



Science Experiment: Nano Where to Go? Project: Design, Building (Woodworking, Robotics, Arts & Crafts, etc.)

Introduction:

Giving youth the capacity to understand how to solve a problem and solution with what they have made available is a great skill that we can use in many different projects in 4-H. Through this activity youth will be given a list of materials, a set of parameters and a nanobot that they need to get through the obstacle course. This will give youth an opportunity to learn about life skills such as teamwork, problem solving, and critical thinking skills.

Engineering Design Process:

1. *Generate Ideas: Brainstorm possible solutions that might address those constraints.*
2. *Evaluate and compare possible solutions: Decide which of the possible solutions are the most logical or make the most sense.*
3. *Build a prototype: A prototype is a first attempt at a design and is built to test your hypothesis.*
4. *Test the Prototype: Conduct a series of experiments to see if your prototype works.*
5. *Tell your story: Record your data to share what you learn with others.*
6. *Refine your design: Explore how you can use what you've learned to improve or change your design.*

Overall Goal:

Each team has the goal to get the nanobot from the start point through the obstacle course while making sure to achieve each of the rules. Once the nanobot has started, no member of the team is allowed to touch the nanobot during the challenge course.

Challenge Rules:

1. The nanobot must start at the beginning of the course
2. The nanobot must go over an obstacle
3. The nanobot must make a 90 degree right turn
4. The nanobot must go completely around an obstacle
5. The nanobot must make a noise that isn't its normal noise (must be different than the normal buzzing)
6. Teams can only use the materials that are given to them in their packet
7. You can only use the nanobot to run through your obstacle when it is time, the nanobot will not be able to present for you to test with
8. Make sure to write down detailed instructions on how to do the challenge for someone else.

Facilitator Suggestions:

Once the teams are assembled give each team 15-20 minutes (or more depending on pace) to design their course. Then give each team post-it notes and have them switch designs. Have them then test the design using the written instructions that are left. Have them use the post-it notes to write suggestions for improvement and what each of the teams can do. As they run the test, also have them write down what works, what didn't work, and what rules they were able complete and which they were not. Once they are all finished, have teams go back to their original design and have them read through the notes (give each team time to ask the teams that evaluated questions if they have any). Then give each team 5 minutes with their nanobot to test and think about redesign. Once they are finished with this 5 minutes, let each team redesign the obstacle course. If time allows, have teams switch to test the redesigned designs, if time is tight have them test their own designs.

Process Questions:

1. When you were designing your course, what was the most difficult part?
2. How did you work as a team to complete this task?
3. Which rule was the most difficult and why?

Generalize & Apply Questions:

1. When have you had to design something in 4-H in which you had a similar experience or challenges to work through? How did you do this?
2. Why is working in teams important not just to this challenge, but in other parts of our lives?
3. When in your life have you had to pay attention to rules, even when some are harder to complete than others? Why do we pay attention to rules?