STEM Attrition and Identity

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Introduction

There is a great need to increase the number of scientists in this country:

- Eliminate the current environmental crisis.
- Reduce reliance on fossil fuels.
- Remain a leader in scientific advances.
- Maintain status as an economic leader in the world.
The Demographic Argument

Projected US Population, 2010

Employed Scientists Engineers, 2006

Source: US Census, 2000

Source: NSF
The Demographic Argument

Projected US Population, 2050

Source: US Census, 2000

Employed Scientists Engineers, 2006

Source: NSF
Identity and STEM Majors
Four perspectives on identity that recognizes a “certain type of person”:

- **Nature**  “I have the ability to succeed in a STEM major.”
- **Institution**  “I was accepted as an engineering major.”
- **Discourse**  “My professor tells me I’m a good computer scientist.”
- **Affinity**  “I hang out with other math majors.”
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Identity defined as stories about persons. Three types of narrative:

- **First-person** \( A \) \( A \) \( C \) I tell you I am a physics major.

- **Second-person** \( B \) \( A \) \( A \) My professor tells me I am a good student.

- **Third-person** \( B \) \( A \) \( C \) My professor tells you I will not succeed in Optics.
Identity defined as stories about persons. Three types of narrative:

- **First-person** \( A A_C \) I tell you I am a physics major.

- **Second-person** \( B A_A \) My professor tells me I am a good student.

- **Third-person** \( B A_C \) My professor tells you I will not succeed in Optics.
Identity defined as stories about persons. Three types of narrative:

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General Attrition Factors for STEM Majors

- Lack / loss of interest in science, attraction to a non-SME major. Seymour and Hewitt (1997)
- Poor teaching by SME faculty. Inexperienced instructors in lower level courses. Seymour and Hewitt (1997)
- Feeling overwhelmed by curriculum. Seymour and Hewitt (1997)
- Weeding out courses. Seymour and Hewitt (1997)
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Women and STEM

- Lack of emphasis on applications of programming (CS) to more practical scenarios. Liu and Blanc (1996)
- Mathematics requirements a barrier to success in CS. Liu and Blanc (1996)
- Women have stronger implicit negative attitudes toward math / science (Irrespective of being a STEM major). Nosek et al. (2002)
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Minorities and STEM


- Inaccurate or unhelpful advising. Bonsangue (2005)


- Cultural congruity (interacting with other racial / ethnic groups). Cole and Espinoza (2008)
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Research Question

How does identity influence leavers of STEM majors?
Sample

- 4 students recruited for in-depth semi-structured interviews.
- Declared STEM major, currently enrolled at the U of A.
- Audio recording of each interview, 6 hours of audio data.
- Subjects filled out survey (demographic information, rated reasons for leaving STEM).
Case Study: Shelly

- 33 yo, white female
- Originally: CS Major, 1994, Tier 3 East Coast Institution.
- Dropped out of college because was unhappy in major. Worked in science heavy industries (aviation, software development, wanted to develop skills / further her career).
- Currently: MIS Major
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Top reasons for leaving Computer Science

- My professors and/or TA’s made me feel that I would not succeed in this field. *(affinity, discourse, second-person narrative)*

- I did not feel I belonged in my science field. *(affinity)*

- I did not feel comfortable approaching my professors when I had a question. *(affinity, first-person narrative)*

- My professors / TA’s had poor teaching skills.
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SH: The classes were predominately male and the teachers weren’t very open to questions... was just talked down to quite a bit in the class when you did try to participate in the class...

GA: Was that you, or just any student?

SH: Mostly me. You know. I was... most of the people in the class were in their 30’s, and at the time I was, ... 20, 21, 22 ... and I was the only girl in there and it was kind of like a boy’s club.
SH: Aviation has a lot of the same thing as far as like women not being accepted into it and everything. You do run into a lot of that there as well. But, ummm but at the point that I changed to aviation, I was starting to get a little bit older and more stubborn in holding my ground a little bit more. I can’t tell you how many times I’ve had guys tell me that I didn’t belong there and women shouldn’t be sticking their nose in there or whatever and I just gave it right back to them. It didn’t affect me nearly as much as it did when I was in school. [younger]
Implications for Further Study

- Incorporate identity studies to study habits of STEM majors.
- Further studies will justify maintaining or expanding funding for minority and women science associations and groups, WISE, Black Scientists Association, AWM, SACNAS
- How does the mathematics identity of a student influence what they will study?
- How is a leaver identified by the professors of their former/current subject?
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