The Influence of Financial Barriers on Transfer Decisions of Community College Students in STEM Courses

Tracy Kruse, Soko S. Starobin, Frankie Santos Laanan, and Daniel Russell
Iowa State University

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 multi-year research 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
Iowa political and educational leaders are increasingly worried about the lack of preparedness amongst Iowa high school students for college-level work, particularly in math and science. In recent data from American College Test (ACT®), 50% of Iowa students who took the ACT exam in 2009 were not ready for college-level mathematics study, while for science only 37% were ready for college-level work (IMSEP, 2011).

In response to these concerns, the Governor called together a statewide collection of educators, business professionals, scientists, consultants, government officials and others in an effort to develop a comprehensive plan for STEM education enrichment in the state. This work resulted in developing some bold initiatives that will, among others, 1.) produce increased interest and performance of Iowa learners in STEM fields (including females and minorities) and 2.) develop increased emphasis on STEM educational opportunities from Pre-K through 20 (IMSEP, 2011).

However, one of the barriers to STEM higher education opportunities in Iowa is the rising cost of education. In ranking 4 year private colleges and public universities nationwide, the Project on Student Debt (2011) reported an alarming fact that Iowa students graduated with the 3rd highest educational debt ($29,598) and the state ranked 4th in terms of the percentage of students with debt (72%). Furthermore, it is disheartening that even though community colleges in Iowa provide education at a much more reasonable cost in comparison to its 4-year public counterparts, Iowa’s community college tuition and fees are still amongst the highest (8th) as compared to its peers nationally (Washington Higher Education Coordinating Board, 2010).

Part of the reason for these increased costs is the state’s decreased investment in public higher education. According to the Iowa Policy Project, appropriations between Fiscal Years 2000 and 2011 have decreased nearly 40% for Iowa’s three public universities, after accounting for inflation (Cannon, 2012a). Community colleges were no exception to these funding woes, decreasing by 21 percent over the same period (Cannon, 2012b). To make up for lost state support, Iowa’s community colleges and public 4-year universities have asked students and their families to cover a larger share of the total cost.

Not only has the decrease in state funding pressured Iowans’ family budgets, but a lack of increase for state and federal student aid has created a serious financial burden for students and their families as well. In 2009-2010, Iowa ranked 34th in the amount of state grant dollars per undergraduate FTE ($244.59), and 44th in terms of percentage of total students receiving grant awards (9.9%). This compares to a ranking of 12th ($378.86) and 28th (13.97%) in 2001-02. In terms of federal support, the maximum Pell grant in 2001-02 was $4,000 and the estimated cost of attending Iowa State for a resident undergraduate, for example, was about $11,000 or a gap of $7000. Last year, the maximum Pell had increased to $5,550, but the cost of attending school had risen to an estimated $18,900, creating a gap of about $13,350 (Iowa State University, 2012). In other words, the gap between tuition and state and federal support has widened at an alarming pace.

This is especially concerning due to the fact that Iowa’s K-12 population is becoming increasingly diverse. The number of minority students in the state is at an all-time high (86,512) and now makes up 18.5 percent of the student body (Iowa Department of Education, 2011). If Iowa is to
make strong gains in the number of postsecondary STEM degrees earned, it will need to focus more on these minority students (IMSEP, 2011). Unfortunately, these students are also most often financially insecure and unable to afford the rising costs of tuition. A report from the College Board (2011), for example, indicates that the median income for black and Hispanic families was less than 60% of the median income for white families. Even more shocking is that the poorest 20% of families actually make 7% less after inflation than what they did in 1980.

**Purpose of the Study**
In response to these critical issues related to financial need and lack of students in the STEM pipeline, this brief will further explore the financial barriers the influence the transfer intentions of STEM students in community colleges in Iowa. The following research questions guided this study:

- What are the background and demographic characteristics of the students?
- Is there a correlation between student loans received, number of hours worked, number of dependents supported, number of hours spent studying and number of hours spent on campus outside of the classroom?
- Are there statistically significant differences in the means of the financial assistance received and intent to transfer or the number of dependents and the intent to transfer? Are there statistically significant differences in the means of the parent's education or parent's income level and intent to transfer?

**Data Source and Methods**
Data for this study was collected from students at five community colleges in the State of Iowa. Students who were 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, 585 students responded to the survey but only 275 students completed all questions in the survey. For this study, data was analyzed using descriptive statistics, a Pearson correlation and an independent samples t-test.

**Results**

**Descriptive Analysis**
About 70% of the respondents were female, which is larger than the percentage of females (56%) within the Iowa community college population as a whole. The average age of the survey participants was 31 years old, compared to 24 for the statewide average. In regard to race, whites made up 83% of the population (compared to 84% statewide), Asians were 4.4% of the population, Blacks 4.0%, Hispanics 2.2% and those who identified as being two or more races were 5.1% (Iowa Department of Education, 2011).

Three-quarters of the survey respondents were full-time, while 32.7% were married, 41.1% single and 16% divorced or separated. Over half of all respondents were supporting dependents with 28.9% supporting 1-2 persons, 16.5% 3-4 persons, and 4.5% supporting five or more dependents. Of the 274 respondents who answered the question “Are you planning to transfer to a STEM field?” only 47 or 17% said yes. Twenty-seven of them indicated they would transfer in a science field, nine in a technology field and 11 in an engineering field. When asked what their probable careers were, 39% of the remaining participants said health occupations. When asked about their transfer intentions to a 4-year college or university, 155 participants responded affirmatively, while 100 did not.

**Correlation Analysis**
A Pearson correlation was conducted to determine if statistically significant correlations exist between variables associated with finances and ability to pay for college. This study shows that number of dependents supported (a positive relationship), number of hours worked at a job for pay (a negative relationship) and parent income (a negative relationship) had a statistically significant correlation with amount of student loans received. The number of dependents supported was also negatively correlated with number of hours spent studying and number of hours spent on campus, but was not correlated to number of hours worked at a job for pay. This would seem to indicate that there are many people with dependents that receive loans and work less hours. This would also explain why people with dependents are more likely to spend time studying, have less concerns about financing their education and why there is no relationship between hours spent at work each week and hours a week spent studying. In addition, students with dependents were also less likely to have outside factors that interfered with their ability to complete the coursework of their most challenging course.

**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 finances and students’ intentions to transfer to a four-year college or university. The two independent samples t-tests that indicated statistical significance were parent's income and parent's education level. This indicates that socio-economic status still plays a large role in a student's decision to attend college and in their degree program choice and in their persistence from a community college to a 4-year college or university. Financial factors related to employment and number of dependents supported were not statistically significant in regards to transfer intentions in this study.

**Implications for Policy and Practice**
According to the Iowa STEM Education Roadmap, if we are to dramatically increase the number of students in the STEM pipeline, we must focus on programs that concentrate efforts on getting more females, minorities and low-income students interested in those fields (IMSEP, 2011).

By scaling up and replicating successful partnerships with K-12 districts, business and industry and community colleges, we can get students engaged in STEM curriculum earlier in their secondary education. By involving the business community, we can ensure timely and relevant curriculum and information about careers in the classrooms and provide positive role models for students.
Community college programs represent one of the best ways to reach disadvantaged students as they disproportionately attend these colleges over other types of institutions. In this environment, more advising and career counseling may be helpful. There seems to be a disconnect between some students and their understanding of requirements and qualifications necessary to complete advanced degrees. In addition, many students might not understand the importance and value of critical career/technical areas in which they may excel. Manufacturing, for example, might offer tremendous opportunities for students interested in STEM technician fields.

In addition, replicating programs with demonstrated success at other colleges should be considered. Programs such as mentoring, learning communities, early academic interventions, scholarships, science fairs and role model programs will be helpful in the recruitment and retention of students in STEM fields.

Partnering with the transfer institutions is also important, developing articulation agreements that make it easier for a student to transfer. Removing some of these key roadblocks are critical for all students, but even more so for the most at-risk students.

This research is meant to not only assist practitioners in developing initiatives to help these at-risk populations succeed in STEM fields, but it can also be used as a tool for influencing policymakers and grantmaking organizations. If community colleges are to help these students, they need additional funds to do so. Funding some pilot projects that test innovative ideas on a small scale might be beneficial.

Lawmakers should also consider ways to financially help disadvantaged students succeed. This is supported by recent research that found that an increase in state need-based grants raised the odds of enrollment in two-year colleges and private competitive colleges (Kim, 2012). For example, if the state is serious about increasing the number of low-income students into STEM programs, they should consider a need-based grant program for students who enrolled in very specific programs named within STEM. This could be administered by the Iowa College Aid Commission. In order to qualify as a STEM program meeting high needs in the state, the college would need to apply and its program(s) would need to be selected. In exchange for receiving the grant, a student must work in the field in the State of Iowa for a specified number of years. If that condition is not met or if the student does not graduate, the grant would be converted to a Federal Direct Unsubsidized Stafford Loan and it would be repaid to the state. Similarly, tuition forgiveness could be given to students who work in STEM fields in Iowa after graduation.

Another idea would be to offer competitive grants through the Department of Education which would require community colleges, 4-year public universities and business/industry to work together to develop innovative 2+2 STEM programs. The grants could require programs that provide one-one-one assistance to students in areas such as tutoring and financial and computer literacy. In addition, using strategies such as Washington state’s I-BEST model could also be incorporated as well as seminars, workshops and summer camps with middle school students and career academies such as Project Lead the Way for high school students. Businesses interested in a qualified STEM workforce could sponsor students, helping cover the cost of their education in exchange for internships during summers and breaks as well as employment after graduation.

Finally, several researchers (Immerwahr, 2003; McDonough & Calderone, 2006; Perna, 2004; St. John, 2006) assert that a main causal factor for the low number of minority and low-income students in college is inadequate knowledge about college costs and a perceived lack of financial aid availability. This suggests that student and their parents could benefit from college financial planning seminars earlier in their secondary education (beginning in middle school). Funding through the Iowa College Aid Commission or other non-profits like the Iowa College Access Network could help pay for such initiatives.

Ultimately, it is important that students and their parents understand the net price — the published price minus the grant aid, scholarships, loans, tax credits and deductions — that students actually pay. These initiatives could also be an avenue to help explain the various types of aid and how to access them. Without this, many students (and their parents) will continue to have “sticker shock” as they go into high school. This could lead to premature decisions about their ability (or inability) to attend college, and lead to poor decision-making regarding whether or not to take college preparatory classes. In addition, educating students about the long-term financial effects of not getting a college education could also counteract some students’ reluctance to take on debt, which researchers say is another reason for lack of higher education, especially amongst minority students. (Burdman, 2005; Chen & Des Jardins, 2008; Gladieux & Perna, 2005; Callendar & Jackson, 2005; Kim, DesJardins, & McCall, 2009; Trent, Lee, & Owens-Nicholson, 2006; Dowd & Malcolm 2012.)
**Enrollment Status**

- Full time (12 or more credits): 74%
- Part-time (less than 12 credits): 26%

**Race/Ethnicity**

- **CC's Statewide Population**
  - American Indian: 0.7%
  - Asian/Pacific Islander: 2.5%
  - Black/African American: 1.0%
  - Hispanic: 0.0%
  - White: 84.4%
  - Two or more races: 1.1%

- **Study Population**
  - American Indian: 2.5%
  - Asian/Pacific Islander: 4.4%
  - Black/African American: 4.0%
  - Hispanic: 4.0%
  - White: 83.2%
  - Two or more races: 1.1%

**Marital Status**

- Married: 33%
- Living Together: 10%
- Single, Never Married: 41%
- Divorced/Seperated: 16%
- None: 50%
- 1-2 persons: 29%
- 3-4 persons: 16%
- 5 or above: 5%

**Number of Dependents Supported**

- None: 50%
- 1-2 persons: 29%
- 3-4 persons: 16%
- 5 or above: 5%

**Age**

- 0-10: 13.4, 11.1
- 11-20: 10.0, 9.5
- 21-30: 13.2, 5.2
- 31-40: 23.4, 10.0
- 41-55: 19.4, 8.1
- >55: 1.1, 3.3
Parent Income

![Parent Income Chart]

Parent Education Levels

![Parent Education Levels Chart]

Table 1: Pearson Correlation to determine significance of relationship amongst financially-related factors

<table>
<thead>
<tr>
<th>Variable</th>
<th>Educational Expenses - Aid which must be repaid</th>
<th>Hours per week spent working</th>
<th>How many people you supporting</th>
<th>Hours per week spent preparing for class</th>
<th>Hours per week spent on this campus outside of class</th>
<th>Concerns about financing your education</th>
<th>Outside Factors interfered with completion of course</th>
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</thead>
<tbody>
<tr>
<td>Educational Expenses - Aid which must be repaid</td>
<td>---</td>
<td>-.140**</td>
<td>.162**</td>
<td>-.006**</td>
<td>.197**</td>
<td>.002**</td>
<td>.151**</td>
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<tr>
<td>Hours per week spent working</td>
<td>-.140**</td>
<td>---</td>
<td>.061</td>
<td>-.063</td>
<td>-.146**</td>
<td>.001**</td>
<td>.151**</td>
</tr>
<tr>
<td>How many people you supporting</td>
<td>.162**</td>
<td>.063</td>
<td>---</td>
<td>.111**</td>
<td>-.116**</td>
<td>-.100**</td>
<td>.098</td>
</tr>
<tr>
<td>Hours per week spent preparing for class</td>
<td>.097</td>
<td>-.063</td>
<td>---</td>
<td>.076</td>
<td>.115**</td>
<td>.122**</td>
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</tr>
<tr>
<td>Hours per week spent on this campus outside of class</td>
<td>-.002</td>
<td>-.146**</td>
<td>-.116**</td>
<td>.076</td>
<td>.115**</td>
<td>.122**</td>
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<tr>
<td>Concerns about financing your education</td>
<td>.197**</td>
<td>.001</td>
<td>-.100**</td>
<td>.015**</td>
<td>.088</td>
<td>---</td>
<td>.163**</td>
</tr>
<tr>
<td>Outside Factors interfered with completion of course</td>
<td>.107**</td>
<td>.151**</td>
<td>.098</td>
<td>.122**</td>
<td>.048</td>
<td>.163**</td>
<td></td>
</tr>
</tbody>
</table>

** Correlation is significant at the 0.01 level (2-tailed).
*Correlation is significant at the 0.05 level (2-tailed).

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

<table>
<thead>
<tr>
<th>Variable</th>
<th>t</th>
<th>df</th>
<th>P</th>
<th>95% CI Lower</th>
<th>95% CI Upper</th>
</tr>
</thead>
<tbody>
<tr>
<td>Financial Aid which must be repaid</td>
<td>.43</td>
<td>250</td>
<td>.67</td>
<td>-.37</td>
<td>.59</td>
</tr>
<tr>
<td>Number of Dependents Supported</td>
<td>-.63</td>
<td>252</td>
<td>.1</td>
<td>-.41</td>
<td>.04</td>
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<tr>
<td>Parent Income</td>
<td>2.76</td>
<td>231.13</td>
<td>.01</td>
<td>.19</td>
<td>1.15</td>
</tr>
<tr>
<td>Mother Education</td>
<td>1.87</td>
<td>253</td>
<td>.06</td>
<td>-.02</td>
<td>.95</td>
</tr>
<tr>
<td>Father Education</td>
<td>2.57</td>
<td>231.8</td>
<td>.01</td>
<td>.15</td>
<td>1.14</td>
</tr>
</tbody>
</table>

Note. CI=confidence interval.

References


Iowa State University (2012). *Despite cost trend, student debt is inching downward.* Retrieved from http://www.inside.iastate.edu/article/2012/02/23/debt


Authors

Tracy Kruse is a doctoral candidate in the Community College Leadership Program in the School of Education.

Soko S. Starobin is an assistant professor in the School of Education.

Frankie Santos Laanan is a professor in the School of Education.

Daniel Russell is a professor in the department of Human Development & Family Studies.

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