



Bulls-EYE Mentoring: Developing a Program Intervention in the College of Engineering

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The Bulls-Engineering Youth Experience (Bulls-EYE) is a STEM mentoring initiative sponsored by the Motorola Solutions Foundation. It provides STEM intervention programs around mentoring relationships between underrepresented undergraduate and middle school students. Departments implementing a Bulls-EYE Mentoring program adapt the core values and methods of the Bulls-EYE Mentoring initiative, train undergraduate students, partner with a local middle school, implement their intervention program, and then assess its effectiveness. The aims of Bulls-EYE Mentoring are the creation of a more innovative STEM workforce and more STEM literate general population through effective outreach methods targeting underrepresented minorities. The initiative will accomplish this through improving the STEM pipeline on two fronts: the empowerment of middle school students serving in the role of mentees and the engagement of undergraduate students serving as mentors. The program intends to produce higher retention rates from both populations as they matriculate through their respective institutions.

What makes Bulls-EYE Mentoring unique is its use of mentoring to improve the interpersonal skills and intrapersonal skills of participants in parallel with a challenging technical curriculum. The core values of the program are based on the belief that mentor and mentee relationships and proven methodologies for fostering these relationships improves the effectiveness of STEM interventions for underrepresented minorities. The effect of Bulls-EYE Mentoring will be studied through its ability to influence students' perceptions and attitudes towards engineering and their growth as an individual. The programs effect on undergraduate students' desire to remain in the college of engineering will also be assessed. In addition, the effect of the program on middle school students' STEM literacy and interest in pursuing STEM related degrees at the collegiate level.

This paper presents the Bulls-EYE Mentoring Initiative Pilot Program structure and curriculum. The pilot program focuses on the development of qualitative and quantitative methods of assessment. In addition, it aims to provide some limited evidence that the proposed methods are effective at improving students' desire to be retained in the college of engineering until the completion of their undergraduate level degrees. The pilot consists of two phases: the recruitment and training of potential mentors which was completed in the Fall of 2014 and the execution of a Robotics Summer Academy during the Summer of 2015. This paper outlines the program structure for Bulls-EYE Mentoring and the logistics of the program's curriculum.

Potential mentors are selected and trained through partnerships with the Society of Hispanic and Professional Engineers (SHPE) and the National Society of Black Engineers (NSBE) at the University. Students are trained using a service-learning curriculum derived from the Thomas Principles, which was originally created for the STARS Alliance in response to the need to provide culturally responsive outreach programs for students in technical fields. From the population of students who receive the training, 12 will be selected to serve as mentors for the Bulls-EYE Pilot Program.

The curriculum is developed applying a service-learning framework and mentoring models with contributions from Nguzo Saba²⁸, Africentricity theory²⁰, and Borderlands theory³. Through the application of mentoring models to existing service-learning

framework, we intend to explore techniques that can be applied in the College of Engineering to directly respond to the underrepresentation of these marginalized ethnic populations in Engineering. Quantitative and qualitative assessments of students' experiences as participants in this program will allow us to develop comparative results to other STEM service-learning programs in existence and to future Bulls-EYE Mentoring programs. Furthermore, the results of this data will provide insight into the participants' understanding of their experience as they are experiencing it.

The aforementioned research has the potential for high impact because it provides quantitative results of students' experiences as well as direct insight into the students' experiences as they occur. This mixed methods approach will help us to gain a rich understanding of the participants' experience in the program. Two aspects of the Bulls-EYE Mentoring initiative make it significant to the discipline. Furthermore, Bulls-EYE's use of mentoring may prove to be a more effective approach to promote STEM and instruct talented students from underrepresented populations. The discipline is in need of approaches to specifically target underrepresented minorities in new and effective ways.

Background

There currently exists a concern for student attrition in the College of Engineering^{10,15,16}. This concern persists when evaluating marginalized ethnic groups especially Black and Hispanic²⁹, and women^{36,39} in the College of Engineering^{10,15}. As a result, there are numerous strategies developed to respond to attrition including but not limited to: first year seminar, collaborative or cooperative learning projects, service learning/projects of social importance, hands-on design projects, community service, student-faculty interaction, tutoring, summer bridge programs, mentoring, undergraduate research programs, etc^{10,16,45}.

Service learning is listed as a method to increase retention, traditionally responding to classroom and academic climate, grades and conceptual understanding, and self-efficacy and self-confidence¹⁶. Frequently used as a response to retention in STEM because it provides an opportunity for "investigative learning, technology...engag[ing students] in hands-on, real life projects...changing the curriculum to promote more collaborative group work [which] has also helped students develop peer networks"^{10(p.4)}. In reference to the approach developed by Geisinger and Raman (2013), there are three potential attrition factors that are not traditionally addressed through service learning. Those factors are high school preparation, interest and career goals, and race and gender. As a result, an alternative method to address race and gender, and interest and career goals is through mentoring. Providing service-learning opportunities that influence undergraduate students and school aged children can support the academic preparation of students prior to entering post-secondary education. Furthermore, mentoring programs that are supportive in socializing students in the STEM fields contribute as a form of support for underrepresented student populations¹⁰.

Concerns with Service-Learning in STEM

While comparing the cited definitions of service learning both in STEM and in other fields, numerous commonalities among the definitions exist. However, within STEM there seems to be components that are neglected in the literature. Nagchaundhuri and Eydgahi (n.d.) approach this issue as it relates to curricula, by recognizing that non-STEM fields such as Social Sciences and Humanities “emphasize more on ‘soft skills’ and ‘social service’ and as such have naturally embraced ‘service-learning’” (p. 1). As a result, integrating academic fields with “service-learning” that emphasizes, “‘technical’ and ‘scientific’ skills such as Engineering...[is] rare”³³.

Another difference in the definition of service learning provided through an evaluation of Jacoby (1996), who defines service learning as a “form of experiential education in which students engage in activities that address human and community needs together with structured opportunities intentionally designed to promote student learning and development. Reflection and reciprocity are key concepts of service-learning” (p. 5). This reference also comes from a field outside of STEM, and acknowledges student engagement in activities to address human needs, while listing reciprocity as a key component. Furthermore, acknowledging the reference of experiential learning and its connection to John Dewey¹³, Paulo Freire, and social justice/change^{8,32,14,43}, which further contribute to the human aspect that is embedded in service learning⁹. These components directly connect to support of underrepresented student populations, and need to be highlighted in STEM service-learning programs in order to alter current concerns as it relates to retaining these student populations.

The service-learning literature demonstrates a gap that develops the need to explore alternative models for service learning in the STEM fields that focus on the human and social component in the program’s development in order to respond to the needs of underrepresented student populations. The proceeding sections will provide a response to this concern by exploring literature on mentoring marginalized ethnic groups and women, to develop a response to this issue existing in service-learning in STEM.

Theoretical Approaches to Mentoring

Mentoring programs that are supportive in socializing students in the STEM fields have been shown to contribute as a form of support for underrepresented student populations¹⁰. As a result, reviewing mentoring literature for women and marginalized ethnic groups is a necessity when attempting to understand the impact mentoring may potentially have in relation to STEM. Literature has explored responsive mentoring programs to the needs of this population, recognizing the need for alternative approaches to mentoring^{5,19,27,30,35,44}, and applying and assessing a variety of methods and theories to execute alternative frameworks for mentoring^{12,20,22,23,24,36,42}.

Africentricity Theory. Harris (1999) researches mentoring responses relevant to African American populations. Africentricity centers particularly African American students, inside their cultural, historical, and scientific roots². Furthermore, “Viewing African people as subjects of the human experience rather than marginal to Europe...We are in effect centered in our own historical

experience and view the world through that experience”^{2(p.30)}. As a result, Africentric philosophy is grounded in Swahili African Culture Nguzo Saba²⁰. Nguzo Saba has seven principles including: (1) Umoja: Unity, (2) Kujichagulia: Self-determination, (3) Ujima: Collective-work and responsibility, (4) Ujamma: Cooperative economics, (5) Nia: Purpose, (6) Kuumba: Creativity and (7) Imani: Faith²⁸.

The Africentric Mentoring Model expands on the principles of Nguzo Saba, including:

1. Umoja/Ujima: (Unity/Collective work and Responsibility)- “This assists the individual in establishing and maintain relationships with others within the community...It is during this process the individual realizes their connectedness to others”^{20(p.232)},
2. Nurturing: Kujichagulia (Self-determination)- “Self-determination allows the individual to respect themselves and others, and take responsibility...in the mentoring process [this principle] allows the individual in the mentoring relationship to receive nurturing from others as well as nurturing themselves”^{20(p.232)},
3. Skill Development: Kuumba (Creativity)- “its focus to uplift one’s spirit through positive engagement in goal directed and socially meaningful activities”^{20(p.232)},
4. Self-Confidence/Independence: Nia (Purpose)- “meaningful purpose for self and others...In addition, the delay of gratification (going to college) and the ability to co-exist with uncertainty, is also essential for long-term success...in the mentoring process allows the individual to see beyond the mentoring relationship to assisting others in the mentoring process”^{20(p.233)},
5. Collaboration: Ujamma: (Convergence of “I” and “We”) “There is a spirit of reciprocity-giving and accepting ‘help.’ That is critical for students who are experiencing academic difficulty because it gives them the ability to ask for ‘help’ without feelings of inadequacy or shame”^{20(p.233)} and
6. Mentor/Mentee: Imani: (Faith) “The individual develops the ability to talk with others about life, freedom and death...give assistance and work as a part of a team. This principle allows the individual to have an intergenerational perspective”^{20(p.233)}.

The Africentric Mentoring Model promotes a holistic and humanistic approach that recognizes the varied dimensions of human experience²⁰. The nature of this perspective is to make sense of individual lived experiences in relation to the community and acknowledge the experiences of others^{2,6,7}.

Borderlands Theory. Bernal, Aleman and Garavito (2009) explore mentoring for Latinas/os in a higher education ethnic studies program. This program applied concepts of “borderlands and the border...as forms of cultural expression and as a critical language...shedding light on race relations in the Southwest...structural inequality and cultural hybridity that has an impact on Latinas/os as forms of cultural expressions”^{3(p.565)}. The Borderlands includes: Psychological, Spiritual, Sexual Borderlands; Chicana identity and oppression; Challenges of mediating between home and dominant cultures; Resisting Binaries; and Genre-blurring¹.

Borderlands theory is helpful for this population of students because it provides a framework for describing class, gender, ethnic, racial, and geopolitical issues that these youth confront, suggesting a more distinct framework of race relations that includes citizenship, phenotype, residency status, immigration, language, and history³. Borderlands theory highlights three main components including:

1. Shifting identities,
2. Critical discourse: Talking Back, and
3. Staying connected through Sitio y Lengua (decolonizing spaces and discourses).

The work of Bernal et al. (2009) is significant because of the application of Borderlands theory to Mentoring and it's intersect with Service-learning in order to provide a service to Latinas/os elementary school children in the local community.

Cultural Community Wealth. Traditionally, cultural capital has been narrowly defined by “White, middle class values, and is more limited than wealth—one’s accumulated assets and resources”^{46(p.77)}. As a result, Yosso (2005) provides an alternative to this way of conceiving cultural capital defining it instead as community cultural wealth. Through a Critical Race theory lens, one can “see’ that Communities of color nurture cultural wealth through at least 6 forms of capital”^{46(p.77)}. Six components are necessary in obtaining cultural capital, including: Aspirational Capital, Linguistic Capital, Familial Capital, Social Capital, Navigational Capital, and Resistant Capital. Embedding community cultural wealth into the Mentor Service-Learning Model can further extend the potential of meeting the needs of underrepresented student populations in STEM as well as in the local community.

STEM programs are being developed that apply mentoring to their program framework to increase success among students^{17,40}. However, STEM programs are still in the trial-and-error stage of identifying a formula for mentoring that yields success for all students, especially those who are apart of underrepresented populations in STEM^{18,21,31,45}. As a result, humanizing the student experience through the development of a Mentor Service-Learning model will provide a culturally responsive academic experience that supports their academic growth in STEM while building and strengthening students identities as members of their community. Furthermore, this model will provide a framework that is responsive to underrepresented populations in STEM. Bulls-EYE Mentoring will apply the principles of Nguzo Saba, Africentricity theory, Borderlands Theory, and Cultural Community Wealth to produce positive outcomes among our participants.

Program Structure

Bulls-EYE Mentoring pilot program has two main components including: Mentor Training and the Robotics Summer Academy. The mentor training prepares undergraduate engineering students to participate in a mentor capacity for the Robotics Summer Academy. Mentor Training occurs during the academic school year and provides students training on coaching, leadership and mentorship. The Robotics Summer Academy is a five-week summer program that facilitates the learning through technical and life skills. Technical skills will include design, hardware, software, and a comprehensive project. Life skills will include goal setting,

resource management, decision-making, and the ability to build upon success. Bulls-EYE Mentoring is unique because this Service-learning program structure is grounded in the Swahili African Culture: Nguzo Saba. Nguzo Saba is a holistic and humanistic approach that makes sense of individual lived experiences in relation to the community and acknowledges the experiences of others. In addition to Nguzo Saba we applied theoretical approaches to our application of mentoring to positively influence Bulls-EYE Mentoring's impact on the participating population. Africentricity theory, Borderlands theory, and Critical Race theory: Cultural Capital is imbedded in the program curriculum to support the development of life skills as they counteract with the progression of technical skills for both mentor and mentee participants.

Mentor Participants

The undergraduate engineering students selected as mentor participants in this program are currently enrolled at the University of South Florida (USF). These students are also members of the USF student chapters of the National Society of Black Engineers (NSBE) and Society of Hispanic Professional Engineers (SHPE).

Mentee Participants

The partner school for the Bulls-EYE Mentoring Pilot Program is Bartels K-8 STEM Academy. Bartels currently executes a comprehensive STEM based curriculum from 3rd grade to 8th grade; however, many of the black and Hispanic students transfer from the USF area as 6th graders and therefore enter the STEM pipeline later than most of their peers. In addition to this population being underrepresented, the majority of these students are categorized as underserved, with 95% of them receiving free or reduced lunch. Twenty-four mentees will be recruited from this population during the Spring 2015 semester for the Bulls-EYE pilot program.

Program Curriculum

Mentor Training Phase

The Mentor training program for the Bulls-EYE Mentoring pilot year occurred during the Fall 2014 academic semester. Four training sessions occurred throughout the semester and the program curriculum was as follows:

- Session 1: This session consisted of building a strong sense of camaraderie between undergraduate students and activities to develop better understanding of one's personal identity. The students had an introduction of what would be covered in their training and completed short activities to get to know other students and their strengths and weaknesses.
- Session 2: Students completed activities to better understand privilege in society and how their experiences compared to each other. Students then discussed how they perceive themselves and how others perceive them. Students then discussed stereotypes and challenges when entering and understanding new cultures. Lastly, students did an intimacy exercise to break superficial relations to get to know one another with greater depth.

- Session 3: Students were able to participate in the “Personal Unfoldment” where they described situations of a challenging time in their life and ended with a happy experience that strengthen them to be where they are today. Students were first introduced to the Thomas Principles and given examples on how to use the Thomas Principles. Finally, students were taught basic concepts on how to mentor others.
- Session 4: This was the final session of training where students covered Situational leadership & mentoring concepts. Students covered how to mentor a reluctant mentee, rules for being fair in a conflict scenario, and the art of listening. In addition, Rogerian theory was covered and its application to mentoring. Students wrapped the session up with an activity called Gifts & Legacies, where they gave each other words of strength and empowerment to take with them after the training was over.

Upon completion of the program, participating undergraduate engineering students received training and certification in service learning and outreach. These students are then eligible to apply as mentors for the Bulls-EYE Mentoring Robotics Summer Academy.

Robotics Summer Academy

Life and Technical Skills. In the development of the Bulls-EYE Mentoring curriculum we have decided to embed the life skills component of the program with theoretical approaches to mentoring, that might assist in the execution of Bulls-EYE Mentoring’s mission. The technical skills component expands on the life skills and assists students in making connections between their personal life and academic goals. A detailed explanation of the lessons for the first week of the program will be provided including activities for life skill and technical skill development. Additionally, a brief overview of the technical skills for the remaining four weeks of the program will be provided. Each week will conclude by making connections between life and technical skills.

Week One:

- *Life Skills:* Week one builds on students’ *community values* and this is supported through an exploration of the seven principles of *Nguzo Saba*.
- *Technical Skills:* Students receive an introduction to the Lego Mindstorm platform and LabVIEW NXT toolkit. Students learn how to work with their small group, which consists of one fellow mentee and their summer mentor. Activities promote introductory skills with hardware and software. In addition, mentees will complete an economic ecosystem activity where they must barter and cooperate with other small groups to complete an activity.
- *Connection to life skills:* Each life skill and technical skill will be applied through the framework of *Nguzo Saba*. This is so mentees feel a sense of community values and group identity. Definitions of Engineering and leadership are given that give youth an understanding that Engineering is a field that promotes helping others. Activities in technical skills and life skills are cooperative in nature and share the theme of the mutual benefit of the group.

Table 1. Summary of Week 1 structure that focuses on the life skill of community and the technical skill of engineering teamwork

	Monday	Tuesday	Wednesday	Thursday	Friday
<p>Life skill lessons and activities.</p> <p>Begin at 10am and End at 12pm</p> <p>Focus on community values.</p> <p>Introduce Nguzo-Saba, the tribe structure, and build rapport.</p>	<p>Introduction Reflect on Family Community, nation and race. Bulls EYE family community activities.</p> <p>Activity: Students will be divided into two tribes and create a tribe identity. They will brand their tribe based on who is in the tribe.</p>	<p>Ujima: Defining leadership as the art of making those around you better and engineering as a career that makes the lives of others in the community better.</p> <p>Activity: Tribes will complete scavenger hunt on campus that will require leadership.</p>	<p>Kuumba: Activities to demonstrate creativity in the tribe and as an integral part of engineering.</p> <p>Activity: Tribes will create a photo collage from the images taken during the scavenger hunt activity. The collage will be made during technical skills and will “live” on the USF campus.</p>	<p>Nia: Activities to demonstrate purpose in the tribe and as an integral part of engineering.</p> <p>Activity: Tribes will complete a service project that involves creating something in the community and using basic hands-on tools.</p>	<p>Reward: Students will travel to Riverfront Park on campus for a fun BBQ and outdoor activities. They will play games outside that are interactive and team building.</p> <p>Activity: Fun outdoor activities in addition to puzzles and games</p>
<p>Technical skill lessons and activities</p> <p>Begin at 1pm and end at 3pm</p> <p>Focus on teamwork</p>	<p>Umoja: Mentees will be divided into groups of 2 and teamed with an undergraduate student.</p> <p>Activity: Introductory games based in LabVIEW that identify what each</p>	<p>Kujichagulia: Groups will identify skills and abilities they possess.</p> <p>Activity: Groups will complete an activity where they can establish what skills they</p>	<p>Ujamaa: Entrepreneurship will be tied to engineering.</p> <p>Activity: Groups will complete a simple activity with the Lego Mindstorm platform and “sell” their creation to the</p>	<p>Imani: Part two of the service project where groups receive feedback from those they helped. Engineering defined as the art of problem solving and a means to help others.</p> <p>Activity:</p>	<p>Reward: Students will continue their reward at Riverfront Park on the USF campus. Activities will become more so tied to math and robotics themed.</p> <p>Activity: Activities tied to math, science, or engineering with more</p>

Introduce LabVIEW, group structure and STEM	person shares in common with their group members.	already have and what they will learn by completing the program. Strengths and weaknesses.	rest of the group. Soft skills will be emphasized and “support” careers for non-engineers.	Sharing with elders to build confidence.	technical content.
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Week Two:

- *Life Skills*: Week two explores the process of *goal setting*, providing activities where students are held accountable for building a business that benefits their community. Participants will establish goals that will develop them as individuals and as a collective. Africentricity theory is used in support of this skill applying *Collaboration: Ujamma*, emphasizing the importance of each member to Bulls-EYE Mentoring and their contribution to the spirit of reciprocity and collaboration in the program process. In addition, *Ujima* is also referenced to emphasize responsibility and accountability.
- *Technical Skills*: The design process will be given as an example of goal setting when the result is the optimization of a system or creation of an end product. Activities will reinforce this analogy and include the design of small robotic cars for simple tasks using Lego Mindstorm hardware. Youth will observe how the design process helped to optimize what they built with the Lego Mindstorm car in the first week.
- *Connection to life skills*: The procedure between how to establish goals and conduct the design process will be very similar. Both will be defined as a systematic way of optimizing performance results.

Week Three:

- *Life Skills*: Week three covers *resource management*, which focuses on helping students identify necessary resources. This ideology will be infused with *cultural community wealth*⁴⁶, engaging students in opportunities that strengthen their understanding of navigational and aspirational capital. To implement this idea, students will have the opportunity to explore the past through research of their ancestors, the present, which enables students to interact with leaders in the Tampa, USF and Bulls-EYE Mentoring community, and the future through interaction with Professionals in STEM, graduate and undergraduate student leaders to expand on their development as individuals. Africentricity theory will be applied, calling on *Umoja* and *Skill Development: Kuumba* as they continue to grow and learn to operate in unity.
- *Technical Skills*: Students will learn how to program the NI DaNI robot and observe its expanded hardware with respect to the Lego Mindstorm. Capabilities of several different sensors will be observed onboard the NI DaNI robot and students

will learn the best sensor or combination of sensors for specific tasks. Students will also compare and contrast different actuators.

- *Connection to life skills:* The individual usefulness of sensors will be related to the individual usefulness of different resources. The value of resources will be tied to the value of specific hardware for a specific task.

Week Four:

- *Life Skills:* Week four focuses on *decision making* and students being able to make the right choices in life. This skill will be tied to Africentricity theory through *Self-Confidence/Independence: Nia* and *Nurturing: Kujichagulia*. Together these skills are intended to assist each student in identifying a meaningful purpose for their life, the ability to operate without knowing exactly what their future holds, and learn self-respect and responsibility. The mentors and mentees will be provided an opportunity to share their personal stories and extend this activity by establishing choices that can develop their total person. This activity will assist students in developing a plan for action that they can apply to their current lives.
- *Technical Skills:* A robotic arm will be programmed to relate this idea to kinematics. Students will also relate software programs to a step-by-step process. They will learn programming principles in detail and be introduced to structures in the LabVIEW programming language such as for loops, while loops, case structures, sequence structures, and data flow.
- *Connection to life skills:* Students will spend time developing their programming ability and observe that they must pay close attention to detail in order to be successful. In addition, the systematic manner in which a program must be structured will be presented to be very similar to the systematic manner in which decisions must be made.

Week Five:

- *Life Skills:* Week five will bring us to a full circle, through the application of Africentricity theory principle *Mentor/Mentee: Imani*. At this stage in Bulls-EYE Mentoring, individual students will have the necessary skills to operate as a member of the team, understanding the intergenerational perspective at play in their community. The focus of this week will be a *rites-of-passage* that allows students to reflect on their time in the program, their experience, what they have learned, and how they will apply this to the person they are becoming. At the end of the program the mentors and mentees will produce a video recording serving as a time capsule of their experience in the program.
- *Technical Skills:* Mentees will design a small robotic car around the NI Robotics Toolkit that uses actuators, sensors, and teleoperation. They will also incorporate goal setting, resource management, and decision-making skills. They will be able to contrast the NI Robotics toolkit car with the Lego Mindstorm car from the first week to compare where they started with how far they have come.
- *Connection to life skills:* Mentees will reflect on their technical growth and their personal growth during the program. This growth will be used in both arenas to emphasize the potential they have and their abilities as problem solvers. Youth will be encouraged to continue this success as they transition into Bartels and will be told that they will use both the technical skills and life skills they learned as they progress through life.

Research Questions and Methods

This mixed methods inquiry will explore the extent and ways in which Bulls-EYE Mentoring influences underrepresented engineering student participants to remain within the college of engineering until the completion of their degrees. Although quantitative methods will be used in this inquiry, we understand the sample size of our data will not yield reliable results, however our purpose is to collect data that can be used comparatively to annual Bulls-EYE Mentoring programs in the future. Since Bulls-EYE Mentoring is in its pilot year, this data will inform us on current program outcomes and give way to suggestions for program improvement in the future.

This mixed methods inquiry will quantitatively assess the undergraduate students' mentor relationships prior to their participation in Bulls-EYE Mentoring. The program's effect on undergraduate engineering students' motivation, self-efficacy, attitudes toward engineering and perceptions of engineering will be quantitatively assessed to provide more insight to possible benefits from Bulls-EYE Mentoring. The following instruments will be adapted as a pre- and post- assessment of the Bulls-EYE Mentoring Robotics Summer Academy participants: perceptions of instrumentality (PI) scale²⁵, Student Perceptions of Classroom Knowledge-Building (SPOCK) survey⁴¹, motivation strategies for learning questionnaire (MSLQ)^{37,38}, self-efficacy scale¹¹, and the Pittsburgh Freshman Engineering Attitudes Survey⁴. Qualitative methods will be used to assess mentors and mentees experience in Bulls-EYE Mentoring through: interviews, pre- and post-surveys, self-assessments³⁴, mentor/mentee/staff reflections, and mentor online weekly reports³⁴.

Anticipated Findings

We anticipate the outcome of this inquiry will provide a successful model for service learning. Bulls-EYE Mentoring will be a program that can become institutionalized within the college of engineering to respond to the needs of its students. Furthermore, Bulls-EYE Mentoring will serve as a model that can be replicated in other colleges and institutions positively influencing their retention rates. Undergraduate engineering students will make personal and academic gains as participants in Bulls-EYE Mentoring, continuing their development of technical and life skills, while positively influencing their motivation, self-efficacy, perceptions of engineering and attitudes towards engineering. Finally, the undergraduate engineering students desire to remain in the college of engineering until the completion of their degrees will be positively influenced as a result of Bulls-EYE Mentoring.

Work in Progress

As this study continues we will extend this research through a mixed methods inquiry of the mentees experiences as participants in the Bulls-EYE Mentoring program. Additionally, qualitative study of the female mentor experiences will also occur in order to extend research on the underrepresentation of women in engineering. Once the pilot year of Bulls-EYE Mentoring is

complete, we will use the information gathered to enhance the program in future years, as well as extend current knowledge in the STEM fields in relation to Service-learning programs.

Future Program Funding

Bulls-EYE Mentoring is currently in its pilot year of the program and is funded by the Motorola Solutions Foundation Grant. We will continue the Bulls-EYE Mentoring program expanding the program to other departments within the College of Engineering and hopefully to other colleges and universities. We are currently seeking grant funding to cover the expenses of this program in future years.

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