

From your community to the United Nations: Growing a successful pre-college program, Introduce a Girl to Engineering Day

Katie Kizziar

**Women in Engineering Program,
University of Texas at Austin**

Abstract—National Engineers Week launched "Introduce a Girl to Engineering Day" in 2001 to bring firsthand experience in engineering to girls and young women. An estimated one million girls have been involved annually in programs across the nation. On March 25, 2004 "Girl Day" was presented to the United Nations Committee on Non-Governmental Organizations and several international programs are now scheduled for 2005 (www.eweek.org).

The Women in Engineering Program at The University of Texas at Austin has hosted "Girl Day" during National Engineers Week since 2002. In the first four years this afternoon of hands-on fun and education for girls of elementary through high school age has grown to 7 times it's original size, with over 750 participants and 200 volunteers. Community involvement has grown to include the Lone Star Girl Scout Council, who now offers a Girl Day patch earned by participants, and the Mayor, who proclaimed the last year's date Introduce a Girl to Engineering Day in Austin, Texas.

Through outreach to schools, community groups, and local media students in grades 1st -12th and their families are invited to campus to explore engineering in a variety of ways. Booths hosted by University student organizations and industry such as TXDOT, NASA, and Caterpillar are offered in connection with age appropriate hands-on activities for younger students; campus tours and college planning programs are additionally offered to older students.

Constantly improving assessment and tracking enable the Women in Engineering Program to work towards meeting program objectives for student participants and current engineering student volunteers. This paper will describe the Girl Day program at UT Austin including activities and event highlights, participation data and assessment, partnerships and fundraising.

Introduction

Introduce a Girl to Engineering Day is an afternoon of fun and education for girls of elementary through high school age. The event, part of a coordinated international outreach effort for Engineers' Week¹, is designed to excite girls' interest in the field of engineering. First graders through seniors in high school participate in a variety of age-appropriate hands-on activities that encourage learning by doing.

In addition to hands-on activities, students have the opportunity to visit booths set up by sponsoring companies, engineering student organizations and student project groups and community groups to learn about engineering in practice and other ways to get involved in engineering. Women and men from the University of Texas (UT) engineering community, including faculty, students, staff, industry partners and alumni, facilitate the hands-on activities and are available to talk to the girls about all aspects of engineering. The Specific objectives of the Introduce a Girl to Engineering Program are as follows:

1. To encourage underrepresented students to explore engineering as a career choice;
2. To expose underrepresented students to technology across engineering disciplines and to build confidence in using technology through a fun and exciting hands-on experience;
3. To expose underrepresented students to engineering role models (students, faculty, and industry professionals); and
4. To establish an ongoing support network for underrepresented students and parents interested in learning about engineering careers.

The first UT Introduce a Girl to Engineering Day in 2002 brought 86 girls to campus after school for a three hour program. 51 volunteers facilitated the event. In 2003 the same three hour program was repeated after school, 94 students and 64 volunteers joined us on campus for the event. Last year, in 2004, the program was moved to a Saturday evening in order to accommodate more students and volunteers. Over 300 students and 155 volunteers participated with several more students on a waitlist to attend. This year in an effort to reach as many students as possible, all students were welcome on campus- there was no waitlist. Over 750 students and 200 volunteers attended Girl Day 2005.

Program Components

Age specific activity rooms. The pre-college students who come to Girl Day participate in a variety of hands-on activities that encourage learning by doing. To facilitate the learning process the participants are divided into four age groups: 1st-3rd grade, 4th-5th grade, 6th-8th grade and 9th-12th grade. Each age group has their own work rooms and age specific activities. Activity volunteers choose an age group to work with and are trained to facilitate in building an activity as well as explaining the relevance to engineering. Many of the activities from Girl Day come from the PBS Kids show and web site **Zoom**TM (<http://pbskids.org/zoom/activities/sci/>). Power point presentations on related engineering topics also run continuously in each activity room. A complete list of the activities each age group worked during Girl Day 2005 is found in table 1.

¹ In 2005 National Engineer's Week changed it's name to Engineers Week; dropping the "National" in an effort to acknowledge the international nature of engineering

Table 1 Activities by age group from Girl Day 2005. All of the activities listed for 1st-8th grades come from the activity section of the PBS ZOOM™ web site: <http://pbskids.org/zoom/activities/sci/>.

Grades 1-3	Balloon Flinker Cotton Ball Catapult Gumdrop Dome
Grades 4-5	Hoop Glider Hovercraft Puff Mobile
Grades 6-8	Egg Bungee Puff Mobile Super Golf Tower
Grades 9-12	Solar Car Workshop Soldering 101 Tour of Visualization Laboratory

One 1st through 3rd grade activity involves designing and building the most stable geodesic dome out of gumdrops and toothpicks. The Gumdrop Dome, as it is called, is a good way to explore different shapes and their strengths. Activity facilitators also use the dome shape to show how objects that students recognize relate to engineering (i.e. Engineers built the Epcot Center). Figure 1 shows a first grader working on her Gumdrop Dome at Girl Day 2004. Other activities appropriate for this age group include exploring weights and measures with Balloon Flinker. To “Flink” is to neither float nor sink; a balloon flinker is a helium balloon with a small paper cup attached by a ribbon. By filling the cup with different objects students can meet the objective of having the balloon “flink”, or float, in mid-air.



Figure 1 A first grade student works to complete her Gumdrop Dome

Hovercraft is an activity from the 4th-5th grade rooms, which is made from a plastic plate, an air filled balloon, a film canister and some poster putty. Students construct their Hovercraft so that the balloon’s air streams out under the plate creating a layer of air that the plate then “hovers” on. The layer of air reduces the friction between the plate and the table causing the plate to float and slide easily. Topics such as pressure and friction are discussed in the building and understanding of Hovercraft.

Middle school-age students tackle more complex challenges, like building a bungee jump for an egg, using rubber bands, nylon stockings, yarn and balloons. The weighted plastic egg must fall five feet and stop two inches from the ground without cracking. Another project, the “Paper Tower,” involves using only two sheets of newspaper – that can be bent, torn, crumpled or rolled—to build the tallest possible tower that will support a golf ball and stand freely for 30 seconds or more.

High school students are treated to tours of top notch research facilities and campus buildings. They also work with engineering student organizations to complete workshops such as building a working solar car model. Skills such as soldering are learned in preparation for the solar car building. Students are also presented with college admissions information and opportunities for continued involvement in WEP’s events.

Engineering Booth Fair. When students are not working on an activity they may visit the various booths hosted by engineering student organizations, student project and research groups, corporate sponsors and community groups like the Girl Scouts and the Girls’ School of Austin. Examples of past booths include the Longhorn Solar Vehicle Team and their solar race car, the Electrical Engineering Honors Society and their bicycle generator, the Texas Department of Transportation and a demonstration on how bridges work and graduate students with a demonstration of a magnetic superconductor. Figure 2 shows a picture of young students testing their strength at a National Instruments booth on measuring devices featured at Girl Day 2005.



Figure 2 Students visiting the National Instruments booth at Introduce a Girl to Engineering Day 2005 test their strength by trying to bend the metal bar. Once the force inflicted on the bar reaches a certain level a camera captures a picture of the experimenter and stores it in the computer. This fun experiment demonstrates how measurement devices can be programmed to record different types of data.

Program Participation, Tracking and Assessment

Figure 3 shows the Girl Day participation, by grade, of students for 2002-2005. Publicity for the program spread to such an extent that the total number of participants doubled by the third year. So many students wanted to participate in 2004 that over a hundred were registered on a “space available” waitlist. In efforts to reach as many students as possible in 2005, the program had an open admission policy (with registration required). Over 750 students attended Girl Day 2005.

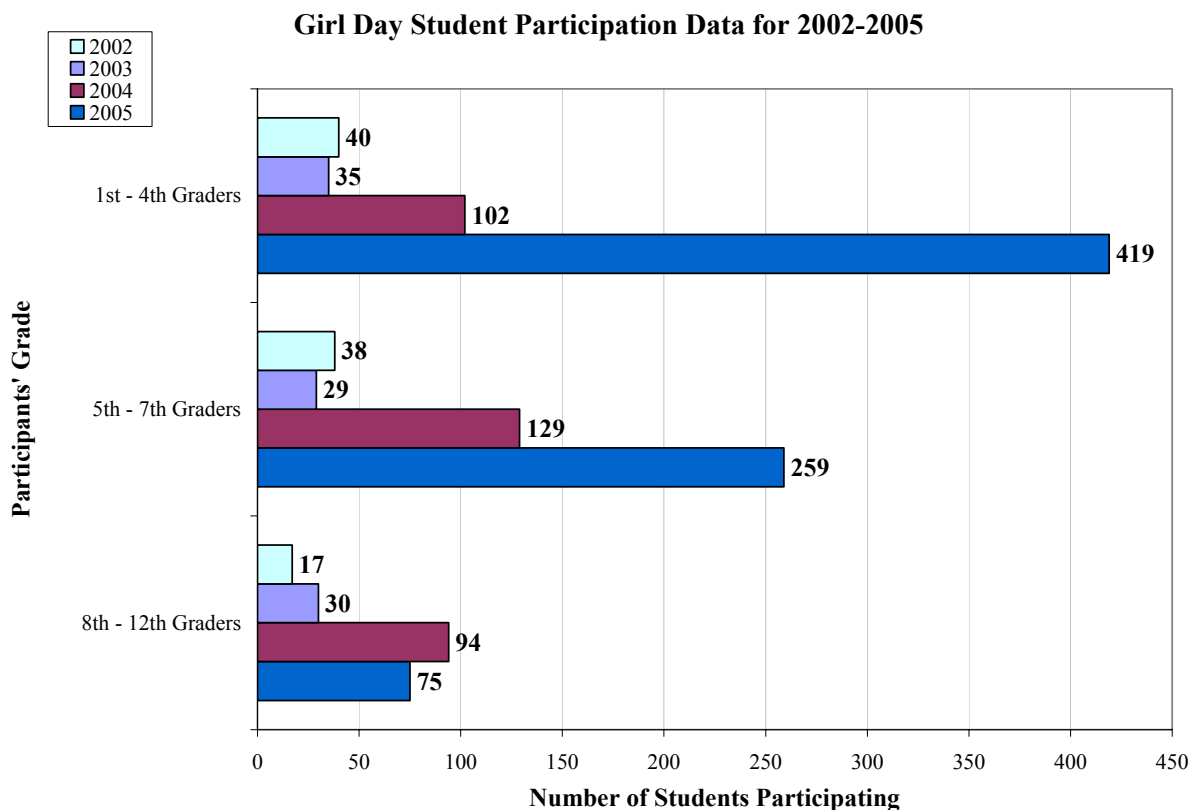


Figure 3 Girl Day student participation data for 2002-2005.

Though this event is titled Introduce a Girl to Engineering Day, female and male students are welcome to participate. Girl Day is advertised as a family event and we find that we have a higher turnout when families can bring all of their children instead of worrying about supervision for their sons. Table 2 shows the gender breakdown of Girl Day participants from 2002-2005. Since 2002 males have made up, at most, 5.3% of the total participating students.

Table 2 Participant gender breakdown for Girl Day 2002-2005

	Females	Males	Totals	Males as a % of total
2002	91	4	95	4.2%
2003	89	5	94	5.3%
2004	316	13	329	4.0%
2005	728	25	753	3.3%

Table 3 shows the ethnicity breakdown of participants from 2004 and 2005. Ethnicity data only exists for Girl Day 2004 and 2005 as we did not record such information for the program in previous years.

Table 3 Ethnicity breakdown for Girl Day 2004 and 2005 participants

	2004		2005	
Asian	17	5%	67	9%
Black	39	12%	77	10%
Latino	68	21%	150	20%
White	189	57%	431	57%
Other	14	4%	23	3%

Girl Day 2004 marked the first year the Women in Engineering Program partnered with the Girl Scout Lone Star Council. Through our collaboration we created an “Introduce a Girl to Engineering Day” Girl Scout badge that students earn through participating in Girl Day. Figure 4 shows the Introduce a Girl to Engineering Day Girl Scout badge. All badge orders and purchases are handled through our Girl Scout contact.

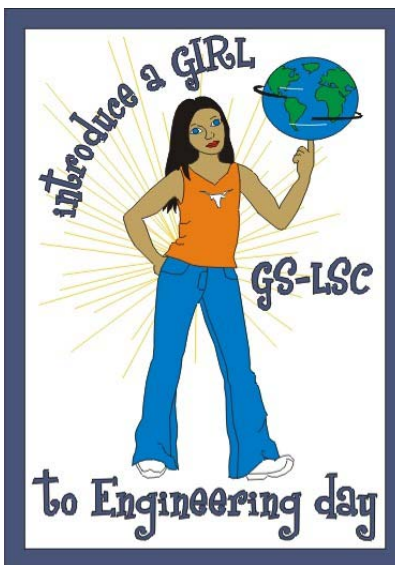


Figure 4 Girl Scout badge offered to students for participation in Introduce a Girl to Engineering Day

61 Girl Scouts attended Girl Day 2004. Girl Day 2005 and other outreach events offered through the College of Engineering were advertised through the Girl Scouts *Possibilities: Camp Guide* as a result of our partnership. 467 Girl Scouts attended Girl Day in 2005. WEP plans to continue to partner with the Lone Star Girl Scout Council in advertising Girl Day to the local community.

Tracking. Information such as name, address, grade, school, etc. is collected from each student participant through the online registration process. This information is entered into the University Recruitment Tracking Database so that interaction with the university can be tracked, even up to the application and admission process. This database is also used in inviting students to activities hosted by the College of Engineering or any other department or college at the University of Texas.

Girl Day 2004 was the first year that all of the information needed to create a database record was collected from the participants. In 2005 all registered students will be entered into the database for tracking and extending future invitations, regardless of their participation in Girl Day. This will ensure that all students interested in our programs are notified of upcoming events and that their participation is tracked in the future.

Assessment. Because of the young age of most participants, surveys are still being developed for Girl Day. In 2004 and 2005 participant, parent/guardian/administrator and volunteer surveys were completed. A more appropriate survey for younger children is being developed for Girl Day 2006. Table 4 shows answers to three of the questions asked on the participant post survey. Each of the three questions begins, “After attending today’s event...” The numbers in the table indicate the number of participants who responded for each answer.

Table 4 Girl Day 2004 participant post survey responses.

After attending today’s event...	I am ___ likely to consider engineering as career than before I came.	I am ___ likely to consider UT Austin for college than before I came.	I am ___ likely to consider attending other WEP activities than before I came.
lots more	67	74	87
somewhat more	72	40	57
just as	48	72	41
somewhat less	3	3	7
lots less	6	6	3

From survey responses gathered the program has been improved over the years. More personal feedback typically comes in the form of e-mails from parents or gurdians after the event. Here is an example from a parent’s e-mail received the same evening of Girl Day 2005:

“I wanted to let you know how wonderful Girl Day was for my daughter, age 7. She attended the event with her father and came home eager to show me all the projects she had made. More important was the opportunity to interact with so many young women involved in engineering. [She] is quite enamored with the concept of being a young woman, but unfortunately our culture presents her primarily with images of them as performers or as obsessed with their love life. How wonderful to meet real young women who know all about science! Thanks for exposing her to other options. My words about her future can only make so much impact. Her participation today was a giant step forward.”

Program Sustainability

Overwhelming response and interest from the Austin community has forced Girl Day to expand greatly since 2003. Due to this expansion, the Girl Day budget has had to evolve during the planning of the event. Part of the funding for Girl Day in 2004 and 2005 came from the TEA State Engineering & Science Recruitment (SENSR) Fund. We apply for the grant through the Texas Alliance for Minorities in Engineering (TAME), one of the organizations that receive funding through the TEA SENSR fund. Table 4 lists the funding needs fulfilled through the

SENSR grant. The numbers indicated were from our 2004 proposal; this year's award was a renewal and did not get updated to reflect the large increase in expected participants.

Description	Project Funds
Student Program Coordinators and Assistants: Engineering students serve Coordinators and Assistants and help the WEP Program Coordinator plan and facilitate event	\$ 1,240
Room fees (in the past space has been contracted from our convention center- engineering classrooms work fine and are free) Light snack foods provided to participants and volunteers	\$ 1,775
Supplies and materials for activities and other incidentals (i.e. Balloons for decorations)	\$ 2,000
Communication expenses such as postage, phones, media Printing and duplication expenses T-shirts and informational materials	\$ 3,400
Total Grant Award	\$ 8,415

In addition to this grant, funding for Girl Day was provided by 3M, AMD, Bechtel, Caterpillar, ChevronTexaco, ConocoPhillips and the Semiconductor Executive Council. Sponsors are invited to register volunteers and booths for the event. Sponsor booths are placed close to the check-in tent for good visibility and sponsor volunteers are recognized during the welcome. In 2005 we invested in an additional banner thanking our sponsors that hung from the front of our building during the event.

From 95 participants and 2 corporate sponsors in 2002 to over 750 participants and 7 corporate sponsors plus a grant from the Texas Education Agency (TEA) in 2005, Girl Day has bloomed into one of the largest E-week activities on UT's campus. Introduce a Girl to Engineering Day has gained the attention of the College of Engineering, the local engineering community and even that of our City Council. The Mayor of Austin has proclaimed our event date "Introduce a Girl to Engineering Day in Austin, Texas" the past two years we have hosted the program. Girl Day is by far our largest outreach program and one of the most anticipated events for our student and professional volunteers. The Women in Engineering Program at the University of Texas at Austin plans to continue to improve and grow this event.

Author Contact Information

Katie Kizziar
ktk@mail.utexas.edu