Factors that Influence Native American's Interests and Aspirations for Engineering Faculty Positions

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Background

- Only 0.4% of engineers are Native American or Alaskan Native (National Action Council for Minorities in Engineering, 2014).
- Even fewer are engineering faculty (0.2%), and that percentage seems to be decreasing (Yoder, 2014).
- Researchers have noted the importance of having faculty to advise, mentor and act as role models for students (Nelson & Brammer, 2010)
- Wanting to help the Native American community to reach our goals has been identified as a motivating factor for Native Americans to enter into engineering (Smith and colleagues, 2014).
- Beyond that, we know very little about the factors that influence Native Americans' preparation for and participation in engineering and the engineering professorate.

Plan for Presentation

To help identify those factors, we are conducting a research project.

Our plan today is to:

1) Share with you what we have discovered so far,

2) Get your ideas and input on how to increase Native Americans in engineering and the engineering faculty, and

3) Invite your participation in the project

Theories

1) Social Cognitive Career Theory (SCCT; Lent, Brown, & Hackett, 1994, 2000)

2) Bronfenbrenner's Ecological Model (BEM; 1979

Factors

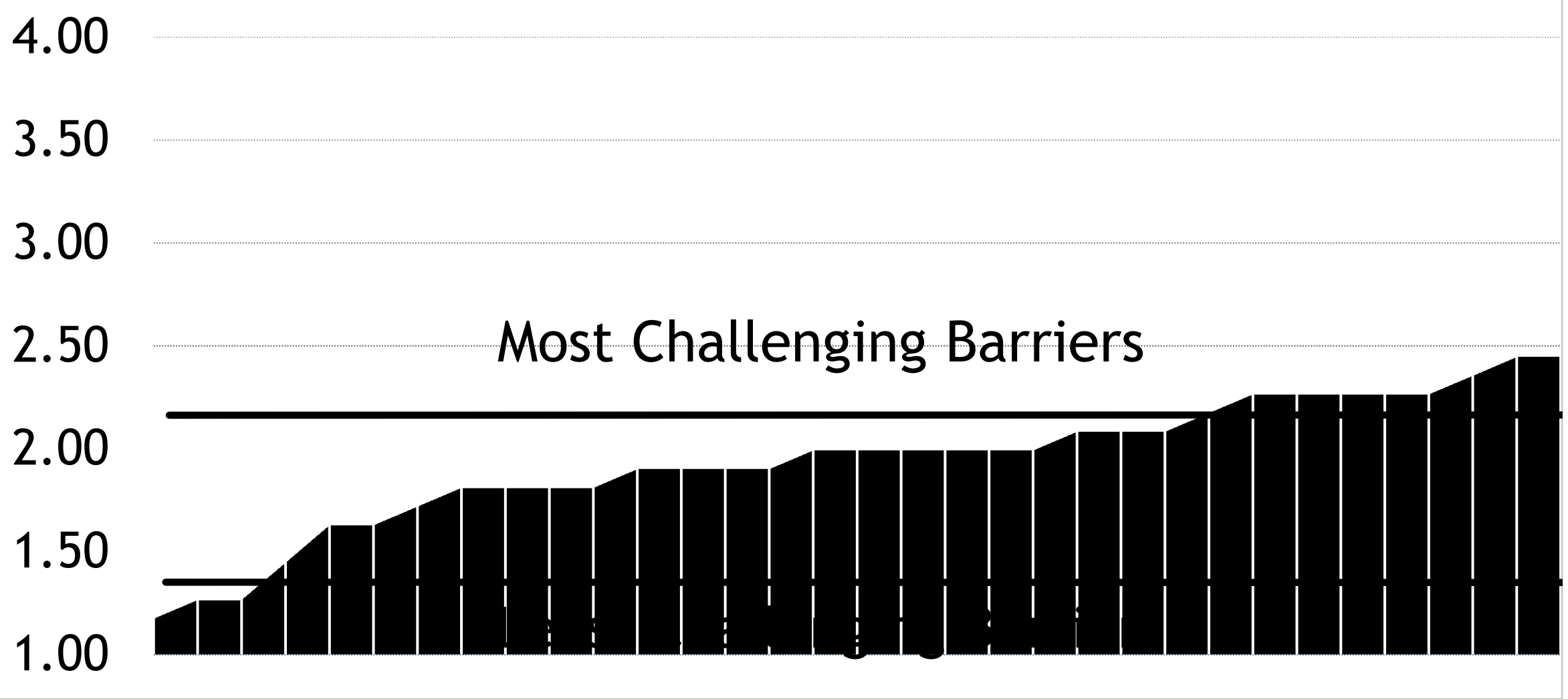
1) Barriers
2) Supports
3) Cultural and Other Contexts

Native American Student Participants

- 14 Students have completed both the survey and interview so far
- Most of them were approximately 21 years old. The median age was 27 years old.
- 10 were men, 3 were women, and 1 was a transgender (2 spirit) male
- The Engineering Programs They Were In
  - Electrical – 5 students
  - Mechanical – 4 students
  - Biomedical 2 students
  - Software – 1 students
  - Industrial – 1 student
  - Aerospace – 1 student
- About 30% thought it was likely that they would become an engineering faculty

Quantitative Results

Barriers to Continue to Study Engineering and to Become an Engineering Faculty



Most Challenging Barriers (N = 14 students)

- **Financial Barriers (Mean = 2.27 to 2.45)**
  - Not enough money
  - Expenses are greater than my income
  - Have to work while going to school just to make ends meet
- **Academic Barriers (Mean = 2.18 to 2.45)**
  - Not sufficiently prepared academically to study engineering
  - Not prepared enough in engineering theory
  - Not confident enough

- 1 = Very Low Barrier
- 4 = Very High Barrier

Least Challenging Barriers (N = 14 Students)

- **Lack of Parent and Peer Support (Mean = 1.18 to 1.73)**
  - Parents do not support my plans
  - Pressure from boyfriend, girlfriend, or other friend
  - Others are not confident in me
  - Not enough peer support

- 1 = Very Low Barrier
- 4 = Very High Barrier

Moderately Challenging Barriers (N = 14 Students)

- **Lack of Career Information and Development Skills (Mean = 1.91)**
  - Lack of career information about engineering
  - They don’t know how to focus their career paths
  - They don’t understand the skills that are required for an engineering job
  - Concerned that they won’t be able to work and raise children

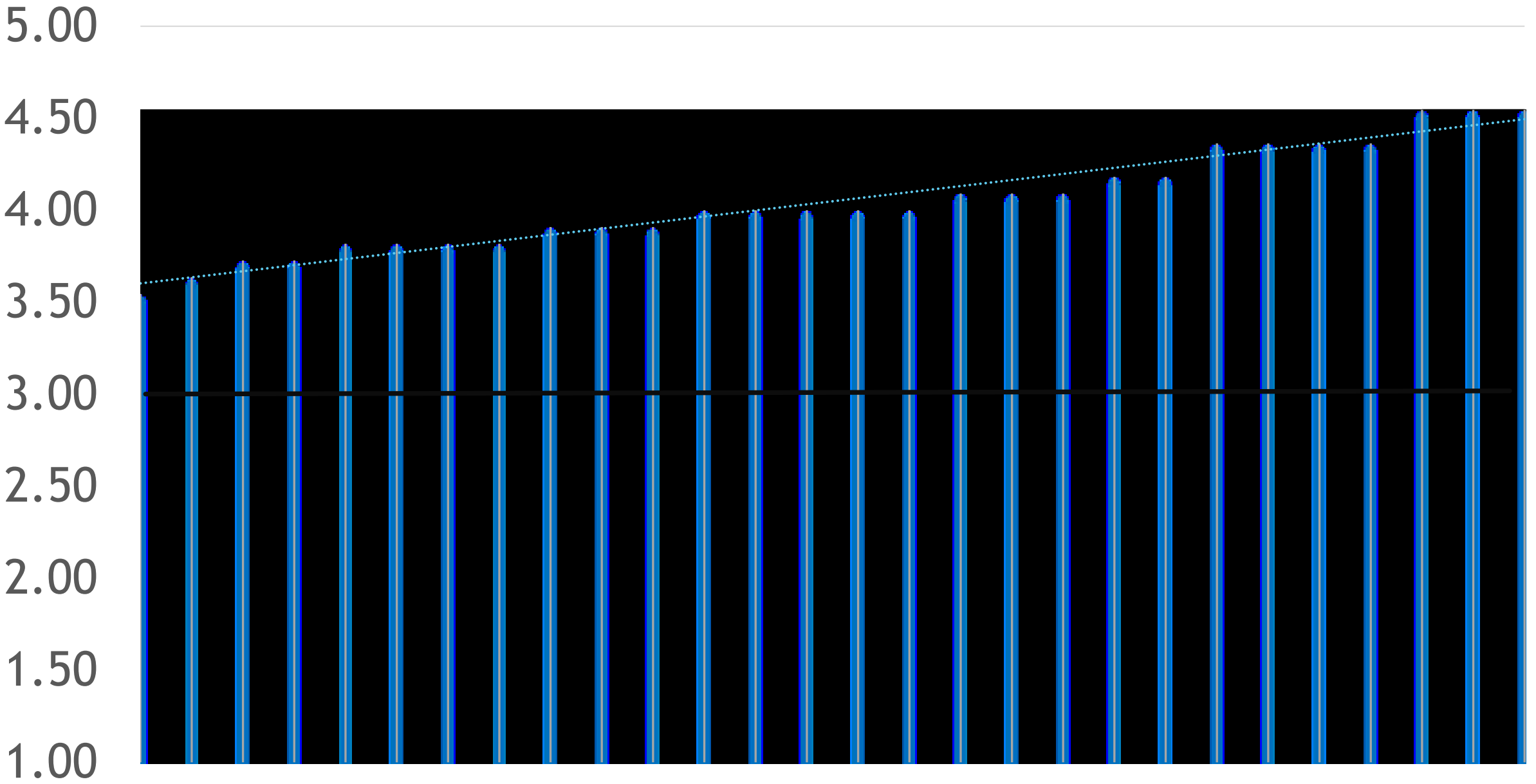
- 1 = Very Low Barrier
- 4 = Very High Barrier

Moderately Challenging Barriers (N = 14 Students)

- **I Don't Fit In (Mean = 2.00 to 2.00)**
  - Don't fit into the engineering program or university
  - Have no mentorship by faculty
  - Feel that they may not be able to get the job they want, but they don't want to move or leave home either
  - Too stressful
- **Lack of Talent and Motivation (Mean = 1.82 to 1.82)**
  - Don't feel talented enough or motivated enough

- 1 = Very Low Barrier
- 4 = Very High Barrier

Engineering Students' Strengths



Engineering Students Strengths

- **Strong Communication and Collaboration Skills (Mean = 4.36 to 4.55)**
  - I work well with others to solve problems
  - I have strong communication skills

- **Academic Commitment (Mean = 4.36 to 4.55)**
  - I try hard to be a good student
  - I am committed to reaching my education & career goals
  - I try hard to do well in school
  - I am committed to doing well

- 5 = A Lot of Strengths in this Area
- 1 = Not Many Strengths in This Area

Engineering Students Strengths

- **Commitment to Preparation (Mean = 4.09 to 4.36)**
  - I take advantage of opportunities
  - I am interested in what I am studying
  - I am actively preparing myself
  - I have explored my abilities and talents
  - I use good work habits in school
  - I make sure I do what needs to be done

- 5 = A Lot of Strengths in this Area
- 1 = Not Many Strengths in This Area

Native American Faculty Participants

- 6 Faculty have completed both the survey and interview so far
- 4 Tenured Faculty, 2 Contract/Term Faculty
- Mean Age = 54
- Gender = 4 Males and 2 Females
- Types of Engineers
  - 1 Materials Engineer
  - 1 Industrial Engineer
  - 2 Civil Engineers
  - 2 Electrical Engineers
- Average time of employment as an engineering faculty = 18 years

A few thoughts from the engineering faculty persisting in their chosen career (N = 6)

- **Why did you choose to work at your university?**
  - 2/3 said to be close to family
- **Why will you return to work as a faculty in your current position**
  - I love and enjoy my job, and I am highly satisfied with my profession
- **Who are your primary supports?**
  - Colleagues, mentors, parents, family, professional organizations, community members

A few thoughts from the engineering faculty persisting in their chosen career (N = 6)

- **Strengths:**
  - Career Goals include being happy and satisfied.
  - Enjoying their work
  - Committed to reaching career goals
  - Committed to doing well in my work
  - Get along well with people who are different
  - Work well with others to solve problems and complete projects

I have outlined what the students told us via survey. I am not going to turn the presentation over to my colleagues to tell you more about what we discovered via interviewing the students and faculty.

Student Qualitative Results

- Parents and family members introduced youth to engineering,
- Teachers encouraged participation in science fairs and science clubs,
- Interest in engineering-like activities pre-dated the ability to name their interest in “engineering”, which often did not appear until college.
- Most students changed their topical interest in engineering (e.g., they were initially interested in mechanical engineering and then became interested in civil engineering) after they began their programs.
- Students sustained their interest in pursuing engineering because of their interest in math, competence in school work, wanting to help people, seeing themselves as an engineer.
- Students experiences that supported their ability to pursue engineering included, confidence in their ability to do the academic work, active support from their family and friends, active engagement in STEM activities in middle school and high school, participating in groups of study buddies, academic tutoring, and having a support system that enabled them to accomplish their academic work.
- Barriers to successfully pursuing their engineering aspirations included not enrolling in or succeeding in higher level math courses either in high school or college, having financial challenges, and competing roles and responsibilities they had outside of school in addition to being a student.

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Audience Questions –

- How Can We Solve These Problems?
- How can we assist Native American students to overcome barriers?
- How can we assist students to increase their strengths?
- How can we encourage more students to become engineering faculty in order to increase the number of Native American engineers?