A Comparative Analysis of Engineering Clubs in Atlanta Area High Schools

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Abstract –Engineering clubs were established at four Atlanta area high schools with differing demographics and curriculum focuses, by science and engineering graduate students placed at the schools through the Georgia Tech Student and Teacher Enhancement Partnership (STEP) program, funded by NSF through the GK-12 program. Each club focuses on exposing high school students to various engineering disciplines and developing analytical problem solving skills with opportunities to interact with engineering professionals. While all the clubs share similar goals, the resources, teacher support, and student interest vary greatly resulting in a different type of club at each school. For example, one school is math/science magnet, another is performing arts magnet, another is approximately four years old and one has a high-achieving suburban population. The paper will provide a comparative analysis of the best practices for starting a club, maintaining involvement, and successful activities. STEP involvement and lessons learned will also be presented.

Keywords: Engineering club, High school

INTRODUCTION

Educating young people in science and engineering and increasing their interest in these topics are paramount to the future of this nation. Many organizations including the ASEE and NSF recognize this and fund various outreach projects for students in elementary, middle, and high school. After-school clubs are a means for students to gain exposure to opportunities in science and engineering outside of the classroom and without the pressure of receiving a grade. The Student and Teacher Enhancement Partnership (STEP) at Georgia Tech is an NSF GK-12 funded program that partners Georgia Tech students with local high schools and attempts to increase math and science performance at those schools. Georgia Tech graduate students that were participating in STEP established engineering clubs at four local high schools. This paper will compare and contrast the engineering clubs at these four high schools with special emphasis on best practices, sustained involvement, and lessons learned.

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STUDENT AND TEACHER ENHANCEMENT PARTNERSHIP

STEP partners advanced undergraduate and graduate students from Georgia Tech with metro-Atlanta area high schools in teams led by master teachers. The program seeks to improve the communication and leadership skills of Georgia Tech students and at the same time use the scholarly expertise from Georgia Tech to assist in increasing the mathematics and science performance of the Atlanta-area high schools in which the students are placed. The program began in 2001 when Georgia Tech received three years of funding from the National Science Foundation to develop a program which provided graduate students with the opportunity to build their leadership, teaching, and presentation skills while using their science content knowledge to assist local high schools improve student learning. In 2004, Georgia Tech received a "Track 2" GK-12 grant for an additional five years. Since its inception, the program has made strides towards institutionalization and currently the program consists of approximately 20 students (undergraduate and graduate) working at seven local high schools [5].

SCHOOL AND CLUB INFORMATION

Marietta High School

School & Club Description: Marietta High School is a public school located in the city of Marietta, GA. In operation since 1892, the current facilities that were completed in the fall of 2001 support the 2,093 member student body. The school is unique in that it offers an International Baccalaureate program. "The Marietta High School International Baccalaureate (IB) program is a four-year comprehensive and rigorous academic program leading to examinations for students in grades nine through twelve. The general objectives of the IB program are to provide students with a balanced education; to facilitate geographic and cultural mobility; and to promote international understanding through a shared academic experience." [4] Marietta itself is a very diverse community and the interests of its students reflect this diversity in both the breadth and scope of after school clubs and activities. Said activities range from the literary and art clubs to science technology and mathematics clubs. The Engineering Club, started in 2006 by STEP fellows meets weekly after school and undertakes short, one afternoon activities and continuous projects.

Club Objectives: The club's projects are aimed at the development of valuable problem solving skills and fostering an interest in higher education through interactions with STEP fellows and an introduction to the complex challenges and opportunities available in various engineering disciplines.

Club Outcomes: Since Marietta's engineering club is unaffiliated with any national organization, nor culminated in any single measureable achievement, major club milestones are difficult to quantify. However, qualitatively, the outcomes of the program are evident in the large increase in membership and participation, as well as the creative and innovative solutions increasingly difficult challenges.

Miller Grove High School

School & Club Description: Completed in December 2004, Miller Grove High School is a Title I school located in Lithonia, GA [2]. It supports students in 9th through 12th grade with an enrollment of 1,795. Georgia Tech students have been working at Miller Grove through the STEP program since the 2004 – 2005 academic year. Jason Weaver started the engineering club in the 2007 – 2008 academic year with a regular attendance of approximately 10 students.

Club Objectives: The principal objective of this club was to introduce interested students to basic engineering concepts and give them practical experience in the design, creation, and presentation of an engineering project. Socially conscious engineering projects that revolve around conservation and community service were selected in order to increase student motivation and interest in the project. In the long term, the club seeks to encourage student interest in engineering and increase the number of students who choose STEM majors in college.

Club Outcomes: During their weekly meetings throughout the year, the club designed and constructed two working solar ovens. The students were responsible for major design decisions and prototype construction. The students presented their work at the 2008 Young Engineer's Day at Georgia Tech, which was a one-day event for local students to showcase engineering work on socially relevant problems. A few of the students were seniors and have gone to college where they planned to study a STEM discipline. The STEP after-school club at Miller Grove has continued into 2008-2009 as two graduate students are leading a forensics club with an average weekly attendance of 15 students – some of which were participants in the previous year's club.

Tri-Cities High School

School & Club Description: Tri-Cites High School is a comprehensive high school located in East Point, GA that houses Fulton County's visual and performing arts magnet program. The school was established in 1988 and offers a wide range of classes in the arts. The Tri-Cities engineering club is the Pre-College Initiative (PCI) component of the larger international organization, NSBE. The Tri-Cities High School Junior Chapter of the National Society of Black Engineers, initiated by STEP Fellows in 2003-2004, serves as an engineering club for students that attend this performing arts magnet school, but are still interested in science, technology, engineering and mathematics. Mrs. Margaret Tarver has served as the STEP coordinator and the NSBE Jr. advisor since the inception of the NSBE Jr. club.

Club Objectives: The NSBE Jr. club is designed to stimulate the interest in science, technology, engineering, and mathematics fields, or STEM. The goal is to encourage students to attend college and pursue technical degrees. The program provides activities to help students discover firsthand how engineering and technology relate to the world around them and discover the excitement of academic excellence, leadership, technical development and teamwork.

Club Outcomes: The 2008-2009 school year is the academic school year that the Tri-Cities portion of this paper is focusing on. With that being said, there hasn't been enough time to determine the direct outcome of the engineering club. What is known, is that the 11 seniors that participate in the engineering club 10 have applied and got accepted to a 4 year university and 1 has applied and got accepted into a technical program. Five of the members competed in a math and science competition at the NSBE Fall Regional Conference and placed 3rd out of 8 schools. This greatly increased their confidence in the math and sciences as it related to their academic school work.

Westlake High School

School & Club Description: Westlake High School is located in southwest Atlanta, GA in a suburban predominantly middle class community in Fulton County. The high school was formed in the fall of 1988 by the closing of Westwood High School and Lakeshore High School. The Georgia Department of Education and also the Southeastern Association of Colleges and Schools accredited Westlake High School as the magnet school for math and science for South Fulton County. Former STEP fellow, David Woessner and the current magnet coordinator, Mr. Douglass Edwards, created the Westlake High School Chapter of the National Society of Black Engineers (NSBE) during the 2002-2003 academic year.

Club Objectives: The mission of the National Society of Black Engineers is to increase the number of culturally responsible black engineers who excel academically, succeed professionally and positively impact the community. The purpose of the Westlake Chapter of NSBE was to parallel the mission of the national organization. The club also aimed to provide the students with hands-on opportunities to learn engineering concepts and design and communication skills. The club aimed to serve as the beginning of the 'NSBE pipeline' to increase the number of black engineers.

Club Outcomes: Throughout the year, students designed and built a Mars like rover to compete in the Georgia Boost Engineering Science and Technology Competition, won 1st place in regional and national conferences for NSBE and engaged in various engineering projects to learn the different disciplines of engineering. Of the 10 seniors in the engineering club for the 2007-2008 year, 8 went on to major in engineering. The Westlake NSBE Jr. chapter has continued into the 2008-2009 academic year, with a STEP fellow overseeing the club and average weekly attendance of 20 students.

Table 1: School Information and Demographics [3, 1]

	Marietta	Miller Grove	Tri-Cities	Westlake
Enrollment (#)	2,093	1,795	1,785	2,065
American Indian/Alaskan Native (%)	< 1	< 1	< 1	< 1
Asian/Pacific Islander (%)	2	< 1	2	< 1
Black, not Hispanic (%)	48	97	81	98

Hispanic (%)	19	< 1	13	< 1
Multiracial (%)	4	1	1	< 1
White, not Hispanic (%)	26	< 1	2	< 1
Female (%)	51	52	53	51
Male (%)	49	48	47	49
Student to Teacher Ratio	15:1	19:1	14:1	16:1
Students Eligible for Free/Reduced Lunch (%)	54	65	59	45
2007 Graduation Rate (%)	78.8	70.9	80.5	82.9
2008 Graduation Rate (%)	77.8	75.7	79.3	87.3
Title I Status	Yes	Yes	No	No
Met 2008 AYP?	No	No, NI-1*	No, NI-1*	No

* Needs Improvement Year One – school must offer public school choice.

Table 2: Engineering Club Demographics

	Marietta	Miller Grove	Tri-Cities	Westlake
Participation (#)	22	11	20	20
Asian/Pacific Islander (%)	-	-	10	-
Black, not Hispanic (%)	27	91	85	95
Hispanic (%)	14	9	5	-
Multiracial (%)	9	-	-	-
White, not Hispanic (%)	50	-	-	5
Female (%)	35	36	55	40
Male (%)	65	64	45	60

BEST PRACTICES

Each club in this comparison is a separate entity with students of different skill sets and abilities. Similarly the demographic makeup, school system and club structure vary. Some clubs are affiliated with national organizations, and others share only the common interest in problem solving and engineering. It therefore stands to reason that activities and programs that thrive in one club may fail in another. With that mindset what follows is a review of the best practices of each engineering club respectively.

Marietta High School

The Marietta High Engineering club meets weekly after school for an hour and a half. In this time frame the optimal structure for club meetings has been to first begin with a brain teaser, real world example, or puzzle, which is generally applicable to the activity for the day followed by a competition between teams of students. For example, a giant paper airplane contest could begin with a question like: Why are airplane windows oval? (the answer being that stress concentrates in corners where fatigue cracks would form and propagate). Some of the successful activities undertaken by the group include:

- Mousetrap Cars
- Egg Drop & Inverse Egg Drop (device to catch an egg without breaking)
- Catapults
- Smoke Bombs
- Model Rockets
- Giant Paper Airplanes
- Marble Roller Coasters
- Spaghetti Bridges
- DC Electric Motors
- Plastic Cup Speakers
- Marshmallow Guns

Other longer-term activities include the modeling and construction of bridges for a nature trail, which was conducted in collaboration with the Environmental Science Club and robotics projects.

Miller Grove High School

At Miller Grove, the best practice was to have a long-term project with achievable goals. From the beginning of the year, the students knew that their goal was to present at Young Engineer's Day at Georgia Tech. By letting the students know up front what was expected of them, they were willing to take on challenges. The students realized that they were responsible for their own success or failure and became invested in the project. Older students were given more responsibility and were able to guide the younger students in their work. As Young Engineer's Day approached, the students became increasingly excited and worked harder. The day of the event was the highlight of the year and many of the students were exposed to a college campus for the first time. They participated in a design competition (several of them walked away with excellent prizes) and were able to see engineering projects from other schools. Overall, the use of a long-term project served to motivate the students to achieve something that they had not done before and taught them about engineering principles.

Tri-Cities High School

At Tri-Cities High School, there are weekly meetings where a teacher and graduate students assists the students in engineering activities. The club is structured so that the students hold positions such as president, vice president, etc. allowing for leadership development as well as a sense of responsibility. Tri-Cities High School also participates in the Try-Math-A-Lon **(**TMAL) competition, placing 2nd and 3rd place in the Regional TMAL competition during the past two years. Students who compete in this competition have weekly practice sessions where they study and prepare for the competition.

The engineering activities that the students participate in require them to think of engineering concepts while simultaneously reinforcing the importance of teamwork. It was found that the engineering activities that used inquiry-based learning had the most desirable outcome. At the beginning of the activities, the students seemed a little confused due to the lack of direction, but by the time they completed the activities the students had a sense of fulfillment knowing that they accomplished the task at hand. Some of the activities include:

- Bridge Building
- How to Design a Burglar Alarm
- Mouse Trap Cars
- Boat Building

Overall, the students perform the task better when they are given the freedom to be creative with their design. Team competition is another strategy that can be used with great results. When the students know that they are competing against their peers for one common prize or goal, they are more motivated to complete the task. Inter-team assistance is encouraged and is usually observed. At the end of the activity the students are encouraged to reflect on what they learned and what they could have done differently.

Westlake High School

The mission of the National Society of Black Engineers (NSBE) is to increase the number of culturally responsible black engineers who excel academically, succeed professionally, and positively impact the community. With this being said, the structure of the club is different in that the STEP fellow attempted to cover each portion of the mission statement. The Westlake High School Chapter has always participated in the Try-Math-A-Lon (TMAL) and performed very well. The Try-Math-A-Lon is used as a means for the students to work as a team to learn basic engineering concepts and reinforce the theory they have learned in their mathematics, science and physics classes. The Try-Math-A-Lon also quizzes the students on black inventors and NSBE history. Last school year the Westlake team won first place at the Fall Regional Conference and then went on to win first place at the National Convention in Orlando, Florida.

Last school year the NSBE chapter competed in the Georgia Boost Engineering Science and Technology (BEST) robotics competition at Southern Polytechnic State University for the first time. The students worked together for weeks designing, building and testing a robot that could achieve a series of remote-controlled tasks required within a 24-foot square field of obstacles. The 2007 theme for BEST was the Mars Rover. The student's robot had three minutes to:

- Exit the base and drive across the Martian surface
- Drive up onto the automated supply vehicles and load supplies
- Drive off the automated supply vehicles and store the supplies in a storage bin

The robots had to be within certain size and weight constraints. Despite a loss in the competition, the students gained important insights into engineering design. The students assumed the role of engineers as they drafted their designs, pitched their ideas, and tested their prototype. The hands-on experience of learning about robotics and wireless technology was invaluable to the students and motivated them to work hard so they could compete again the next year.

SUSTAINING INVOLVEMENT

Many clubs and organization do not have continuous involvement and support from meeting to meeting or from year to year. This section will investigate the different methods used to gain continuous involvement from the students and how the school manages to keep the engineering club going when the STEP fellow/mentor changes. In some cases the focus of the engineering club may change from year to year, or in other cases, with the structure of a national organization, there is more continuity from year to year. As with the best practices, methods for sustaining involvement in the clubs varies based on the school and club structure. While the strategies for maintaining student involvement differ, there are still some commonalities between the clubs.

Marietta High School

The Marietta High School engineering club has been in existence for 3 years, and over that span has accrued a core group of students who regularly attend. However, in the fall of 2008 the club's membership expanded in large part due to publicity from flyers, teachers in related areas (STEM fields), and through word of mouth. Other factors that have been observed attributing to involvement include type of activity, regularity of meeting time, availability of transportation, and finally other conflicting activities like sports teams and ROTC. Overall the participation in the club has been very positive and membership continues to grow.

In order to sustain the club, the STEP Fellow working with the club must be flexible and willing to work with the students, the administration, and the teachers to ensure a fun, engaging, and challenging environment that rewards participation.

Miller Grove High School

As the club at Miller Grove was brand new, attracting students and maintaining student involvement was difficult, especially during the beginning stages. Posting flyers and personally inviting students worked at the beginning and drew a large group (over twenty) to the first meeting. Unfortunately, attendance slipped the following weeks until only a few students were still attending with any regularity. At this time, the club was still finding its identity and did not have a specific project chosen. Introducing some fun activities that could be completed in one afternoon might have helped to keep attendance higher during this time. Eventually, the solar oven project was chosen and

attendance leveled off at approximately five students. In order to reach a larger audience, the STEP Fellow contacted some of the STEM teachers at the school and asked for their assistance. Several offered to speak with their students and encourage them to attend. A few of the teachers offered their students incentives to go to engineering club (a few extra points on a quiz or homework), and attendance quickly became more regular. Once they were in the club, students realized that it was interesting, fun, and worthwhile. From that point on, attendance continued to grow through word of mouth and student referrals.

Tri-Cities High School

The NSBE Jr. Club at Tri-Cities High School is organized in a way that allows for leadership development and assigns responsibility to students; thus the students see value in participating in the NSBE Jr. club. One way in particular is that they have the opportunity to attend three conferences during the school year: the Regional Summer Camping Conference, the Fall Regional Conference (FRC) and the National Convention. The conferences afford the students the opportunity to participate in engineering and mathematic competitions. Tri-Cities High School students have competed in the FRC competition for the past two years, winning 2nd and 3rd place awards out of eight teams. This type of student involvement allows for a commitment from the students that keeps them involved.

Tri-Cities High School is a performing arts magnet school; so many of the programs are centered on the performing arts. While many of the students are interested in performing arts, the school has made a commitment to allow and support the NSBE Jr. club. A chemistry teacher with 20 years experience serves as the advisor for the club and several Georgia Tech graduate students and past STEP Fellows assist during the weekly meetings. The STEP Fellows stay after school and assist with the club in addition to their teaching commitment. Because of the STEP program, year after year an experienced graduate student is at the school willing to dedicate their time and expertise to the NSBE Jr. club.

Westlake High School

The Westlake NSBE Jr. Chapter has sustained involvement since its inception in 2002 for several reasons, but the most significant influences have been STEP Fellow participation and that the club is a part of a larger organization. Since former STEP Fellow, David Woessner, and magnet coordinator, Douglas Edwards, founded the club, STEP Fellows have always been supportive. STEP Fellows assist the club's advisor by planning projects, preparing the students for robotics and NSBE conference competitions and inviting outside speakers to put on workshops for the students. This consistent resource for the club each year has helped to maintain student involvement. Westlake is also unique in that it has an Introduction to Engineering course offered through the magnet program that sometimes has a STEP Fellow assisting with instruction. Several of the students in the engineering course tend to participate in the NSBE Jr. Chapter, so they are able to apply the theory they have learned to class to the projects in the club.

Similar to Tri-Cities, the fact that the NSBE Jr. Chapter is part of a national organization adds structure to the club, resources, and exposure. The students look forward to holding leadership positions and having a voice in the types of projects they work on. The anticipation of competing in regional and national conferences is a major factor which leads to students maintaining their involvement in NSBE throughout their high school career. Student interest in the club was attained from opportunities for leadership development, participation in regional and national conferences, and voicing an opinion for project selection. While the national organization plays a large factor in the sustainability of the club, it is the collective support of the magnet program, STEP program, and student interest that have allowed the club to flourish since 2002.

LESSONS LEARNED

One of the most important aspects of working with the engineering clubs is the feedback from the students and how to improve on what is being done. The lessons learned will provide an insight on to what can be done differently to increase involvement or increase the scientific knowledge transferred to the students involved. Lessons learned will serve as a guide for future engineering clubs, especially in terms of planning projects and meetings.

Marietta High School

The instructor should be an active participant in the activities of the group. Instead of simply supervising, the instructor can offer helpful tips, practical applications, and personal experience. In doing so, the activity becomes more than an exercise in problem solving, rather it is something from which the core concepts can be extracted and tied to real world applications. Another method is to literally become a participant, working with or as a competitor

to the students.

Turning activities into a competition helps keep students interested and instills a sense of pride in their accomplishments. Competitions also motivate the participants to be more creative and innovative than their classmates, thus increasing the variety and quality of solutions.

Quick exercises are preferred over long-term projects. This is true unless there are distinct achievable milestones along the way. It has been observed that students tend to lose focus and motivation if the results of their efforts are not immediately observable or tangible. Activities should be challenging and should not be attempted at a level that requires little creativity or ingenuity. However, caution must be exercised that a project is not so challenging that it becomes a frustration and risks loss of interest. Thus a happy medium must be found that is neither too easy nor too difficult.

Miller Grove High School

When students are working on a project, they can be split into different groups that work on different aspects of the project. This should be done in a thoughtful way which allows students to utilize their talents, e.g. computer skills, building skills, or leadership. However, students must still be challenged academically and encouraged to get out of their comfort zone and learn new skills. Students will be more productive if they are allowed to work on an aspect of the project which they particularly enjoy. Additionally, this can serve to cut down on horseplay if students are physically separated as they work.

A one-year project may be too long for high school students to tackle. After the semester break, there was a large turnover of students that either moved away or had new schedule conflicts. A semester-long project may seem more tractable and reasonable to the student who is not accustomed to long-term projects.

Using socially conscious engineering projects as the core can help raise interest and motivation in the club. Students see a direct consequence of their project and may feel more inclined to participate than if a project consists solely of more traditional engineering problems.

Tri-Cities High School

Some of the benefits to being a chapter of a national organization can be seen through the lessons learned. Having the students take leadership roles definitely increases their involvement in the club. Encouraging the students to determine what type of projects they would like to work on increases their responsiveness to the projects.

Projects that can be completed in one meeting are beneficial to the students who do not come to every meeting. For the miniature projects that change from week to week, the concepts rely heavily on inquiry-based learning. This serves as a way to challenge the students to think and use skills outside the classroom that they learned in the classroom. Having a long-term project (over a whole semester) is beneficial to the students who come to the meetings every week. Usually these projects are on a larger scale and give a greater sense of accomplishment.

Westlake High School

Since the NSBE Jr. Chapter is structured like the national organization to have a president, vice president, etc. it is important to have the students play an active role in selecting the agenda for each meeting and planning the projects. This proved to be a challenge because several of the students on the executive board were involved in multiple after-school activities so they tended to wait until the last minute to set the agenda. Having an agenda for the meeting set ahead of time helped the students to use their time more productively and simultaneously develop their leadership skills.

Having projects that last approximately 2-3 months works well for the students that come on a regular basis as well as the students that may come sporadically. Each week the students know that in addition to their speaker or developmental activity they will have time allotted to work on the projects. This also alleviates some of the pressure on the chapter sponsor to cancel the meeting if they are unable to attend.

Lastly, catering the projects to the students' interests helps to keep their attention. It was noted that when the students decided what types of projects to work on they were more engaged then when the NSBE Jr. sponsors selected the projects. This was not always the case, but students did point out that they liked being able to help select their project's focus.

CONCLUSION

Much work has been done in order to establish and maintain engineering clubs at these four high schools. Best practices vary from school to school, but they have an underlying theme – challenge the students and give them responsibility. In general, long-term projects (semester or year) do not work for high school students unless they are able to see important milestones along the way. By using milestones or short-term projects (single afternoon), students are able to see that they are progressing and tend not to lose interest as easily as the might otherwise. Some of the differences in best practices and lessons learned may stem from the different populations of students and the amount of emphasis that different schools place on science and engineering. Nonetheless, the lessons learned from these schools are dynamic and can be adapted to fit the different needs of different engineering clubs. Things to consider when forming a similar club include the resources available (both in terms of equipment and personnel), history of previous science or engineering clubs, and the support of STEM faculty. Keeping projects interesting and fun may seem obvious, but can have a huge impact on the success of a club and its sustainability. The use of socially relevant projects is another tactic which may help to sustain involvement in a club.

The clubs at Westlake and Tri-Cities High School are both chapters of NSBE and are similar in how they sustain involvement. The continued support and structure from the national organization provides stability which helps to sustain the club and keep student involvement high. The clubs at Marietta and Miller Grove High School lack the structure of a national organization and thus rely heavily on publicity and word of mouth to attract new members. Depending on the stage of the engineering club, different strategies can help to increase student involvement. When first starting a club, publicity (through both teachers and students) and support from teachers through incentives will help to peak student interest. Once a club has matured, a continued resource is necessary for the club to continue to grow. STEP Fellows are in a unique position to lead these types of clubs and provide excellent content knowledge and a fresh face to energize the organization. The school administration and STEM teachers are also in a position to maintain student involvement in engineering clubs. Once a student has a positive experience with the club, he or she will likely continue attending.

In summary, this paper investigated four different Atlanta area high schools extracurricular engineering clubs and found best practices, how to sustain involvement and lessons learned that can be applied by anyone interested in forming an after-school engineering club. These clubs can serve as a spring board for high school students towards future STEM careers. The topics discussed in this paper can serve as a template for creating a successful engineering club which could ultimately lead to improved STEM performance in school, increased learning and retention of STEM topics, and increased interest in STEM majors in college among participants.

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Jason Weaver received his B.S. in mechanical engineering (highest honors) from Purdue University in 2005. Upon graduation, he participated in a one year volunteer program in Durán, Ecuador where he taught English as a second language, physics, and reading. In August of 2006, he entered the Ph.D. program in BME at Georgia Tech and was the recipient of both a President's Fellowship and an NSF Graduate Research Fellowship Honorable Mention. He participated in the STEP program at Georgia Tech where he taught in high school physics, calculus, and pre-calculus classes in addition to leading an after-school engineering club. He is currently a graduate research assistant and his main research interest is the design of novel stents for the treatment of atherosclerosis.

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