Science Clubs for Girls

A Guide to Starting Your Own

EDC
Education Development Center, Inc.

Science Clubs for Girls: A Guide to Starting Your Own

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Preface

In 1992, the American Association of University Women reported in *How Schools Shortchange Girls* that girls' confidence in mathematics and science drops significantly as they reach adolescence. The report also highlighted the failure of education to engage and promote the study of math and science for girls in the fifth and sixth grades. A subsequent report in 2000 from the U.S. Commission on Civil Rights suggested that women do not enjoy the same educational opportunities as men in the pursuit of scientific and technological careers. This report, *Equal Educational Opportunity and Nondiscrimination for Girls in Advanced Mathematics, Science and Technology Education*, further outlined the disparities that continue to exist between the sexes in standardized tests scores and access to advanced math and science courses.

Today, our school systems still foster a climate where girls bring less confidence to their work in math and science than do boys—an attitude that appears to be reinforced by their teachers. To address this gender inequity, a group of parents at the King Open School in Cambridge, Massachusetts, formed a Gender Issues in Education Committee. Their goals were to counter the cultural exclusion girls face upon entering these disciplines and to set an agenda to combat this exclusion. In 1994, the committee created an after-school Science Clubs for Girls program to introduce girls to the excitement of hands-on, inquiry-based science. Women scientists from the academic and medical fields were recruited as volunteers to lead the Science Clubs. Supported by female Junior Assistants, the young girls participate in a range of activities designed to empower them and give them confidence in the areas of scientific thinking and investigation. Since its inception,

the program has grown to include more than 35 volunteer scientist/mentors, a Junior Assistants program for girls in grades 8–12, and an enrollment of more than 160 girls in kindergarten through grade 7.

A committed group of parents and educators began with an idea, a response to an issue, and a plan. Over the years, as pioneers of the program, we learned a lot about what was important to the young girls and to their scientist/mentors. This brochure was developed to provide others with the essentials of what made Science Clubs for Girls work in our community—how we started it, how we maintain it, and how we continue to support it. Each school and community is different, with distinctive needs, but we know that your creativity and commitment can make this program possible anywhere.

Let's get started!

Beth O'Sullivan

Parent Co-Founder and Board Member

Mary Memmott

Program Director

The Why

The Science Clubs for Girls program was created with the following objectives in mind:

Opening doors

Opening doors and creating new scientific frontiers for girls is the primary objective of the Science Clubs. The Clubs seek to ignite girls' interest and spark their enthusiasm in science and math. Starting in the early grades, the Clubs capture girls' natural curiosity about the world around them and steer this into a potential interest in science and math. The Clubs continue to nurture this interest during the difficult middle-grades years. Once they are comfortable working with scientific concepts in a tangible and practical way, the girls develop the confidence to continue their exploration of math and science.

Continuing support and reinforcement

Reinforcing the girls' pursuit of science requires an evolving system of support and involvement as they go through the educational system. The Science Clubs offer a protected and safe environment for scientific exploration guided by responsive scientist/mentors. The inter-generational mentoring relationship between the women scientists, the Junior Assistants, and the elementary-age girls provides the foundation for a professional network of women that the girls can rely on in the coming years.

Reaching out to vulnerable populations

A critical objective of the Science Clubs is to reach out and include all girls, especially those who have historically been actively discouraged from pursuing interests in science and math. Girls of color and girls from families of low socioeconomic status have especially been vulnerable to academic exclusion, as well as failure in the sciences and math.

Consequently, they have also been less likely to pursue advanced work in these fields, thereby limiting their future choices and opportunities. By providing female scientist/mentors and role models, some of whom are also women of color, the Science Clubs have been successful in showing the girls that women can be successful scientists with full and rewarding lives.

The What

The Science Clubs for Girls consist of numerous small teams (or clubs). Each club is composed of 8 to 12 girls from grades K–7 and is led by one or two female scientist/mentors and one or two Junior Assistants. The Clubs emphasize informal learning experiences in the physical sciences (e.g., chemistry, biology, physics) and in engineering, making connections between the science the girls are doing and real-life applications. Through the Clubs, the girls engage in a wide range of hands-on, project-based activities, such as bridge building, frog dissection, and code breaking. The girls are also encouraged to bridge the gender barrier by learning how to use tools and expanding their manual dexterity skills. On any given day, the girls can be seen hammering and sanding wood as they build something for an engineering project. As they problem-solve, with the guidance of their scientist/mentors, the girls open new avenues of possibility for themselves and build the confidence they need to explore these possibilities. Girls also use journals to write about and draw pictures of their experiences, which encourages reflection and is also a way for them to communicate with their mentors. Journals are also used to facilitate discussion about gender issues. The women scientists are encouraged to write back to the girls about their journal entries, so that the journals become true avenues of communication.

The Where

The Clubs operate in the participants' school, making it accessible to all interested girls. Teachers contribute the use of their classrooms for the Clubs. School-based locations also make it easier to coordinate activity planning and recruitment with classroom teachers.

The When

The Science Clubs are held once a week for an hour, immediately following school dismissal. Two 9- or 10-week sessions are held during the school year.

The Who

Girls in grades K–7 are eligible to join the Clubs. Various recruiting strategies have been successful. In the early years, the program director noticed that many girls—non-Club members—hung around the school after dismissal. She started encouraging these girls to participate in the Clubs, so that they could see for themselves what was going on. This approach, which the program director named "trolling the halls," turned out to be an excellent recruitment strategy, especially when she was able to entice the girls who were leaders among their friends.

As the girls had fun in the Clubs and began attending on a regular basis, word of mouth became the most effective strategy. The girls talked to their friends and siblings and started bringing them along. The Science Clubs for Girls became a "cool" thing to do, and more girls wanted to be involved.

Until word of mouth can build, however, recruitment requires other community efforts:

Appeal to parents

Flyers and registration forms are typically sent home with the girls several weeks before the Clubs begin. Teachers distribute the flyers to every girl and help identify which girls would benefit most from the program. Very often, girls start out attending the Science Clubs because their parents sign them up. They continue, however, because they grow to enjoy it.

Conduct direct recruitment of girls of color and girls from families of low socioeconomic status

The most successful way to recruit these girls is direct, one-on-one connections with parents. Staff members usually call the parents at home and tell them that their daughter is being recruited, by special invitation, to join the free Science Clubs for Girls program.

Enlist the support of teachers and other school personnel

Teachers know the girls who could most benefit from this program and can encourage them to participate. Teachers are also aware of peer groups and can work through the "natural leaders" to bring more girls into the program. Successful recruitment strategies also include bilingual teachers and counselors who can reach out to those families in need of an interpreter's services.

Showcase what the Clubs are doing

Families can be invited to Science Nights or Speaker Programs where girls can experience the excitement of the Clubs and become interested enough to join. In our school, Family Science Night was an annual teacher-sponsored event that would attract dozens of families to try hands-on

science activities in classrooms throughout the building, after a free or pot-luck dinner. Children working alongside their parents would often come to the Science Clubs for Girls station, attracted by a particularly "explosive" or "gross!" experiment, and sign up on the spot.

The Volunteers

The volunteers are the core of the Science Clubs for Girls. The value volunteers bring to the program is priceless. Four different groups of volunteers make the program possible:

- Women scientists and/or college students of science serve as primary teachers, mentors, and role models.
- Young women in middle and high school serve as Junior Assistants; they provide an important link between the young girls and the adult women.
- Dedicated parents assist in recruiting other families, donating snacks, and serving on an advisory board.
- School-based teachers volunteer their classroom space for after-school use by the Clubs and assist in recruitment.

PROFESSIONAL WOMEN SCIENTISTS AND COLLEGE STUDENTS

Rationale

Professional women scientists and college students of science bring their technical expertise, enthusiasm for science, and success as scientists or students of science to the program and serve as positive female role models and mentors for the Junior Assistants and the young girls. The girls can see directly that success in the sciences is possible and that women are important contributors to the world of science. Women of color who volunteer for the Science Clubs are

especially valued, as these women enhance the cultural diversity of the Clubs and reinforce the mentoring process for at-risk girls.

Recruitment

The most effective way to recruit professional women scientists is to call on their own experience with being mentored, as students and/or early on in their careers. All of the volunteer scientist/mentors to date have expressed their understanding of gender discrepancies in the sciences; they often cite the women who played a pivotal role in their own academic and professional development. Participating as mentors and role models in the Science Clubs provides them with an opportunity to give back to others what they themselves received in the past. For the college students, volunteering in the Science Clubs is a form of community service that keeps them connected to community life. The college women also volunteer in order to gain hands-on experience in teaching and to develop their own leadership skills—something they recognize as important to demonstrate on their resumes when applying for jobs or for graduate school.

A number of resources exist that can aid recruitment efforts. For example, in most metropolitan areas, there are multiple organizations that support volunteer involvement in the community. Volunteers can be recruited from local universities and businesses, such as biotechnology firms, pharmaceutical and computer companies, local laboratories, undergraduate institutions, and medical schools. In general, companies are supportive of their employees doing community service. Local chapters of professional organizations, such as the Society of Women and Engineers and the National Society of Black Engineers, are also important sources for volunteers.

Retention

Keeping volunteers positively engaged in the program requires a mutual commitment from the program staff, the volunteer scientists, and the community to the mission of the program and to the critical roles they each play. Two main strategies are vital to this effort:

Create a partnership

The volunteers need to feel that they are a vital link in the success of the program. They should see the mentoring program as a vehicle for change, with clear, measurable results that benefit all partners. Reinforce the female-to-female connection this program provides: These volunteers are giving back to the community of women in science as well as supporting the future generation of female scientists.

Be supportive

The women scientists and college students are highly motivated but often do not have teaching experience. Volunteers often comment that managing the classroom is the most difficult challenge they face, not just in terms of the young girls in the Clubs, but also in terms of their relationship with the Junior Assistants. Volunteers may also not have time to prepare lesson plans and/or gather the needed materials.

To ensure the success of the program, it is important that program staff offer the necessary support. At the beginning of the program, it is crucial to provide an orientation and training for both the volunteers and the Junior Assistants and to offer an opportunity for the groups to get to know one other, set some ground rules for how they will work together, and agree on the roles they will play. Volunteers need to be assisted in seeing how productive the Junior Assistants can be and not

expect them to be there simply to clean up. The training should include tips on how to keep the girls engaged, set limits, build positive expectations, and manage challenging behaviors.

In addition, volunteers should not be expected to create "lesson plans" for each club meeting; program staff need to have available a range of activities, including resources and materials, that volunteers can choose from. Volunteers, in turn, should be encouraged to suggest or bring in experiments or activities that are most relevant to their professions and/or disciplines and to which they can infuse their own passion for science.

JUNIOR ASSISTANTS

Rationale

Junior Assistants provide the link between the scientist/mentors and the young girls. The Junior Assistants often understand the young girls' needs better than the adult volunteers do and consequently can resolve group issues more quickly. They may also be able to translate concepts into simpler language that the young girls can grasp.

The eighth grade is a critical time in a girl's life. Transitioning to high school requires girls to make critical choices about math and science courses—choices that can seriously affect their future plans in school and in life. Peer pressure becomes especially important at this age—and the pressure, usually, is to conform to gender-based expectations. The attention and interest of a female scientist/mentor at this stage in a girl's life is invaluable.

Their deepened involvement in science helps the Junior Assistants build a base of important skills in such areas as research methodology, computer use, and media design, which they can carry into the future. Through the Science Clubs, they receive leadership training and become role

models to the younger girls. The Junior Assistants have acknowledged that having the younger girls look up to them has had a positive impact on their lives.

Recruitment

The Junior Assistants component of the Science Clubs for Girls started out as a volunteer program. However, it soon became apparent that it was difficult to keep the young women volunteering on a consistent basis. The solution was to offer the girls a stipend that they would receive at the end of each 9- to 10-week session. The stipend has been very effective as a recruitment strategy.

Another strategy that has evolved over the years is, simply, participation in the Science Clubs! As the young girls move into the upper grades, they aspire to become Junior Assistants themselves.

Retention

The stipend has been effective in retaining the Junior Assistants. It gives them the sense that this is a real job in which they have specific responsibilities to fulfill, and makes them feel like their time and contributions are valued. But equally important is for the Junior Assistants to believe that they are an integral part of the program. For example, in the Science Clubs, the Junior Assistants have opportunities to build their leadership skills by working collaboratively with the women scientist/mentors, with the program staff, and with one another. They experience what it is like to work as a team to successfully complete projects, such as documenting the program on video. They learn how to become advisory board members. They stay in the program because they come to feel confident that what they have to say matters.

A Peer Leader program also helps keep the Junior Assistants involved through high school by giving them opportunities

for more responsibility and "promotion" to a higher stipend. This does require more funds (in our program, Peer Leaders receive a $250 stipend and take on many extra responsibilities), but it helps keep the girls involved at a time when they're old enough to think about other part-time jobs.

PARENTS

Rationale

There is growing evidence that parents' involvement in after-school programs can significantly influence student achievement regardless of the family's level of education or income. Many parents want to be involved in their children's education but do not know how—or lack the confidence—to do so. The Science Clubs for Girls can help by offering specific ways that parents can be involved. For example:

Joining the Advisory Board

The science content of the program can discourage parents from becoming part of the advisory board, because they believe that they "don't know anything about science." Reassure parents that the Science Clubs are about informal, fun learning and that their input is needed to ensure that the needs of their girls are being met and that the lines of communication between parents, program staff, and volunteers are kept open.

Recruiting other parents

Tell parents that word of mouth is the most effective form of recruitment. While you may want to consider offering training on effective recruitment, let parents know that sharing stories of what their girls are doing in the Science Clubs will get other parents interested. Parents can also assist by distributing flyers and making phone calls.

Doing small tasks

Parents can be of great assistance to the Science Clubs by doing things like donating snacks, helping plan special events, such as Science Nights, and assisting with child care logistics.

Participating at home with their daughters

The Science Clubs offer science ideas that parents can do with their children at home. Parents can reinforce a daughter's budding interest in science by doing some of the experiments with her and by showing that they are interested in learning too.

Work with parents to create a successful partnership with the Science Clubs, guided by these ideals:

- ✓ Parent-community collaboration strengthens school and after-school programs and offers parents added resources.
- ✓ Effective outreach to parents regarding school and after-school programs requires effective communication.

SCHOOL-BASED TEACHERS

Rationale

Open communication and coordination with the classroom teachers at the school site is integral to the success of the Clubs. It is important to create a partnership with these teachers, because they can support the Clubs by encouraging their female students to participate and by supporting their students' interest in science. Teachers lend credibility to the program for both the girls and their parents. Work with teachers to promote the success of the Science Clubs by attending to the following:

- Check in regularly with the appropriate teachers to ensure that experiments done in the Clubs are different from (or build on) experiments done in the classroom—Science Clubs activities are meant to supplement classroom academics, not supplant them.
- Brainstorm with teachers on how to promote gender equity.
- As a goodwill gesture, be sure to clean classrooms after they are used and, when possible, donate science equipment to those teachers' classrooms.

Here are some more tips for successful volunteer relationships:

✓ Build a strong foundation. Create opportunities for the adult volunteers and Junior Assistants to get to know one another and see one another as partners.

✓ Be clear about the mission of the program. Volunteers should be aware of and willing to promote the mission of the program, and fully understand its gender focus.

✓ Check in on an ongoing basis, and make adjustments as needed. Connect with the volunteers and young girls regularly to address any obstacles or challenges they may be facing.

✓ Monitor progress toward the program goals. Find ways to identify changes in the ways the girls think about science in general and in relation to themselves. Evaluate the volunteers' impact on girls' learning and interest in science.

✓ Celebrate success. Recognize volunteers for their time, expertise, and experience.

The Paid Staff

A small paid staff is critical in order to support the adult volunteers and to work closely with the Junior Assistants. Other staff positions may arise depending on how large the program is, but, if possible, at least three part-time staff members should be hired to share the workload:

- A program director who is responsible for the coordination and entire functioning of the program. The program director coordinates resources, including the compilation of activities and sample experiments, recruits the adult volunteers, maintains the budget, and coordinates with the school and teachers.
- A Junior Assistants coordinator who is responsible for recruiting, supervising, and working with the Junior Assistants throughout the program.
- A program assistant who is responsible for parent outreach and community coordination, such as getting speakers for Speaker Programs.

The Funding

While it is possible to run the Science Clubs for Girls as a purely volunteer endeavor, the program is most effective when some funding is available for key components, such as the Junior Assistants.

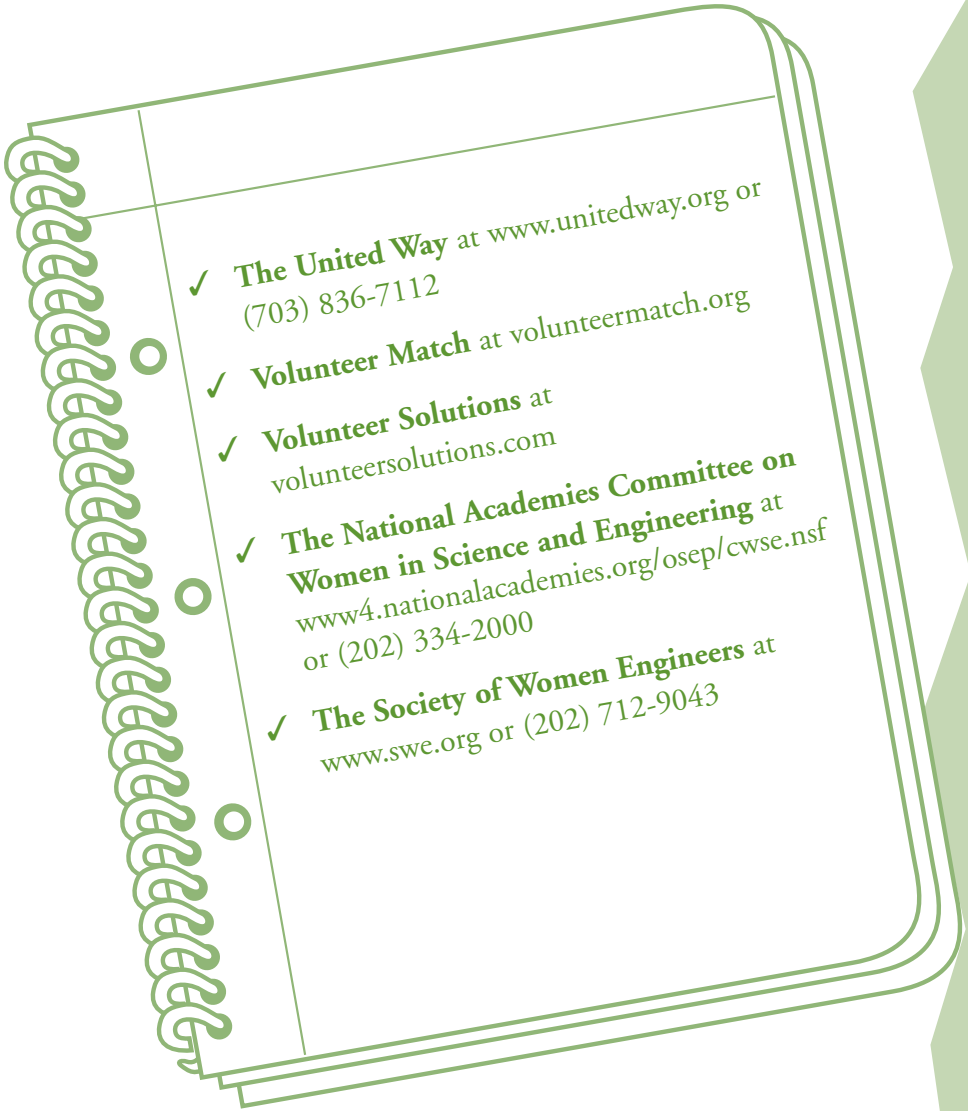
Sustaining the program depends on developing a clear, sensible, and convincing plan for marshalling key resources. Each program should have a self-assessment strategy to help measure progress and identify areas needing extra attention, resources, and technical assistance. Knowing what program

elements you want to emphasize will tell you how to sustain them. Most important:

- Be clear about what program goals really need funding. For example, through experience we found that it was critical to provide the Junior Assistants with a stipend, even though it is one of the larger budget items for the program.
- Identify and develop a variety of financing options, with the idea of keeping the funding stream small and localized. Municipalities often support programs such as this through funding streams from the federal government. Also, be sure to investigate the small grants that are available from local companies.

Volunteer Resources

A number of organizations can help you find volunteers for your program. Here are some suggestions:



- ✓ **The United Way** at www.unitedway.org or (703) 836-7112
- ✓ **Volunteer Match** at volunteermatch.org
- ✓ **Volunteer Solutions** at volunteersolutions.com
- ✓ **The National Academies Committee on Women in Science and Engineering** at www4.nationalacademies.org/osep/cwse.nsf or (202) 334-2000
- ✓ **The Society of Women Engineers** at www.swe.org or (202) 712-9043

A Sample Activity

THE SCIENCE CLUBS FOR GIRLS CHEMICAL COMPANY CHALLENGE

Background/teaching tips

This lesson is used with third graders after a series of "kitchen chemistry" activities to encourage them to build on what they have learned about chemical changes. Teamwork and problem-solving should be emphasized as the girls work on the problem. Encourage volunteers to ask the girls questions instead of providing explanations (e.g., "Why do you think the balloon inflated less this time? What would you change to get more gas next time?").

Real-life connections

A volunteer who is a chemical engineer would be the best person to lead this lesson. She could talk with the girls after the experience about how chemical processes are refined to reduce cost or to improve safety and efficiency.

Text to read to the girls

Congratulations! Today you have been hired to work for the GSCC—the Girls Science Chemical Company. The GSCC has been working on different ways to produce carbon dioxide gas. As part of our research and development effort, each team of two to four girls will be given a 20-ounce bottle, a balloon, and six cents. Your goal is to produce as much carbon dioxide gas as possible, using these tools. How will you produce carbon dioxide gas for just six cents? You can use that six cents to purchase chemical raw materials from your Science Clubs teachers at the following prices:1 tablet Alka-Seltzer, 4 cents; 1 tablespoon vinegar, 2 cents; and 1 tablespoon baking soda, 2 cents. Water is free! You should collect whatever gas you produce by capturing it in the balloon. You can find the amount by measuring the circumference of the balloon at its widest point—your teachers can give you a measuring tape. After one trial, your teachers may "refund" your six cents and let you try again. Think carefully about how to spend your money differently on a second trial. And don't forget to record your results in your journal!

Contact Information

To order copies or learn more about other gender-related projects, contact:

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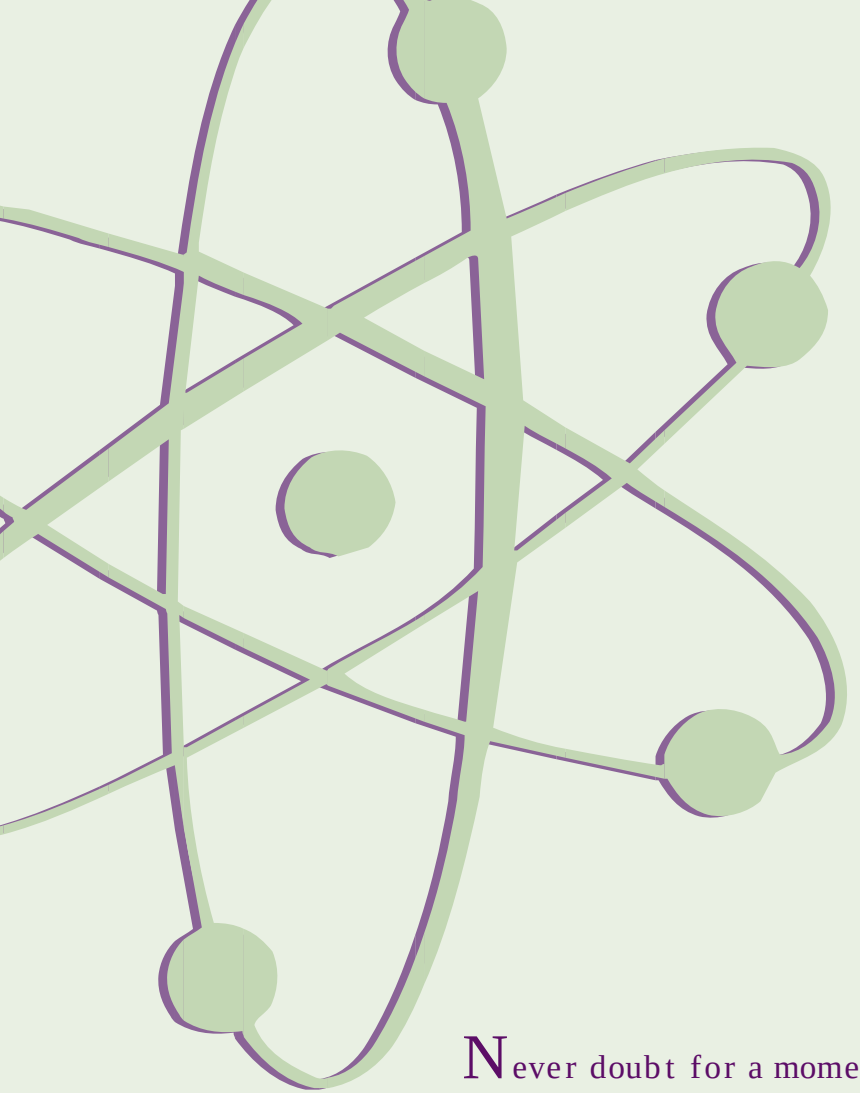

Never doubt for a moment that a small group of thoughtful, committed citizens can change the world. Indeed, it is the only thing that ever has.

—Margaret Mead