Weick, 1995, pp. 43-44).

         i. Six properties of thrownness: (Weick, 1995, p. 44, from Winograd & Flores, 1986, pp. 34-36):

            1. "You cannot avoid acting"

            2. "You cannot step back and reflect on your actions"

            3. "The effects of action cannot be predicted"

            4. "You do not have a stable representation of the situation"

            5. "Every representation is an interpretation" ("There is no way to settle that any interpretation is right or wrong, which means an 'objective analysis' of that into which one was thrown, is impossible")

            6. "Language is action" ("Whenever people say something, they create rather than describe a situation")

         ii. "Rough start" is a phrase that several students used to describe their first experiences at State University. It's not exactly "thrownness" because that phrase implies someone has thrown one into a situation. In the CCU transition, it is the students themselves who are (for the most part) doing the throwing.

        iii. Ongoing situations can become a "cosmology episode" in which "people suddenly and deeply feel that the universe is no longer a rational, orderly system. What makes such an episode so shattering is that both the sense of what is occurring and the means to rebuild that sense collapse together. Stated more informally, a cosmology episode feels like vu jàdé—the opposite of déjà vu: I've never been here before, I have no idea where I am, and I have no idea who can help me" (Weick, 1993, p. 633).

     e. Emotion and arousal often accompany ongoing situations.
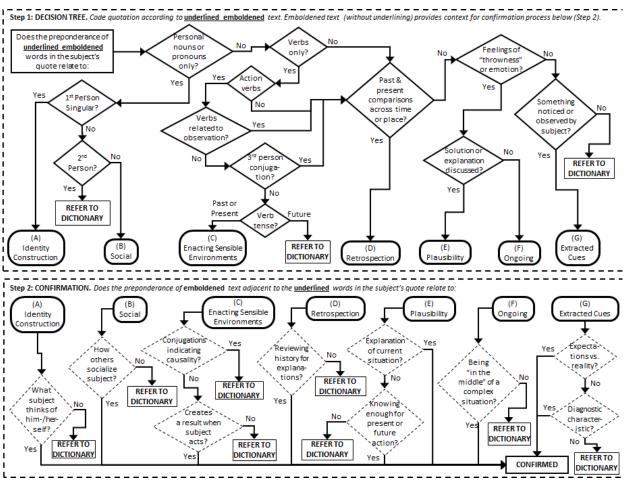
6. Extracted cues

     a. From Weick's (1995) "recipe": "Extracted cues: The 'what' that I single out and embellish as the content of the thought is only a small portion of the utterance that becomes salient because of context and personal dispositions" (p. 62).

     b. Keywords: verbs that focus on awareness (e.g., see, observe, hear, notice, stands out)

     c. "Extracted cues are simple, familiar structures that are seeds from which people develop a larger sense of what may be occurring" (Weick, 1995, p. 50)

         i. "'First, an extracted character [cue] is taken as equivalent to the entire datum from which it comes'" (Weick, 1995, p. 49, from James, 1950, pp. 340-343). For example, if the dye of a cloth is suspected to be inferior, that one characteristic

(i.e., cue) is used to judge the entire piece of cloth as inferior (i.e., other characteristics such as fiber or weave are ignored).

 ii. Explaining extracted cues using seed metaphor: "a seed is a form-producing process that captures much of the vagueness and indeterminacy of sensemaking" (Weick, 1995, p. 51).

d. Noticing cues: "For [Starbuck and Milliken], noticing refers to the activities of filtering, classifying, and comparing, whereas sensemaking refers more to interpretation and the activity of determining what the noticed cues mean" (Weick, 1995, p. 51).

e. Attending to the environment

 i. "Context affects the extraction of cues" (Weick, 1995, p. 52).

 ii. "Social context is crucial for sensemaking because it binds people to actions that they then must justify, it affects the saliency of information, and it provides norms and expectations that constrain explanations" (Weick, 1995, p. 53).

f. "Faith in [extracted] cues and their sustained use as a reference point are important for sensemaking. The importance lies in the fact that these cues tie elements together cognitively. These presumed ties are then given more substance when people act as if they are real" (Weick, 1983, pp. 228-230).

 i. "Extracted cues are crucial for their capacity to evoke action" (Weick, 1995, p. 54).

7. Plausibilities

a. From Weick's (1995) "recipe": "Plausibility: I need to know enough about what I think to get on with my projects, but no more, which means sufficiency and plausibility take precedence over accuracy" (p. 62).

b. Keywords: might, could, maybe, probably, possible, possibly, sufficient, because (see also Retrospection), if; try is equivocal (see Enactment 3.b.ii.)

c. Not driven by accuracy; often speed counts more than accuracy

d. Pragmatism

e. Coherence

f. Reasonableness

g. Creation

h. Inventions

i. Instrumentality (fact or function serving some purpose)

j. Plausibility vs. retrospection: retrospection is identifiable when the subject explicitly draws on past experience to make sense of the here and now. Plausibility does not explicitly exhibit the use of past experience. Plausibility can be either forward- or backward-looking, but retrospection is typically backward-looking.

Appendix B: Decision Tree for Coding Sensemaking Properties

Figure B1. Decision Tree for Coding Sensemaking Properties

Appendix C: Student F's Retrospection of Identity Construction

Ongoing situations in the second semester appeared to be associated with identity constructions that were more contextualized to the university environment. For example, Student F described how she began to think of herself not only as a university student (rather than as a community college student) but also as something more:

> **Student F:** *Well, definitely since last time I didn't feel—I was here, but I didn't feel like a university student. I just felt like I was here. I really didn't feel like I had a title or, really a place here. I just felt like I was just here from community college. So, since the last time I think that I've grown a lot…. Now I feel like a State University student, and I love being here and the environment…. But, I guess you have to go through a change to get there.*

> **Interviewer:** *[Based on previous discussions in this interview] Yeah, and it wasn't an easy change.*

> **Student F:** *No, it was not easy to change at all. It took a lot of, uh, emotional days, a lot of wanting to quit, but, uh, I think anything worth having is not going to be easy. It takes a lot out of you mentally, and to me that's more draining than physical pain. But once I got through that, I'm better off. Maybe if I didn't go through that, I wouldn't be here. I wouldn't be as driven as I am now. But I had to go through that to get here.*

> **Interviewer:** *What are some of the things that helped you make that change in your perception?*

> **Student F:** *Well, I have a strong faith. So, I think that was the Number 1 thing. Uh, realizing that I can't do everything on my own. And that I have to be patient with myself and others, and that was hard for me because I wanted to do everything right then, right now. And prioritizing— realizing that, okay, I am a university student, but that's not who I am overall. I still have to have a life outside of my academics for me to be truly happy. And I think last semester it was just more of accounting, work, work, work, work, work. And, I wasn't enjoying my time as just being a student and being social with everyone else. So my priorities were in order but I didn't leave room for me, in a sense. [At community college] I was working two jobs, and 15 hours of coursework, and extracurricular activities, which I could do a breeze, but here the classes are harder. The work demands more of your time. You can't just study an hour before the test. You have to study all week long. But once I changed my priorities and re-arranged them, and had more patience with myself, I think that made me adapt better than I started off with.*

She also described how she had to reconstruct her identity after the initial transfer shock:

> *I was always used to As and Bs, honor roll [in community college]…. I think it takes a toll on your mind, because you're like, "I'm an A and B student," but when you get here, well, nine times out of ten, you may not get those As and Bs that you had, or all As because, like I said, the classes are harder and the classes demand more time. Some people, they still do great, but from my experience I end up having to take a class over. I've never had to take a class over in my whole life, so that can weigh heavy on your mind that you feel like you're not, you're not, uh, excelling like you should.*

She elaborated on this reconstruction as an ongoing, emotional process. Moreover, she offered a somewhat different perspective on personal initiative and how she came to reconsider her self-image:

> *So that's why I said, well, you know, patience comes in. Well, okay, I didn't do as well in this class. I'll have to take it over. That takes patience for you to have to go through the same class all over again. But the upside to that was, you know, I'm not starting all over. This is kind of a review because I've been here before, and I can do better because I've already really experienced most of the class anyway.*

Student F engaged in retrospection to make sense of herself in this new, more rigorous environment. Moreover, she put a positive spin on her predicament and noted that, in the end, it made her a better person. Her candor and honesty regarding her admission of failure lends credence to her story.

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