

Outreach Activities Introduction

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Educational outreach refers to activities that support formal or classroom-based education, as well as informal education that occurs outside the classroom. Educational outreach provides educational experiences for young people in classrooms, after-school programs, community-based organizations, museums, summer camps, and a host of other formal and informal contexts as well as supporting the professional development of teachers who work with students.

Working with education students and community youth-serving organizations, QESST seeks to implement outreach events that create pathways for learning the lead participants toward photovoltaic engineering futures. Our efforts should help participants

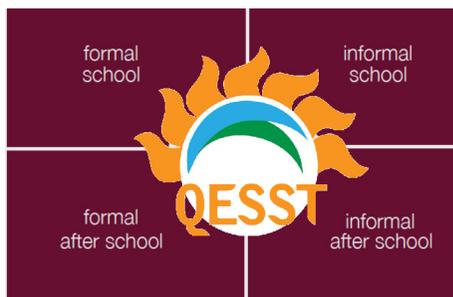
- Construct knowledge,
- Identify with the domain, and
- Navigate pathways toward photovoltaic and engineering goals

QESST outreach volunteers participate in this work in a myriad of ways, including

- Designing and sharing photovoltaic engineering learning materials and curriculum (the outreach activities and classroom lessons in this book are a few of the many examples!)
- Creating learning environments for learners to encounter online, during outreach events, and in the everyday world

- Teaching the community about core disciplinary ideas and cross-cutting concepts, and mentoring learners into engineering practices

Here are some Tips and Good Practices shared by QESST Education leaders and outreach leaders.



Tips on Preparing for Outreach Events

Tiffany Rowland, QESST Outreach Coordinator

- **Email the host prior to coming:** Do you have a table? Ask about space, and number of participants.
- **Know your audience:** What are the demographics and age levels of students? What is their prior knowledge and experience related to the activities you plan to present?
- **Have a plan:** What lesson/activity are you teaching? Do you understand the anticipated learning outcomes?
- **Be prepared:** Do you have the necessary materials to complete your lesson? Have you personally “walked through” all the steps necessary to teach and participate in the activity?
- **Expect the unexpected!** Just go with the flow, and remember you are making a difference!
- **HAVE FUN!**

Tips for Motivating and Engaging Outreach Participants

Stefi Weisburd, University of New Mexico Outreach Coordinator

- If you do a presentation, pick big vivid, captivating, unusual or funny images and use few words on slides. Ask as many questions throughout the presentation as you can. Act silly sometimes.
- Talk about the social consequences of engineering. Students listen very attentively, for instance, when I describe how solar-powered LED lamps given to the women in a town in Mali resulted in a night school and health clinic for the town.
- To engage girls in engineering, emphasize that engineering needs people who are interested in a lot of different things; you don't have to be coding every free moment of your life to belong in engineering. I like to show videos from Engineer Your Life that amplify that message.
- Bring it home – there are 18,000 people in New Mexico who do not have access to an electric grid. Some live just a few miles from Albuquerque. A company in Albuquerque makes most of the solar cells for satellites. Also, if it's possible, have college or high school students who grew up in the area conduct the outreach.



3-minute Strategies for Active Learning

- Research suggests that learning is more likely when participants are **interactive**, explaining ideas and elaborating on their thinking with peers (Chi & Wiley, 2014).
- **Think-Pair-Share:** Pose a question to which individuals think of own answer; two individuals then pair up to discuss their individual answers; pairs then share with a group.
- **Peer Instruction:** Pose a multiple-choice question to all participants who think a minute by themselves and then respond with an answer shown by 1-5 fingers; if answers split give 2-minute small-group discussion.
- **One Explain-One question:** Give participant-pairs a problem; one partner be the explainer and the other be the questioner who asks for elaboration and further explanation; then reverse.
- **White boarding:** Small groups are given a few different short problems; they use white boards to solve problems; they then report out their solution to the whole group.

What other smart teaching moves do you use in outreach?

Collected Wisdom of QESST Scholars

Outreach leaders at QESST ASU are implementing “event debriefings” to inform the continual improvement of their outreach efforts. At the immediate close of an event, the outreach team gathers for 10 to 15 minutes to discuss: What went well and what can we improve?

Here are some insights shared at event debriefings.

- The entire outreach team should meet at least 30 minutes before an outreach activity to “talk through and walk through” the entire sequence of their planned activities.

- Avoid overloading participants with too much information at once. Instead, engage participants in iterative cycles of learning: (a) get a little information, (b) do something, (c) explain what you did and get feedback, (d) do something again in a different way, coupled with expert explanation.
- As a general rule, young learners can only actively listen for 10 to 20 minutes. Use “just in time” learning: tell a little, do a little, tell a little, do a little...
- Model good engagement and attention – no texting while others are teaching!
- Explicitly communicate the VALUE of an activity (why is it important) and the EXPECTATION that participants can be successful.



How much time do you have?

Learning takes place over time and there is little we can do to rush the process of coming to awareness, gaining knowledge, applying knowledge, and identifying with and committing one’s self to a discipline. So, we must be careful not to overload learners with information. Limit new vocabulary – people have difficulty making sense of information with too many unfamiliar words.

7 Reasons Why You Should do Outreach

Silvana Ayala, University of Arizona

Outreach is awesome for bringing engineering activities to students that would otherwise not have access to it. The goal is to engage students in the coolness of science, to break down their fear of math, to increase representation of women and minorities in all of STEM fields, and in general to form better, more prepared students. Moreover, teaching others has long been shown through educational research to be one of the best ways to learn. Thus, when QESST Scholars participate in outreach, they are supporting not only the larger community, but also their own learning trajectories. However, some college and graduate students are discouraged from doing any activities other than lab research, and they miss out on (or don’t see) the value of outreach for themselves. So, here are 7 reasons why you should participate in Outreach, for your own benefit:

- 1) **Publicizes your research.** Maybe 4th graders will not understand the intricacies of the research that you’ve devoted years into, but planting seeds of ideas or showing people that things are happening in your area is very important to create momentum. Reaching a wider audience gives your area more credibility and impact.
- 2) **Makes funding agencies happy.** A lot of grant proposals include sections asking

how your research will impact society, and doing outreach is a direct way of giving back and expanding knowledge.

- 3) **Brings you back to basics.** As you advance on your career, you learn the basics of your area, then you learn the sometimes asphyxiating math, theories, and state-of-the-art research, and the knowledge tower grows taller, and taller, and taller. It is easy to forget your

foundations if you don't dust them off now and then. Even if it's scary to find out you have "expert blind spots", what better scenario than to find out during outreach where you can turn it into a "curiosity" opportunity for you and the students, and get to feel that astonishment at the wonders of the world again?

- 4) **Teaches you how to teach.** Being able to explain your research with different levels of depth to different audiences ensures that you know your topic from the foundations, the big picture, to the little details.
- 5) **Builds relationships others won't build.** Participating in outreach connects you with peers, teachers, parents, adults and kids with unique stories and points of view on the world. You might find mentors, collaboration opportunities, or just many more reasons to remember why what you do is important.
- 6) **It's not only "out-reach" but "in-reach".** Doing outreach generates dialogue with other areas, and in a multi-disciplinary world this only leads to progress. If you are not establishing dialogue with people of other fields, you are missing critical opportunities for breaking new ground!
- 7) **And last but not least: it is an investment in the future of STEM.** Some of those kids, teenagers or adults who you are educating will hold a vote and hold a say in the future of funding for education, and will become leaders of schools, universities, companies and even government. Showing them that STEM opportunities are all around us, and that learning matters, is putting coins into a piggy bank that will eventually support or fund future generations of graduate students. Okay, this one is not totally for your benefit but, you see what we mean? Outreach is an important part in the life-cycle of STEM, so make sure to save some space in your agenda to join one of the many activities going on in QESST, and in your University, for outreach.

7 Reasons



You should do OUTREACH

