

# **The Motivations of STEM Mentors**

## **Abstract**

This paper seeks to understand the motivations and benefits of mentoring in an afterschool engineering program on college student mentors. We draw on social exchange theory as the foundation for our thinking and analysis. In this paper, we report on early findings from an ongoing, three-year study of an afterschool engineering program for fourth and fifth grade boys of color where undergraduate STEM majors serve as mentors. Data come from interviews with and observations of five male mentors. Early findings suggest that the mentors' motivations were somewhat different, with two of the three mentors joining for self-enhancement, and the other three joining for reasons such as empathy. We found some limited evidence of our hypothesis.

## **Purpose**

School-Based mentoring (SBM) currently is the most widely available and fastest-growing form of mentoring in the United States (Karcher, 2008). One challenge limiting mentoring programs is their ability to attract and retain mentors. While we know some demographics about individuals that mentor, we know less about why mentors decide to become mentors, why they persist, and what effect the mentoring relationship has on them. Existing research points to several potential explanations for why individuals decide to mentor, including self-enhancement (Batson, Ahmed, & Tsang, 2002; Clary et al., 1998; Mondisa & McComb, 2015) or the fulfillment of personal values (Diversi & Mecham, 2005; Karcher & Lindwell, 2003), such as altruism (Clary et al., 1998). Self-efficacy and confidence have been related to whether mentors persisted in their relationships (Rhodes, 2002). Mentoring also has been described as having improved mentors' personal (e.g., organization) and leadership skills (Nelson et al., 2017). Better understanding the potential motivations of and benefits to mentors can help SBMs recruit mentors and design more mutually beneficial mentor/mentee interactions.

This paper seeks to understand the motivations and benefits of mentoring in an afterschool engineering program on college student mentors. Specifically, we argue that for some mentors, particularly those who are underrepresented in their own institution, the reasons they become involved in mentoring, may be derived from the combination of interpersonal guilt and impostor syndrome. Individuals who are underrepresented in a particular institutional setting (e.g., people of color and first-generation college students in a STEM major) may have impostor syndrome (Piorowski, 1983) and feel as if they do not deserve to be where they have made it (e.g., college), and simultaneously may experience interpersonal guilt (O'Connor & Berry, 1996) due to the sense that they "made it" when others in their community have not. Mentoring youth, may give mentors the opportunity to be experts and to give back to others like themselves. Prolonged engagement in the mentoring relationship and setting can enhance the mentor's sense of belonging (Lave & Wenger, 1991), which in turn can strengthen the mentor's identity as an expert and leader in the institutional community.

This paper seeks to begin to answer the following questions:

1. *What motivates STEM undergraduate students to become mentors in an intensive afterschool engineering program?*
2. *What motivates the mentors to persist?*
3. *In what ways does the mentoring experience affect the mentors?*

Here, we report on early findings from an ongoing three-year study of an afterschool engineering program in which undergraduate STEM majors work alongside fourth and fifth grade boys of color to learn about engineering design and to solve engineering problems.

### **Theoretical Framework**

We draw on social exchange theory (SET; Blau, 1968) as the foundation for our hypothesis. Blau (1968) argued that much of human behavior can be explained by focusing on the costs associated with and the rewards derived from different behaviors. In other words, individuals decide what to engage in (e.g., mentoring) based on the relative costs (e.g., time and effort) and benefits or rewards (e.g., a sense of fulfillment, burnishing a resume, etc.). We posit that mentors become engaged and persist as mentors at least in part as a way to address the simultaneous experience of impostor syndrome and interpersonal guilt (see Figure 1). We contend that this explanation may be particularly well-suited to explaining why mentors who themselves are underrepresented in a particular setting become and persist as mentors, and how they benefit from mentoring.

Interpersonal guilt consists of three components (see Table 1): Survivor guilt, omnipotent guilt, and separation guilt (O'Connor, Lynn, Berry, & Weiss, 1999) (see Table 2). This guilt may affect one's academic performance and well-being (Brockner, Davy & Carter, 1985; Whitten, 1992) as well as positive relationship development and normal progression through life (Piorkowski, 1983; Tate, Williams, & Harden, 2013).

Secondly, we hypothesize that feelings of being an impostor may motivate mentors. Impostor syndrome describes the feelings of inauthenticity that high-achieving individuals often experience (Clance & Imes, 1978). This sense of inauthenticity and the externalization of success also may exacerbate feelings of guilt and worry as students may fear being 'discovered' as impostors or as unable to fulfill classroom or workplace expectations (Brown & Ramsey, 2015).

Interpersonal guilt and impostor syndrome may drive certain students to participate and persist as mentors because mentoring can mitigate both feelings. Mentoring provides the mentor with an opportunity to be an expert in front of younger students, to create an identity in their new community (e.g., a STEM identity), and to open doors for others like them to enter that community. As an example, Philips and Devore (2009) found that mentoring helped female astronomy students partially overcome their sense of being impostors in their major because they were more likely to feel welcomed and accepted in the mentoring community and to form positive perceptions of themselves as a result of their involvement in a mentoring relationship.

If mentors become engaged to alleviate negative feelings, they persist because of the process set in motion. Positive engagement in a mentoring relationship can help cultivate a sense of belonging and community, which in turn supports the formation (or strengthening) of an identity

attached to that community (Lave & Wenger, 1991). These two effects further alleviate any sense of guilt or impostor syndrome, and also can create an intrinsic motivation to remain engaged as a mentor.

### **Data Sources**

In this paper, we report on early findings from an ongoing, three-year study of an afterschool engineering program for fourth and fifth grade boys of color. A key component of this program is that undergraduate students majoring primarily in engineering serve as mentors during each of the sessions, which occur three times a week—twice after school for an hour and a half, and on Saturday mornings for two hours. The mentors wear multiple hats as they alternately help teach and model activities, and also sit with the elementary school boys to facilitate conversations and work. As such, they serve as STEM role models as well as role models in the more traditional way that mentors do.

The data are from a single school case study of the afterschool program and mentoring relationships (Merriam, 1998). The school is an elementary charter school (K-5) that is part of the university that the undergraduate students attend. The participants include five male undergraduate students enrolled in a large state university (See Table 2). They were recruited by the program director through their engineering courses, or through campus-based professional organizations such as the National Society of Black Engineers. All five were paid to serve as mentors.

### **Data Analysis**

We collected data on the mentors in two ways to enhance the trustworthiness of the findings (Morse, Barrett, Mayan, Olson, & Spiers, 2002). First, we observed a full week (three sessions) of the afterschool program twice during the semester, focusing on the interactions and conversations between the boys and the mentors. During the observations, we sat with a dyad (one mentee and one mentor) for three to five minutes while taking detailed field notes, and then we rotated to the next dyad. This continued for an hour during a total of six sessions. Second, we interviewed each of the five mentors at the end of the semester. In this paper, we focus on the findings from the interviews, drawing on our observations as appropriate.

We began our analysis of the interviews by using open coding (Bogdan & Biklen, 2007), in which we read through the transcripts with no *a priori* codes to identify emergent themes. Then, we re-read the transcripts using a set of *a priori* codes we developed based on the literature review and the competing explanations for mentors' motivation and persistence we identified (see Table 3). For the purpose of this paper, we analyzed our field notes by searching through them to identify and code examples of the findings identified in the interview data.

### **Findings**

Each of the five mentors joined the program via different paths and had somewhat different motivations. Two of them were motivated by self-enhancement. They decided to become mentors in the program at the urging of the program director as a way to improve their resumes.

As one explained, "I decided to try it because, well, I mean, I needed some volunteer hours on my resume. I wasn't really big into that kind of stuff in high school." The other mentor echoed this sentiment, adding that he had joined every initiative the program director was running. The other three mentors described more complex motivations to become mentors. These reasons included liking working with kids, altruism, and a sense of empathy. All three of these mentors reported that wanting to work with kids was a reason they joined and were hoping to continue to mentor. This sentiment was expressed very clearly, as in this statement from one of the three: "I love working with children". Interestingly, the two mentors who explained they joined primarily for self-enhancement reasons either did not mention kids or explicitly stated they did not like working with kids.

While none of the mentors mentioned alleviation of guilt in their motivations, some responses alluded to a sense of responsibility for others with backgrounds similar to their own, which could be evidence of responsibility guilt. Two of the three mentors expressed altruistic reasons for joining the afterschool program. One of them stated simply that, "I want to give back to the community by helping others", while the other told us that "I've never heard of something like [the afterschool program], where we go out and help the kids in this way, especially minority students who don't have the same upbringing and opportunities that everybody else has." A final common reason among the three other mentors was empathy. They felt that they could understand the students' situation in some way that made them well-positioned to help them. For example, one of the mentors explained that, "I didn't know STEM existed when I was younger. So, I believe that being a mentor right now, you can inspire people there that are younger me, and so they would know what they want to do as they get older." Another mentor reflected specifically on his position as an engineering student, saying, "I know how to talk to a kid when he doesn't get things because I've been in that situation where I didn't understand the math or I didn't understand this or the project or what's going on".

We only heard one reason related to our proposed explanation of expertise. This mentor explained that he was motivated to join in part because of his position as an engineering student. He told us that, "[the afterschool program is] in a subject that I feel like I could have an impact on their lives, because I feel like I can explain that well enough to them". In other words, he was drawn to the mentoring program specifically because of the opportunity he would have to act as an expert for the younger students. Additional data will be collected from these five mentors and five new mentors in the fall of 2018.

### **Significance**

The purpose of this study is to test the hypothesis that interpersonal guilt and impostor syndrome motivate certain individuals to become and persist as mentors, and also help explain the ways mentors benefit from the relationship. This argument adds to the literature on mentoring by drawing on novel constructs and also by providing a unified explanation for key mentoring outcomes. Based on the early findings briefly described here, we see limited support for our hypothesis. As this study is part of a three-year study, we will have additional findings to report on that may provide additional evidence.

Word Count: 1,943

## References

- Batson, C. D., Ahmad, N., & Tsang, J. A. (2002). Four motives for community involvement. *Journal of Social Issues, 58*(3), 429–445.
- Blau, P. M. (1968). Social exchange. *International encyclopedia of the social sciences, 7*, 452-457.
- Bogdan, R., & Biklen, S. (2007). *Qualitative Research for Education* (5<sup>th</sup> Ed.). Boston, MA: Allyn & Bacon.
- Brockner, J., Davy, J., & Carter, C. (1985). Layoffs, self-esteem, and survivor guilt: Motivational, affective, and attitudinal consequences. *Organizational Behavior and Human Decision Processes, 36*, 229–244.
- Brown, D., & Ramsey, E. (2015). Translating Failure into Success. *PNLA Quarterly*.
- Clance, P. R., & Imes, S. A. (1978). The imposter phenomenon in high achieving women: Dynamics and therapeutic intervention. *Psychotherapy: Theory, Research & Practice, 15*(3), 241.
- Clary, E. G., Snyder, M., Ridge, R. D., Copeland, J., Stukas, A. A., Haugen, J., & Miene, P. (1998). Understanding and assessing the motivation of volunteers: A functional approach. *Journal of Personality and Social Psychology, 74*(6), 1516–1530.
- Diversi, M., & Mecham, C. (2005). Latino (a) students and Caucasian mentors in a rural after-school program: Towards empowering adult–youth relationships. *Journal of community psychology, 33*(1), 31-40.
- Karcher, M. J. & Lindwell, J. (2003). Social interest, connectedness, and challenging experiences: What makes high school mentors persist? *Journal of Individual Psychology, 59*, 293–315.

- Karcher, M. J. (2008). The study of mentoring in the learning environment (SMILE): A randomized evaluation of the effectiveness of SBM. *Prevention Science, 9*, 99–113.
- Lave, J., Wenger, E., & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation* (Vol. 521423740). Cambridge, U. K.: Cambridge University Press
- Merriam, S. B. (1998). *Qualitative Research and Case Study Applications in Education. Revised and Expanded from " Case Study Research in Education."* San Francisco, CA: Jossey-Bass Publishers.
- Mondisa, J. L., & McComb, S. A. (2015). Social community: a mechanism to explain the success of STEM minority mentoring programs. *Mentoring & Tutoring: Partnership in Learning, 23*(2), 149-163.
- Morse, J. M., Barrett, M., Mayan, M., Olson, K., & Spiers, J. (2002). Verification strategies for establishing reliability and validity in qualitative research. *International journal of qualitative methods, 1*(2), 13-22.
- Nelson, K., Sabel, J., Forbes, C., Grandgenett, N., Tapprich, W., & Cutucache, C. (2017). How do undergraduate STEM mentors reflect upon their mentoring experiences in an outreach program engaging K-8 youth?. *International Journal of STEM Education, 4*(1), 3.
- O'Connor, L., & Berry, J. (1996). *Control mastery research: Empirical studies of guilt*. Retrieved from [http://www.behavior.net/forums/archives/clinicalcase/1998.harold/2\\_5-9.htm](http://www.behavior.net/forums/archives/clinicalcase/1998.harold/2_5-9.htm).
- O'Connor, L. E., Berry, J. W., & Weiss, J. (1999). Interpersonal guilt, shame, and psychological problems. *Journal of social and clinical psychology, 18*(2), 181-203.
- Phillips, C. B., & DeVore, E. K. (2009). Astrobiology Research Experience for Undergraduates: An Interdisciplinary REU Program at the SETI Institute. *In Memoriam*, 188.

- Piorkowski, G. K. (1983). Survivor guilt in the university setting. *The Personnel and Guidance Journal*, 61, 620–622.
- Rhodes, J. E. (2002). *Stand by me: The risks and rewards of mentoring today's youth*. Cambridge, MA: Harvard University Press.
- Tate, K. A., Williams III, C., & Harden, D. (2013). Finding purpose in pain: Using logotherapy as a method for addressing survivor guilt in first-generation college students. *Journal of College Counseling*, 16(1), 79-92.
- Whitten, L. (1992). Survival conflict and survival guilt in African American college students. In M. Lang & C. Ford (Eds.), *Strategies for retaining minority students in higher education* (pp. 64–74). Springfield, IL: Charles C. Thomas.

## Tables

Table 1: Components of Interpersonal Guilt

Guilt	Definition
Survivor Guilt	Excessive worry by an individual who is in a better position than their peers
Responsibility Guilt	Guilt due to the belief that one is responsible for the well-being of others
Separation Guilt	Fear that one is harming another by separating from them physically, emotionally, or socially

Table 2: Participant Characteristics

Participants	Race/Ethnicity	Major	Mentoring Duration
1	African American	Math	1 semester
2	Latino	Engineering	2 semesters
3	African American	Engineering	1 semester
4	Latino	Engineering	1 semester
5	Caucasian	Engineering	1 semester



Table 3: Codes

<b>Emergent codes</b>	<b><i>A priori</i> codes</b>
<i>(added on first round of coding)</i>	Mentoring reason: Altruism
Background	Mentoring reason: Community
Challenge	Mentoring reason: Empathy
Change	Mentoring reason: Extroversion
Change: Career thinking	Mentoring reason: Impostor syndrome
Connection	Mentoring reason: Interpersonal guilt
Family	Mentoring reason: Transactional
Goal	Mentoring persistence: Altruism
Major reason	
Mentor experience	
Mentor reason	
Path in program	
Prior mentoring	
Prior volunteering	
UH reason	
<i>(added on second round of coding)</i>	
Mentoring reason: Likes working with kids	
Mentoring reason: Preparation for future	
Mentoring reason: Fulfilled	
Mentoring reason: Guilt	
Mentoring persistence: Fulfillment	
Mentoring persistence: Learn about self	

Mentoring persistence:  
Preparation for future

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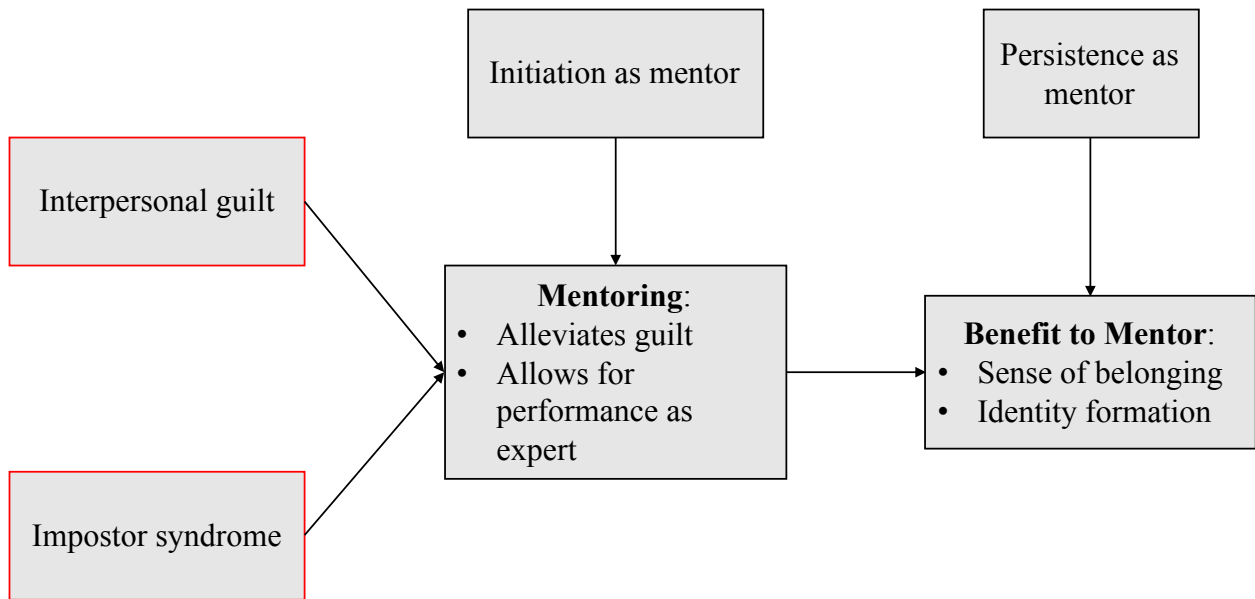


Figure 1. Theoretical model of mentoring