Venom: From Lethal to Lifesaving

Interdependence of Science, Engineering, and Technology on Society and the Natural World

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Grade Level	6th – 8th Grade	**Time Frame**	3-4 class period(s)
Subject	Science	**Duration**	160 minutes

Essential Question

What is the societal impact of creating synthetic materials from natural resources?

Summary

In this lesson on the interdependence of science, engineering, and technology, students will use the example of snake venom to explore how natural resources can be used to make synthetic products that humans rely on. Students will learn and practice research strategies and evaluate sources. Finally, students will display their knowledge in the form of posters. This lesson includes optional modifications for distance learning. Resources for use in Google Classroom are included.

Snapshot

Engage

Students share their understanding of venomous snakes using the How I Know It strategy.

Explore

Students investigate what venom does to humans and how antivenom is made using the Card Sort strategy.

Explain

Students read an article about the production of antivenom and learn about other human uses for natural venom, using the Jigsaw strategy.

Extend

Students develop an understanding of relevance, accuracy, bias, and reliability when selecting websites and articles for research. Given a list of synthetic materials, each student selects and researches a natural resource that is converted by humans into a new product.

Evaluate

Students create a poster about a natural resource converted by humans into a new product. Students peer review other student posters using the Gallery Walk strategy.

Standards

ACT College and Career Readiness Standards - Science (6-12)

IOD301: Select two or more pieces of data from a simple data presentation
EMI502: Determine whether presented information, or new information, supports or contradicts a simple hypothesis or conclusion, and why

Next Generation Science Standards (Grades 6, 7, 8)

MS-PS1-3: Gather and make sense of information to describe that synthetic materials come from natural resources and impact society.

Oklahoma Academic Standards (7th Grade)

7.PS1.3 : Gather and make sense of information to describe that synthetic materials come from natural resources and impact society.*

Attachments

- Gallery-Walk-Rubric-Venom-From-Lethal-to-Lifesaving - Spanish.docx
- Gallery-Walk-Rubric-Venom-From-Lethal-to-Lifesaving - Spanish.pdf
- Gallery-Walk-Rubric-Venom-From-Lethal-to-Lifesaving.docx
- Gallery-Walk-Rubric-Venom-From-Lethal-to-Lifesaving.pdf
- How-I-Know-It-Venom-From-Lethal-to-Lifesaving - Spanish.docx
- How-I-Know-It-Venom-From-Lethal-to-Lifesaving - Spanish.pdf
- How-I-Know-It-Venom-From-Lethal-to-Lifesaving.docx
- How-I-Know-It-Venom-From-Lethal-to-Lifesaving.pdf
- Identifying-High-Quality-Sites-Venom-From-Lethal-to-Lifesaving.pdf
- Image-Card-Sort-Venom-From-Lethal-to-Lifesaving - Spanish.docx
- Image-Card-Sort-Venom-From-Lethal-to-Lifesaving - Spanish.pdf
- Image-Card-Sort-Venom-From-Lethal-to-Lifesaving.docx
- Image-Card-Sort-Venom-From-Lethal-to-Lifesaving.pdf
- Lesson-Slides-Venom-From-Lethal-to-Lifesaving pptx.pptx
- Text-Card-Sort-Venom-From-Lethal-to-Lifesaving - Spanish.docx
- Text-Card-Sort-Venom-From-Lethal-to-Lifesaving - Spanish.pdf
- Text-Card-Sort-Venom-From-Lethal-to-Lifesaving.docx
- Text-Card-Sort-Venom-From-Lethal-to-Lifesaving.pdf

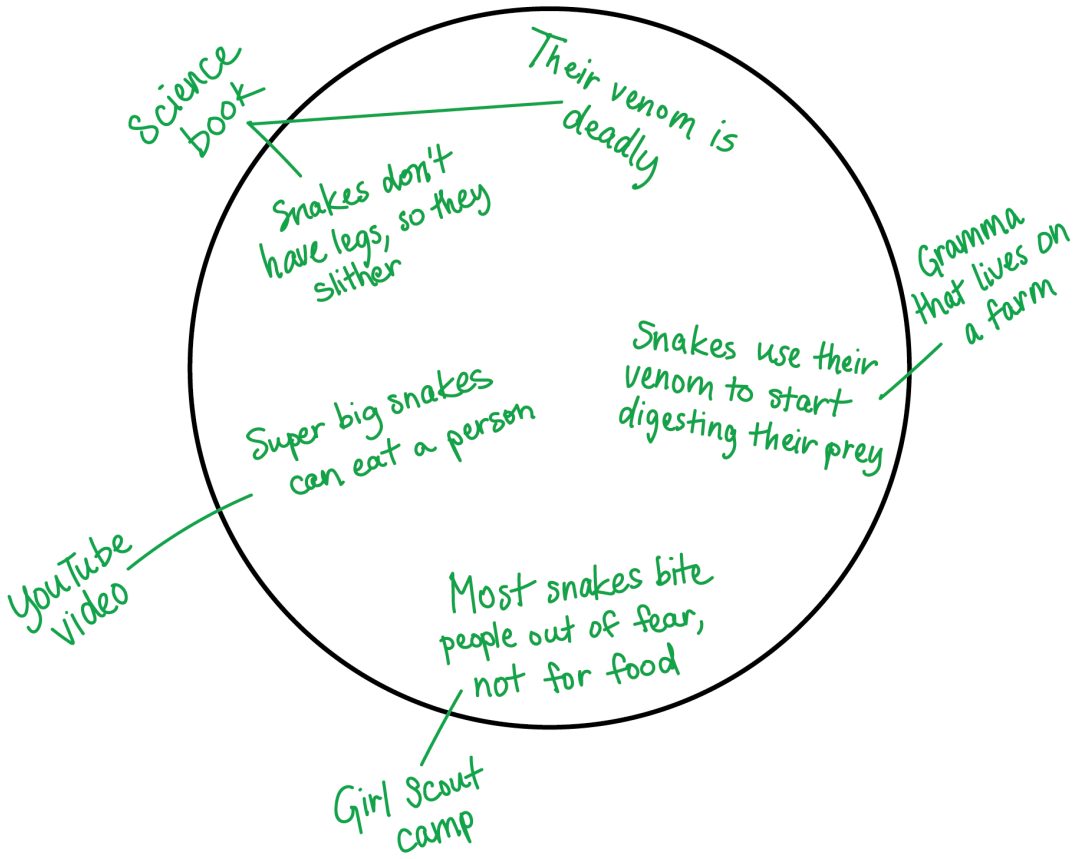
Materials

- "Venom: From Lethal To Lifesaving" Lesson Slides
- "We're Running Out of Antivenom" linked video
- "This is What Snake Venom Does to Blood!" linked video
- "How I Know It" handout
- "Text Card Sort" and "Image Card Sort" activities (one of each set per student group)
- "Antivenom: How It's Made and Why It's So Precious" linked article
- "Biting Back" linked article
- "How is Snake Antivenom Actually Produced?" linked article
- "Identifying High-Quality Sites" PDF handout
- "Gallery Walk Rubric" handout
- Poster boards and craft supplies, or access to internet-enabled computers or laptops

Engage

Use the attached slide show to guide the lesson. Begin with **slides 2 and 3,** introducing students to the lesson and the essential question.

Continue to **slide 5.** Use the instructional strategy How I Know It to activate/elicit students' prior knowledge of venomous snakes. Pass out the attached **How I Know It handout.** Ask each student to write facts they know about snakes and venom inside the circle. On the outside of the circle, ask them to write how they know the facts.



"How I Know It" example.

After students complete the How I Know It handout, have them share out with Elbow Partners.

Go to **slide 6.** Show students the first 41 seconds of the video "We're Running Out of Antivenom." Prompt students to answer the following questions:

1. Why does this matter?
2. Why should we care?

Embedded video
https://www.youtube.com/watch?v=gudUuRFba3M

Explore

Go to **slide 8.** Show the video "This Is What Snake Venom Does to Blood!"

Embedded video
https://www.youtube.com/watch?v=4WvnjCkLbvY

Teacher's Note: Card Sort Preparation

Print and cut the attached **Card Sort Image cards** out before the lesson. Prepare one set of images for each group of three students in your class. You can store the cards in envelopes or plastic bags for ease of distribution and future use. Consider printing on card stock or heavy paper for durability and extended future use. Follow the same procedures for the attached Card Sort Text cards, to be used in the Explain section, but keep the images and text cards separated.

Place students in groups of three, then prompt them with the question: "How do you think antivenom is made?" Hand out the prepared Image Card Sort to student groups. Tell the students that these cards represent a very simplified view of the steps involved in making antivenom. Using the Card Sort instructional strategy, ask students to organize the cards into the order of the steps they think it takes to make antivenom. Instruct the students to either record the order in which they placed the cards or put them somewhere they won't get rearranged while the students are completing the next activity.

Optional Modification for Distance Learning

To make the Card Sort activity accessible for distance learners, you may choose to invite students to print and cut out their own Card Sorts. A web-based platform (e.g. Google Classroom) or a digital platform for sorting (e.g., Desmos, Quizlet) can also be used to create a digital Card Sort. Students can place the cards in order and describe their thought processes for each step as part of an online discussion. Download all attachments to use this lesson in Google Classroom.

Explain

Teacher's Note: Preparation for Research

If you have student devices with access to Internet, you can have students access the article used in this portion of the lesson online. Otherwise, it will need to be printed out for students to read.

Go to **slide 10.** Instruct students to read the "Antivenom: How It's Made and Why It's So Precious" article. Number students off 1 to 6. Using the Jigsaw instructional strategy, assign students to read individually one portion of the article based on their number. Do not group students; instead, have them read individually first.

Teacher's Note: Suggested Reading Assignments

Consider having the six student groups jigsaw the reading in the following chunks— for 1's, the first two paragraphs; for 2's, "The first antivenom;" for 3's, the first two paragraphs of "How to make antivenom;" for 4's, the third and fourth paragraphs of "How to make antivenom;" for 5's, the last two paragraphs of "How to make antivenom;" and for 6's, "How to turn yourself into an antivenom." Adjust group numbers and section sizes as you see fit.

Optional Modification for Distance Learning

To make this activity accessible for distance learners, you may choose to have students read the entire article instead of using the Jigsaw strategy. Students can still use the CUS and Discuss strategy to read the article. If you choose to keep the Jigsaw strategy, you can invite students to share their assigned sections of the reading in a discussion board on a web-based platform (e.g., Google Classroom).
Download all attachments to use this lesson in Google Classroom.

To help guide their reading, have students use the CUS and Discuss instructional strategy. As students read, they will **circle** new words, **underline** details to support main ideas, and **star** the main ideas. Move around the room and look at the words that students are circling. As the students finish reading, clarify some of the common words that you saw students circle. Ask for volunteers that might know what those words mean.

Go to **slide 11.** Once students have read their sections, invite them to group together based on their number and the section they read. In their number groups, have students discuss their section using what they underlined and starred. Each group will assign one spokesperson to share out the content of their reading passage.

Keeping Groups on Task

Assigning specific spaces in the room for each group will reduce off-task behavior during the regrouping time. In addition, give students a set amount of time to complete this activity based on their abilities.

Go to **slide 12.** Have students return to the groups with whom they organized their **Venom Cart Sort** images. Hand out the prepared **Text Card Sort cards**. Ask students to place the text cards with their matching image card. Inform students there are seven text cards and eight image cards, so students will have to use one of the text cards for two images. Have students revise the order of their cards now if they'd like to make any changes. Ask the groups if they made any changes. Allow those who did to share out what they changed and why. Go to **slide 13**. Reveal the correct order to the class.

Optional Modification for Distance Learning

Similarly to the previous Card Sort in this lesson, you may choose to invite students print and cut out their own Card Sort or use a digital platform (e.g., Desmos, Quizlet), and then ask students to organize the steps and discuss on a web-based platform (e.g., Google Classroom). Download all attachments to use this lesson in Google Classroom.

Teacher's Note: Card Sort Answers

1) The snake is "milked" for venom. 2) Venom is injected into a horse whose immune system starts making antibodies. 3) After getting additional booster shots of venom over a year, the horse produces many antibodies. 4) Some blood is withdrawn from the horse. 5) Blood is spun in a lab and separated into plasma and blood cells. The plasma, containing antibodies, is kept. 6) Plasma is sent to a lab, purified, and packaged into individual vials. 7) Snake bite patients get vials of antivenom through an IV.

Text card sort and image card sort answers.

Go to **slide 14.** Explain to the class that antivenom is a synthetic product that is made from a natural resource. Prompt students to answer the following questions:

1. What does synthetic mean?
2. What does natural mean?

Possible Student Responses

The discussion should be fairly open at this point. Ask for 2–3 student volunteers to give their definition of synthetic and natural. Based on what they've learned about antivenom, students will likely arrive at synthetic meaning something that is human-made or something that is made from a natural resource. Students will likely also arrive at natural meaning something that exists in nature or is not made by man. If students aren't able to give a valid description, inform the students of the difference between synthetic and natural.

Go to **slide 15.** Reveal to the class that human-made products are created to solve a problem and usually impact society and the environment. Prompt students to answer the following questions:

1. Can you think of any human-made products that have a positive impact and how they are used?
2. Can you think of any human-made products that have a negative impact and how they are used?
3. Can you think of any human-made products that have both a positive and a negative impact? Explain how this can be the case.

Possible Student Responses

Students may or may not know of examples of synthetic products made from natural resources. If they don't offer up any examples, that's alright. There will be examples on the next slide. Here are just a few ideas about society/environmental impacts, listed + and – : **insulin** = + helps diabetic patients, - uses animals, is expensive; **rhino horn** = +/- (cultural but also a misconception) cures cancer, - rhino poaching; **dog flea dip/shampoo** = + safer for dogs, made from an inexpensive flower that is renewable, - may not be as effective at killing pests as chemical dips/shampoos.

Optional Activity to Share Examples

Be sure to give students a chance to share their examples. You could also do a Think-Pair-Share activity if time permits.

Go to **slide 16.** Allow the students time to read through the slide while you point out a few examples of human-made products, the natural resource they are made from, and their use.

Extend

Go to **slide 18.** Hand out the attached Identifying **High-Quality Sites checklist** and discuss the components with students. Introduce students to concepts of reliability, accuracy, bias, and relevance.

Teacher's Note: Preparation For Research

Once again, if you have student devices with access to the Internet, you can have students access the articles used in this portion of the lesson online. Otherwise, they will need to be printed out for students to read.

Go to **slide 19.** Ask students to read the "Biting Back" article and the "How is Snake Antivenom Actually Produced?" article. Students will individually assess the reliability, credibility, accuracy, and bias of each article using the Identifying High-Quality Sites checklist. Have the students discuss their findings with their groups.

Sample Student Findings

Students will likely find that "Biting Back" is the higher quality of the two articles for the reasons that it is a Scholastic article, other research scientists are cited, and data and numbers are given. The "How is Snake Antivenom Actually Produced?" article, on the other hand, is written by "herpatologyguy" and appears to be a blog.

Alternatives for the Extend Activity

If it is feasible, consider a field trip to the Oklahoma City Rattlesnake and Venom Museum (free admission) or to a zoo that has a herpetarium (reptile house). Or invite a guest speaker from the medical field who specializes in toxicology to visit with the class.

Evaluate

Go to **slide 21.** In their groups of three, invite students to research the production of other synthetic materials that are derived from natural resources and create a poster for that product. Go over the components that you expect to see in their finished product: the natural resource used, the derived synthetic material or product, how it's made, how it's used, the impact of the product on society, and citations of sources used. Pass out the **Gallery Walk Rubric handout.** Inform the students that this rubric will be used by their peers as they are viewing other groups' posters.

Poster Alternatives

A poster is suggested, but you can allow students to have a choice in how they present their information. Students could create a PowerPoint, Prezi, or something similar to this emaze presentation. Note that the rest of the lesson is based on a poster as the final project. If you decide to use an alternative, you will need to modify the Gallery Walk.

Teacher's Note: "deep Dive" Research

There are examples of human-made products that students can choose on slide 11. Encourage students to dig deeper and research further if they wish to go outside of that example list.

Go to **slide 22.** Using the Gallery Walk/Carousel instructional strategy, have students rotate throughout the room and evaluate other posters using the Gallery Walk Rubric.

Facilitating The Poster Creation And Gallery Walk

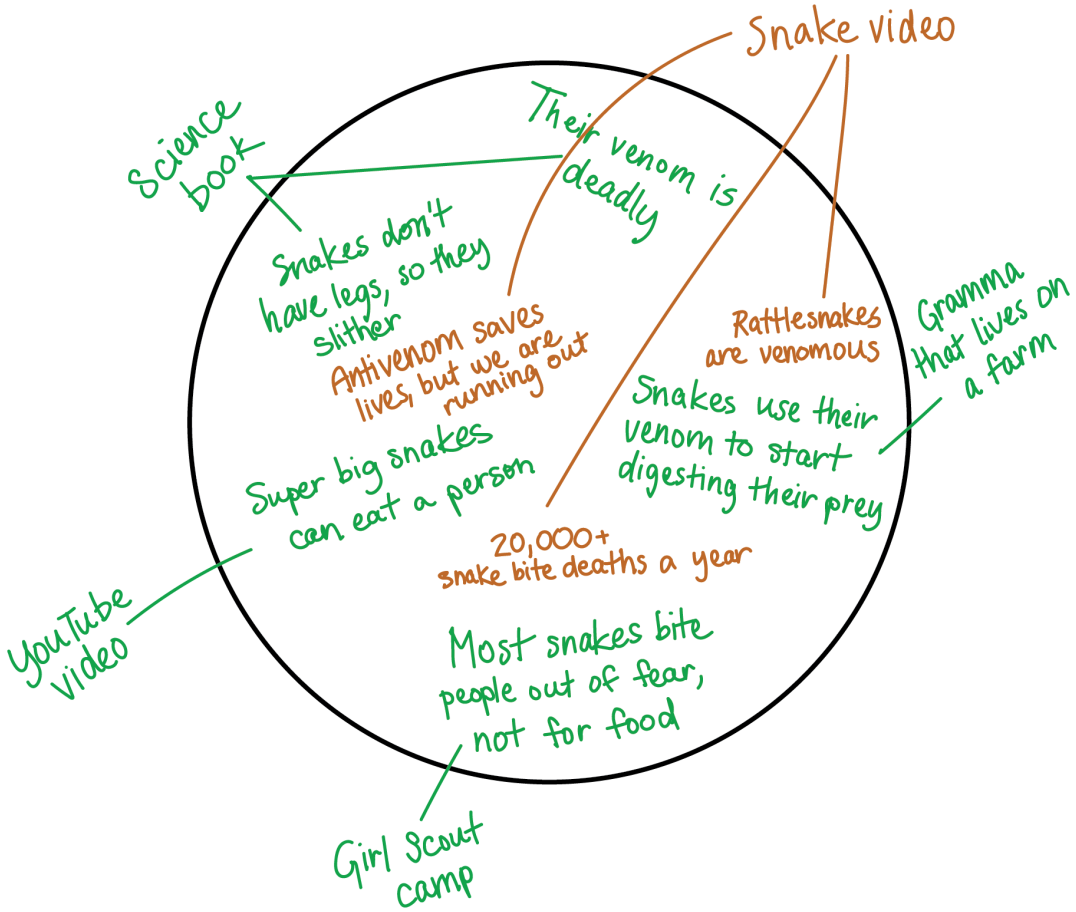
Move around the room and ensure students understand the poster creation expectations. It might be helpful to assign jobs for students to keep them on task. During the Gallery Walk, you may want to give students an example and a non-example of feedback to help them contribute constructive conversations to the event.

Optional Modification For Distance Learning

If conducting this lesson in an online or distance learning environment, you may choose to omit the Gallery Walk activity. You can substitute a peer review activity, with a website such as VoiceThread. With VoiceThread, you can upload students' posters to the site; then, students can choose whether they would like to make a quick video, a voice memo, or a written note to give feedback on other students' posters. . Download all attachments to use this lesson in Google Classroom.

Go to **slide 23.** Revisit students' How I Know It diagrams from earlier. Ask them to use a different ink color to add any new facts about snakes and venom to the inside of the circle and how they knew it to the outside. Inform students that they may also need to revise their information and sources from their original How I Know It if they confirmed information or had a misconception. Ask for volunteers to share out what they added as a result of what they learned in the lesson.

This activity will wrap up the lesson and remind students that there are multiple ways to add new and reliable information as they are researching other synthetic products that are derived from nature. Ask for 2-3 volunteers to share out what facts and sources they added and whether any of their information changed as a result of the lesson.



Example of revised "How I Know It" (note different ink color).

Resources

- Anti-Venom: How its made and why it's so precious (2017). https://www.zmescience.com/other/feature-post/antivenom-made-precious/
- emaze. Venom: from lethal to lifesaving. (n.d.). https://www.emaze.com/@AIQCOWTT/presentation-name.
- Grunbaum, M. (2013). Biting back. Science world. https://www.aaas.org/sites/default/files/sw-091613-bitingback.pdf
- Herpetologyguy. (n.d.). *How is Snake Antivenom actually produced?*. Steemit. https://steemit.com/science/@herpetologyguy/how-is-snake-antivenom-actually-produced
- Identifying High-Quality Sites. https://www.commonsense.org/education/lesson/identifying-high-quality-sites-6-8
- Inside Science. (2016, November 18). We're running out of antivenom [video file]. https://www.youtube.com/watch?v=gudUuRFba3M&feature=youtu.be
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- K20 Center. (n.d.). Desmos. Tech Tools. https://learn.k20center.ou.edu/tech-tool/1081
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- K20 Center. (n.d.). Gallery Walk/Carousel. https://learn.k20center.ou.edu/strategy/118
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- K20 Center. (n.d.). How I Know It. Strategies. https://learn.k20center.ou.edu/strategy/144
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