

## ENGINEER GUIDE

*“Engineers are changing the world all the time. They dream up creative, practical solutions and work with other smart, creative people to invent, design, and make things that matter.”*

As a classroom visitor, you have the opportunity to inspire the next generation of engineers! Your goal is to encourage young people to consider careers in science, mathematics, engineering, and technology—STEM careers. You will do that by sharing who you are, what you do, and why what you do makes a difference for yourself and the world.

Most kids don't really know what an engineer does—or they might know about one kind of engineering, but not all the others. You are most likely aware of the stereotype that engineers are nerds who sit at desks all day. You have the opportunity to break that stereotype and to open the world of engineering options to students.

When you share your experiences and your knowledge with students, you will engage them as you:

- Share the big picture. Engineers find solutions that make our lives better.
- Use words that inspire. Engineers design sports stadiums, roller coasters, and racecars!
- Talk about the rewards. Engineering is creative, fulfilling, fun! And it pays well.

Remember: One adult can change a child's future. Role models can have a significant, lasting impact.

The *Engineers in the Classroom* website has been developed to provide you with tools and resources to help you in this very important role. This guide was created to give you a framework for planning and implementing your visit. It includes guidelines, suggestions, ideas, practical tips, and other resources to help engineers and non-engineers participate more fully with youth groups, community organizations, classroom teachers, and students in kindergarten through high school (K-12). **We encourage you to download and review this guide at least two weeks prior to your classroom visit**, if possible, in order to have time to work with the educator and prepare for your visit.

As a classroom visitor, you will share your understanding and passion for engineering and science, as well as your stories about using engineering and other STEM careers to understand and make a difference in the world and to help shape the future.

This guide includes:

1. HOW TO USE THE ENGINEERS IN THE CLASSROOM RESOURCES
2. PREPARING FOR YOUR VISIT
3. ELEMENTS OF A WINNING CLASSROOM VISIT
4. AFTER YOUR VISIT
5. CLASSROOM MANAGEMENT TIPS

## How to Use the *Engineers in the Classroom* Resources

- Activities:
  - Several step-by-step full-length activities have been created for you to use during your classroom visit. They are organized by grade ranges, with descriptions of the primary content goal for ease of use. The activities are provided as PDFs, with introductory information, details for conducting the activity, materials lists, background information, links for further information, and classroom management tips. Each of the activity PDFs also includes some of the information for you to provide to the host classroom educators to help them prepare for and follow up after your visit.
  - Short activities: A collection of other activity ideas is provided for grades 3-5 and 6-8.
- Introductory Video:

A short video (3.5 minutes in length) is provided to use at the beginning of your classroom visit. The introduction video is a high-energy, fast-paced “sizzle” reel that gives students a fun look at what engineers do. The video is suggested for middle school and high school audiences, but is also appropriate for upper elementary.
- Video Clips:

Several short video clips are included in the media collection. These videos are included to be used by educators as they prepare their students for a classroom visit.
- Letterhead and Postcard Templates:

We have provided both color and black-and-white versions of letterhead and a color version of a postcard (printed on front and back). You may wish to use these in your communication with educators or others as appropriate in your work as a classroom visitor.
- PowerPoint Presentation: Introduction

A short introductory PowerPoint presentation has been provided for your use in middle school and high school classrooms. We suggest that you use this presentation immediately after showing the introductory video. The presentation gives a very quick overview of what engineers do—specifically what different types of engineers do. It is designed to move through the slides quickly.

We also encourage classroom visitors to personalize the PowerPoint presentation by adding some slides—photos of yourself at work, for example, or photos of what you do in your job. You can then use these slides as you move into introducing yourself and what you do. Feel free to use the PowerPoint as you wish and make it your own! In case you haven't added or edited PowerPoint slides, here's a quick primer.

- To add text to slides, to either the blue background or white background slides near the end of the deck, click on the center box that says “Content here.” Highlight the words “Content here” and enter your own text. The space will expand to hold all the text you enter and you can modify the text—to make bold, italicize, etc.—just as you would in the Word document.
- To add images or photos, click on that same center box and then on Insert in the PowerPoint menu bar. Select the photo or image from the dropdown menu.
- Save your new presentation.

## Preparing for Your Visit

- Familiarize yourself with the resources provided on the *Engineers in the Classroom* (EITC) website—prepared activities, introductory video, PowerPoint presentations (generic and/or activity-specific), other resources.
- Contact the educator to talk about your visit. Make sure the educator has your contact information in case his or her plans change. Find out the best method of contacting the teacher in case your plans change.
- Determine which activity you'll be doing with the class.
- Send the educator links to the appropriate (activity-specific) resources and information on the Educator version of the [EITC website](http://www.classroomengineers.org) ( [www.classroomengineers.org](http://www.classroomengineers.org)).
- Contact the educator at least one more time before your visit. Give the educator as much information as possible about your plans for your visit. Share the outline of the hands-on activity at the link above.

### Find out:

- Grade level of the class you'll be visiting
- Number of students in the class
- Classroom setup/layout
- Technology that is available to you for your visit—and what you might need to bring along
- Materials available from the teacher/visit location—this will be specific to the activity you are doing with the class
- Prior knowledge students have of the activity topic(s)
- Logistics of your visit: date, time, location, room number
- Classroom and school rules or procedures you need to be aware of as a visitor

### Before your visit:

- Read this guide and think about how you will conduct your classroom visit—introductions, information about yourself and your career, warm-ups (if any), sample visit agenda, and available resources.
- Carefully review the activity you are going to do with the class.
- Prepare an outline of your presentation and hands-on activity. The detail of this outline will vary depending on your experience conducting classroom visits, but even a brief outline will help you prepare and stay on track during your visit.
- Practice your presentation. Focus on personalizing your “story,” finding ways to add visual interest, and integrating opportunities for student participation.
- Prepare any handouts you plan to leave with the class or teacher/educator.
- Make sure you have all of the materials you will need for the activity you have chosen. Be sure you have the proper quantity of materials based on the number of students in the classroom you are visiting.

### Plan with the educator:

- Involve the teacher/educator as much as possible. Ask the teacher/educator to do the pre-visit activities described in the activity guide, including showing the video clip (as appropriate) to the class before your visit. You may find the class has had lessons on your topic and is quite familiar with the topics you will be addressing in your activity. Or you may find out the class is unfamiliar with the topic. Your visit and the students' engagement with the activity, including what they learn from it, will be enhanced by the preparation they receive prior to your visit.
- As part of your meeting with the teacher/educator, discuss the standards your visit will meet. Have the goals of your visit in mind when you plan.

## Elements of a Winning Classroom Visit:

### Your Agenda:

1. Intro video: Present a fun, engaging look at what it means to be an engineer.
2. PowerPoint (as appropriate): Gives a quick overview of different types of engineers.
3. Personal Story: Makes a connection between you and the students.
4. Hands-on Activity: Gets the students actively involved and engaged.
5. Wrap-up: Gives a chance for questions and reflections.

### Tips for your message:

- Take your cue from the introductory video! What is engaging, exciting, passionate, and cool about the view of engineering you see in the video? Build on that in your presentation.
- Don't focus on the math and science first. They are important, but they can turn off kids.
- Relate your presentation and the hands-on activity you do to real-life situations. Why is this important to know? How does this make a difference—in the real world?
- Keep science/engineering terminology to a minimum. Try to avoid jargon specific to your field, unless you are using it as an example and plan to explain what it means.

### Keep in mind:

- Keep the age of the students in mind. If you are unfamiliar with students of the age you'll be working with, seek advice from someone more experienced with the age group. You might consider asking the teacher/educator for specific things to keep in mind regarding his or her class.
- Start with a personal story! Students will relate to your personal stories—stories of how you became interested in your career and stories about events, discoveries, or adventures that have been especially meaningful to you. What were those “aha” moments? What has happened that has caused you to see the difference you are making through your work? What is really “cool” about what you do?
- Don't lecture to students. You'll keep their interest and encourage their questions if you involve them as much as possible, ask them questions, and avoid giving a lot of science facts or background. You need to tell students why something happened in the hands-on activity, but you don't need to go into a lot of detail. Ask them what they think happened.
- Keep it informal. Walk around as you tell your story and work with students in small groups as appropriate to the hands-on activity.
- Encourage questions. Don't ask if there are any questions. Be specific; use prompts.
- Relax. Have fun!

## After Your Visit

- Send a thank-you note to the educator—and the class.
- Follow up with the educator with any information or resources he or she has requested—or that you think would supplement the learning you facilitated during your visit. Let the educator know you are available for a follow-up visit to the classroom, if you are willing and able to do so.
- Share your experience with your colleagues—share tips with other classroom visitors and encourage new visitor volunteers.
- Write down your reflections on your visit experience. Record things that went well and things you will change on your next classroom visit.

## Classroom Management Tips

### Elementary Classrooms

1. Use a normal, natural voice. The students will mirror your voice level, so keep it neutral and soft. If you want students to talk at a normal, pleasant volume, you must do the same. You also want to differentiate your tone. If you are asking students to put away their notebooks and get into their groups, be sure to use a declarative, matter-of-fact tone. If you are leading a classroom discussion, use an inviting, conversational tone.
2. Use hand signals and other non-verbal communication. Holding one hand in the air and making eye contact with students is a great way to quiet the class and get their attention on you. Have the students raise their hand along with you until all hands are up. Then lower yours and talk.

Flicking the lights on and off is a helpful cue to let the students know a transition is coming up. At that point let them know they have 3-5 minutes to finish up their current task.

Another helpful tool to gather attention is to clap or sing a certain rhythm for the students to repeat.

3. Address attention needs quickly and wisely. Always take a positive approach while addressing an interruption to your instruction. Say, "It looks like you have a question," or, "Is there something that I might clarify for you?"  
When students have conflicts with each other, use neutral language as you guide them to a solution.
4. Use reflective questioning. Paraphrase and restate comments. By repeating or reflecting the student's statement in the form of a question, you will help them gain valuable insight and they will know you are listening to them.
5. Emphasize safety. The most important component of any environment is safety. Let the students know it is your job to keep them safe and it is their job to help keep it that way.

### Secondary Classrooms/Students

1. Consult the educator prior to the class period so your classroom management approach aligns with the management plan, routines, and procedures already in place. When relevant, discuss learning needs or behavioral challenges of specific students.
2. Establishing a culture of mutual respect and trust is key. At the beginning of the class period, tell students about yourself and why you are there. Discuss a clear and concise set of expectations that are phrased positively.
3. Complete any necessary setup prior to the start of the class period. Be well-prepared and organized so you can keep things moving. "Down time" can lead to a loss of student attention and respect for your authority.
4. Help yourself stay on track with the activity and its objectives by using a timing device and notecard to guide you. The notecard could include a brief outline of the activity, key concepts/vocabulary, and questions to facilitate discussion.
5. In preparing for the activity, think about why the content is interesting and important. Then you can communicate that to the students, thereby creating more buy-in from them and increasing their willingness to learn and engage in the activity.
6. Moving around the classroom, varying the tone and volume of your voice, enlisting volunteers to assist you, using non-verbal communication, and calling on students to answer questions and share their ideas can help keep them engaged and focused. Avoid lecturing and talking at students without any interaction, especially for more than a few minutes at a time.
7. Seek educator assistance in grouping students. Groups could be pre-determined based on specific criteria, such as student learning and communication styles, ability to self-direct, and collaboration skills. During group work be sure to circulate around the room, engage students with questions, and use proximity control to keep students on track.
8. Be yourself and have fun! If you are enjoying yourself and engaging with the students and the activity, they will do the same.