

# Lessons Learned From a Single Gender Outreach Program

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**Abstract** – The Herff College of Engineering at the University of Memphis hosts a summer outreach program for young women to give them an overview of the engineering profession and career opportunities available to them and to help them better understand engineering concepts through hands-on experience. Now in its fourth year, this program is funded by the Women's Foundation for a Greater Memphis.. It was modeled after similar co-ed programs offered at the Herff College over the past 10 years. This paper details the lessons learned from migrating from a co-educational program to one exclusively for young women, and it outlines why we believe that a single gender program for young women, an underrepresented group in the field of engineering, is superior to co-educational models.

*Keywords:* women, enrichment, middle school, high school, outreach.

## PROGRAM BACKGROUND

In the spring of 1996, the Herff College of Engineering approached the Memphis City Schools (MCS) with a proposal to present a summer enrichment program aimed at middle-school students to generate interest in engineering as a possible career. The school system was beginning a NSF grant for an Urban System Initiative and incorporated the proposal within that grant. Additional funding was provided by the Carrier Corporation through their local offices. In the summer of 1996, four one-week programs for students entering grades seven through nine were presented on the University of Memphis campus. Each program included middle-school teachers as mentors and classes of 36 students. The program ran from 9 a.m. until 3 p.m. with a lunch included. Topics in the programs ranged from simple structures to robotic programming. The programs were presented for four years until funding was no longer available. At that time, the programs were moved in-house into the city school system and continued for another three years.

During the partnership with MCS, an additional program was developed along similar lines and funded by a grant from CN (Canadian National) railroad. This program, which also targeted middle-school students, had a sharper focus on transportation issues. Each program was two weeks long and included speakers from the transportation industry and field trips to local organizations.. Times were changed from 8a.m. until noon, and lunches were eliminated, solving a number of logistical challenges. The program was presented for two years.

Based on what we learned from these outreach programs, we approached the Women's Foundation for a Greater Memphis (WFGM) with the idea of presenting a similar program for young women. The program's goals were to show the young women the career possibilities in engineering while providing them with strong female role models through contact with successful female engineering students and working professionals. The WFGM agreed to support a pilot model for the summer of 2004 with two one-week sessions. The same model of middle-school teachers as mentors for groups of four to five middle-school students was utilized. At the completion of the 2003 program, the WFGM approved the program for 2005.

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The 2005 program was presented in a slightly different manner. Rather than using middle-school teachers as mentors, we used female college students with the teachers serving as support staff and observers of the program. The student mentors responded favorably to the younger women, and the mentoring program was expanded for 2006. In 2005 an additional program was developed for young women entering grades 10 through 12. This program, while similar in feel to the previous middle school programs, had a much sharper focus on career decisions and how to move through the process of choosing a path to achieve a career goal. More female professional speakers were included and a leadership component was added for the high school students. Mentors for the high school students were female engineering students from the University of Memphis. High school teachers were also included in the program but rather than have them as observers, they formed a design group and competed with the high school groups. Selected high school participants then became mentors to the middle school groups. Both the middle and high school programs were continued in the summer of 2006, with the main change being the role of the teachers. The middle school and high school teachers participating in our 2006 program were more actively involved than in previous years. Instead of being assigned as a teacher-mentor for a group of students, the teachers were asked to form a group and participate in all activities and compete against the students.

The GEE program hosts female engineering professionals as guest speakers. These women volunteer time to engage in question and answer sessions with the young women. Leaders in local industry, the speakers represent a wide array of the professional opportunities in math, science, and engineering. They discuss their jobs and careers, providing practical insight into what it means to be a female engineer on a day-to-day basis and stress the importance of preparing for these careers with appropriate math, science, and technology courses in middle and high school.

## **REASONS FOR A SINGLE GENDER PROGRAM FOR WOMEN**

Engineering suffers from a lack of workforce diversity and diversity in the educational pipeline. Minority females, in particular, are grossly underrepresented in the field and are largely either unaware of or not interested in pursuing engineering professions.

Success in engineering requires creativity, teamwork, and the ability to effectively communicate with others, along with strong academic preparation. Moreover, to develop effective solutions to problems impacting nearly every aspect of daily life, it is essential that the engineering workforce be populated with diverse voices that are able to bring a variety of experiences and perspectives to the problems at hand. Unfortunately, white males predominantly populate the engineering field, with women comprising less than 10 percent of the engineering workforce in the United States [8]. Moreover, the educational pipeline doesn't portend a different future for minority students, who represent collectively just 27 percent of undergraduate engineering enrollments with minority females representing only 7% [6].

Though it has often been suggested that the reason women are so underrepresented in engineering fields is a lack of preparedness, research now shows that the gender gap in preparedness has been closed. Today, girls are performing as well as boys on standardized tests of math and science skill, and are taking high school math and science electives at rates similar to boys [1,2,5,6]. The exception to this trend is with minority students, who still face challenges in preparedness for engineering coursework due to lack of access to quality K-12 math and science curricula in poor, urban environments [2,6,4].

Research to determine the causes of this situation has revealed that girls do not pursue engineering careers because of lack of interest [3,6,4]. In a survey released by the Society of Women Engineers (SWE) in 2006[8], 75 percent of girls responding indicated they do not plan to pursue science, math, or technology careers, and only 10 percent have even contemplated engineering careers as possibilities for their future. Further SWE research indicates that women tend to choose careers in which they feel they will be making a contribution to society and will be working with people. The unfortunate perception of engineering, however, is that it is a career of little societal import, and that it is performed in isolation [4,6,7]. These findings echo those found in our own work, which has revealed that most young women in Memphis lack even a basic level of understanding about engineering and begin self-selecting out of math and science courses that position them for future STEM study as early as middle school.

Social barriers that mislead girls into thinking that science and math careers are for men, and negative stereotypes about engineers and engineering are also contributing factors to the lack of interest in engineering as a career option [8]. The most significant causes of the pervading negative stereotypes, it appears, are the scarcity of female role

models in engineering and portrayal of engineers and scientists as socially inept men in the media [7,2]. These issues are especially critical for minority females due to the paucity of available female and minority teachers, mentors, and professional role models in the field.

## **PROGRAM GOALS AND RESULTS**

The goals of the Girls Experiencing Engineering (GEE) program is to offer female high school and middle school participants along with math and science teachers from the local/regional area opportunities to learn about existing opportunities in the fields of math, science, engineering, and technology. Specific objectives include the following:

1. To use K'NEX manipulatives to introduce students to links between math, science, physics, and engineering concepts;
2. To expand students' knowledge of application-based technical communication skills required in the field of engineering;
3. To provide and promote opportunities for active problem solving designed to foster active collaboration and extend program content;
4. To promote awareness of future career opportunities in the fields of math, science, and engineering;
5. To interest and educate teacher participants by modeling innovative instructional methods; and
6. To provide a forum for faculty outreach/participation at the community level.

In each of the programs, simple manipulatives were utilized as the framework for showing the engineering design process. Each group of young ladies was tasked to design, develop, test, and perform competitive tasks on increasing complexity during their program. The manipulatives used for all the programs were K'Nex building sets designed to support varied topics that included simple machinery, structures, and vehicle design.

Every year that the program has been presented, the number of applicants has far exceeded the number of places available and even though the program applications are officially available in mid-March, requests begin to come in as soon as September of the preceding year.

### **Program Results**

According to program data from student participants through completion of multiple measurement instruments, we were successful in achieving our stated program objectives. Students submitted quantitative data in the form of individual pre/post program surveys and qualitative data was collected through daily writing exercises, group discussions where the girls asked questions and provided comments, and through narrative feedback from the program's participating teacher-mentors. Data from these sources support attainment of program objectives as follows:

- 87 percent of high school participants and 88 percent of middle school participants indicated that the GEE program information increased their interests in studying math, science, or engineering in college;
- Of the students who indicated an interest in non-science majors (cosmetology, fashion, business, performing arts were the most frequently cited) prior to the program, 89 percent of high school participants and 76 percent of middle school participants reported the GEE program influenced them to make engineering/math/science majors their new priority.
- 100 percent of program participants reported an increase in knowledge in math/science/engineering content areas as a result of the GEE program;
- 80 percent of program participants reported "engineering was more interesting to them" as a result of the GEE program;
- 100 percent of high school and middle school participants would recommend the GEE program to a friend; and

- Exit Surveys indicated that 100 percent of participants from the high school session and 96 percent of middle school participants reported an increase in problem-solving knowledge and strategies.

According to program data from the student participants, program outcomes are significant. Final analysis of data collected from student participants revealed the following results:

- Quantitative results indicated that 98 percent of middle school participants and 100 percent of high school participants reported positive group experiences. Interestingly, three of the middle school participants from different sessions had never worked in a group setting before their GEE experience. One of these girls wrote about the group experience in the margin of her survey, saying “It’s more fun than being by yourself because you get to work together and get different opinions.”
- Exit Surveys included this question: “How can you take what you’ve learned about problem solving back to your regular classrooms?” Results were varied, but frequent responses included using the brain-storming approach to solve a problem, working in groups to achieve a solution, and using the analytical approach they learned in the GEE program to approach a problem. One middle school student noted, “It will help me a lot when I think I can’t figure a problem out. I just have to think outside the box, excluding my artificial restrictions.” A high school student responded, “In math, especially, you need good problem solving skills, and it will really help me with word problems.”

The 2006 GEE program represented the second time that peer-mentors had been included. We added a more formal support system for the mentors through the middle school teachers and program faculty based on responses from mentors from the 2005 program. Based on the feedback and our observations of the 2006 mentor program, we made the following conclusions.

- The middle school students really enjoy the interaction with their group mentor. In fact, many of the middle school students listed the experience with their mentor as one of the aspects they liked most about the GEE program.
- All of the mentors reported that they enjoyed the experience and would like to serve as a mentor in future programs. In addition, journal entries from the mentors indicated that they found the mentoring process challenging, but rewarding. Several mentors reported that the most challenging part of the mentor experience was working within the dynamics of the group to help facilitate activities. Comments concerning this aspect of the mentoring experience include, “I think the most important part of this experience for me is interacting with others and learning to adapt to other personalities,” and, “Getting all the members to communicate and be themselves was the most important part of this experience for me.” All the mentors felt that the interaction with middle school teachers and program faculty helped them feel more secure in their leadership role.
- One mentor did indicate that she thought it might help to have a separate training day for the mentors, which we have proposed for the 2007 program.

As previously stated, the middle and high school teachers were much more actively involved in the 2006 GEE program. In fact, this year one teacher even volunteered to be involved in curriculum planning/lesson plan design for future programs. The more active approach worked very well in terms of getting the teachers more involved and more interested in how to bring the GEE experience back to their classrooms, and the students loved competing against the teachers. One middle school teacher, who also participated in the 2005 program, wrote, “It was far more enriching to do the project as opposed to watching them. I believe that my lesson plan will also be more enriched because of it.” Another responded, “We were allowed to play along which always helps teachers to see from a student’s point of view. I would definitely encourage teachers to involve themselves to experience problems so that they can better troubleshoot for students.” When asked the question, “How has the GEE program helped you in terms of bringing ideas and activities back to your classroom?” one teacher responded, “The GEE program has helped me to come up with problems for the students to solve that require more thinking than just computation.” Another interesting response came from a high school teacher, who replied, “As a math educator, I am always looking for fun, interesting ways to help students understand the role of mathematics in solving real-world problems. I plan to use all of the activities and challenges from this program in the fall with my geometry students.” Still another teacher wrote, “I want to set up my classroom to this type of learning environment. This program inspires me to teach science interactively, and in turn it makes me love what I do more!”

While all of this information provides a positive support and basis for our presenting this type of program, the focus of this paper is on the lessons we learned from presenting both co-educational and single gender programs.

## UNIQUE ASPECTS OF SINGLE GENDER PROGRAM

### Manipulatives

In both the co-educational and single gender programs K'Nex were used as manipulatives. The sets used were designed for educational use but contained pieces commonly found in sets available from retail outlets. In initial work in all the programs, some type of simple structure or device is built following instructions given with the set. Overall, young men seemed to be much more familiar with these types of manipulatives and had no problem moving very quickly to assembling the devices. The young women were more reticent in co-ed groups and often took a secondary role during this initial project. They would very often take extra pieces and explore the way that the pieces joined together outside of their project goal. By the second day, the young women were adept at construction.

The young women overcame this initial setback in most groups, but without strong guidance, there were groups where the young women would be placed into roles where they did not have a primary role as "constructors." Since so much of the program was based on building and testing of ideas to achieve their design goals, this tended to marginalize those young women who were most unfamiliar with the manipulatives and who were not given time to develop skills at the same level as the young men. In these co-ed programs, since mentoring was not as strong as it was to become in the single gender program, intervention was usually the task of the program presenters. Since there were five to six groups and two presenters, there were times when this was not successfully addressed.

In the program limited to young women, there was a different dynamic to the process of learning to work with the manipulatives. While there was still as great a variety of skill levels in initial exposure to the K'Nex, there was much more experimentation by all the girls in different ways to put the pieces together. The groups were more willing to divide up the work and allow the girls who had less previous contact to be included as an integral part of the group. There was more teaching within the group than with the co-ed groups.

All of this cooperation was most evident during the final project challenges where a random individual was drawn from each group to build their design while being timed. In the co-ed groups, certain individuals by the end of the week were usually in-charge of constructing designs for testing. When a group member who was less familiar with constructing the design was selected, they had difficulty completing the construction within a short period of time. In the single gender groups, while this did occur, it was limited to a few groups with other problems of group dynamics. In several cases, each member of the group constructed and practiced constructing the submitted design as so was able to perform at a high level when selected.

### Focus on Tasks

One of the sets of K'Nex used involve the construction of vehicles. These are powered by either wind up motors or by rubber bands. We do not recommend using the rubber bands in any type of program for middle school kids; the possibilities for mischief are just too numerous. The design tasks given to the groups usually involve carrying a payload a specific distance using the lightest vehicle possible.

In the co-ed groups, the young men would often forget exactly what the goal was and begin to develop vehicles to race against one another. Speed became more important than weight or the ability to deliver the payload. The young women in the co-ed groups often assumed passive roles and allowed the young men to become the decision makers. When individuals in the group attempted to bring the group's focus onto the actual goal rather than the artificial goal, they were most often overruled by strong willed young men. This caused quite a bit of group friction and lowered the performance of a number of groups. The young men would not keep their focus on the actual task instead they developed a pseudo-goal that they decided should have been important. In the single gender program, the young women were much more willing to consider what the actual goals were as presented and not wander off task. There were some rather elegant designs made that could have been more functional but they were most often able to accomplish the design needs than the co-ed groups.

### Communication

Communication between group members is critical to the development of a successful group in this type of setting. Since the problems given to the groups are design oriented, they require a significant level of input from all the group members as the design evolves to a final structure. The most successful teams are those where all the team members felt that their views were listened to and their ideas were respected.

In the co-ed programs, far too often, the young men discounted the ideas presented by the young women because the young men "knew more" about vehicles or bridges. There was an underlying bias that engineering was a man's job

and that while women could be engineers, it was really men that would do the “real” engineering. This bias was evident in the speech of the young men when they would become upset at the idea of a female supervisor as presented in several scenarios given in the program. Very few of the young men would overtly state that women should not be engineers but the roles played in the groups would have underlying stereotypes. For example, when notes were to be taken, it was almost always one of the young women who was assigned the role as note taker.

In the GEE program, it was just an accepted fact that women could and should be engineers. This led to much better communication with the groups. While there were still some of the young ladies who began the week reticent to voice their opinions, by the end of the week, most of these were active and vocal within their groups. When roles were assigned, it was much more appropriately based on skill level rather than on gender. For example, when notes were to be taken in GEE, it was either the young woman who could write the fastest or who had the best handwriting.

In the co-ed programs, groups tended to stratify early into leader and follower roles. Within this structure, the ideas of the leader were usually used and some of the members became disaffected from the group. In the single gender program, there was less of a well-defined role structure. During the week, it was not unusual for one team member to gain an insight and to be given a vote of confidence to explore this insight. There were still times when team member felt as if their ideas were not being listened to but these occurrences were far fewer than had been experienced in previous programs.

#### Competition

All of the programs were based on having competitive tasks for the groups each day. Points were assigned for each task and awarded based on how well the group was able to accomplish the task compared to all the other groups. At the end of the week, the group that had accumulated the most points was named the champion team and each group member was given a small award.

In the co-ed programs, there was a high level of competitive spirit shown by all the team members but as the week went on, poor performing groups seemed to lose interest and lose cohesiveness. The emphasis was on winning and when it became apparent that a group would most probably not be able to win the overall award, there was a decreased amount of effort and some of the group members would wander off to work with more competitive teams. Rather than buying into the team identity, school relationships became more important. Part of this was the way in which the earned points were structured; it would be evident by the fourth day that a team did not have a chance to win the overall title.

In the GEE program, there were two dynamics in place. During working sessions where tasks were being completed, there was a firm connection to the team. During breaks, for the first two days, students would migrate to be with friends rather than with their group. After the first two days, the teams tended to stay together during work and break sessions. Each group developed a well-defined sense of group identity. Since the scoring method was changed to provide for higher points for events later in the week, no real comparison can be made for groups with marginal performances as they approached the end of the program.

There were a limited number of young women who did not bond with their groups but their alienation from the group was never as pronounced as we saw with the co-educational groups. Part of this may well have been the impact of the peer mentors on the groups. The young women in the program identified closely with the mentors and were able to communicate problems in the group to them long before they became a group crisis. In the co-ed programs, teachers were used as mentors for the groups and the communication was not as easy for all the students. Even for the shy students, it appeared that they were able to work with the mentors. An additional consideration was the familiarity of the mentors with the problems. The mentors for the middle-school program had all participated in at least one year of the high school program. The mentors for the high-school program were all university engineering students and had experience in the engineering design process. This was not the case when middle school and high-school teachers were used as mentors. Mentors in the single gender program were much more able to give appropriate advice to groups when they encountered technical or group dynamic problems and were more able to convey problems to the program faculty before they became critical to the group.

#### Response to Speakers

In the co-ed programs, attention to the speakers was dependent on the degree to which the individual students were interested in the topic. The speakers were not the focus of attention. In the GEE program, there was a significant level of personal interest in the speaker themselves. Many of the young women had never encountered women as technical professionals outside the education and health care fields. Care was taken when selecting the speakers to

have a cross section of women professionals. Speakers ranged from engineers entering the profession to vice-presidents with supervisory responsibility over very large technical projects.

In the co-ed program, questions were normally focused on the topic being presented. In GEE, the questions varied from technical questions about the topic to personal questions about how the women achieved their positions, the problems they encountered in the workplace, and any unique things that they had to face as women in a male dominated profession. Responses were honest and most of the speakers could have talked long beyond their allotted time about their careers responding to questions from the young women.

## **RECOMMENDATIONS AND CONCLUSIONS**

Given our experience in offering the single gender GEE program, we would not hesitate to offer the program again. We have applied for funding for 2008 to expand the program from general engineering to include focused discipline-specific programs. During the speakers' presentations and in exit surveys, the high school students asked for more information on specific disciplines with special emphasis on environmental engineering, biomedical engineering, and computer engineering. We have proposed for 2008 to have three-day intensive programs in each of these fields as a secondary program to the general engineering program.

The GEE program has attracted a significant amount of positive response from the community. There is always a waiting list for applicants, and teachers and schools contact us for information to put in their school papers and campus bulletins. We have had four graduating high school seniors complete the program. Two of these young women are now studying engineering. Of the two, one is at the University of Memphis and continues to serve as a mentor in the program. One student, who chose to study psychology rather than engineering, still wishes to act as a mentor. We have had press coverage in local television and newspapers.

The greatest reward from offering this type of program is the feedback from introducing young women to something they may not have considered. In the exit interviews, surveys, and journals, there is a new confidence that females can accept the challenges that engineering offers and succeed. Even if they do not enter the engineering field, if they can sustain this confidence, our effort will have been worthwhile. For at least one week, we give them the permission to step outside of the social pressures placed on them. It becomes okay even admirable to be the adept student at the technical. They get a chance to see that there is a place for the professional woman in engineering. They get a chance to see the "that could be me."

Many of these young women come from academic environments where there is not a chance to go beyond the classroom basics. Their teachers, media, and peers shape their career choices. Providing contact with professional women and peers from other environments expands the career choices and life plans for these young women. Even the high achievers find some new ideas to consider.

### **If You Plan To Start This Type Program**

We would like to share some of the lessons that we have learned from presenting this type of program to guide other institutions. The rewards to participating faculty are significant, as is the impact on your community. Since our program was designed for students in the immediate area of Memphis, it runs Monday through Friday from 8a.m. until noon and does not include live-in arrangements. Although you may adopt other program models, you should consider the following items which we deem to be critical to success:

- Selection of mentors for the program is paramount. Mentors who are close in age to the students in the program and who have had experience with the program (or similar programs) are the best choices. Provide some form of training for the mentors and work through possible problems that they may encounter. Provide detailed outlines of their responsibilities and the criteria under which they will work.
- Positive role models are essential. Both in the mentors and in the guest speakers consider the impact that they will have on the young women. We were very successful in having a range of speakers from recent graduates to women who had been in the field for a number of years. They also had a range of careers from supervising a soils testing lab to vice president of a biomedical firm. All of the speakers were very happy to donate their time to the program and to act as contacts for the young women after the program.
- Field trips are nice but not necessary. In our early programs, we took field trips to local industries to show engineering applications. Travel times of 30 minutes or more were a problem as students were not excited about long bus rides. Most of the field trips did not involve the students actively. They were more of a site

view than active events. With the GEE program, we limited the field trips to a visit to an on-campus earthquake research center within 5 minutes of the engineering building. Since we were able to work closely with the research center, they tailored the field trip to actively involve the students. This has worked very well and gotten positive responses from the students. Depending on availability, consider field trips and how they can be integrated into the program.

- Manipulatives such as K'Nex, Legos, and other similar materials offer a wide range of opportunities to show the design process. We chose K'NEX because of their academic support and the ability to develop a number of challenges that were hard enough to have the girls work while not beyond any of their capabilities. The simple manipulatives allowed us to also integrate some mathematics and physics into the program, which pleased the middle and high school teachers. For example, working with vehicles, the students plotted the distance their vehicle traveled against the distance they wound up the spring motor. This led to a discussion of how changing the wheel diameter would affect the vehicle performance and if weight really mattered. While not overtly pushing this type of information, it is very easy to put these types of discussions if the manipulatives are selected and projects are designed with an eye to including them.
- Include a wide variety of ability students. Thought was originally given to selecting from the applicants only those who had exceptional abilities in math and science as recognized by their middle and high school teachers. Even though these would be the students more likely to become engineers, students who had yet to excel in math and science brought a lot to the design groups. Some of these young women provided significant communication and leadership components while others began to see math and science from a different point of view. It may well be that this type of program can inspire those students to become high achievers in math and science.
- Consider what you want from the middle and high school teachers that you include. Our goal shifted from having the teachers act as mentors to having the teachers as active participants. Once we moved all the teachers into their own competitive group and had them parallel the student groups, they became much more active and provided us with significant feedback on each day of the program. We also tasked to teachers to develop plans, in accordance with state standards, that would implement using the manipulatives and the lessons they learned from the program for their classrooms.
- In the age groups that we are dealing with, we have young people entering adulthood. In the co-educational programs, there was the gender tension that you would expect when young men and women are in the same environment. Both groups had a number of individuals who were more focused on impressing the other gender than on performing the task at hand. This led to hurt feeling and some "chest thumping" by the participants. In a single gender program, while you will be dealing with the same age group, the elimination of the opposite gender reduced that tension, at least within the program time, so that it does not become a distraction from the program itself.
- Keep in contact with the participants during the following year. We keep contact through email with as many participants as possible. This year, we will send out holiday cards to the young women. This allows us to keep in touch and to keep the fires that we hope we started alive. Students that participated in the middle school program have first preference to the high school program.
- Keep in contact with the teachers during the following year. We work with the teachers on science clubs, projects, and general help with their classrooms during the academic year. This actually allows us to expand the program and to keep developing a window to engineering in the local academic community. We host an open house every year and ask the teachers to bring teams of their students to participate.

Developing an outreach/enrichment program for middle and high school students is a difficult undertaking with innumerable rewards. The gender specific program has exceeded our original expectations for response and student acceptance. We asked these young women to give up a week of their short summer vacation to return to a classroom. With varying levels of enthusiasm they did just that, and by the end of the week, they were asking for more. When they leave and ask if they can come back next year, you will know why you took on this type of program

If we can help you in any way to develop or run a program like this, please don't hesitate to contact us.

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### Stephanie Ivey

Dr. Ivey is an Assistant Professor with the Department of Civil Engineering at the University of Memphis, where she currently teaches transportation engineering and engineering statistics courses. She has been a program faculty for the Herff College of Engineering's targeted outreach program, Girls Experiencing Engineering, since its inception in 2004, and has also served as program faculty in other co-educational outreach programs. She also has experience as a high-school math and science teacher. Dr. Ivey is the faculty advisor for the student chapter of the Institute of Transportation Engineers at the University, and serves as the Younger Member Chair for the West Tennessee Branch of the American Society of Civil Engineers.