



## Examining Student Engagement and Transfer Intentions Among Community College STEM Students

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### About SSSL-STEM Student Success Literacy Survey

This is part of a five series policy brief based on the STEM Student Success Literacy project directed by Dr. Soko Starobin, Assistant Professor, School of Education and Director of Office of Community College Research and Policy at Iowa State University (ISU). This project is the first phase of a study entitled, *Measuring Constructs of STEM Student Success Literacy: Community College Students' Self-Efficacy, Social Capital, and Transfer Knowledge*, funded through the College of Human Sciences at ISU with Dr. Starobin serving as Principal Investigator (PI) and Dr. Frankie Santos Laanan and Dr. Daniel Russell as co-PI's. The goal of this study is to ascertain the level of literacy of community college students regarding their transfer readiness for obtaining a baccalaureate degree in STEM fields. A team of researchers developed a survey instrument, STEM Student Success Literacy survey or (SSSL), which includes 63 items and measures self-efficacy, social capital, financial literacy, and general student demographics. In spring 2012, the research team conducted a pilot study with five community colleges in Iowa. An open section was provided for the pilot participating colleges to customize the instrument. This brief presents selected results and policy issues pertaining to the role of community colleges in STEM education in the State of Iowa.

### Background

The state of Iowa has begun to implement programs and policies to improve STEM education across all aspects of the educational system, K-12 through higher education. Unfortunately, this effort has come long after Iowa has fallen far below other states in the quality of STEM education and has begun to lag in the graduation rate of STEM students from institutions of higher education. Across Iowa and the rest of the United States, females, non-traditional students and under-represented minority students are failing to complete degrees in STEM fields in which they initially enroll.

As a result of the in-depth analysis of STEM education, an Iowa STEM Education Roadmap was established to improve the quality of education in STEM-related fields. It is a goal of the Iowa STEM Education Roadmap initiatives that Iowa students will once again rank near the top in the nation in STEM fields. The STEM roadmap not only intends to produce more STEM graduates and better STEM teachers, but it also hopes to retain the STEM majors that graduate from our colleges and universities and employ them in careers in STEM fields within the state of Iowa.

Despite current policies to improve graduation rates, community college students across the nation encounter many obstacles that inhibit their desired goals of completing a degree or transferring to a four-year college or university. Some factors that influence community college completion rates include: working part-time or full-time jobs, caring for children or family members, lack of available funding and lack of academic preparation and institutional support (Espinosa, 2011; Lloyd & Eckhard, 2010; Reyes, 2011; Scott, Tolson, & Huang, 2009; Whalen & Shelley, 2010). Many of these barriers are life choices that will continue to impact the students' education regardless of completion strategies implemented by the community college.

Fortunately, existing studies have shown that an increase in engagement can assist students in overcoming some of the barriers that currently prevent degree completion (Astin, 1993; Deil-Amen, 2011; Kuh, Kinzie, Schuh & Whyitt, 2010; Marcus, 2011; McClenney, Martin & Askins; Pascarella & Terenzini, 1991, 2005; Tinto, 1998). Factors associated with student-student and student-faculty engagement have been found to have positive effects on scholarship, social activism, retention and degree attainment (Astin, 1993).

Astin's Theory of Involvement suggests that students bring with them a specific set of individual characteristics that are distinct only to themselves. He characterizes these individualized characteristics as input variables (known as "I"). The students and the characteristics they have brought to college with them are influenced by the college environmental variables (known as "E") the minute the student sets foot on the college campus. Environmental variables include the type of college attended, participating in college-sponsored activities, living in residence halls or working off-campus. The influence of the environmental variables on the input characteristics create the student output variable (known as "O"). Output variables may include college GPA, degree attainment/completion, reaching career goals and changing of religious or political views (Astin, 1993). Astin's Theory of Involvement (I-E-O) suggests that as students become engaged with on-campus clubs, groups and dorm life they continue to persist and attain their goals at statistically higher rates than students who are do not engage in campus-sponsored activities. Astin's Theory of Involvement also suggests that engagement abets engagement, meaning that if students are engaged with one on-campus group then they are more likely to become engaged with other on-campus groups. Astin's theory speaks heavily on the need for engagement, but lacks data on the level of engagement in the community college.

In 2001, the Center for Community College Student Engagement was established with the intention of providing information on effective educational practices utilized at community colleges. The CCSSE survey focuses on five key areas of engagement: Active and Collaborative Learning, Student Effort, Academic Challenge, Student-Faculty Interaction and Support for Learners (McClenney, 2006). A longitudinal review of CCSSE results indicate that an increase in student engagement at the community college level positively correlates with student learning outcomes. The focus areas found to have specifically positive influences on student learning outcomes are Active and Collaborative Learning, Student-Faculty Interaction and Support for Learners (McClenney, 2007; McClenney, Marti & Adkins, 2012).

An understanding of the engagement practices that have statistically significant influences on persistence will allow community college administrators to make informed decisions about best practices to increase student retention, completion, persistence and, for the sake of this study, student transfer rates to a four-year college or university.

## Purpose of the Study

The purpose of this study was to understand the influence, if any, of student engagement on Iowa community college STEM students' intentions to transfer to a four-year college or university. The research questions that guided this study are:

1. What are the demographic and background characteristics of the students in the SSSL survey?
2. Is there a correlation between the engagement variables (peer engagement, transfer engagement, faculty/staff encouragement/assistance and faculty engagement on coursework) among all SSSL survey respondents?
3. Are there statistically significant differences in the means of variables associated with engagement (peer engagement, transfer engagement, faculty/staff encouragement/assistance and faculty engagement on coursework) and intention to transfer to a four-year college or university for the students in the SSSL study?

## Data Source and Methods

Data for this study was collected from students at five of the fifteen community college districts in the state of Iowa. The community colleges selected for the SSSL study represent colleges in nearly all regions of the state. Students invited to participate in the study were enrolled in STEM-related courses in the fall 2011 or spring 2012 semesters. Of the students invited to participate in the study, 565 students responded to the survey and 275 students completed 100% of the survey. For this study, data was analyzed using descriptive statistics, a Pearson correlation and an independent samples t-test.

## Results

### Descriptive Analysis

More than 70% of the students in the study are female. That number is greater than the percentage of female students enrolled in Iowa community colleges (56%) and is slightly

higher than the national average (62%) of female students who earned associate degrees in the 2009-10 academic year (Iowa Department of Education, 2011; NCES, 2012). The majority of the students (35.2%) are in the traditional range from 18-24, but a large percentage of students were non-traditional students ranging in age from 30-40 and 41-55 (27.1% and 19.4% respectively). The ethnicity of the study is overwhelmingly white, with 83.2% self-identifying as white or Caucasian. Survey respondents also identified as Asian (4.4%); Black/African American (4%); Hispanic (2.2%); and Native Hawaiian or Pacific Islander (0.4%). Some students also indicated that they identify as two or more races (5.1%) or that their ethnicity is unknown (0.7%).

More than half of the students indicated that they intend to transfer to a four-year college or university. Nearly 3% indicated that they intend to transfer to another two-year college and 36.5% do not intend to transfer to another academic institution. Of the students who intend to transfer and continue their education, 89.7% have a goal to complete at least a bachelor's degree and 24.4% plan to complete a master's degree.

The students in the study are engaged with their peers, faculty and staff members, but there is room for improvement. Nearly half of the students indicated that they did not engage with their peers for encouragement or assistance during their most difficult course at their community college. However, more than 60% responded that they did engage with counselors or advisors to assist them in the transfer process. More than 30% of students indicated that they did engage with faculty and staff members for encouragement or assistance during their hardest course. Of the students in the survey, 56.4% indicated that they engage with faculty on coursework at least once per month.

### Correlation Analysis

A Pearson correlation was conducted to determine if statistically significant correlations exist between variables associated with engagement: peer engagement, transfer engagement, faculty/staff encouragement/assistance and faculty engagement on coursework. The Pearson correlation revealed that faculty/staff encouragement/assistance correlated positively with transfer engagement, peer engagement and faculty engagement on coursework. Similarly, faculty engagement on coursework positively correlated with peer engagement, transfer engagement and faculty/staff encouragement/assistance.

The positive correlations in the engagement variables suggest that the more students are involved with one group on campus the more likely they are to become involved with other campus groups and activities. The relationship between peer engagement and transfer engagement was not statistically significant. This relates to Astin's findings that some aspects of peer engagement (partying and staying out too late) may have negative impacts on student outcomes (1993).

### Comparative Analysis

A t-test for independent means was conducted to determine if statistically significant differences exist between the

means of the variables associated with engagement and students' intentions to transfer to a four-year college or university. The t-test revealed that students who do not intend to transfer engage with their peers and with faculty and staff for encouragement and assistance more often than students who do intend to transfer to a four-year institution. This implies that students who sought encouragement and assistance in their hardest course were not as likely to transfer as the students who did not seek, or possibly need, the extra encouragement or assistance. A possible explanation for this result is that students who sought the encouragement and assistance truly struggled with their hardest course. They also may have felt they were unable to complete the work or became frustrated with their educational process and chose not to continue their education and transfer to a four-year college or university.

A comparison of the means of faculty engagement on coursework and students' intentions to transfer to a four-year institution revealed that students who intend to transfer engage with their instructors at statistically significantly higher rates than students who do not intend to transfer. Students who engage with faculty members on coursework on a regular basis may be more committed to excelling in their course of study, have higher goals or may put more effort into making contact with faculty members to assist with their coursework.

### Implications for Policy and Practice

In President Obama's State of the Union Speech (2011), he noted, "America has fallen to 9th in the proportion of young people with a college degree." In his goals for improving education, the president mentioned that community colleges are important to the success of the nation's educational system. The community college may be the way to a better-educated American public and it can be a means to improve the graduation rate of all students attending colleges and universities in the United States.

The state of Iowa and Governor Branstad have developed and begun to implement numerous new STEM initiatives that seek to improve STEM education for all students. The Iowa STEM Education Roadmap outlined seven priorities that include increasing student interest in STEM fields, producing high-quality STEM teachers at colleges and universities in Iowa, becoming one of the leading states in the production of a high qualified STEM workforce and the creation of STEM educational opportunities across the state (IMSEP, 2011).

The SSSL project seeks to provide data to assist in understanding the STEM students attending Iowa's community colleges in the areas of student demographics, engagement, transfer knowledge, self-efficacy and social capital. The findings of the SSSL study can be utilized to inform policies such as the Iowa STEM Education Roadmap and assist in developing new initiatives to meet the desired goals of an increase in females and minorities in STEM fields and an increase in STEM student achievement (IMSEP, 2011).

The demographic data revealed that Iowa community college STEM students participating in the SSSL study are

not representative of the national demographics of STEM students. This indicates that Iowa community colleges need to further analyze the demographic make-up of their STEM students and take into account that the students in their classrooms may not be of the same background as students in other parts of the United States. Therefore, policies and practices that are effective in other areas of the country may not work with Iowa students. The SSSL students did not fit the traditional make-up of STEM students across the nation and therefore practices to encourage females to enter into STEM fields may not be as important as implementing practices and procedures to retain females in STEM-related fields after their initial enrollment. Providing females and other under-represented minorities in STEM fields with instructors, counselors and mentors of the same gender or ethnicity can assist in retaining those students through to graduation and potential transfer to a four-year college or university (Reyes, 2011).

This research also revealed the importance of engagement on students' intentions to transfer to a four-year institution. The Pearson correlation revealed that if students are engaged with an on-campus group, they are more likely to become engaged with another group of students or faculty. This increased engagement, especially in the form of faculty engagement on coursework, implies that students are more likely to transfer to a four-year institution. This data can be used by strategic planning committees and community college administrators to encourage or incorporate engagement opportunities into course curriculum. Colleges could implement required student-faculty meetings at least one time per semester, mandatory counseling/advising for all students, or establish group study areas in designated areas near faculty offices (Lloyd & Eckhardt, 2010). Providing opportunities for engagement with faculty, staff and advisors can assist students in attaining their desired goals.

Figure 1

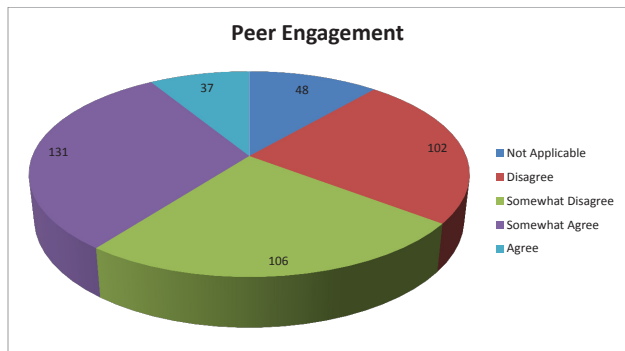


Figure 2

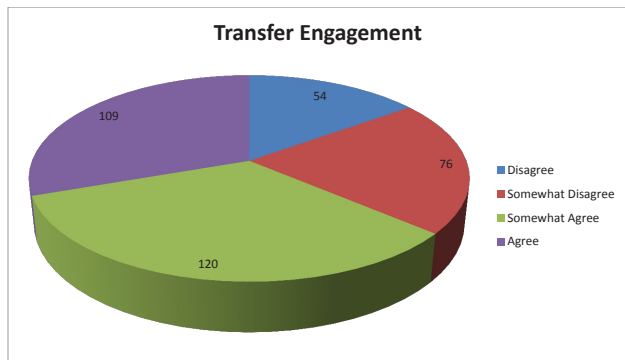


Figure 3

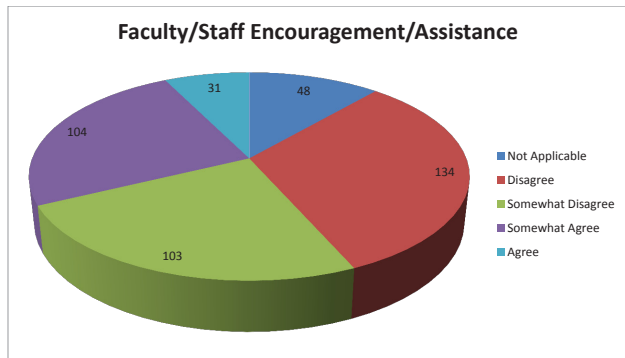


Figure 4

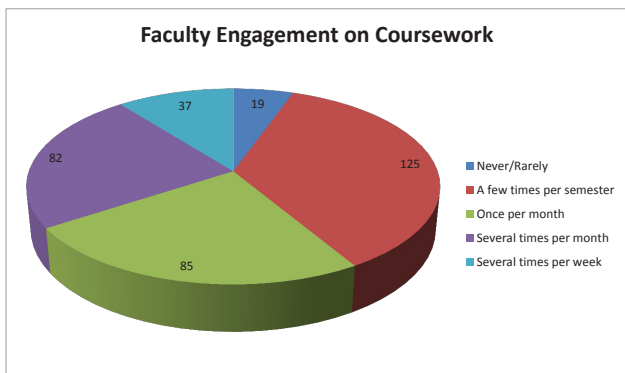


Table 1: Pearson Correlation of Transfer Engagement, Peer Engagement, Faculty/Staff Encouragement and Faculty Engagement on Coursework

	Transfer Engagement	Peer Engagement	Faculty/Staff Encouragement	Faculty Engagement on Coursework
Transfer Engagement	---	0.081	.168**	.334**
Peer Engagement	0.081	---	.512**	.284**
Faculty/Staff Encouragement	.168**	.512**	---	.294**
Faculty Engagement on Coursework	.334**	.284**	.294**	---

\*\* Correlation is significant at the 0.01 level (2-tailed).

Table 2: Independent Sample t-test of Engagement and Intention to Transfer to a Four-Year College or University

Variable	t	df	P	95% CI	
				Lower	Upper
Peer Engagement	-2.96	249	0.00	-0.64	-0.13
Engagement in Transfer Process	0.25	250	0.80	-0.25	0.33
Faculty/Staff Encouragement	0.71	246	0.46	-0.19	0.41
Faculty Engagement on Coursework	-0.93	245	0.36	-0.41	0.15

Note. CI=Confidence Interval

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