



# Science Experiment: Engineering Security Project: Animal Science

## **Introduction:**

Many times in the animal project, we have question arise about the safety and security of our animals from things we can see and things we cannot. As we work with animals, we must always think about ways to “engineer” safe practices that keep not only our animals safe, but us safe as well. Also the opportunity to work with others (leaders, parents, siblings, other 4-H’ers) is also critical in success. You are now charged with the same task, except your animal is a nanobot. Through this activity you will be given a list of materials, a set of parameters, and an animal (nanobot) that you need to get through each of the biosecurity protocols. This will give you an opportunity to learn about life skills such as teamwork, problem solving, and critical thinking skills, while seeing what it takes to keep your animal safe on the farm or at the fair.

## **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 through the all three “security protocols”. Once the nanobot has started, no member of the team is allowed to touch the nanobot during the movement. You will work together with your team members using the materials that you have to create an opportunity to get your dog (nanobot) through the course.

## **Tasks to Complete:**

You must complete all three, fastest time wins

1. Clean the stall. It is very important to keep stalls clean. Use your “animal robot” to clean the stall by making an entire sweep of the stall
2. Wash your boots. One way disease is spread is through dirty boots. Clean your animal robots boots by taking the robot through the PVC pipe wash rack.
3. Gates and doors are very important for animal and people safety. Navigate the narrow door that just fits your animal robot.

## **Challenge Rules:**

1. The nanobot must start at the beginning of the course
2. The nanobot must complete all security protocols.
3. When designing the course, all obstacle completion must be continuous. No starting and stopping and readjusting your nanobot.
4. Teams can only use the materials that are given to them in their packet

## **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?



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