Investigation of Social Cognitive Factors Affecting Computing Transfer Students *

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Abstract

There is a disproportionate racial and ethnic enrollment of students in community colleges. Alongside this disproportionate enrollment, underrepresented minority (URM) students also have lower retention rates than their peers. While the literature addresses some of the factors that impact students' degree completion, there still exists a gap in overarching factors that affect URM students. This study aims to explore the specific

personal and social factors that impact URM Computing transfer student success. Specifically, exploring factors using Bandura's social cognitive theory (SCT). Data was gathered with two methods, one-on-one interviews with students and a self-assessment of the student's abilities in the three categories of the SCT: self-efficacy (SE), outcome expectation (OE), and goal setting (GS). The analysis showed that the average rating of the SE and GS of post-transfer students was slightly higher than the Pre-transfer group. Moreover, stratification of word clouds from surveys of the data showed overarching factors between pre and post-transfer groups. Pre-transfer students were impacted by time and income.

1 Research Problem

In recent years the need for a large workforce specializing in STEM fields has increased. However, along with the need for more workers there has also been a focus on decreasing disparities in the representation of diverse populations in STEM. The U.S. Census Bureau lists 71% of STEM workers as non-Hispanic white with only 6% and 7% being black or Hispanic, respectively. Similarly, only 13% and 27% of engineers and computer scientists are women [12]. Part of this disparity can be attributed to the lack of representation and persistence of underrepresented minority (URM) students in colleges. To begin addressing these disparities in the workforce it is imperative to build an understanding of the factors impacting URM success in college specifically at the community college (CC) level as many URM students begin their journey there. Among the students enrolled in community colleges 29% are first-generation along with 42% and 52% of all Black and Hispanic students beginning their academic journey at CC [4]. As [6] states, "For many ... URM populations, community colleges serve as an entry point to post secondary education and offer a unique opportunity in the preparation of a future STEM workforce that reflects the diversity of the U.S. population". In order to build a more diverse workforce that is representative of the population, URM students must be properly supported and have the needed resources to be successful at CC and 4-year institutions. While the literature extensively covers academic factors affecting URM transfer success, in order to establish more equitable practices and support, a holistic understanding of the social and behavioral factors of URM students is crucial. The authors have previously examined personal and academic factors impacting transfer students [17], so this paper focuses on social and behavioral factors, specifically aspects of Bandura's Social Cognitive Theory [1].

2 Review of Related Literature

2.1 Behavioral factors

Previous research has identified elements such as engagement with communities, social belonging, academic uncertainty, and the transfer process, which impact the success of transfer students. Transfer students have a higher success rate when engaging with the community [15]. There is additional success when students feel that they have course-level social belonging [8]. A decline in academics stems from situations where students try to balance work with academics and relationships or do not have a sense of belonging, leading to a feeling of academic uncertainty [9]. Transfer students have less time in the new environment, so it is harder for them to adapt [2]

2.2 Conceptual Framework

Bandura's Social Cognitive Theory (SCT) [1], depicted in Figure 1 was used as a working guide for understanding the underlying personality traits driving student success. The SCT serves as a psychological framework used to understand the relationship between environmental factors and one's motivation, learning, and self-regulation [16]. Under this model, it is understood that an individual's self-conception and personal beliefs will be a greater predictor of their future success rather than their previous achievements. Within this context, our interest was in evaluating students' perception of themselves quantitatively within the three constructs of the SCT, self-efficacy (SE), goal setting (GS), and outcome expectation (OE).

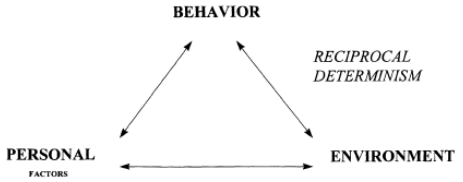


Figure 1: Model of the relations between the three classes of determinants in Bandura's (1986) conception of triadic reciprocity

Self-efficacy can be defined as an individual's belief in their own capacity to be successful in achieving a given goal. SE is identified as a factor in predicting student behavior and overall academic performance [11]. As stated by [14], "Efficacy beliefs help determine how much effort people will expend on an activity– the higher the sense of efficacy, the greater the effort, persistence, and resilience (p544)." Self-efficacy is thought to be pivotal to the human agency as a person will not participate in an activity if they do not believe that they can produce results [11]. [3] used the SCT model and SE was found to be the most dominant predictor of academic performance among a sample of 404 high school Information Technology students.

Goal-setting is the behavior of setting a goal for the future and actively taking steps to eventually achieve it. Bandura [1] indicates learners are motivated by goals and plan and execute their behavior accordingly.

Outcome expectation is the anticipated result of engaging in a given behavior. OE is not thought to be as significant as self-efficacy in predicting a student's performance, rather it is thought that there is an interplay between the two constructs in an individual's overall behavior. As stated by Bandura, "In social, intellectual, and physical pursuits, those who judge themselves highly efficacious will expect favorable outcomes..." [1].

3 Methodology

This study used data derived from the self-report Likert scale, interviews, and survey responses. This form of measurement allows for collecting quantitative data for otherwise unmeasurable constructs. Since understanding a student's self-perception under the SCT model was not otherwise directly accessible, this data collection method allowed insight into the needed modalities. Furthermore, the data was then analyzed with two methods under the three previously defined constructs within the SCT and by stratification with word clouds.

3.1 Integration of Framework

The population consisted of students attending both community colleges (CC) and 4-year institutions in four different states. All students were enrolled in a computer science or related program, and students had either transferred to a 4-year institution after attending CC or were currently enrolled in a CC. The interviewees' data was evaluated under the SCT, and the dependent variables used were GS, OE, and SE, while the independent variable was transfer status. The transfer student data set was analyzed using first-generation status, low-income status, ethnic minority, and sex as independent variables. The dependent variables were average transfer GPA, average overall GPA, and average increase from transfer GPA to institutional GPA.

3.2 Data Collection Method

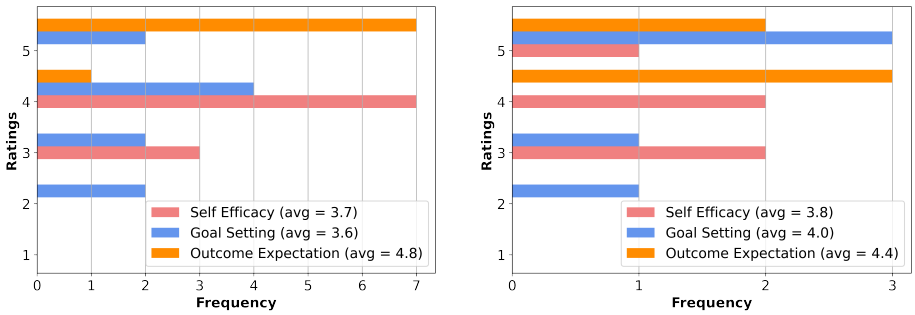
The SCT data was collected by interviews with 15 students from the target population and a self-reported survey of 65 students. The interview consisted of several questions aimed at assessing students' decision-making processes: SE, OE, and GS. These interviews were comprised of six or seven questions depending on whether students were currently attending CC with an intent to transfer (six questions) or had already transferred to a 4-year institution (seven questions). Consequently, the data from particular questions in both interviews and surveys were utilized to create word clouds, examining issues relevant to both pre-transfer and post-transfer students.

The first five questions were open-ended questions that allowed students to describe their personal and academic experiences. Questions 6 and 7 were closed-ended questions with self-reported measurements of their own personal OE, GS, and SE. This was measured by asking students to rate themselves in terms of their self-perception as a highly confident student, as someone who sets goals each semester, and as one who is motivated by previous experiences of self and others. For the

stratification within the survey segment, a word cloud was created, and the questions where the word cloud was utilized included a pre-transfer question (Q16) that asked the respondents to list the information they used when deciding between a community college and a 4-year university. Additionally, they were prompted to mention any information they felt was needed but not available, such as the proximity of a 4-year university, better job opportunities at a 4-year university, ease of transfer, cost considerations, and guidance from family and friends. For the post-transfer word cloud stratification, a combination of interview and survey questions was employed. The relevant post-transfer questions (Q6 and 25) requested participants to share any particular experiences they deemed important as a transfer computing major student.

4 Results

Evaluating under the SCT model, the hypothesis was that students who had already transferred from CC to a 4-year university would on average rate themselves higher in SE, GS, and OE. The expectation is that students who successfully transferred would have a higher self-rating specifically in SE as indicated by their previous success [5, 7, 10, 13, 14]. As seen in Figure 2, it was found that the average rating of the group of post-transfer students was slightly higher than the pre-transfer group in both measurements of SE and GS. However, it should be noted that the sample size for the two groups was not even and a larger sample size would allow for a more accurate reflection. Similarly, the students interviewed in the pre-transfer group consisted of individuals who intend to transfer to a 4-year institution. For this reason, it is possible that this group already had higher levels of self-perception in the given constructs as they already held this expectation for themselves. In the future having a sample population of students who do not intend to transfer out of CC to a 4-year institution would allow for better insight into the correlation of these constructs on student persistence to transfer.



(a) Pre-Transfer

(b) Post-Transfer

Figure 2: Student responses to Questions 6 (a) and 7 (b)

The most urgent concerns impacting students before transferring are time and

(a)Pre-Transfer Survey Q16 (b) Post-Transfer Survey Q6 and Interview Q25

Figure 3: Word clouds of 65 students' responses

income. Income is crucial regarding the affordability of attending a 4-year university, relying on either parental income or their own. Time is a significant factor as it affects their income situation. This stems from the notion of opportunity cost, where the more time individuals spend in school, the less time they have to earn money.

5 Conclusion

This paper first reported a literature review to identify the key social factors, based on the SCT theory, that influence the transfer decision, particularly for students from traditionally disadvantaged groups. Secondly, an exploratory analysis was performed on these factors by interviewing 15 current students. The results revealed that their rating of SE and GS were higher after transfer than pre-transfer. This suggests that the post-transfer students felt better about their academic success than the Pre-Transfer students. Thirdly, word cloud analysis from a survey of 65 students indicated that cost is the main factor for CC students in deciding where to start their degree. Based on these results, the survey will be extended to a larger group of students across multiple states, and the combined results from factors ascertained to design an AI-driven advising system for transfer students, particularly URMs. The researchers anticipate that this will be beneficial to transfer students, their advisors, and other stakeholders of higher education.

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