Teaching Tips

- Kids very aware of their teacher's methods. Be thoughtful about your methods and how to sequence everything. You need to allow room for kids to experiences the successes and (temporary) failures of the engineering process but also provide enough scaffolding and prior experience, skills, and knowledge so they can be successful.
- If you can afford them, the resource kits make a big difference in open-ended engineering challenges.
- Be careful not to let one experience color kid's perceptions of engineering too much. In 2011, sixth grade students had no previous robotics experience and I really built up the unit as being what real engineers do. As happens sometimes with new units, I made it too hard and we also ran out of time. I ended up frustrating some of the students. So when I went ahead with a questionnaire to gauge students' interest in engineering, I ended up disappointed with the results. However, with a full preschool to grade 6 program now initiated, students will have an engineering experience every year and no single experience will have an overwhelming impact.
- It took lots of trial and error to determine a good sequence of units for each grade. This guide will give you a good basic on which to base your own robotics program.
- Programming can be difficult to teach to young children. I use a variety of programs to teach programming in different ways. I have found that it does need to be taught explicitly. Most students won't just pick it up from copying the WeDo Activity Guide. I use large laminated cards of the programming icons to have students physically place them in a good order to perform tasks and explicitly teach what each one does. Without this instruction, young students tend to drag up icon after icon, many times the same one in a row, without really understanding what they do. WeDo provides a good programming basis for which to take off with NXT-G.
- I found the same thing with the mechanical knowledge of WeDo. I spend a lot of time in grades one and two discussing gears, levers, pulleys, cam gears, motors, and sensors.
- It is also good, especially with all the WeDo projects, to have students always think about the transfer or energy from electrical energy from the computer to motor and how the mechanical energy may also be transmitted with simple machines such as gears, belts and pulleys, and levers.
- The use of teams of two for robotics has been critical in our experience. While an occasional single is fine if you have an odd number of students and will a good opportunity to shine for an advanced student, groups of three do not work well.

- Don't solve problems for them. Provide support, give hints, teach the basics, but try not to solve the problem for them. This can be hard for elementary teachers but they really need to solve things themselves. When I find myself operating the laptop and programming and/or find the robot in my hands, I know I am doing too much. I also tell the kids the same thing when I see them doing the work for other students, however good the intention.
- Isolate problems when you are troubleshooting both mechanical and programming issues. Also, have other kids help with troubleshooting. Teach troubleshooting principles even when you are troubleshooting for them.
- Something I tell students when they blame the computer for their own programming errors, "Computer are dumb, they do what you tell them to do, not what you want them to do."
- Different classes can look quite different and can also be very different at different times of the year especially in the lower elementary grades. Adjust accordingly.
- When using BeeBots, always have students start the same way. I have them start with the lip of the BeeBot at the number line or at the masking tape.
- You don't have to do everything all at once. Robotics is rich in cooperative learning, math, science, technology, engineering, and programming. Typical lessons have programming, science, a secondary subject such as math, science, or English language arts, and cooperative. Especially in the early grades, don't feel that you have to do it all. You may have give the program sometimes or let go of the science piece in another case to focus your goals.