

Derailed: Investigating the disconnect between aspiration and achievement in STEM

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INTRODUCTION

How do first year college students who aspire to attain a degree in STEM - and who expressly applied to live in a STEM Living Learning Community - get derailed? Data collected from three separate first-year STEM LLC cohorts showed that college-ready standardized test scores, strong STEM aspirations, and the deliberate choice to live in a STEM-focused learning community, was not predictive of academic success for 26% of the total cohort.

Data from three separate first-year STEM LLC cohorts was collected over a three year period, 2013-2016 (111 students, total). We reviewed ACT and SAT Math scores, STEM grades after the first semester, end of year GPAs, and students' personal statements regarding their STEM aspirations.



Requirements to join the STEM LLC:

- Incoming, fulltime first year student
- Declared major in STEM (note - this LLC is not for health professions)
- Eligible to enroll in Pre-Calculus or higher in first semester**
- One math course and one science course required each semester
- Supplementary application explaining STEM career goals & how student will benefit from being in STEM LLC

** Pre-Calculus Prerequisites: ACT Math score 24+, SAT Math score 520+, or MATH 1315 with C or higher

** Calculus I Prerequisites - ACT Math score 27+, SAT Math score 580+, or Pre-Cal with C or higher

Support elements in the STEM LLC:

- Cohort lives together in shared space in residence hall
- Resident Assistant STEM major who lives with cohort
- Faculty advisor for STEM LLC
- Co-enrolled class sections in STEM
- Social events, study groups, STEM-related events

The students followed in this study specifically chose to live in a STEM-focused learning community, which can be reasonably perceived as an extra indicator of their commitment to be a STEM major.

#RedFlag

However, for first year STEM majors, GPAs below 2.0 are warning signs in student performance; those students with GPAs barely above 2.0 may also be academically at risk.

METHODS

GROUP A

GPA <2.0 at end of first year
14 total students; 100% attrition rate; 1.23 avg GPA
13 no longer enrolled
1 changed to non-STEM major, still enrolled

| Majors | # students |
|------------------|------------|
| Engineering | 9 |
| Computer Science | 4 |
| Biology | 1 |

| Standardized Test Scores | lowest to highest | # students |
|--------------------------|-------------------|------------|
| MATH ACT | 24 - 27 | 3 |
| MATH SAT | 450-510 | 4 |
| MATH SAT | 530-570 | 3 |
| MATH SAT | 580-640 | 4 |

| STEM Course | Outcome |
|---------------------|-------------------|
| Pre-Calculus | 99% failure rate |
| Calculus I | 100% failure rate |
| Computer Science I | 99% failure rate |
| General Chemistry I | 99% failure rate |

GROUP B

GPA 2.0-2.49 at end of first year
15 total students; 50% attrition rate; 2.21 avg GPA
3 no longer enrolled
5 changed to non-STEM or undeclared major, still enrolled

| Majors | # students |
|------------------|------------|
| Engineering | 7 |
| Computer Science | 4 |
| Physics | 2 |
| Mathematics | 1 |
| Biology | 1 |

| Standardized Test Scores | lowest to highest | # students |
|--------------------------|-------------------|------------|
| MATH ACT | 16 - 26 | 4 |
| MATH SAT | 510 | 1 |
| MATH SAT | 530-570 | 6 |
| MATH SAT | 620-630 | 4 |

| STEM Course | Outcome |
|---------------------|-------------------|
| Pre-Calculus | 60% passing rate |
| Calculus I | 50% passing rate |
| Computer Science I | 45% passing rate |
| General Chemistry I | 100% passing rate |

METHODS (cont'd.)

GROUP C

GPA 2.5-2.99 at end of first year
24 total students; 21% attrition rate; 2.76 avg GPA
3 no longer enrolled
2 changed to non-STEM major, still enrolled

| Majors | # students |
|------------------|------------|
| Engineering | 11 |
| Computer Science | 8 |
| Biology | 2 |
| Biochemistry | 2 |
| Mathematics | 1 |
| Physics | 1 |

| Standardized Test Scores | lowest to highest | # students |
|--------------------------|-------------------|------------|
| MATH ACT | 23 - 24 | 3 |
| MATH SAT | 400-510 | 7 |
| MATH SAT | 550-570 | 5 |
| MATH SAT | 590-680 | 9 |

| STEM Course | Outcome |
|---------------------|-------------------|
| Pre-Calculus | 100% passing rate |
| Calculus I | 50% passing rate |
| Computer Science I | 82% passing rate |
| General Chemistry I | 94% passing rate |

FINDINGS

Group A trends

- 50% of cohort failed to enroll in one math/one science class per semester
- None of the students who only took the ACT enrolled in a Calculus class
- Of the 11 students who only took the SAT, 82% enrolled in a Calculus class

Group B trends

- 20% of cohort failed to enroll in one math/one science class per semester
- 2 of the 4 students who only took the ACT enrolled in a Calculus class
- Of the 11 students who only took the SAT, 100% enrolled in a Calculus class

Group C trends

- 13% of cohort failed to enroll in one math/one science class per semester
- All 3 students who only took the ACT enrolled in a Calculus class
- Of the 21 students who only took the SAT, 99% enrolled in a Calculus class

Students with GPAs of <2.5 at end of first year appear to be at greatest risk of attrition from STEM.

“Low-but-college-ready” ACT/SAT Math scores may indicate under-preparation for college level STEM coursework, particularly in Calculus.

Failure to enroll in one math/one science course each semester may increase risk of attrition. May also indicate reluctance/resistance to transitioning to college level work or college life, or suggests lack of certainty in initial aspirations for a career in STEM.