

Fangs in Focus:

Demystifying the Snake's Arsenal

Pet: Snake	Class: 3-5	
Brief Overview:Through hands-on modeling and experimentation, students explore different fang types, construct their own models, and witness the flow of "venom" (colored water) using turkey basters. This engaging activity ignites scientific curiosity, fosters critical thinking, and encourages creative problem-solving.For an older grade version, please see: Fangs in Focus: Demystifying the Snake's Arsenal 		Lesson Breakdown Lesson 1: Exploring the World of Snake Fangs Lesson 2: Modeling Venom Injection
Essential Question How do different types of snake fangs inject w their prey?		

Subjects	Stem Connections
Science	Science: animal adaptations
🗹 ELA	Technology: modeling software (optional)
🗹 Math	Engineering: modeling and testing different types of fangs
STEM	Math: measurement of liquids, creation of a bar graph
☐ Art	

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Performance Expectations/ Standards NGSS

3-LS1-1. Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death

3-LS4-3 Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.
3-5-ETS1-2. Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

CCSS

Math.Content.3.MD.A.2. Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l).

Math.Content.4.MD.B.4. Make a line plot to display a data set of measurements in fractions of a unit (1/2, 1/4, 1/8).

ELA-Literacy.W.3.2. Write informative/explanatory texts to examine a topic and convey ideas and information clearly.

ELA-Literacy.SL.3.1. Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners

ELA-Literacy.RI.3.7. Use information gained from illustrations (e.g., maps, photographs) and the words in a text to demonstrate understanding of the text

I CAN statements

- explain the different types of snake fangs and their venom injection methods.
- use my understanding of fangs to design and build a simple model.
- observe and describe how "venom" (colored water) flows through my model using a turkey baster.
- compare and contrast different fang types based on their venom delivery mechanisms.
- write a clear explanation of my observations and conclusions about fang functions.

Materials

- Exploring the World of Snake Fangs
- Fangs in Focus Student Worksheet
- Modeling clay
- Modeling software (optional)
- Turkey basters (1 per group)
- Colored water
- Beaker

Teacher Background

Snakes have captivated our imaginations and instilled both fear and fascination for millennia. Their repertoire of adaptations is impressive, but none is more captivating than their potent arsenal: venom. Delivered through a diverse array of fangs, snake venom unlocks a wealth of ecological opportunities, shaping prey selection, predator-prey interactions, and even niche specialization.

1. Aglyphous Teeth Toothy Trappers

The simplest venom injectors, aglyphous teeth, resemble our own teeth, lacking grooves or channels for venom transport. Found in boas and some rear-fanged snakes, these fangs rely on a primitive delivery system. During a bite, the venom, secreted from modified salivary glands, flows along the grooves in the jaw and onto the teeth. Aglyphous snakes often constrict their prey, allowing the venom to seep into wounds created by their serrated teeth.

2. Opisthoglyphous Fangs: The Rear-Fanged Ambushers

A step up in complexity, opisthoglyphous fangs have a small groove or channel running down the back of the tooth, closer to the base. While not as efficient as other types, this grooved channel allows venom from modified salivary glands to flow onto the prey during chewing or scraping actions. Snakes like hognose snakes and boomslangs employ this strategy, often relying on venom's neurotoxic properties to subdue their prey.

3. Proteroglyphous Fangs: The Forward-Fixed Fury

Proteroglyphous fangs represent a significant evolutionary leap. Longer and more mobile than their predecessors, these fangs are hinged to the maxilla, allowing them to fold backwards when the mouth is closed. When striking, powerful muscles propel the fangs forward, injecting venom through a single, fixed-position groove located near the tip. This rapid, controlled delivery system is characteristic of colubrids like the coral snake and the African twig snake, allowing them to inject potent neurotoxic venoms with precision.

4. Solenoglyphous Fangs: The Masters of Speed and Efficiency

Finally, we arrive at the pinnacle of fang evolution: solenoglyphous fangs. Found in vipers and rattlesnakes, these needle-like marvels possess a closed channel running the entire

length of the fang, connected to specialized venom glands at the base. During a strike, powerful muscles contract, squeezing the venom glands and propelling the venom through the channel at lightning speed. The tip of the fang, often razor-sharp, boasts multiple openings or "spits" for injecting the venom deep into the prey's tissues. This rapid, high-pressure delivery system makes solenoglyphous fangs the most efficient venom injectors, enabling vipers to subdue even large prey with incredible speed and lethality.

Understanding the diversity of snake fangs provides insights into predator-prey relationships, shaping our understanding of ecosystem dynamics and even inspiring biomimetic advancements. From developing rapid drug delivery systems to designing self-cleaning medical devices, the study of snake fangs offers a treasure trove of potential applications.

Lesson 1: Exploring the world of Shake Fangs			
Time	Materials	Activity	
10 mins		Show students pictures of different snakes. Ask questions like "Do all snakes have the same fangs?" and "How do snakes inject venom with these fangs?" to spark their curiosity about different fang types and venom delivery strategies.	
15 mins	<u>Exploring the</u> World of Snake <u>Fangs</u>	Share the presentation with the students to help them understand that not all snake fangs are the same.	
20mins	Clay Modeling software (optional) <u>Fangs in Focus</u> <u>Student</u> <u>Worksheet</u>	Make a model: Divide students into teams and challenge them to build models of specific fang types based on their unique venom delivery mechanisms. Tell students the fangs must be between 2 and 3 inches in length. Provide students with pictures of the different types of fangs. You may have the students create all four models or only one depending on you time constraints. Modeling software and 3D models can be used if this is available	

Lesson 1: Exploring the World of Snake Fangs

Lesson 2: Modeling Venom Injection

Time	Materials	Activity
35 mins	Fangs in Focus Student Worksheet Turkey baster Colored water Tray to collect the water Beaker	Once the models are complete, equip each team with a turkey baster filled with 50 mL of colored water (their "venom"). Have them simulate venom flow through their models, observing how the water travels and discussing how it relates to the actual fang function. Hold the model of the fang over a tray and slowly squeeze the turkey baster. Carefully pour the water that is ejected into the beaker. Have the students write their observations in their Student Worksheet. Students will also measure the amount of "venom"that is ejected from the fang.
10 mins	<u>Fangs in Focus</u> <u>Student</u> <u>Worksheet</u>	Fangtastic Findings: Gather as a class to share observations and compare the effectiveness of different fang types based on the model simulations. Focus on factors like speed, precision, and control of venom delivery. Encourage students to draw connections between fang structures and their venom injection methods

Differentiation

For students who need additional support:

- Provide pre-designed templates or guiding diagrams for struggling teams.
- Have each team make only one of the fangs and share their observations with the class.
- Test the different fangs in front of the whole class.

For students who need additional challenges:

• Explore how different fang types might be advantageous for specific types of prey and hunting strategies.

Assessment				
Category	Criteria (4 points)	Criteria (3 points)	Criteria (2 points)	Criteria (1 point)
	Explains the different types of snake fangs and their venom	Provides some explanation of different fang types and their	Shows limited understanding of different fang	Demonstrates minimal understanding of
Understanding of Fangs:	injection mechanisms	functions, but may lack detail or	types or confuses their functions.	snake fangs and venom delivery.

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	clearly and accurately.	accuracy.		
Model Construction:	Creates a well-constructed model that accurately reflects the specific fang type chosen, utilizing appropriate materials and demonstrating effective problem-solving.	Builds a functional model that generally reflects the chosen fang type, but may have minor construction flaws or lack detail.	Constructs a model with significant flaws or inaccuracies in representing the chosen fang type.	Model is poorly constructed or does not effectively represent any specific fang type.
Observation and Analysis:	Makes detailed and accurate observations about how "venom" (colored water) flows through their model, comparing and contrasting it with the real venom delivery mechanisms of different fang types.	Observes and describes flow of "venom" in their model, but may lack detail or accuracy in comparison to real fang functions.	Observations are limited or inaccurate, hindering comparison with real venom delivery mechanisms.	Shows minimal observation or understanding of how "venom" flows through their model.
Communication and Reflection:	Writes a clear and concise explanation of observations and conclusions, effectively drawing connections between model simulations and real snake fangs	Presents an explanation of observations and conclusions, but may lack clarity or detail. Connections to real fang functions might be missing or inaccurate.	Explanation is unclear or incomplete, with limited connection to real fang functions.	Written explanation is missing or poorly written, showing minimal reflection on observations or fang functions.

Extension

- Have students research specific snake species and analyze their fang type in relation to their habitat and diet.
- Invite a guest speaker, such as a zookeeper or reptile expert, to share firsthand knowledge about snakes and their fascinating venom delivery systems.