



pets in the  
classroom

## Guinea Pig Design Challenge

<b>Adapted from</b>	<a href="https://petsintheclassroom.org/wp-content/uploads/2019/08/Stephanie-Montefinese-Guinea-Pig-6th-9th-Grade-Small-Animal.pdf">https://petsintheclassroom.org/wp-content/uploads/2019/08/Stephanie-Montefinese-Guinea-Pig-6th-9th-Grade-Small-Animal.pdf</a>
<b>Pet:</b> Designed for guinea pigs, but can be easily used with other pets	<b>Grade</b> Designed for PK - 2, but can be scaled to higher grades easily
<b>Brief Overview:</b> The class guinea pig needs more accessories for inside its cage, and to play outside of the cage. The students' challenge is to develop a pet friendly object for the guinea pig. Easily adapted to other grade and pets	<b>Lesson Breakdown</b> <b>Lesson 1:</b> Ask: Research <b>Lesson 2:</b> Imagine and Plan : Design Ideas and Identify needed Materials <b>Lesson 3:</b> Create <b>Lesson 4:</b> Test <b>Lesson 5:</b> Improve: Redesign and Retest
<b>Essential Question</b> How can we design and create a safe and stimulating environment for our guinea pig, both inside and outside its cage, using materials that are readily available and pet-friendly?	
<b>Subjects</b> <input checked="" type="checkbox"/> Science <input checked="" type="checkbox"/> ELA <input checked="" type="checkbox"/> Math <input checked="" type="checkbox"/> STEM <input type="checkbox"/> Art <input type="checkbox"/> Other	<b>Stem Connections</b> Science: Needs of pets Technology: 3D Modeling software (optional) Engineering: Design of a pet toy Math: Data collection

## Performance Expectations/ Standards

### NGSS

**K-2-ETS1-1:** Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.

**K-2-ETS1-2:** Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

**K-2-ETS1-3:** Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.

### LS1.A: Structure and Function

**Students will learn about the basic structures and functions of living organisms, including their pets.**

**LS1.D: Behavior** Students will learn about the factors that influence animal behavior, including genetics, environment, and learning. They will also learn how to observe and interpret animal behavior.

**PS3.A: Motion and Forces:** Students will learn about the basic concepts of motion and forces, such as inertia, friction, and gravity. They will also learn how these concepts apply to the design of pet toys.

### I CAN statements

- explain how the structures and functions of pets allow them to play and interact with their environment.
- observe and interpret animal behavior.
- apply the concepts of motion and forces to the design of enrichment objects
- follow the engineering design process to design and build enrichment objects
- use creativity, problem-solving, and communication skills to brainstorm and develop successful designs.
- understand the importance of safety when designing products for animals.
- evaluate and select the best design for an enrichment toy
- communicate my design ideas to others in a clear and concise way.
- test my enrichment object with a pet and make revisions as needed.
- explain how my enrichment object meets the needs of the pet.

## Materials

Paper, pencils,  
Cardboard, duct tape and building materials  
[Guinea Pig Design Challenge - Student Worksheet](#)

## Teacher Background

Guinea pigs are social creatures that need plenty of stimulation and interaction to thrive. Spending too much time confined to a cage can lead to boredom, stress, and even health problems. Therefore, it is crucial to provide guinea pigs with opportunities to engage in playtime both inside and outside their cage.

## Toys for Indoor Playtime

Guinea pigs are naturally curious and playful animals that enjoy exploring and interacting with their surroundings. Provide them with a variety of safe and stimulating toys to keep them entertained, such as:

- Chew toys: Guinea pigs have a constant need to chew, so providing them with chew toys made from safe materials like wood, hay, or untreated cardboard can help prevent them from chewing on inappropriate items.
- Tunnels and hideaways: Guinea pigs love to burrow and hide, so provide them with tunnels, tubes, and hideaways made from cardboard, fleece, or other safe materials.
- Balls and toys with bells: Guinea pigs are attracted to sounds and movement, so provide them with lightweight balls or toys with bells to chase and bat around.

## Interactions Outside the Cage

Guinea pigs should be allowed to roam and explore outside their cage for at least an hour each day. This provides them with much-needed exercise and mental stimulation. To ensure a safe and enjoyable playtime, consider the following:

- Create a safe play area: Choose a secure area free from hazards like electrical cords, poisonous plants, or open windows. Cover the floor with a soft material like fleece or towels to protect their delicate paws.
- Supervise their playtime: Always supervise guinea pigs when they are out of their cage to prevent them from getting into trouble or escaping.
- Introduce new items gradually: When introducing new toys or objects, do so slowly to avoid overwhelming them.

## Importance of Teaching Engineering Design

Engineering design is a valuable skill that can be applied to various aspects of life, including caring for pets. By teaching students about engineering design, you empower them to solve problems creatively and construct solutions tailored to their specific needs.

### Engineering Design Process

The engineering design process is a cyclical approach to problem-solving that involves the following steps:

- Identify the problem: Clearly define the problem or challenge that needs to be addressed.
- Research and gather information: Explore existing solutions, research materials, and gather relevant data.
- Brainstorm and generate ideas: Collaborate and generate a variety of potential solutions without judgment.
- Design and develop a solution: Select a promising solution and create a detailed design or prototype.
- Test and evaluate the solution: Implement the solution and evaluate its effectiveness in addressing the problem.
- Refine and improve the solution: Based on the evaluation, make adjustments and refinements to improve the solution.

Teaching students about engineering design not only enhances their problem-solving skills but also fosters creativity, critical thinking, and adaptability, all of which are essential for success in various disciplines.

### Lesson 1: Research

Time	Materials	Activity
45 mins	<a href="#">Guinea Pig Design Challenge - Student Worksheet</a> Books, internet, interview classroom teacher	<p>Introduce the challenge to the students: Your challenge is to develop a pet friendly object for the guinea pig. It must be constructed with animal safe materials only</p> <p>Allow the students to work in their groups to research the needs of a guinea pig. What do they need to know about guinea pigs that will help them to create their toy? Their research may include books, internet searches and observation of the guinea pig. Students should summarize their findings and record them on the worksheet.</p>

## Lesson 2: Imagine and Plan : Design Ideas and Identify needed Materials

Time	Materials	Activity
45 mins	<a href="#">Guinea Pig Design Challenge - Student Worksheet</a>	<p>Allow the students time to brainstorm ideas - this might be done in their own groups or as a class discussion.</p> <p>The worksheet guides the students through the planning stage. They will design their toy and identify the materials they will need. They will justify their choice of a toy based on what they have learned from their research.</p>

## Lesson 3: Create

Time	Materials	Activity
45 mins	Paper, pencils, Cardboard, duct tape and building materials <a href="#">Guinea Pig Design Challenge - Student Worksheet</a>	Allow students to build their toys. Encourage the participation of all of the group members

## Lesson 4: Test

Time	Materials	Activity
45 mins	Newly designed toys	<p>Prior to testing the toy with the guinea pig, the students should identify what criteria they will be looking for to determine success. It might be qualitative, such as the guinea pig engages with the toy, or quantitative, such as the amount of time the guinea pig spends with the toy.. They should create a data table to record their observations.</p> <p>It is important to note that the guinea pig may become fatigued depending on how many toys it is asked to test. It would be best to schedule the tests on different days to decrease fatigue to the guinea pig.</p>

## Lesson 5: Improve

Time	Materials	Activity
45 mins	Paper, pencils, Cardboard, duct tape and building materials <a href="#">Guinea Pig Design Challenge - Student Worksheet</a>	Allow students to redesign and retest their toys based on their analysis of the tests they completed.  Have the students share their results with their classmates and discuss which was the guinea pig's favorite toy

### Differentiation

**For students who need additional support:** Conduct this lesson as a whole class experiment.

**For students who need additional challenges:** Ask students to identify the physics of the toy and energy transfers that occur.

### Assessment

Students complete the Reflection Questions in their worksheet. Additionally they can be assessed on their participation in the project using this rubric:

Criteria	4 points	3 points	2 points	1 point
Contribution to Discussions	Actively participates in discussions, shares ideas thoughtfully, and listens respectfully to others.	Participates in discussions, shares ideas, and listens to others.	Occasionally participates in discussions and may interrupt others.	Rarely participates in discussions and may be disruptive
Completion of Assigned Tasks	Consistently completes assigned tasks on time and to a high standard.	Completes most assigned tasks on time and to a satisfactory standard.	Completes some assigned tasks, but may miss deadlines or produce work of	Does not complete assigned tasks or produces work of

			lower quality.	consistently poor quality.
Collaboration and Teamwork	Works effectively with others, shares responsibilities, and resolves conflicts constructively	Collaborates with others and shares responsibilities.	May have difficulty collaborating with others or sharing responsibilities	Does not collaborate with others or may create conflicts.

### Extension

This project can be extended by having students observe the guinea pig throughout the year - are there certain toys the guinea pig seems to favor? Does he/she avoid some of the toys over time? Have students redesign their toy after they have observed the guinea pig over an extended period of time.