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NGSS ASSESSMENT DEVELOPMENT TEMPLATE

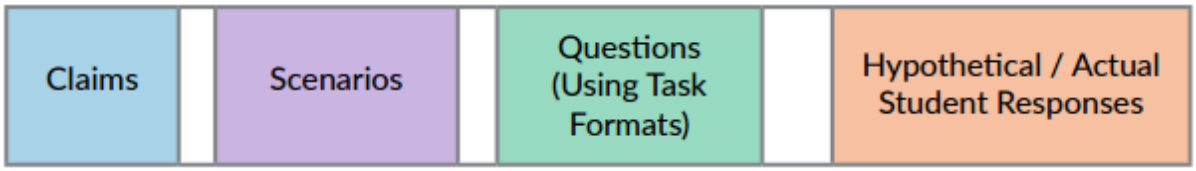
This NGSS Assessment Development Template was developed in alignment with Creative Commons by the Research + Practice Collaboratory, 2016. These five steps were designed to help teams develop assessment tasks.

- *Step 1: Define what you will assess by analyzing relevant sections of A Framework for K-12 Science Education and crafting learning **claims**.*
- *Step 2: Brainstorm Possible **Scenarios** for Eliciting Student Understanding.*
- *Step 3: Use Task Formats to Build **Questions** to Engage Students with the Scenario.*
- *Step 4: Imagine the Range of Possible **Student Responses** to the Questions.*
- *Step 5: Share, Review, and Revise.*

Authors, Subject Area, Unit Topic:

Ashley, James, Gabby: Flesh Eating Bacteria

STEPS TO DESIGNING A THREE DIMENSIONAL ASSESSMENT



Original Framework Text: This can be found written in the *Framework for K-12 Science Education*.
Examples of original framework text (1, 2, 3).

By the end of grade 12. Systems of specialized cells within organisms help them perform the essential functions of life, which involve chemical reactions that take place between different types of molecules, such as water, proteins, carbohydrates, lipids, and nucleic acids. All cells contain genetic information in the form of DNA molecules. Genes are regions in the DNA that contain the instructions that code for the formation of proteins, which carry out most of the work of cells.

Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level. Feedback mechanisms maintain a living system's internal conditions within certain limits and mediate behaviors, allowing it to remain alive and functional even as external conditions change within some range. Outside that range (e.g., at a too high or too low external temperature, with too little food or water available), the organism cannot survive. Feedback mechanisms can encourage (through positive feedback) or discourage (negative feedback) what is going on inside the living system.

Step 1: Define what you will assess by analyzing relevant sections of *A Framework for K-12 Science Education* and crafting learning claims.

Claim: Using the original framework text, identify learning claims you want to be able to make about what students know and can do.

Claim 1: Cell division occurs via a process called mitosis: when a cell divides in two, it passes identical genetic material to two daughter cells. Successive divisions produce many cells.

Claim 2: Although the genetic material in each of the cells is identical, small differences in the immediate environments activate or inactivate different genes, which can cause the cells to develop slightly differently.

Step 2: Brainstorm Possible Scenarios for Eliciting Student Understanding

Possible Scenario: 3D assessment tasks are multi-component tasks meaning there is one single scenario with multiple questions for students to answer relating to that scenario. These scenarios should also be based upon a new but related phenomenon. Brainstorm multiple scenarios and evaluate which is best for eliciting student understanding. Write a detailed description of the scenario and what you expect from students when approaching this scenario.

- Part A: Selective parthenogenesis in snails

Depending on environmental conditions, the New Zealand mud snail can produce either asexually or sexually (asexually when fewer pathogens are present). Why do this?

- Part B: A bacterial sample was taken from the football player's helmet to determine the cause of the infection. Doctors identified the bacteria as *Streptococcus A,* which is often found to be the cause of strep throat. This type of bacteria usually causes generalized infections with mild symptoms and can be cured with a course of antibiotics. Why was this case so different?

Step 3: Use Task Formats to Build Questions to Engage Students with the Scenario

Questions (Using Task Formats): Use the task formats in the Framework to help design specific questions for students to assess your claims. Keep in mind, scenarios should be accessible to all students and connect with their interests and experiences (Example 1).

Part 2 Questions:

*A bacterial sample was taken from the football player's helmet to determine the cause of the infection. Doctors identified the bacteria as Streptococcus A, which is often found to be the cause of strep throat. This type of bacteria **usually** causes generalized infections with mild symptoms and can be cured with a course of antibiotics.*

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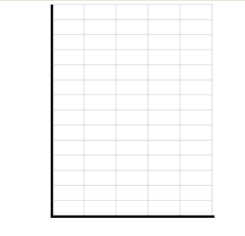
1. (*Constructing Explanations*) Describe how this bacteria was able to survive in the tissue of the football player's hand.
2. (*Analyzing & Interpreting Data*) Using the blank axis below, construct a graph illustrating the most probable scenario of the growth of bacteria in the football player's hand over 24 hours:



3. (*Evaluating and Communicating Evidence*) Of the following choices, select the correct sequence of events that allowed for the bacteria to evade the football player's healthy cells:
    a. Bacteria toxins invade host cell → mRNA translated to tRNA → DNA transcribed to mRNA → tRNA generates ASP amino acid → bacteria produce more toxins in response to ASP
    b. mRNA translated to tRNA → tRNA generates ASP amino acid → DNA transcribed to mRNA→ bacteria produce more toxins in response to ASP → bacteria toxins invade host cell
    c. Bacteria toxins invade host cell → DNA transcribed to mRNA → mRNA translated to tRNA → tRNA generates ASP amino acid → bacteria produce more toxins in response to ASP
    d. DNA transcribed to mRNA → bacteria toxins invade host cell → mRNA translated to tRNA→ bacteria produce more toxins in response to ASP → DNA transcribed to mRNA → tRNA generates ASP amino acid
4. (*Engaging in Argument from Evidence*) How is the *Streptococcus A* swabbed from the football player's helmet similar to, and different from, the *Streptococcus A* swabbed from your throat when you have strep throat?
5. (*Analyzing and Interpreting Data)* Now that you have compared and contrasted the bacteria found in the football player's hand to the bacteria found in someone with strep throat, explain why the bacteria found in the football player's hand caused a much more severe illness.
6. (*Engaging in Argument from Evidence)* When you get strep throat, you are able to get antibiotics prescribed by your doctor to treat you. Could the doctors treat the football player using antibiotics? Explain why or why not.
7. (*Engaging in Argument from Evidence)* Could the football player's illness have been prevented? What do you think the football player could have done differently?

8. (*Constructing Explanations)* If you were to share a takeaway idea from the football player's story with your peers, what would you tell them?

Questions (Using Crosscutting Task Formats): This set of prompts is intended to help teachers elicit student understanding of crosscutting concepts in the context of investigating phenomena or solving problems.

Step 4: Imagine the Range of Possible Student Responses to the Questions

Hypothetical Student Response: (Example 1): Imagining how students will respond to your prompts is an important stage in designing assessment tasks. Through thinking like a student, you will get a better sense of how your prompts might elicit their understanding developed throughout the unit.

References

National Research Council. (2012). *A framework for K-12 science standards: Practices, crosscutting concepts, and core ideas*. Washington, DC: National Academy of the Sciences.

NGSS Lead States (2013). *Next Generation Science Standards: For states, by states*. Washington, DC: The National Academies Press.

NGSX. (n.d.). *The Next Generation Science Exemplar*. Retrieved September 22, 2016, from http://www.ngsx.org/

Research Practice Collaboratory. (n.d.). Retrieved September 26, 2016, from http://researchandpractice.org/

Stem Teaching Tools. (n.d). Retrieved March 21, 2017, from http://stemteachingtools.org/