The Effect of Gender Groupings at an Engineering Summer Camp on Increasing Engineering Knowledge and Confidence

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Alison Haugh is a recent graduate from the University of St. Thomas with degrees in Elementary Education, STEM Education, and a focus in Engineering Education. Her undergraduate research with the Playful Learning Lab focused on expanding quality engineering education with an eye to under-served populations, including students with disabilities, emphasizing learning through play. Alison was the Lead STEPS (Science, Technology, and Engineering Preview program) curriculum constructor and continues to be an off-site researcher. Additionally, Alison has assisted on and led after-school engineering programs at nearby schools.

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Jenna is in her third year of studies at the University of St. Thomas, majoring in Elementary Education and STEM Education with a minor in Psychology. She works at her university’s Playful Learning Lab which focuses on engaging students of all ages in hands-on, innovative engineering education, especially focusing on several outreach projects reaching groups otherwise underrepresented within the STEM fields. Jenna is also leading the University’s STEPS (Science, Technology, and Engineering Preview Summer) Program, developing the curriculum, leading the staff, and working as the primary researcher.
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Introduction

This paper focuses on evaluating methods of effective practice of an engineering design summer program for middle school students. The paper reflects on findings and observations regarding gender groupings in STEM, and how they affect student learning and confidence. In 2009, President Obama's Administration implemented the "Educate to Innovate" program to emphasize STEM (science, technology, engineering, and math) education. Women and men hold nearly equal professional positions in the biological sciences, and close to that in math, yet women comprise less than 30% of the science and engineering workforce as a whole. Students as young as kindergarten express the belief that fields of study such as science and math are “boy subjects.” The societal norm that males succeed in STEM more than their female counterparts is reinforced as students mature and move into middle and high school. By early adolescence, females start to lose interest in the STEM disciplines and even lose confidence in their abilities in these subjects. First Lady Michelle Obama stated “If we’re going to out-innovate and out-educate the rest of the world, we’ve got to open doors for everyone. We need all hands on deck, and that means clearing hurdles for women and girls as they navigate careers in science, technology, engineering, and math.”

Recognizing this call to action and the increased need for K-12 Engineering Education Outreach, in 2015 the University of St. Thomas Playful Learning Lab redesigned a preexisting camp for rising 7th grade students. The new camp featured a one-day engineering design intensive workshop in place of the previous weeklong camp. In 2016, this new camp invited 125 students from the metro area to participate in a one-day workshop, which was conducted at the Saint Paul Public Library and at the University of St. Thomas in St. Paul, Minnesota. Accepted participants mainly attended Title I schools, and nearly 80% identified as female. Two main projects (circuitry and laser cutting) were completed by participants, focusing on both the creative and technical aspects of each.

Students were formally and informally assessed throughout each camp session to allow for data to be collected for use in comparison to the previous week-long camp structure. The research questions explored to what extent is the new format effective in obtaining the new camp goals. Participation in the formal assessment measures was high, with 88% of participants completing a questionnaire upon arrival and again at the end of the day. Using this data from 2016 and 2015 camps, researchers identified patterns and offer possible explanations for how gender breakdowns affect student learning and confidence in STEM. Furthermore, using reflections from camp staff and feedback from students, effective engineering education practices, programs, lessons, and curriculum designs were created and modified.

In 2000, the University of St. Thomas first offered a Science, Technology, and Engineering Preview Summer camp (STEPS Camp) which was supported by the University of Wisconsin-Stout STEPS program. The initial offering of the STEPS Camp at the University of St. Thomas (UST) was driven by the desire to educate, motivate, and inspire young girls about the STEM disciplines. For the first fifteen years of the camp, students were resided on campus and attended classes which culminated in model plane building. By 2014 the program's goals no longer aligned with reports which highlighted race, gender, and income disparities in STEM. Recognizing this, members of the engineering faculty determined that a camp that does not reflect the target demographic of students in its staff nor accommodate for low-income families, was an ineffective way to reach students falling on the lower end of the national achievement gap. In 2015, the School of Engineering partnered with Saint Paul Public Libraries in an effort to redesign the STEPS Camp. Unlike the last fifteen summers of the camp, the 2015 camp was a one-day session for 15-25 rising seventh grade students, and reflected a variety of different neighborhoods and schools, a variety of cultures, and allowed for a range in gender identity. This shift was made for a variety of reasons, including the desire for greater levels of diversity at the camp.

In 2015, NAEP published their findings from a study regarding the Black-White achievement gap in the United States, demonstrating that Black students attend schools that are 48% Black whereas their White counterparts attended schools that are less than 10% black. When reviewing the graduation rates for the state of Minnesota, it is evident that from 2011-2015, white students graduated at a rate 10% greater than the next closest racial demographic of students, with just over 50% of American Indian and Black students graduating from high school in four years by the year 2015. Furthermore, in a report published by the U.S. Census Bureau in September of 2014, the median income for non-Hispanic White households was $58,270 while that of Black and Hispanic households ranged from $34,598 and $40,963, respectively.

The disparities between race, income, and their effect on achievement levels of students led faculty members to change STEPS participation composition. In an attempt to achieve greater levels of economic and cultural diversity at STEPS, the structure of the camp was changed to a single day. By changing the duration of the camp and partnering with the local library (situated in a diverse part of the city), it was anticipated that enrollment numbers would increase among students of color. By offering a one-day camp, it was expected that families with working parents could more easily part with middle-school children for a single day. Previously, the overnight camp was housed in a university with less than 20% undergraduate students of color. It is quite possible that the lack of critical mass contributed to a lack of confidence and sense of belonging on the campus for overnight guests, thus decreasing in their enrollment.

2016 Participants and Recruitment

In 2016, the one-day camp model replicated, striving for even greater diversity and a mixed-gender opportunity. In 2015, researchers compared gender groupings at by inviting male-
identifying participants to participate. In this second year of the revised STEPS Camp, more than 300 students applied from around the metro area. From these applications, students were selected to participate in the STEPS Camp program for the 2016 sessions using a blind selection method, using only the student’s school criteria. Students were allowed to list their first three camp session choices. Students who attended schools with 80% enrollment of students qualifying for free or reduced lunch programs were admitted first, impartially chosen after reviewing this information provided on the application form. The decision to randomly select applicants in this manner was made after reviewing the connection between race, income, and achievement.

The 2016 STEPS Camp was marketed both online and with hard copy flyers. Camp coordinators hand delivered and mailed flyers to local principals, as well as to principals of suburban school districts where contacts were already established. While it is possible that the choice of marketing to students in person could cause bias in camp attendance, the flyer was also posted online, and shared by professors and community members on social media, reaching a large audience. The flyer was gender neutral and featured the STEPS logo, which emphasizes the art and the science aspects of engineering design. When reviewing the large area from where applications were received, it appears that there is no greater application rate from students who attended schools with hard-copies of flyers. When students applied for the camp, they worked with family members to complete an online Google forms survey. This worked much more efficiently than the 2015 registration form, which used hard-copy forms.

Similar to the 2015 camp, the 2016 program was comprised of five one-day, 13-hour sessions. In 2015, the first three sessions were female-only, while the last two were male-only. In 2016, the decision was made to maintain the first two middle school camps as female only, the third as a mixed-gender camp, and the fourth session inviting male-identifying students only. As stated earlier, there are large levels of disparity between men and women in STEM professions. When striving to help close this gender gap in STEM, one of the goals of STEPS Camp was to not only provide an opportunity to encourage young female students in STEM, but to reverse gender stereotypes possibly occurring in all students, therefore providing rationale for the mixed-gender camp. The belief that males are better than females at subjects like science, technology, engineering, and math is continually reinforced as students mature and pass through middle and high school. According to a report published by the NAEP in 2009, female high school graduates earned more advanced mathematics and science credit than their male peers, but significantly less engineering and computer credits. This is reflected in the United States job force; according to the United States Department of Labor, Women’s Bureau, in 2014, women held 75% of secretary and teaching jobs, while only 46% maintained jobs in computer and information systems, and 8.8% of jobs as mechanical engineers. Knowing this, the University of St. Thomas chose to invite students of all genders to participate in the 2016 camps, choosing the gender breakdown they would like to attend. In order to emphasize the ability of all students to perform and participate in the same areas, the lessons and activities were structured to appeal to all students. The instructor breakdown however, was intentionally ¾ female, ¼ male. When reviewing statistics such as those stated above, men hold positions in engineering and computer science at rates much higher than women. Therefore, instructors felt that it was crucial to portray participants (male or female) with role models in engineering while at camp.
2016 Logistics/Schedule

With the change of camp from one continuous week to a single day, it was crucial that the schedule and structure of the single day be well planned to optimize for substantial connections with students. Therefore, students were randomly divided into two groups at the beginning of the day (to minimize transition time throughout the day) using pairs of playing cards. Each day, camp began around 8:30 am, concluding with a ceremony ending twelve hours later.

8:00 am: Check-in begins (Location: Saint Paul Public Library)
8:30 am: Ice breakers, camp introduction, research surveys completed
9:15 am: Breakout Session #1
11:15 am: Lunch and outdoor break
12:30 pm: Breakout Session #2
2:30 pm: Clean-up
3:00 pm: Depart for University of St. Thomas
3:15 pm: Bowling and snack break (Location: University of St. Thomas)
4:15 pm: Breakout Session #3
5:15 pm: Breakout Session #4
6:15 pm: Dinner on campus
7:00 pm: Research surveys distributed
7:30 pm: Depart back to public library
8:00 pm: Prepare for closing ceremony (Location: Saint Paul Public Library)
8:15 pm: Closing ceremony
8:30 pm: Farewell!

Upon checking in, students participated in a variety of name games and ice-breakers with camp instructors to aid in creating a comfortable and welcoming environment that fostered learning, but was clearly identifiable as a different environment than a school classroom. In order to achieve this, instructors were called by their first names, wore street clothes, camp t-shirts, and engaged students in respectful and equal conversations that allowed for relationships to form.

Students then broke into two smaller groups focusing on different engineering design projects, each with no more than ten students. A 2014 study stated that in active learning environments, students are most successful in STEM when classroom groups are less than 50 students, claiming that the smaller the student groups, the more learning will take place. Once divided randomly, one group of students worked with two to three camp instructors on creating a laser-cut birch picture frame using Adobe Illustrator. The second group of students participated in a scaffold circuit activity involving the creation of play-dough circuits using Squishy Circuits, and small robots powered by a DC motor. Each lesson was conducted in its own format, redesigned for the 2016 camp sessions using new pedagogical knowledge as well as drawing on insights gained for effective time management from the 2015 camp.

Contrasting with small-group work in the morning, the afternoon brought students back together for large-group bonding as the participants and instructors took a bus from the community center to the University of St. Thomas main campus. When on campus, students were guided through
the student center and able to go bowling with current engineering students present on campus. Following this short break, students divided themselves into two groups once again, and took turns in two-hour increments touring the university engineering labs and campus, as well as creating peg-and-hole games with faculty in the machine shop.

During the students’ time on campus, the engineering students accompanied them to all activities, including dinner and taking post-surveys. 98% of students responded positively to the question: “Did you like having college students at STEPS Camp?” stating reasons such as:

“Yes, I like having college students because they have fresh minds on the subject because they were just recently taught about this, and they were able to understand our problems because they once had them too.”

and

“I think the college students added a perspective of how we would be using engineering in the future. They told us of some of their experiences and they were very nice.”

**Art Bots**

In 2015, campers completed a circuitry project adapted from *The Tinkering Studio*. After completing this lesson, it was intended that students would have met the following learning objective: “Students will be able to demonstrate using relevant vocabulary (closed circuit, open circuit, power source, electricity, positive lead, negative lead) why their Art Bot works, either verbally, physically, or a combination of both.”

While the lessons for the 2016 camp were nearly identical to the lessons and activities from the 2015 camp, a variety of changes were made in the instructional methods and rationale behind teaching these subjects, aiding researchers in determining the benefits and downfalls of each lesson. Similar to the 2015 camp, the 2016 Art Bots lesson plan began by scaffolding student knowledge with Squishy Circuits, allowing for student experimentation with a substance (play dough) that offers students the ability to creatively express themselves while also constructing electrical circuits. Throughout the 30 minutes of experimentation with Squishy Circuits, students were encouraged to engage in conversation with one another about what they were finding, what they wondered about, and what they would like to try. By allowing students to converse with one another while working, camp instructors were creating a cooperative-learning classroom. After completing experimentation with Squishy Circuits and forming a basic understanding of closed and open circuits (formally assessed through student-instructor conversation,) students were provided with the materials needed to create their Art Bots. This included paper cups, pipe cleaners, DC AA battery holders, two AA batteries, a toothbrush with a DC motor, electrical tape, and markers. For the next hour, students were guided loosely through the construction of their art bots, encouraged to reference their knowledge about circuits from Squishy Circuits when they were confused or discouraged. Upon completion of their robots, students were invited to test their designs on a large roll of paper, and allowed to redesign as they saw fit.
In 2015, the allotted time for the Art Bots was two and a half hours, which proved to be far too much time for students, as they often finished before the session time was up. Therefore, in 2016 the time was shortened to only two hours. Despite this time change, it became evident after the first day of the 2016 camp that students still rushed through activities, especially when male students were present. Noticing this, camp staff suggested a change in the lesson structure – what if we had students create the play dough for the Squishy Circuits themselves? We found through observation that this resulted in positive changes in student interest and learning.

One of the most positive changes that resulted from students creating dough themselves was how it allowed for students to partake in the inquiry process before beginning in the engineering design process for the Art Bots. When creating the dough, students began to ask questions, such as “Why do I have to add salt?” and “Does the food coloring I use make a difference in how conductive the dough is?” While the camp structure didn’t allow students more than a few minutes to test their various hypotheses that developed from these questions, it was discovered that by allowing students to create their own materials student’s understanding of circuits was deeper. After completing the dough and experimenting with Squishy Circuits, students were able to employ the engineering design process, drawing on existing knowledge established from the Squishy Circuits activity to design their Art Bots. Students first identified the problem (create a coloring robot), brainstormed solutions using provided materials, and eventually built a prototype, tested, and redesigned, asking questions and finding answers through experimentation at the same time.

Frames

While one group of students completed circuits and Art Bots, the other half of camp participants worked on creating a vector design of a picture frame using Adobe Illustrator. The learning objective of this project was: “Students will be able to use computer software (AI) to create multiple designs of a picture frame to be laser cut. Students will demonstrate understanding of the software as well as the design process and constraints by developing picture frame that will be cut in a single piece, and contain more than two unique shapes.”

The structure for the frames lesson was quite different. With the Art Bots activity, students were immediately touching materials, engaging in conversation as they interacted with materials. Students began sitting in a circle with an instructor at the front of the classroom, leading a discussion about engineering design. Discussions included probing questions on constraints, design goals, and possible “solutions” to the task. For example, one prompt was, “Create a picture frame that can be laser cut out of ¼” birch wood in a single piece.” Students discussed the importance of meeting design criteria and constraints. This instructor consistently responded to student questions with questions rather than answers, encouraging students to develop their own answers rather than accept what they were told. By making this change in instruction compared to the 2015 camp, students demonstrated greater enthusiasm when allowed to design their frames on the computer. In 2016, students were much more apt to adhere to the engineering design process than in 2015. It is the student-instructor discussion that was identified as the change agent.
After discussion about engineering design and the design process, students were given paper templates and encouraged to make at least two possible sketches. When this was complete, students were invited to computers to experiment with the software. It was found that this was a crucial step in 2015, as it minimized time students asked questions about software use when actually designing their frames on the computer. After becoming familiar with the software, students were free to design their frames using Adobe Illustrator. Students needed to pick one design, which appeared to be much easier than expected.

**Research Questions**

The 2015 camp research questions were the following. To what extent does a one day STEPS camp affect participants engineering knowledge? And to what extent does a one day STEPS camp affect participants engineering self-efficacy? In 2016, these research questions were supplemented with the following two questions. To what extent does gender affect how students respond to engineering self-efficacy questions in a one day STEPS camp? And to what extent does gender affect engineering knowledge-based questions in a one day STEPS camp?

The camp activities were intentionally planned to feature design, engineering and scientific inquiry. The intention of the multi-faceted camp curriculum was to draw in students who would be interested in an engineering/science camp, as well as those who may not think that they are interested in an engineering/science camp. The camp was divided by female, male, and co-ed camps, resulting in gender groupings. In order to isolate the gender factor, all other elements of the camp, including staff, activities, location, remained the same. Gender neutral activities, including designing robots, brainstorming the picture frames design and laser cutting allowed students to explore the science, art and design aspects of the camp, and to understand how these disciplines are connected. Students completed surveys with ranking questions and open-ended questions. Analysis consisted of gender-identification grouping responses being evaluated change in responses.

**Research Structure**

Research questions were structured and assessed using pre-program and post-program surveys. When students were accepted into the camp, research assent and consent forms as well as registration and photo release forms were included in the mailings along with a return envelope. Students were invited to participate in the STEPS Camp research project. There were no penalties for opting out, and the researcher was never informed of who participated and who did not.

If students did not mail their research confirmation or registration forms in before attending camp, they were asked again during check-in the morning of camp if they would like to participate. Of the 83 participants who attended camp, 72 chose to participate in research, and 64 provided viable data. Nearly 2/3 of research participants returned their forms using the envelopes provided, while all other participants completed forms during check-in on the day of their assigned camp session. As students completed the check-in process, they were ushered into the Createch (maker space) studio at the local library/community center. Here, students engaged in
conversation with camp counselors, who were in-service middle and high school educators and undergraduate engineering and education students from the University of St. Thomas.

Beginning at 8:30 am, students were guided through a brief, three-minute power point regarding the intent of the research and the process undergone to collect data. Survey questions included topics such as females in engineering, males in engineering, and knowledge necessary to succeed in engineering and design. At the end of the camp session, students completed a post-survey using the same format, with similar questions. More than one-month after all camp sessions ended, student researchers reviewed and compared pre and post data between single participants and analyzed comprehensive data between the different camp sessions.

Surveys consisted of demographic, free-response, and ranking questions. Ranking questions allowed students to choose an answer on a five-point scale ranging from "strongly agree" to "strongly disagree". The questions were pulled from previous research studies conducted on STEPS. The decision to keep questions similar to previous models was made in an attempt to keep data consistent for comparing data across years.

Sample questions included the ranking questions, In order to be a good engineer, I have to be good at art and design. And I can see myself pursuing a career with some sort of engineering. As well as the free responses questions, What do you think it means to be an engineer? And What are you hoping to learn or gain from the STEPS program?

Student responses were coded using fill and font colors, comparing each student answer to the corresponding answer on their post survey. Color-coding was also used for thematic analysis by gender and race to identify patterns, similarities, and differences.

**Gender and Growth**

One goal of STEPS Camp was to reach students who may not have opportunities to attend engineering and STEM camps. Coupled with this goal was an effort to create and refine pedagogically responsive content. To this end students were asked engineering knowledge and self-efficacy questions on their pre and post surveys. The four middle school camp sessions were broken down by gender as follows: Camp 1 all female; Camp 2 all female; Camp 3 8 male and 7 female; Camp 4 all male.

When assessing students for engineering self-efficacy, the 2016 camp proved to be more effective than the 2015 camp. In 2015, 18.9% of students noted an increase in confidence in their engineering knowledge and/or ability to pursue a degree in engineering, while in 2016 camp participants noted a 36% increase regarding their engineering and design ability. The main changes made for the 2016 camp were staffing related. In 2016, camp coordinators emphasized training staff on lesson plans, a larger staff consisting of both current educators as well as engineering students, and allowing staff member’s anonymous feedback. While there were other factors, the change in staff was the greatest single factor change.
Perhaps most interesting is the contrast in engineering self-efficacy between males and females in 2016. The third session of the camp welcomed students identifying as both male and female, attending in equal amounts. Out of all females at camps 1 through 3, 39% stated an increase in confidence. However at the mixed-gender camp session, female campers noted an increase in overall confidence in engineering knowledge by 71%, almost doubling in confidence. Opposing this is the male data- when females were present at the camp, 13% of male participants noted an increase in engineering confidence, but this percentage reached 50% when the camp was male-only (figure 1).

![Changes in Engineering Confidence Between Single and Mixed-Gender Camp Sessions](image)

**Figure 1**

Engineering Self-efficacy Self Reports

* n for female only = 35 participants, n for male only = 8 participants, n for co-ed = 7 female, 8 male students

The final camp session was male-only. STEPS student responses from this session compared to the mixed-gender session indicates that the absence of female campers led to male self-efficacy increase of 100%. The study was not designed to measure the effect of female participation on male student self-efficacy. And while the data sample is small, this is an interesting observation.

While having male students present at the camp appears to have aided in building female student confidence, there was no statistical difference in attainment of knowledge at the camp with males present or absent. When reviewing the change in student answers to the question “What does it mean to be an engineer,” 55% of students provided an answer after their camp session that was
either more accurate or detailed. (For the purpose of this research and student demographic, an engineer can be defined as a person who designs and creates solutions to problems). Ten students’ answers mentioned something about designing/building, four additional students reflected on the significance of creativity in engineering, one student emphasized STEM, while fifteen students now included problem solving in their answers and/or mentioned helping others (Figure 2).

![Additions to Student Explanations of "What does it mean to be an engineer?"

Common student responses to the question *What does it mean to be an engineer?*

The mixed gender camp responses of male and females was equivalent. When males attended STEPS Camp without female participants present, their answers did not significantly change when compared to mixed gender response variations to the same question. By reviewing this data, it is possible to draw the conclusion that mixed-gender camps do not necessarily have an effect on student achievement.
Gender and Perceptions

An uneven distribution between men and women across some areas of the STEM fields is still prevalent. The STEPS responses reflect these trends. The STEPS response to the statement “I have male role models in engineering and/or science” was that 71% of all participants stated that they “agree” or “strongly agree” with the statement. Only 57% of participants answered similarly to the same question regarding female role models.

After attending STEPS Camp there was a 20% increase in the number of students who reported that they felt they had female role models in science and engineering. Additionally in the post-program survey there was a 24% increase in the number of participants who felt that they had male role models. Of these students, 67% more students reported an increase in having role models of both genders after attending camp. Student perceptions of their role models in STEM align with national statistics.

Gender Conclusions

The 2016 data is mixed. Overall, the camp increased student engineering self-efficacy, built on student definitions of engineering, and provided students with a wider view of engineering. This wider view draws in math, science, art and design. Student responses disaggregated for gender presents findings that a mixed-gender camp appears to help to improve female student self-efficacy. Additionally a female-only camp resulted in an increase in female-student confidence but had no statistically significant effect on increasing engineering knowledge.

STEPS Camp in 2017

The survey responses has led to adjustments to the 2017 program. STEPS originated as a program to encourage females into the engineering field, and the program will return to serving this population. The article Girls Experiencing Engineering found that in coed STEM programs, males tended to dominate the design and generating roles whereas women fell into the more supportive roles. The UST STEPS program strove to provide females with opportunities to design projects and generate new ideas with the intention of providing a career springboard. Women make up 48% of the work force, but only 24% of the STEM fields. Engineering in particular is a path in which women have fewer opportunities. Of the individuals working in a STEM career, 48% of the males in STEM professions are engineers whereas only 18% of all the women in STEM careers are engineers. Data collected demonstrates that all-female programs support female student self-efficacy.

In order to increase female engineering knowledge, curriculum changes will be structured to prompt specific learning objectives. The pre-program surveys indicated that 36 of the 73 participants wanted to solve problems related to people, medical, and/or global issues. Following the program, 37 of the 70 post-program surveys aligned with these responses. Biomedical engineering is a field which encompasses helping others through medicine and engineering, a track which reaches the girls in our program who strive to help others. A study conducted by Seymour and Hewitt found that 90% of women and minorities cited choosing a field of study in
order to help others during their careers. The applications of positively impacting others are easily connected in the biomedical engineering field. Nearly 40% of biomedical engineers are women. Although males are still the majority in this field, biomedical engineering is one of the more popular engineering fields among women. The final major change to our program for next year is our goal to interview participants about their experiences. We will utilize this as a way for students to reflect on their experiences as well as a way for us to receive more rich data about the short-term impacts of our program.

Resources


http://tinkering.exploratorium.edu/scribbling-machines


Appendices:

Pre-Survey Form: .................................................................................................. 1A
Post-Survey Form: .............................................................................................. 1B
Flyer: .................................................................................................................. 2
STEPS Pre-Survey

This survey is to help us learn a little bit about you and what you know about engineering before camp starts. We would like to have this information so we can determine if our program is effective, and if your background has anything to do with your feelings and knowledge about engineering. There are no right answers! If there is a question you are not comfortable with, you do not have to answer it.

1. Please enter your STEPS identifier

2. I identify as
   Mark only one oval.
   - Girl
   - Boy
   - I don't want to answer
   - Other: ____________________________

3. My family learned about STEPS from a
   Mark only one oval.
   - teacher
   - friend
   - library
   - Other: ____________________________

4. I most closely identify with
   Mark only one oval.
   - White/Caucasian
   - Black/African American
   - Hispanic/Latino/a American
   - Asian/Pacific Islander
   - American Indian
   - Other: ____________________________

5. In the Fall of 2016, I will attend school at ...
Tell us how you feel

6. Please mark the response that best describes how you feel about the statements below:
   Mark only one oval per row.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>I can see myself pursuing a career with some sort of engineering</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>I consider myself to be good at math</td>
<td>○</td>
<td>○</td>
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<td>I consider myself to be good at science</td>
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<tr>
<td>I consider myself to be good at engineering</td>
<td>○</td>
<td>○</td>
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</tr>
<tr>
<td>I have female role models in engineering and/or science</td>
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</tr>
<tr>
<td>I have male role models in engineering and/or science</td>
<td>○</td>
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<tr>
<td>In order to be a good engineer, I have to be good at art and design</td>
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<tr>
<td>In order to be good at engineering, I have to be good at math and science</td>
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<td>○</td>
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<td>○</td>
<td>○</td>
</tr>
<tr>
<td>I am encouraged in math and science at my school</td>
<td>○</td>
<td>○</td>
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<td>○</td>
<td>○</td>
</tr>
<tr>
<td>I am encouraged in art and design at my school</td>
<td>○</td>
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<td>○</td>
<td>○</td>
</tr>
<tr>
<td>I consider myself to be good at art</td>
<td>○</td>
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</tr>
<tr>
<td>I consider myself to be good at design</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>

7. What kinds of problems do you want to solve?

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
8. What do you think it means to be an engineer?


9. What are your favorite subjects in school? and why?


10. What career do you see yourself pursuing?


11. What are you hoping to learn or gain from the STEPS program?


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STEPS Post-survey

This survey is to help us learn a little bit about you and what you know about engineering before STEPS starts. We would like to have this information so we can determine if our program is effective, and if your background has anything to do with your feelings and knowledge about engineering. There are no right answers! If there is a question you are not comfortable with, you do not have to answer it.

1. Please enter your STEPS identifier

2. I identify as
   Mark only one oval.
   ○ Girl
   ○ Boy
   ○ I don’t want to answer
   ○ Other: ____________________________

3. My family learned about STEPS from a
   Mark only one oval.
   ○ teacher
   ○ friend
   ○ library
   ○ Other: ____________________________

4. I most closely identify with
   Mark only one oval.
   ○ White/Caucasian
   ○ Black/African American
   ○ Hispanic/Latina/o American
   ○ Asian/Pacific Islander
   ○ American Indian
   ○ Other: ____________________________

5. In the Fall of 2016, I will attend school at ...

   ____________________________
Tell us how you feel

6. Please mark the response that best describes how you feel about the statements below:
   Mark only one oval per row.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>I can see myself pursuing a career with some sort of engineering</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>I consider myself to be good at math</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>I consider myself to be good at science</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>I consider myself to be good at engineering</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>I have female role models in engineering and/or science</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>I have male role models in engineering and/or science</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>In order to be a good engineer, I have to be good at art and design</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>In order to be good at engineering, I have to be good at math and science</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>I am encouraged in math and science at my school</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>I am encouraged in art and design at my school</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>I consider myself to be good at art</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>I consider myself to be good at design</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>

7. What kinds of problems do you want to solve?

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
8. What do you think it means to be an engineer?


9. What did you learn at STEPS?


10. Would you recommend STEPS to a friend? Why or why not?


11. What parts and aspects of STEPS were helpful for you?


12. Did you like having college students in the STEPS program?


13. If you could change one thing about STEPS, what would it be and why?


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Google Forms
STEPS Camp is free

Deadline to apply is Monday, April 15
Visit www.stthomas.edu/steps camp

How to apply?

with a trip to University of St. Thomas Engineering School
1200 Payne Ave., St. Paul, MN 55105
Armitage Hills Community Center

Where?

Participants attend one day only
August 10 (6th grade boys)
August 3 (3rd grade girls and boys)
July 13 (9th grade girls)
July 6 (7th grade girls)
June 29 (7th grade girls)
These one-day camps will be 8 a.m. to 5 p.m.

When?

Students going into 7th or 9th grade

WHO?