What’s Love Got to Do With It?  
The Importance of Relationships for African American Women in STEM  

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Introduction

21 year veteran teacher (4&5th grade teacher -13 yrs, gifted resource teacher – 8 yrs)

Science Instructional Leader
Year-Round Enrichment Instructor

PhD Candidate, Educational Policy Planning & Leadership at the College of William and Mary

Research Interest in Self-Efficacy Beliefs of African American Women in STEM
Role Mentoring has in STEM Persistence
STEM’s FUTURE

• By 2020, the top occupational need for the United States will be for science related practitioners (Lockard & Wolf, 2012)

• The Congressional Commission on the Advancement of Women and Minorities in Science, Engineering and Technology Development (2000) reported business leaders were concerned that there is a shortage of American workers and that this shortage threatens the ability of American business to compete in the global market.
The Need

By 2022, American colleges and universities will need to increase enrollment in STEM majors by 33 percent to fill the one million jobs projected to be in the STEM fields (Gates & Mirkin, 2012).
Who is going to college?

- In 2011, the college enrollment of female African Americans hit a historic high (Moton, 2015).
- The representation of female African Americans in college had experienced a 31 percent increase from the 2000 reporting by the United States Census Bureau.
- Between the ages of 15 and 24, 9.7 percent were enrolled in colleges and universities in 2011.
The Problem

Lack of Representation in STEM Degrees

• Since 1988 women outnumbered men in baccalaureate degrees (USDOE, 2011).
• Although more women were earning baccalaureate degrees, they were still under-represented in fields of science and engineering (NSF, 2011).

Women Leave STEM majors

• Although women enter into undergraduate engineering and science programs with a similar level of motivation, ability, or academic preparation as their male classmates, they did not obtain degrees at the same rate as men (Single, Muller, Cunningham & Single, 2000).
STEM Facts on Women & Girls

74% of STEM workers are male. Only 26% are female.

Women comprise more than 20% of engineering school graduates, yet only 11% of practicing engineers are women.

Women's presence among computer/mathematical scientists declined from 31% to 25% over the period, but only because men's rate of growth in this area was higher than women's. The number of women working in computer/mathematical sciences has increased more than in any other broad occupational area.

Of 100 female bachelor students, 12 graduate with a STEM major but only 3 continue to work in STEM fields 10 years after graduation.

The wage gap between women and men is much smaller in STEM occupations than other occupations. In STEM fields, women earn $0.92 for every $1 earned by men, compared to $0.77 for other fields.

Although women fill close to half of all jobs in the U.S. economy, they hold less than 25 percent of STEM jobs.

Women with STEM jobs earn 33 percent more than comparable women in non-STEM jobs, considerably higher than the STEM premium for men. As a result, the gender wage gap is smaller in STEM jobs than in non-STEM jobs.

The Problem

• According to the National Action Council on Minorities in Engineering (2012), “African American students entering engineering programs are less likely to complete their degrees, take longer to complete their degrees, and transfer to and complete an associates or certificate program at a higher level” (p. 2).
STEM’s Departure
Contributing Factors

Sexism
• Leaper, Farkas, and Brown (2008) documented that many female undergraduate students experienced academic sexism in regards to their ability in science and mathematics through the comments made by their peers and teachers. In their study, they found the females who perceived sexism felt less competent in math and science than minority females who did not perceive academic sexism.

Racism
• Racial prejudice, ethnic stereotypes, and gender stereotypes were identified as pervasive elements in the professional lives of women and minorities (“Land of Plenty,” 2000).
• Researchers Beasley and Fischer (2012) reported minorities experienced stereotype threat more strongly than whites and that stereotype threat had a significant positive effect on the likelihood of women and minorities leaving science, technology, engineering, and math majors.
The Environment

How connected do you feel to the science community?

• I feel very isolated. My lab feels very isolated. We interact with each other but outside of our lab we are called, “Minority Row.”

• We work on a lower floor, and we are all Brown people. All of that together makes us seem less accomplished, or at least abnormal. Julie – STEM undergraduate
The Environment

I feel kind of like an outsider because of when I go to the lectures and the talks.

I am really involved in it, but I don’t feel connected to it.

I would go to the lectures and the talks and be like the only Black student there. Or, I would walk into the lab and not see any Black people.

I feel involved with it because I am always in the lab, always doing research, always attending these lectures. But at the same time, I don’t feel connected because there are no people like me who are attending these talks. There are no people who look like me in my lab. I feel very involved in it, but I don’t feel connected to it at all. Marqueta – STEM Undergraduate
Mentoring

Historically, relational experiences have been reported to be very important to successful women in STEM fields (Zeldin, Britner, & Pajares, 2008).

Women in a male dominated field reported using relational experiences to buttress their confidence so that they could succeed in a male dominated field (Zeldin, Britner, & Pajares, 2008).
Mentoring can help...

- Mentoring could provide support to students through **psychosocial and emotional support, career support, and academic support**, leading to increased STEM persistence.

- Mentoring has been reported to significantly predict the degree to which students become socially and academically integrated into an academic area of study and to have a positive outcome on a students’ self-confidence, self-actualization, expectations, future aspirations, and persistence rates (Crisp, 2010).
MENTORING

Ragins and Kram (2007) defined mentoring “as a relationship between an older, more experienced mentor and a younger, less experienced protégé for the purpose of helping and developing the protégé’s career” (p. 4).

“At its best, mentoring can be a life-altering relationship that inspires mutual growth, learning, and development. Its effects can be remarkable, profound, and enduring; mentoring relationships have the capacity to transform individuals, groups, organizations, and communities” (p. 3).
Mentoring

Career Focus
* Coaching
* Sponsorship
* Increasing the protégé’s exposure and visibility
* Providing the opportunity to complete challenging assignments
(Ragins & Kram, 2007).

Psychosocial Focus
* Provides emotional bonds
* Offers acceptance
* Provides confirmation
* Friendship
* Role modeling
# Sources of Mentoring

**Informal**
- Teachers
- Parents
- Community members
- Family

**Formal**
- Scholarship programs
- University sponsored
- Internship sponsored
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<td>Rondell</td>
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<td>Susan</td>
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I’ve have always considered my geometry teacher as a role model for me. She was a missionary. When she finished college, she was too young to go overseas. She came to this all girl’s school in Appalachia. She taught math. She had her way she worked. You didn’t waste time in her class. I liked the way she explained it. She was a good teacher. I think kids can tell good teachers too.

She eventually became a principal of a junior high. She actually invited me to speak at the school. We have always corresponded. I have driven down there several times. She has often commented that I was one of the best math students she had. I think that was important too.
Informal Mentor

I met my mentor in 9th grade of high school. He was my professor and he had a passion for teaching knowledge but also being a mentor. So, I guess through classes and talking to various students, he picked out like a handful of us and followed us through high school, and then through college.

I didn’t realize that he was my mentor until college. He would give me positive advice to make sure that I was on the right track as far as being a productive member of society. He gave me advice with school and advice with personal things.

Susan’s Psychosocial support
Teachers

Informal mentor

I’ve been a part of an organization for Black engineers, and I am on a regional board. So with these events, he not only comes to them, he is actively with the membership that’s been there. He is also a presenter at the workshops. When I get involved in different organizations, he has been a supportive factor there, giving me contact information of people he might know and help me out.
Informal mentors

I had one math teacher and one physics teacher who influenced me to pursue a technical major. (I attended a pretty small school.) So, I had the same math teacher from my sophomore year to my senior year.

My high school math teacher was just encouraging. I may not have had the best self-esteem as far as my academics even though I made all As. I always doubted myself. He always reminded me of how good of a math student I was.

Psychosocial support - Adrienne
Teachers

Informal Mentor

My physics teacher, I will never forget him. He did ask me early in my senior year what I planned on majoring in.

At that time, I thought it would be computer science. He kind of voiced his displeasure with me choosing computer science saying that I should definitely pursue physics and engineering.

I didn’t have any real reason to choose computer science. I was kind of thinking of something. He kind of helped me narrow it down. When I got my full scholarship my freshman year that really put the top on it.
Informal Mentor

- I think my mentor relationship has helped me because he’s an older person. It’s kind of comforting to know that I can speak with him; so, it makes me more comfortable speaking with my other professors.

- Generally, they are the same age in college. Like today, I just requested that one of my teachers and me have a standing appointment so that I can do better in class. I probably wouldn’t have done that if I didn’t have him as a mentor. The teacher was very intimidating, and I probably wouldn’t have gone that extra mile. I’m glad that I did because now I feel more confident that I will do better in the course.

Psychosocial support- Susan
Informal Mentoring

I had a very solid support network from the standpoint of going to college. I would also say that my mother also attended Hampton University. I even had a relative that worked in the financial office there. You have networking by having both parents go there. My parents supported me in my college career and had the expectation that I would do well there.
Family

Informal Mentor

In addition, I had an uncle that works for General Motors that had a chemistry background, and he also had his Ph.D. in physical chemistry.

Just hearing a lot about the work that he had done in the industry for General Motors sparked me to want to pursue an engineering degree as I learned more about his career. It really fed a lot into my interest of math and science fields.
Informal Mentoring

He did not live in Virginia. So, often times, he returned home to visit the family.

He would see my interest in science from having a microscope and talking about science. That is really where we would start to have that dialogue about math and science fields.

He would say, “Well, you know what? You really should pursue engineering. He too went to Hampton University. He was already aware that Hampton had an engineering program that was added around the time I started middle school. He was doing research as well on those opportunities of colleges for me to attend.”
Informal Mentoring

One memorable story that helped me learn where I got my scientific and mathematic capabilities was from a conversation I probably held with my father when I was in the ninth grade.

Although he was a pipefitter in the shipyard, and he didn’t go to college, he had a very good knowledge of nuclear submarines. When we were talking at home, I asked him how a submarine worked, and he described it from a scientific perspective and not a very generic explanation.

I was like, “Wow!” I can actually get knowledge from my father. I never knew.
Family

Informal Mentoring

• My grandmother had a report card of my father’s. He had A’s in chemistry and physics.

• I found out it was in my gene’s that influenced me to like science. It was something that came easy (to me). Why not use it and do something a lot of people like me do not do?
I spent a lot of time with my dad growing up. He would take me out with him. He would teach me how to change the tires on a car. I even learned how to prime the carburetor with gasoline. We had an old Pontiac. It would choke down sometimes, and we had to start it by priming it.

I think my relationship with my dad was an encouraging thing. He would ask me every day what I learned in school. I did a lot of things with him and spent a lot of time with him. I think that might have been a factor.
University Professors

Informal mentoring

Prior to the beginning of my freshman year, I entered the scholars program. The advisor for the program became my advisor. We kind of stuck with each other since then. He saw that I really enjoyed what I was doing there and when I applied for freshman research through the Howard Hughes Medical Institute, I was the one who was able to work in his lab. It’s been like that since the beginning.

Career Support – Julie, STEM Undergraduate
Informal Mentoring

He (the mentor) encourages a familiar kind of relationship in the lab with all of the other lab members. My lab is different from all of the other labs. There is a lot of diversity; ethnically and gender wise.

This past year, out of the twelve undergrads that work there, only one was White and she was female. It is really unusual in that way.

I think that did a lot to increase comfort because you are surrounded by people who look like you, or at least if they are not Black, they are Southeast Asian, or they are Mexican.

He has us eat lunch together or watch a movie together. It makes it comfortable. We do our work, but we also enjoy each other’s company.
He takes time to get to know us. He is not intrusive when interacting with us, but he does take into account the things that we say.

When I say, “I have to go home and see my sister; she needs me.” He understands. He expects me to complete my workload but also wants me to be with my family.

He constantly demonstrates the willingness to be flexible and understand that we are humans who have lives outside of the lab.
Informal Mentoring

Academically, he is constantly putting me up for opportunities. So when I first started as a freshman, he gave me a project that he was pretty sure would get published. He gave me opportunities to make sure that I got that work done. That let me know he felt like I was capable of doing the work.

He has submitted my work to conferences where I can speak on my own work. We are talking regional conferences in the field where I am interacting with other people who are professionals. I really appreciate that he constantly thinks of things I could do to propel myself professionally and make myself a better candidate for the grad work that I want to do.
Informal Mentoring

This summer we were really, really close because I was the only person doing research in his lab.

I remember my freshman year, I really didn’t talk to him that much or feel like we were able to have that much of a strong connection. But, I feel like this summer has given me a really huge opportunity to get to know him better one on one. (I saw) how much he values education and how much he kind of has some of the same interests (as me).

It is really cool that we have established such a strong connection. I never thought that would happen. It is pretty exciting.
Informal Mentoring

My family actually came up one time for one of my presentations, and he really reached out.

He wanted to have lunch with us. He wanted to get to know my mom. Different stories I told him about my mom, he would ask her to confirm them.

He really tried to get to know me outside of being his research student. Getting to know me; my aspirations and goals.

That was pretty cool.
What’s Love Got to Do With It?

A lot!!!!

Women in a male dominated field reported using relational experiences to buttress their confidence so that they could succeed in a male dominated field (Zeldin, Britner, & Pajares, 2008).
References


Congressional Commission on the Advancement of Women and Minorities in Science, Engineering and Technology Development. (2000). Land of plenty: Diversity as America’s competitive edge in science, engineering, and technology.


References


