

Teaching Girl Scouts the Science of Style

A Successful Collaboration between the Greater Pittsburgh Area Women Chemists Committee and ACS Student Chapters

BY RACHEL HARRIS

When you think of Girl Scouts, images of pre-teens selling cookies, braiding friendship bracelets, and eating s'mores likely come to mind. But you will probably be as surprised as we were to learn that such activities are just a tiny part of a bigger picture.

When the Greater Pittsburgh Area Women Chemists Committee (GPA-WCC) was looking for an outreach project for our inaugural year, we were thrilled to find that the Girl Scouts of Western Pennsylvania had numerous opportunities for us to get involved in their community. Among other STEM (science, technology, engineering, and mathematics) badges that the Girl Scouts organization offers, girls could earn the new Science of Style badge.

As a group of chemists with extensive knowledge of both science and style, the GPA-WCC created Couture, Cosmetics, and Chemistry, an event that aims to encourage female involvement in the sciences by teaching girls in grades 6–10 the chemistry behind accessories and makeup. From the idea's inception in October to its realization in April, this event was a hugely collaborative effort that involved volunteers at all academic and professional levels.

From the ground up

Bringing together a brand-new Girl Scouts badge and our fledgling organization presented a number of challenges for us. Having no previous experience in planning an outreach event from scratch, we drew ideas from the University of Pittsburgh's highly successful Saturday Science program, an effort by the institution's ACS student group that brings female and minority high school students to



campus for an engaging, hands-on laboratory experience. We wanted to create a similar learning environment that allowed for a lot of different activities to be completed in a relatively short program, and that would also provide our guests with one-on-one face time with other young women in the sciences.



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Partnering with your local Girl Scout Council is a great way to enhance your outreach efforts. Contact volunteer management staff at your local Girl Scout Council. The councils are happy to work with you to develop a program that works toward a badge, or is simply a fun activity for girls.

In addition, the event was designed with the requirements for the Science of Style badge in mind. The badge description offers some flexibility in choice of activities, so we wanted to include hands-on experiments that were relevant to the chemical sciences. There are five major steps involved with completing the badge:

- Testing skin care and makeup
- Examining the science behind fabrics and accessories
- Exploring the science behind hair products and perfume
- Investigating the sociology of style
- Formulating future style.

Each area included several suggested activities girls might do to fulfill the badge requirements. Step 2, "Examining the science behind fabrics and accessories," for example, could involve testing sunglasses for ultraviolet (UV) shielding (which is the activity we chose to offer), as well as learning about outdoor fabrics or grading a gem. To narrow down the possibilities, we held a series of planning meetings to ensure that the Girl Scouts had the best experience possible.

Our first meeting was an informal brainstorming session of experiment ideas for each of the badge requirements. There were a number of experiments that we would have loved to do, but felt that they might take too much time or were geared toward older students (such as having the girls make their own sunscreen, then test it with a UV spectrophotometer). We also wanted to provide a well-rounded explanation of makeup by explaining some drawbacks, such as the harmful chemical additives that are present in certain cosmetics.

For our second meeting, we came up with a schedule of rotating activities for the event and finalized the procedures for each activity. In addition, we developed a supply list and budget.

At our final meeting, the week before the event, several volunteers participated in a dry run of all the experiments, going through the procedures and making sure everything was working as it should. During this time, several adjustments were made to ensure that the activities would run smoothly on the day of the event.

Lip-smacking lip balm

Once we decided on the activities, we wanted to incorporate many different areas of chemistry that relate to makeup and fashion. One of the activities was making homemade lip balm from natural ingredients. For background, we discussed the properties of oils and their importance in moisturization, as well as additives that might be used in commercial cosmetics and the benefits of homemade makeup.

We showed the girls how to make lip balm with four basic ingredients: beeswax, sunflower oil, essential oil, and honey.



girl scouts western pennsylvania

To make the lip balm, we worked with the girls to melt three tablespoons of beeswax and five teaspoons of carrier oil together in a large test tube in a hot water bath (or double boiler), stirring until the ingredients were combined. After that, the girls added one teaspoon of honey and six to seven drops of essential oil. Getting the honey to dissolve into the wax was the trickiest part; we warmed the honey slightly in another test tube before mixing it with the melted wax. The girls then poured the mixture into containers and let it sit 20 minutes before covering or moving.

To examine the science behind accessories, the girls tested the UV absorption of sunglasses. While shining UV light on sunglasses, we explained the basic principles of the electromagnetic spectrum and the harmful effects of UV rays. Using a UV detector behind the sunglasses, the Girl Scouts came to understand how their cool shades also protected their eyes from damage.

To explore hair products, we dyed several samples of hair with different colors (the clippings were graciously donated by a local salon). Then we helped the girls examine them under a microscope at 100 \times after different lengths of time and compare them with the undyed hair sample. We explained the types of chemicals that hair dye contains and what they do to one's hair — but looking at the hair under high magnification really illustrated the breakage and other damage that hair dyes cause.

Stylish Shrinky Dink pendants

To give the girls an opportunity to formulate future style, we focused on making environmentally friendly jewelry from recycled materials. Do-it-yourself Shrinky Dinks can be made from any type of plastic container marked with the recycling label 6 (polystyrene). For background on this activity, we explained the basic concepts behind polymers and plastics, the importance of recycling and sustainability, and how to figure out what kind of plastic you have by looking at the recycling label.

How I Became Involved with the WCC— and How You Can Too

GPA-WCC volunteers for the Science of Style Girl Scout event included members from the ACS student chapters at the University of Pittsburgh and Carlow University, as well as graduate students and professors from Carnegie Mellon University.

I became involved in the GPA-WCC two years ago when the local Pittsburgh WCC chapter had just formed. One of my professors, Michelle Ward, thought a WCC chapter would be a good way for more women to get involved in the ACS and other chemical societies specific to Pittsburgh. I became the inaugural outreach coordinator because I had done a lot of outreach with ACS and wanted to become more involved with organizing events that would encourage girls to go into the sciences.

Want to get involved with the WCC or start your own local chapter? The National WCC maintains a contact list of existing local chapters on their website. If there is not currently a local chapter in your area, you can contact wcc@acs.org for information on starting one! **irc**

To make her pendant, each girl cut a piece of plastic into desired shapes about three times the size that they wanted the final dimensions to be. Then they used a hole punch to make a hole in each Shrinky Dink so they could hang it on a necklace strand. Using colored Sharpie pens, the girls drew their desired designs onto their pendants. Our volunteers used heat guns to shrink the pendants. As the girls watched, the pendants curled and flattened as they shrank on an aluminum foil surface. During this process, the plastic shrank to about one-third of its original size and became five to six times as thick. Once the plastic cooled, the girls added metal jump rings and strung the pendants onto recycled yarn or twine. Girls could also use this same process to make pins or bracelets!

Properties of fabrics

After the lab rotations, there was a 25-minute break for snacks and juice. Afterward, we investigated the sociology of style by conducting a short lecture-style presentation and demo on women's athletic outfits from the 1800s to the present. We explained some big themes from a female historical perspective: the Health Movement of the 1800s, the creation of women's colleges, and Title IX. Of course, these explanations were accompanied by hilarious pictures of old sports gear, from corset-wearing tennis players to bloomer-style gym shorts. For the demo, we gave the Girl Scouts small squares of absorbent cotton fabric and technical wicking fabric. They used drop-per pipets to put drops of water on each fabric sample. We explained that technical fabrics had a similarity to the Shrinky Dinks they had made earlier, in that they also contain synthetic polymers. The girls were so amazed at how the water beaded and slid right off the wicking fabric that they asked for more fabric to take home with them!

Encouraging future scientists

For our final activity, we showed the girls another kind of timeline: the journey from middle school student to chemistry professor. The purpose of this was to allow the Girl Scouts to picture themselves as future scientists by showing real people going through the process. At the front of the room, we had two Girl Scout volunteers (one in middle school and one in high school). The next logical step, of course, is undergraduate study as a chemistry major, so a college student joined them, along with a graduate student, a postdoc, and finally a chemistry professor. Tara Meyer, a chemistry professor volunteer from the University of Pittsburgh, explained to the girls how to progress from one stage to the next. Seeing the progression took the abstract idea of becoming a scientist and turned it into something relatable and concrete. At the conclusion of the demonstration, each Girl Scout received a certificate of completion in addition to a badge.

Working with your local Girl Scout Council

You can become a program partner with your local Girl Scout Council by contacting its volunteer management staff. They are happy to work with you to help you develop a program that works toward a badge, or is simply a fun activity for girls of any age. The advertising for our event was done through our local council's website and print publications. We charged a nominal fee of \$10 per Scout, which covered the cost of the food, badge, and most supplies. If your student chapter is considering a similar program, my advice is start early! We contacted the Girl Scouts in October for an event in mid-April.

Additional considerations

Here are some additional tips we learned along the way that your student chapter may find helpful. It is helpful if some chapter members are current or former Girl Scouts because they can have great ideas from similar projects in their past that can be repurposed as a more science-oriented activity. If these are new activities that no one has experience with (as was the case with us) going through a dry run with your volunteers is essential because they need to understand the potential safety issues and should be familiar with the procedure. Our event was such a success largely because of our amazing volunteer turnout, so smaller chapters with fewer members might find it difficult to host a large number of Girl Scouts — we had at least one volunteer per participant. It's certainly not necessary to have your volunteers outnumber the participants, but it was great to have so much help. Smaller chapters should consider teaming up with nearby chapters or other local science organizations to host something on this scale. **irc**



Rachel Harris graduated from the University of Pittsburgh in 2012 after serving as co-president of its ACS student chapter; she also is former outreach coordinator for the Greater Pittsburgh Area WCC. Currently, she is a first-year graduate student at Northwestern University.