

Encouraging Girl Scouts through a Saturday Workshop

Fran Lee and Paige E. Smith
University of Maryland, College Park

Abstract— The Girl Scout Engineering Saturday (GSES) program at the University of Maryland, College Park is a primarily participant funded program developed in November 2002 and piloted in February 2003. Since the pilot programs, this program has been held in October and February of each year.

The program initiated when a local troop leader approached the Women in Engineering (WIE) Program to form a science and engineering program for local Scouts in Fall 2002. The potential for a collaborative relationship between Girl Scouts, a community based organization and the University of Maryland was very strong. Girl Scouts were an ideal group to work with because they represented an audience that may not have previously considered a technical field (compared to programs designed specifically for girls with a pre-existing interest in engineering, mathematics, and science). GSES reaches out to young women who have the potential to become engineers or scientists. The pre-college years are the perfect years to inspire and guide young students to begin to set their career goals.

After piloting the program in 2003, the program was integrated into WIE's regular outreach program offerings. This paper will provide program goals, logistics, benefits, and initial evaluative data for GSES.

Introduction

In fall of 2002, the Women in Engineering (WIE) Program at the University of Maryland, College Park was approached by a local Girl Scout Troop Leader. The leader's request was simple; she wanted the University to create a program for local Girl Scouts. She provided WIE with potential program ideas and resources for program planning. At the time WIE was approached, they had a two-week residential orientation program called RISE: The First Year Summer Experience. The goals of RISE were to quickly acclimate the incoming first year students to campus, expose them to female role models and mentors and provide them with experiences which could improve their general self confidence and self efficacy with engineering-related activities (Smith, Schmidt, & Schmidt, 2002). This latter goal provided the perfect match for having the RISE participants work with the Girl Scouts. The RISE students were selected to work with the Girl Scouts for a variety of reasons. The RISE students were on campus for a two week summer orientation program prior to their first year at the University of Maryland. They had one common goal: they were all entering STEM fields. While participating in RISE, they established a strong sense of community. They also knew the importance of mentoring and role modeling younger students who may become interested in STEM fields.

This mindset and the strong relationships between the students was what WIE was looking for to create and establish the new Girl Scout initiative.

Many of the RISE participants who worked on the initial Girls Scout pilot program became members of the Society of Women Engineers (SWE) during the fall semester of their freshman year. And, as such, the SWE section adopted the program in collaboration with WIE. The first full program for Girl Scout Engineering Saturday (GSES) was held in February 2003.

The workshop that was created was called the Inventions and Inquiry Interest Project Patch. The patch was selected from a book, *Interest Projects for Cadette and Senior Girl Scouts*, which the troop leader provided to generate ideas (Boas, 1997). We selected the Inventions and Inquiry patch because it fit well with our personal goal of helping younger students to understand more about engineering. Each RISE student was responsible for planning a portion of the activities and as a group created the workshop and prepared workbooks. By sharing the work amongst the students, the program was quickly put together within a relatively short amount of time. The workshops that were created were relatively low cost.

Program Goals

GSES has the following goals:

- To reach out to an audience who may not have previously considered science, technology, engineering and mathematics (STEM) careers as opposed to students who self-select into STEM outreach programs
- To inspire young women to choose professional careers in engineering or science through the activities required to earn Interest Project Patches (for example, Inventions and Inquiry)
- To provide university students with the chance to develop and implement engineering-related activities
- To improve students communication and leadership skills through leading the young women in hands-on engineering and science activities.

Program Description

The GSES program is held on a Saturday morning once per semester. This typically is the most convenient time for both volunteers and participants to avoid conflicts with classes or athletic events. Each program begins with a check-in period for the Girl Scouts. Upon completion of check-in, undergraduate volunteers lead the Girl Scouts in a series of icebreakers. The Girl Scouts that participate come from a variety of troops in the Washington Metropolitan area. At the beginning of the program icebreakers are essential to encourage communication and collaboration between the participants who do not know each other. In the first GSES program, icebreakers were not included and we found the interaction between troops to be very low.

The patch-related activities begin right after the icebreakers. The Girl Scouts are divided into three smaller groups to rotate through a series of activities. Each activity was designed to meet specific patch requirements. An interest patch is earned when Scouts accomplish all activities across four areas: Skill Builder, Career Exploration, Technology, and Community Service. The specific activities selected for the GSES program include:

- *Skill Builder #4 Word Search:* Scouts learn about patents by completing a word search and cross word puzzle. This was used as a warm up activity while Girl Scouts checked-in.
- *Skill Builder #3 Invent a Bridge:* Volunteers introduced Scouts to basic concepts in bridge building, for example, tension and compression. Then Scouts sketched, built and tested their bridges. The materials for this activity included toothpicks and marshmallows (or gumdrops).
- *Skill Builder #5 Develop an Ad Campaign:* Scouts developed an ad to sell their bridge. The ads were shared with all of the scouts, parents and troop leaders in the closing celebration.
- *Career Exploration #1 Be an Inventor:* The Scouts were given the opportunity to learn about a female inventor in great detail through reading short articles and conducting internet research. Scouts then presented their inventors to their peers.
- *Service Project #2 Create an Inventor Website:* Scouts worked in groups of three to compile the information they learned about an inventor into a website. The website is linked to the WIE website for later viewing and to teach others about their inventors.
- *Technology #2 Inventing Solutions for the Future:* The Scouts explored how time alters various inventions. During this activity they brainstormed ways that an invention might change in the future and made a drawing of their concept. They shared their concept with their peers. The materials for this activity included poster board and markers.
- *Career Exploration #3 Inventions and Careers:* Prior to inventing a solution, the Scouts participated in a discussion of careers related to inventing. And throughout the presentations of the inventions, the presentations included identifying which careers would be important for producing the invention.

At the completion of the activities, lunch is served and the Scouts work on an Ad campaign for the closing celebration. During the closing, the Scouts are each given a certificate of completion, an Inventions and Inquiry Project Patch and a SWE Event Patch. Parents and troop leaders are strongly encouraged to attend the closing. A sample schedule of the day is provided in Table 1. In the schedule shown in Table 1, the Bridges activity incorporated Skill Builder #3, Invent a Bridge, and Skill Builder #5, Develop an Ad Campaign. The Website activity incorporated Career Exploration #1, Be an Inventor, and Service Project #2, Create an Inventor Website. And the Inventions activity incorporated Technology #2, Invent Solutions for the Future, and Career Exploration #3, Inventions and Careers.

Table 1. Sample schedule for Girl Scout engineering Saturday

TIME	EVENT		
8:30 – 9:00	Set Up		
9:00 – 9:30	Registration/Word Search		
9:30 – 10:00	Introductions & Ice Breaker		
	Group A	Group B	Group C
10:00 – 10:50	Bridges	Inventions	Website
10:50 – 11:50	Website	Bridges	Inventions
11:50 – 12:50	Inventions	Website	Bridges
12:50 – 1:30	Closing & Lunch		

Program Benefits

GSES is a program that introduces young women to science and engineering as potential fields of study. Girl Scout troop leaders reported that they did not have the resources or the expertise

to provide similar experiences for their troops. This program reaches out to a new audience and to positively impact young girls' self-confidence and interest in science and engineering.

Participants gain the opportunity to interact with college students who give them a different perspective on science and engineering. The different activities make engineering less abstract to the students who are unfamiliar.

This program also provides undergraduate engineering students with mentoring and leadership opportunities that enrich their college experience, increase their learning and personal commitment to science and engineering, and enable them to practice citizenship through service to their community. These types of experiences have been shown to be important to undergraduate retention (Bandura, 1986). A group of 2-3 undergraduates leads each group of Girl Scouts from one activity to another. At each activity there are also 2-3 students who lead each lab. This was a program created completely by incoming first year undergraduate students under the guidance of a WIE staff member.

Program Costs

Initially, WIE decided to make the pilot program free to the participants to encourage participation and to test out the materials developed. The pilot proved to be a success and so the program continued to be offered once or twice each semester. While the program began as a free program, we found the attendance to be low despite the high number of Scouts registering for each program. Therefore, by the third program, there was a registration fee of \$5. This fee of \$5 not only guaranteed us a greater attendance. The additional benefit of charging a fee was that the cost of the program was almost completely covered by the fee. The program was recently increased to \$8 to take into account the increase in activity supplies, patches, and food. Table 2 contains a sample budget for a program including 40 Girl Scouts and 15 volunteers. The registration fee for the Girl Scouts covers a portion of the costs for the program. The remaining costs are covered by WIE. The exception to this was in 2004 when SWE secured a grant from ExxonMobil. During this period the grant covered the majority of the costs in addition to t-shirts for the Girl Scouts and Volunteers.

Table 2. Sample Program Costs

Item	Cost
Breakfast for 15 volunteers	\$30
Lunch for 60	\$250
Girl Scout Patches	\$50
SWE Patches	\$70
Activity supplies	\$30
Total	\$430

Evaluation

Data has been collected on the Girl Scout Engineering Program since April 2003. Data were collected from both volunteers and participants. Upon completion of the Girl Scout program, the participants were asked to complete a brief evaluation. The average response to each question

for each program is shown in Table 3, where columns two through 14 represent the following questions:

1. The program met my expectations. (EXP)
2. I learned a lot from Skill Builder #4 Word Search. (SB4)
3. I learned a lot from Skill Builder #3 Invent a Bridge. (SB3)
4. I learned a lot from Skill Builder #5 Develop an Ad Campaign. (SB5)
5. I learned a lot from Career Exploration #1 Be an Inventor. (CE1)
6. I learned a lot from Service Project #2 Create an Inventor Website. (SP2)
7. I learned a lot from Career Exploration #3 Inventions and Careers. (CE3)
8. I learned a lot from Technology #2 Inventing Solutions for the Future. (T2)
9. The workshop handbook was useful to me. (HBD)
10. I liked working with college students. (COL)
11. I enjoy learning math. (MTH)
12. I enjoy learning science. (SCI)
13. I enjoy learning about engineering-related concepts. (ENG)

Responses to the questions are based on a Likert-type scale of 1-5 with 1 being Strongly Disagree and 5 being Strongly Agree. The average responses to selected questions are summarized in Figures 1 and 2. The first and last questions were added to the surveys at the February 2004 program.

Table 3. Participant response to selected questions from the post-program questionnaire

	1 EXP	2 SB4	3 SB3	4 SB5	5 CE1	6 SP2	7 CE3	8 T2	9 HDB	10 COL	11 MTH	12 SCI	13 ENG
Apr 03	n/a	2.40	4.20	3.33	4.47	3.67	4.13	3.87	4.20	4.53	3.53	3.67	n/a
Oct 03	n/a	3.07	4.55	3.76	4.34	3.83	3.97	4.31	4.10	4.52	3.86	3.97	n/a
Feb 04	4.33	3.47	4.17	4.03	4.23	4.03	4.21	4.23	3.87	4.17	3.52	3.45	4.07
Jul 04	4.07	3.14	4.00	3.29	4.00	4.21	3.54	4.23	4.29	4.64	3.29	4.14	4.00
Oct 04	3.72	2.81	4.08	3.72	3.67	3.44	3.83	3.63	3.67	4.19	3.03	3.69	3.53
Feb 05	3.91	2.89	4.17	3.93	4.04	3.61	3.71	3.91	3.80	4.72	3.74	4.02	4.02
Oct 05	3.92	2.78	4.11	3.49	3.78	3.43	3.65	3.70	3.40	4.28	3.22	3.92	3.97
Feb 06	4.18	3.21	4.11	3.72	3.86	3.91	3.86	3.95	3.61	4.50	3.55	3.75	3.73
Oct 06	4.00	3.39	4.14	3.81	3.95	3.69	3.81	4.00	3.70	4.12	3.41	3.76	3.79
Feb 07	4.00	3.39	4.14	3.81	3.95	3.69	3.81	4.00	3.70	4.12	3.41	3.76	3.79

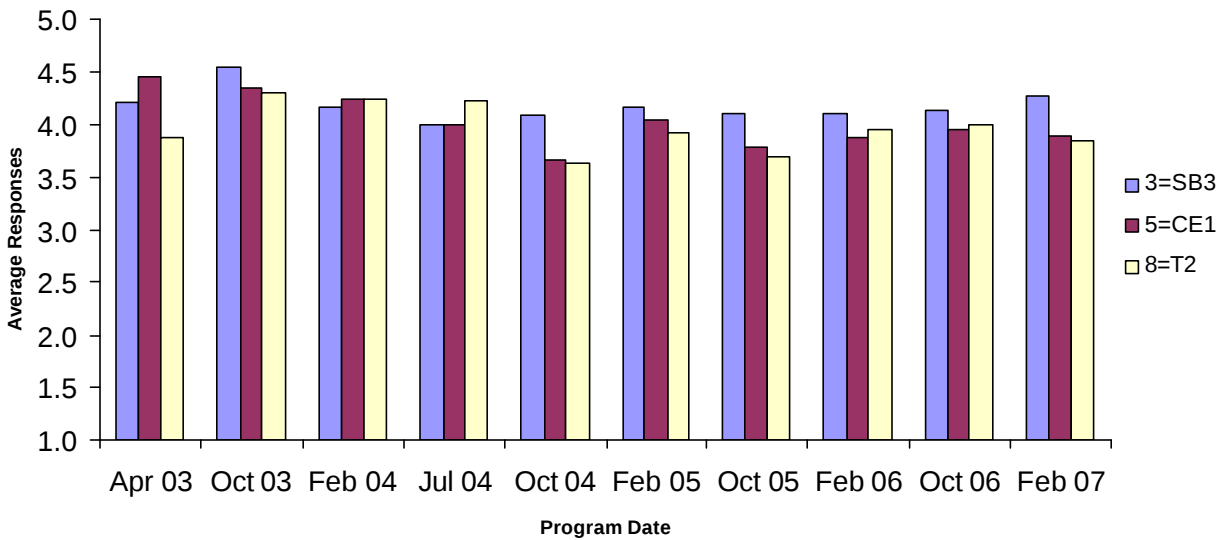


Figure 1. Participant responses to selected questions from the post-program questionnaire

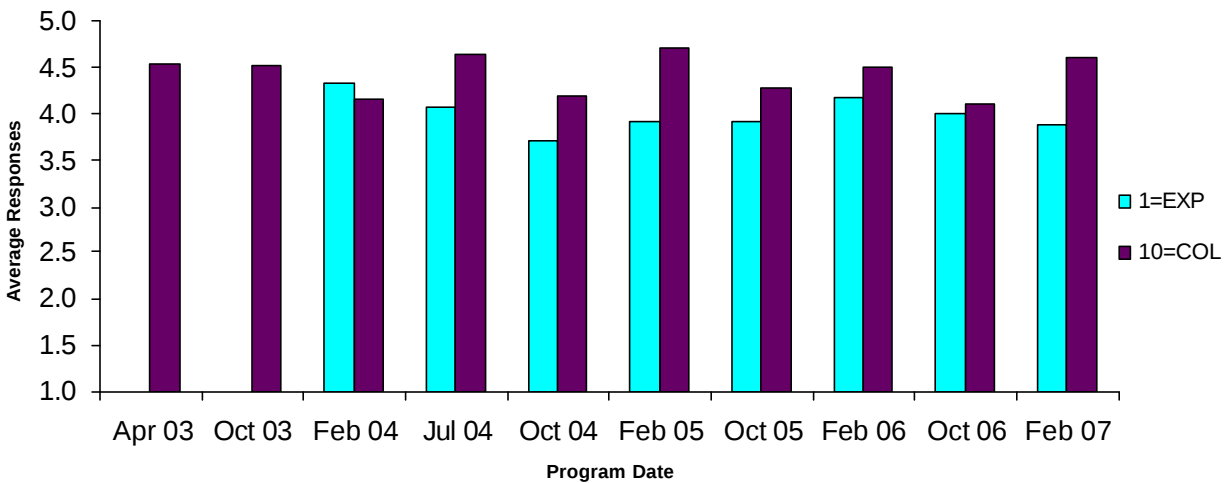


Figure 2. Participant responses to selected questions from the post-program questionnaire

From Figure 1, the participant evaluations showed that students learned a lot from the workshops and from Skill Builder 3, Career Exploration 1 and Technology 2 in particular. The Skill Builder 3 and Technology 2 were also the activities that required the most hands-on involvement. In Figure 2 it is evident that the program met the Girl Scouts' expectations and younger students looked to college students as role models.

Volunteers also completed a questionnaire after each program. The responses to each question are based on a Likert-type scale of 1-5 with 1 being Strongly Disagree and 5 being Strongly Agree. The results are shown in Table 4 and Figure 3. In Table 4, the first column provides the date of the program, while column two through eight contain the average response to the following questions:

1. I applied concepts I learned from my math, science, technology classes. (MST)

2. Outreach programs like GSES are important. (IMP)
3. I enjoyed interacting with the Girl Scout participants today. (ENJ)
4. The GSES Program met my expectations. (EXP)
5. I was given enough information prior to the GSES Program. (INF)
6. I feel more confident in my abilities to work effectively with young students. (ABI)
7. I would recommend my friends to volunteer for the GSES Program. (REC)

Table 4. Volunteers' average responses to selected questions

	1 MST	2 IMP	3 ENJ	4 EXP	5 INF	6 ABI	7 REC
Jul 04	3.21	4.53	4.42	4.11	4.63	4.05	3.89
Oct 04	3.56	4.44	4.11	3.78	3.89	3.78	4.11
Feb 05	2.75	4.75	4.50	4.50	4.75	4.00	4.25
Oct 05	3.56	4.82	4.71	4.53	4.24	4.18	4.56
Feb 06	3.91	4.92	4.83	4.75	4.58	4.50	4.67
Oct 06	3.33	4.87	4.67	4.60	3.73	4.47	4.67
Feb 07	3.64	4.86	4.71	4.36	3.57	4.23	4.43

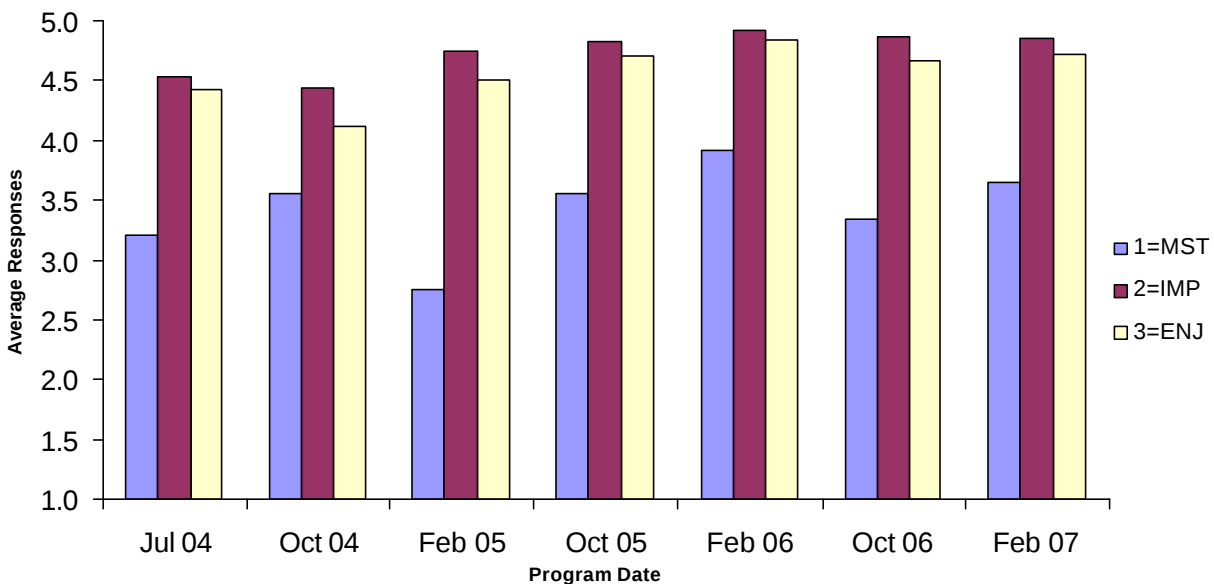


Figure 3. Volunteers' average responses to selected questions

Figure 3 represents a snapshot of three questions posed to the students. The first (MST) is the response to "I applied concepts I learned from my math, science and technology classes." The responses to this question ranged from 2.5 to 3.5 range. Students for the most part were neutral to this statement. Since GSES is a program where it is structured around the requirements of an Interest Project Patch, there are requirements that must be followed in order to provide the program. This program is about inventions and inventors which contains more research and knowledge-based workshops for the participants to conduct (as opposed to the volunteers). The only workshops that contain engineering-specific topics are the Bridge workshop where students learn about the concepts of tension and compression to build a bridge and in Inventions, where students present an overview of a variety of engineering and technical careers. In the case of

bridges, the volunteers have the opportunity teach the participants what they learned from their classes (particularly statics). With Inventions and Website, volunteers use skills which they take for granted, e.g., imagination and Internet, to help the participants.

The second statement (IMP) shown in Figure 3 is “Outreach programs like GSES are important.” This statement is about awareness. The responses from volunteers are in the 4.5 to 5 range. From this we can see that volunteers strongly agreed that outreach programs are important, they are aware of the impact that outreach programs can have. This can be a result of self identification for many students, particularly as many of the volunteers were women.

The last response (ENJ) captured in Figure 3 is “I enjoyed interacting with the Girl Scout participants today.” This further shows that volunteers had a positive experience. Another question we asked the volunteers is if they would volunteer for GSES again. One hundred percent (100%) of the volunteers in all programs responded ‘yes’ to this question. This further backs up the reasons for continuing to offer this program. Not only are Girl Scouts benefiting from this program but the student volunteers benefit as well.

Conclusion

Five years later, the program continues to be a success. The RISE students who created the program have long graduated with their bachelor degrees and have moved on to the working world, some returning to academia.

GSES gives us the opportunity to reach out to a group of students who may not have otherwise participated in a STEM activity. By being able to earn a patch upon completion of the program, students get exposed to STEM-related activities. The demand for the program currently exceeds the capacity available. Each program continues to have a long waitlist of Girl Scouts who are eager to attend and participate in the program. The program has grown to accommodate over 50 Girl Scouts, while still maintaining its original structure and goals.

References

- Bandura, A. (1986). *Social foundations of thought and action: a social cognitive theory*, Englewood Cliffs, NJ: Prentice Hall.
- Boas, E.K. (1997). *Interest Projects for Cadette and Senior Girl Scouts*. Girl Scouts of the USA.
- Smith, P.E., Schmidt, L.C., & Schmidt, J.A. (2002). Research Internships in Science and Engineering (RISE), in *Proceedings of the Women in Engineering Program Advocates Network Conference*, San Juan, Puerto Rico, 2002

Fran Lee, franlee@umd.edu
Dr. Paige Smith, pesmith@umd.edu