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Grade range: 6<sup>th</sup> - 9<sup>th</sup> grade  
Subject: Science  
Topic: Life Science  
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**Objective:** Test and observe how a small animal responds to specific environmental factors.

**Essential Question 1:** Do small animals have specific bedding preferences?

**Essential Question 2:** Do environmental stimuli affect how a small animal performs a task?

**Concepts:** environment, stimuli, independent variable, dependent variable, control, constant

**Introduction:** In this two-part experiment, students will test how guinea pigs respond to various changes in their environment. First, they will observe whether guinea pigs have specific preferences for their bedding. Second, students will detect if any sight, sound, touch, or smell affect a guinea pig's performance

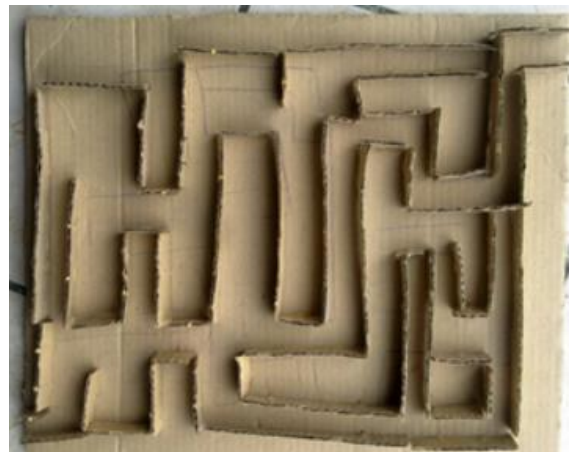
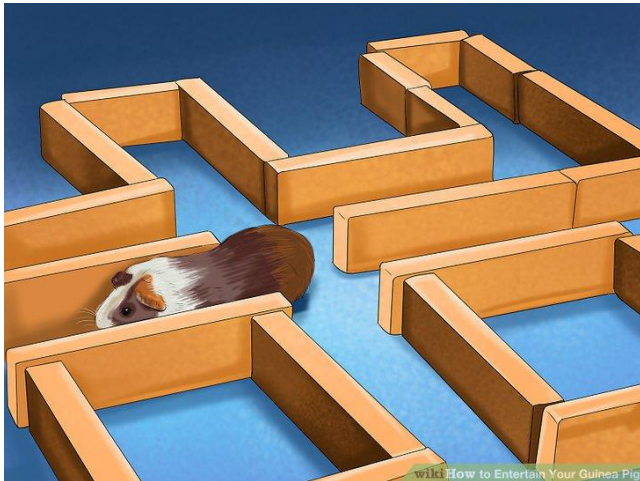


## Next Generation Science Standards (Grades 6-9)

*MS-LS4-6 Biological Evolution: Unity and Diversity.* Use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time.

*MS-ETS1-2 Engineering Design.* Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.

*MS-ETS1-4 Engineering Design.* Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.



### Introduction to Experiment #1.

Guinea pigs are able to live on various types of bedding. Common bedding materials are grass, recycled paper, and wood shavings. Is there a specific type of bedding that guinea pigs prefer more?

- a. Reliability. The teacher will ask students about reliability in testing. Can we rely on results of a one-time experiment? The answer is no, because the result may be due to chance. That is why students should have at least three trials of the same experiment, in order to ensure reliability of results.
- b. Control. The teacher will ask students how they can know if the outcome of the experiment is the result of the intervention or simply a matter of randomness? At this point, students should answer that we need two groups to compare the results. One will be the experimental group (one guinea pig, in this case-), and the other will be the control group (the second guinea pig, in this case).

- c. Constants. The teacher will ask the students how they can ensure that the effect of the independent variable is the only aspect being measured. Students should be able to respond that we can ensure reliability of results by keeping all other variables constant.

Students will set up the experiment in their lab notebook, by filling in the following table. Possible answers are provided in red.

What are the constants in this experiment? **Type of bedding**

What is the dependent variable in all cases? **Time spent on each type of bedding**

Students will measure the guinea pig’s preference for bedding by filling three different cages with each type of bedding. The guinea pigs will then be placed in front of the three cages. Whatever type of cage they choose will signal the preference for the bedding. It is suggested that students do multiple trials with at least two guinea pigs, so that the results are more reliable.

	<b>Independent variable</b>	<b>Experimental guinea pig 1</b>	<b>Experimental guinea pig 2</b>
Trial 1	Type of bedding		
Trial 2	Type of bedding		
Trial 3	Type of bedding		
Trial 4	Type of bedding		
Trial 5	Type of bedding		
Trial 6	Type of bedding		

### **Introduction to Experiment #2.**

Guinea pigs may respond different to various types of stimuli in their environment. In this experiment, we will observe whether sight, sound, touch or smell affect a guinea pig’s performance of a task. We will use a stopwatch to measure how fast a guinea pig is able to complete a maze.

For each part of the experiment, we will introduce a different stimulus. For sight, the guinea pig will have to navigate the maze with obstacles; for sight, the guinea pig will be guided through the

maze with sound whenever it makes a correct choice in the maze; for touch, the guinea pig will be aided by small adhesive pads that will guide it to the correct way out, and for smell, the guinea pig will be able to smell a strong odor (like eucalyptus) along the correct path out.

For this activity, the teacher can either purchase an inexpensive maze, or students can build one out of cardboard.

What are the constants in this experiment? **Same time of the day, same food, same bedding, same location**

What is the dependent variable in all cases? **Time needed to complete maze**

	<b>Independent variable</b>	<b>Experimental guinea pig (time needed)</b>	<b>Control guinea pig (time needed)</b>
Trial 1	Sight		
Trial 2	Sight		
Trial 3	Sight		
Trial 1	Sound		
Trial 2	Sound		
Trial 3	Sound		
Trial 1	Touch		
Trial 2	Touch		
Trial 3	Touch		
Trial 1	Smell		
Trial 2	Smell		
Trial 3	Smell		

### **Analyzing and Reporting Data.**

For both experiments, students will construct a scatterplot of the data points. They will then use the graphs to conclude whether there is a correlation between bedding type and bedding preference on one hand, and external stimuli and task performance on the other hand.