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## Introduction

Spira is a free summer engineering camp for rising tenth grade girls from Rhode Island high schools. The camp consists of:

- hands on projects
- guest speakers in the field of engineering
- field trips
- discussions on issues related to engineers and being a woman in engineering



Fig. 1: Mentors with their assigned mentor group that they remain with through the summer

Since 2012, Spira has had a mentoring program where campers from previous years return and help out with the camp. Mentors apply for the position in the spring.

## Motivation of Research

A primary goal of the camp for summer of 2015 was to enhance the mentoring program in order to make the program more valuable for mentors themselves. This goal was motivated by observations of the 2014 mentor program which included:

- Mentors sometimes seemed bored and distracted during camp likely because they were not given enough to do.
- Mentors were not given much leadership or responsibility.
- Mentors did not feel capable helping out with certain projects because they did not remember content from the previous year.
- Coordinators did not provide surveys for mentors asking about their experiences with the mentoring program.

The responsibilities of being a mentor prior to and including this year's mentoring program involved:

- Participating in a training.
- Helping lead discussions with campers.
- Helping campers with projects.
- Sharing advice and experiences with campers.



Fig. 2: Mentor Leslie helps campers with breadboarding circuits

In an effort to make the mentoring program more valuable, the following additions were made to the responsibilities of the mentors in the hope of addressing the observations from the previous year:

- An enhanced mentor training where mentors prepared discussions and lessons for campers.
- Mentors led lessons.
- Lessons by coordinators taught in smaller groups where mentors could have more input.
- Mentors came in before camp started on certain days to review the content that they would be helping with that day.
- Mentors participated in a refresher on particularly difficult topics.
- Mentors filled out surveys on their experiences.

## Results

### Results from pre-mentoring and post-mentoring surveys

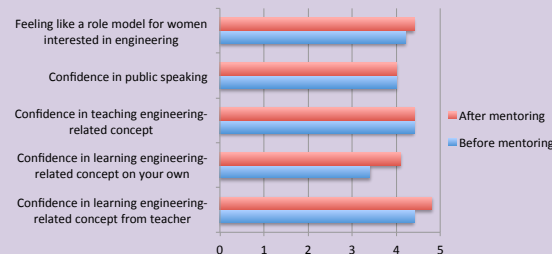


Fig. 3: Bar graph of responses from anonymous surveys where "1" was not confident at all and "5" was very confident (or not feeling at all like a role model and feeling completely like a role model respectively)

Although the results do not show a numerical increase in confidence in teaching engineering-related concepts, 100% of the mentors in the written portion of the survey said that they became more confident in teaching engineering-related concepts because of mentoring.

Many of the mentors reported that their public speaking skills were already good before mentoring which is why mentoring did not have an effect on their public speaking skills.

Many of the returning mentors reported that the changes to the camp were big improvements and that the mentoring program had changed for the better.

The mentors said that the added refreshers made it possible for them to help out the campers more. Mentors also noted in the evaluations and in a panel that they continued to learn about engineering as mentors, and they got just as much out of being mentors as they did out of being a campers.

Many of the mentors felt that getting to know and help out the campers was the best part mentoring. They found that being able to help campers felt very rewarding.

Below are some of the reported experiences with teaching lessons:

*"I think being able to teach lessons made the mentoring experience better because it gave me more of a voice in the camp... it allowed [the campers] to get to know me a little better and feel more confident in asking me questions because they'd now feel secure that I knew what was going on."*

*"[Teaching lessons] made my experience as a mentor better because when I would have to teach a lesson, it would give me a chance to learn more about something I had some interest in."*

Below is how one of the campers explained why mentoring has made her feel more like a role model:  
*"Being a mentor at this engineering [camp] really does make me feel as if I could be a great role model... I feel that through the mentoring program myself and the other mentors are able to show the campers that being female in engineering is so much more than what is shown on television."*

Though the feedback was overwhelmingly positive in all areas, there was one mentor that reported that she did not greatly enjoy her teaching experiences.



Fig. 4: Mentor Colleen (left) helps with project



Fig. 5: Mentors Patricia (left) and Colleen (right) answer camper's questions about school, finding jobs, and other topics.

## Research Question and Methods

Although there is research on how having mentors for women in STEM affects the mentee, there is not much research on how mentoring affects mentors. The research question for this summer was how does Spira's enhanced mentoring program affect the mentors in the following categories:

- Confidence in learning and teaching engineering-related concepts.
- Self perception of being a role model for girls interested in engineering.
- Confidence in public speaking.



Fig. 6: Mentor Callie (left) teaching Arduino to camper

Research was conducted by giving anonymous surveys to mentors weekly. There was also an evaluation before camp started and an evaluation after camp started where the mentors had to rank and explain their confidence levels in the above categories. There are fifteen campers and eight mentors. Of the mentors, four were rising 11<sup>th</sup> graders and were mentoring for the first time, two were rising 12<sup>th</sup> graders and were mentoring for the second time, and two were rising college freshmen and were mentoring for the third time.

## Conclusion

- This study supports the idea that mentoring can help build confidence in certain areas and can make young women feel like role models. As such, the mentoring program is a key part of the Spira program as a whole.
- Confidence can be built through the campers' questions and trust in mentors to help them with both academic topics and topics unrelated to school.
- The additions to the mentoring program were positive improvements since the mentors thought that the mentoring program had improved from last year. Mentors felt that the refreshers helped them be more ready to aid campers in their work. Leading lessons helped the mentors to continue learning, share their interests, and work on public speaking skills. This dealt with many of the problems faced in the 2014 mentoring program.



Fig. 7: Mentor Joy (middle back) teaches and leads an activity about biomedical engineering

## Potential Next Steps

- Make the refresher sessions more organized.
- Provide more time for mentors to make their lessons when the whole group is together and coordinators are present to help.
- Give mentors more teaching opportunities.
- Continue giving evaluations to mentors and make sure they explain why a teaching experience was or was not meaningful/positive.
- Communicating with mentors through a group text instead of email.
- Spread mentoring programs to other groups that work on women in STEM initiatives, not just as a way to help out mentees, but also to give mentors themselves more confidence.



Fig. 8: Mentor Michaela gives a lesson on electrical engineering

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