

GRSC 7770 Graduate Seminar

A Field Guide to teaching MATH 1113

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Question

Does it matter if I do a good job of teaching MATH 1113?

Albert Einstein

“It's a miracle that curiosity survives formal education.”

STEM Entrance

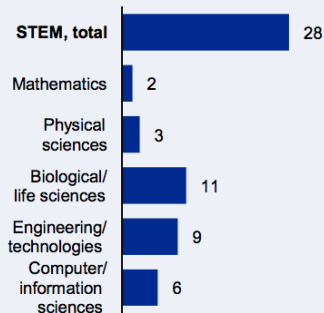
- ▶ About 28% of 2003-04 beginning bachelor degree students choose a STEM major at some point during their enrollment between 2003 and 2009 (see Figure 1).
- ▶ Within STEM fields, biological/life sciences was the most popular field, attracting 11% of bachelor's degree students.
- ▶ Mathematics and physical sciences were the two least popular fields, with $\sim 3\%$ of students.

STEM Entrance

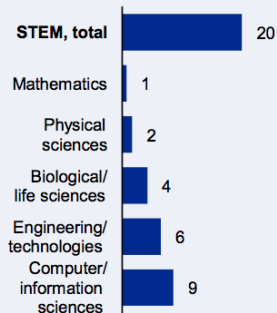
Figure 1.

Percentage of 2003–04 beginning bachelor's and associate's degree students who entered STEM and selected non-STEM fields: 2003–2009

Beginning bachelor's degree students



Beginning associate's degree students



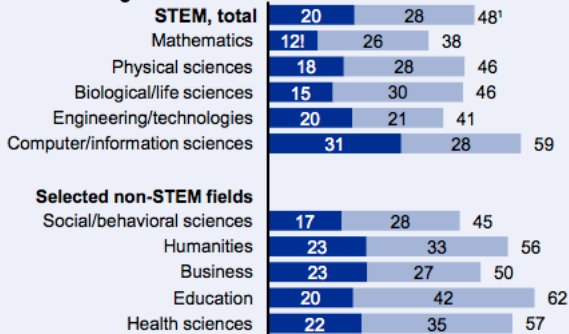
STEM Attrition

- ▶ Among bachelor's degree students entering STEM fields between 2003 and 2009, nearly one-half (48%) had left these fields by spring 2009 (fig. 2).
- ▶ Some left STEM by switching their major (28%).
- ▶ Some left STEM by dropping out (20%).
- ▶ Attrition rates varied across STEM disciplines– 38% for mathematics and 59% for computer/information science majors.

Figure 2.

Percentage of 2003–04 beginning bachelor's and associate's degree students who left STEM and selected non-STEM fields after their entrance into these fields, by major field entered: 2003–2009

Beginning bachelor's degree students

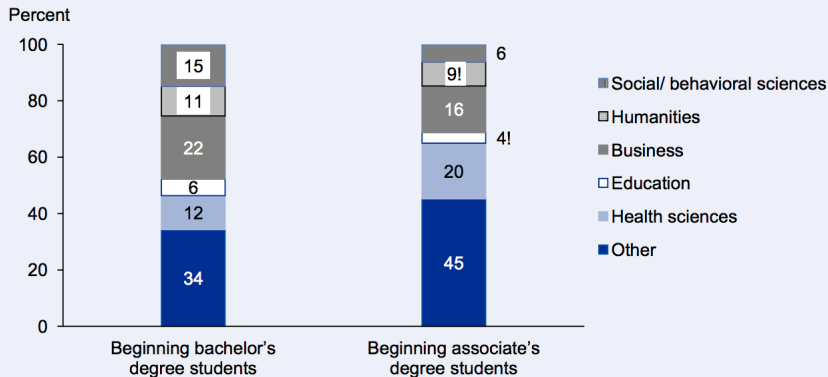


Where do people go?

- ▶ Business is one of the most popular destinations: 22% of bachelor's degree students who entered STEM fields and later switched majors ended up pursuing business.
- ▶ The field health sciences was also popular: 20%.
- ▶ Education was the least favorite: 6%.

Figure 3.

Percentage distribution of the last major field among 2003–04 beginning bachelor's and associate's degree students who entered STEM fields and later switched to non-STEM fields: 2003–2009



STEM coursetaking and performance

- ▶ Students come to college with expectations and preferences based at least in part on their high school coursework, achievement, and parental and social influences.
- ▶ These expectations and preferences are reinforced or altered by students first-year curricular experiences, which, in turn, influence their decisions about their subsequent coursetaking and major field of study (Attewell, Heil, and Reisel 2012; Crisp, Nora, and Taggart 2009; Huang, Taddese, and Walter 2000; Stinebrickner and Stinebrickner 2011).

Participation in undergraduate STEM coursework

- ▶ A majority of bachelors and associates degree students attempted to earn STEM credits (87 and 78 percent, respectively), and many did so (81 and 67 percent, respectively) during their first year in college.
- ▶ On average, STEM credits accounted for 27 percent of all credits earned by bachelors and associates degree students in their first year.

STEM leavers vs. persisters

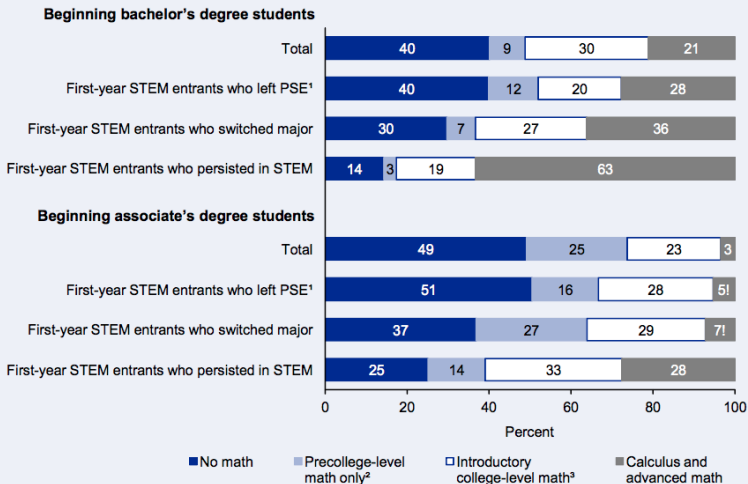
- ▶ Despite this widespread participation, however, there were some measurable differences between STEM leavers and persisters in the number of STEM credits earned in the first year.
- ▶ Regardless of degree level, students who persisted in STEM fields through 2009 earned more STEM credits in the first year than did those who had left STEM fields.

Highest level of math course

- ▶ Mathematics is a foundation for all STEM disciplines, and thus, deciding whether to take mathematics in the first year and what type of math courses to take is crucial to students progression along the STEM pipeline (Shaw and Barbuti 2010).
- ▶ During their first year in college, 40 percent of bachelors degree students did not take mathematics; 9 percent took only precollege-level math courses; 30 percent took introductory college-level but no higher-level mathematics; and 21 percent took calculus or other advanced mathematics (figure 4).

Figure 4.

Percentage distribution of the highest level of math course in which 2003–04 beginning bachelor's and associate's degree students earned credits during the first year of enrollment, by STEM entrance and persistence through 2009



The level of first-year math coursetaking distinguished STEM leavers from STEM persisters. At both the bachelors and associates degree levels, proportionally more STEM leavers than STEM persisters did not earn any math credits in their first year, whereas proportionally more STEM persisters than STEM leavers earned credit in calculus or advanced mathematics. For example, among bachelors degree students, 3040 percent of those who entered STEM fields in the first year but subsequently left college or switched majors took no mathematics at all in the first year, compared with 14 percent of those who persisted in STEM fields. On the other hand, 63 percent of STEM persisters, compared with 2836 percent of the two types of STEM leavers, took calculus or advanced mathematics in the first year. Results followed a similar pattern at the associates degree level.