Instructor influence on student retention in STEM disciplines

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Background

The problem...

- STEM majors have a lower retention rate than other majors
- 'At-risk' groups, including minorities, first-generation college students, and early undergraduates, are particularly included in student population studies (O’Keefe, 2013; Collier & Morgan, 2007)

Our goal is to figure out and discuss why in hopes of beginning to reverse this trend for the future.

- Low retention can be due to various factors such as student support systems, student socioeconomic status, culture, etc.
- Research at Northern Kentucky University suggests that integration of academics and social experience in and out of the classroom is linked to continued participation in education (Bowling, Bulen, Doyle, & Fila, 2013).

- Additional research shows that the more interaction of any kind between students and faculty themselves, the better chance the students have of persisting until graduation.
- Professors, their LAs, and their TAs can have a huge impact and be extremely impressive upon their students.

What factors contribute to this problem...

1. Student interaction with faculty, TAs, LAs, and peers (social connectedness)
2. Instructor’s understanding of his/her classroom dynamic
3. Attitude of faculty and influence on classroom climate
4. Instructor availability and approachability
5. Student interaction with faculty, TAs, LAs, and peers

Current Research

The majority of current research points to the importance of student interactions with faculty and the perceived classroom and social climate in determining student retention in the STEM disciplines.

1. A 2008 study conducted at the College of Education and Psychology at the University of Southern Mississippi sought to identify the factors responsible for student retention in the college. Students in the college were surveyed in the Spring 2008 semester and re-enrollments for the Fall 2008 semester were subsequently monitored. Student ratings of faculty approachability and social connectedness differed significantly between students who returned to the college in Fall 2008 and those who did not return. It is not unreasonable to assume that these factors may influence student retention in any discipline, including the STEM fields in which we are particularly focused on here.

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Returned Means</th>
<th>Mean Diff.</th>
<th>Sig.</th>
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<tbody>
<tr>
<td>Academic Advising</td>
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<td>-0.11</td>
</tr>
<tr>
<td></td>
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<td>Social Connectedness</td>
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<td></td>
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<td></td>
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<td></td>
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<td></td>
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<td></td>
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<tr>
<td></td>
<td>No</td>
<td>4.10</td>
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</table>

(Roberts & Styron, 2010)

2. Regarding the STEM disciplines specifically, survey of undergraduate STEM students by the Center for Research on Learning and Teaching (CRLT) at the University of Michigan showed that classroom climate, a function of instructor attitudes toward students and learning, significantly influenced the decision to continue study in the STEM fields.

3. A study conducted at the Portland State University used focus group data to analyze how instructor expectations are understood and interpreted differently by first-generation college students and their peers. First-generation students were found to prefer more detailed syllabi, descriptions of assignments and exams, as well as more detailed expectations for writing assignments in comparison to their non-first-generation peers. Additionally, first-generation students were more likely to be deterred from approaching a professor who uses excessive jargon or gives unclear explanations above the level expected for the class. These findings on the differences between first-generation students—a major at-risk group—and their peers are broadly applicable to many disciplines including the STEM fields (Collier & Morgan, 2007).

"Not only do students and universities benefit from student-faculty out-of-class communication (OCC) in terms of overall retention, but also students realize benefits in the improved nature of their college experience. For example, students who engage in OCC with faculty showed greater academic and cognitive development (Terenzini, Pascarella, & Blimling, 1996), higher educational aspirations (Pascarella & Terenzini, 1991), greater levels of academic integration into the university (Millen & Berger, 1997), and increased feelings of affiliation, confidence, and self-worth (Kuh, 1999). Finally, faculty benefit from OCC with students in that increased student-faculty OCC is linked to higher teaching evaluations (Jasna and Koper 1999, p.41)."

In many STEM courses and majors, students feel as though they are not communicated from course faculty and in many cases, therefore, the material. These feelings have a strong influence on the student’s decision to continue his or her studies. The recent research presented here shed light on how instructor attitudes and behaviors, as well as their facilitation of the learning experience influences student retention in the STEM fields.

Discussion

Many of the factors influencing student retention in college, and more specifically in STEM, can be mediated both directly and indirectly by instructors and their TAs and/or LAs. Following are recommended actions that instructors can take to promote STEM student retention.

Direct action

1. maintain positive attitude toward learning
2. avoid using excessive jargon
3. reach out to at-risk, struggling students
4. establish clear and explicit expectations and instructions for completing assignments and succeeding in the course
5. incorporate real-life applications and problem-solving exercises into classroom learning

Indirect action

Indirect action refers to long-term changes that instructors may want to consider making to their classroom and/or research programs to facilitate a positive social climate within given STEM majors.

1. offer more at-risk, struggling undergraduate students the opportunity to conduct research or engage in similar unique opportunities in class
2. incorporate LAs into the class to facilitate peer learning and social connectedness

The increasing heterogeneity of the college student population within the United States makes universal suggestions as to how professors can best interact with and motivate their students to continue STEM studies difficult. However, the recommendations offered above are a start to improving the faculty-student and peer-student relationships which seem highly influential in student retention.

It should be noted that LAs have great potential to improve retention rates. As a peer, an LA can provide a student with much-needed social support free from intimidation or anxiety that sometimes characterizes faculty-student interactions. As an assistant to the instructor, an LA can provide faculty with meaningful feedback on classroom climate and act as a role model for other students seeking success in the course. Recruitment of LAs from a variety of backgrounds also helps to diversify the learning environment and help students from all backgrounds feel welcome and able to succeed.

References