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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.*

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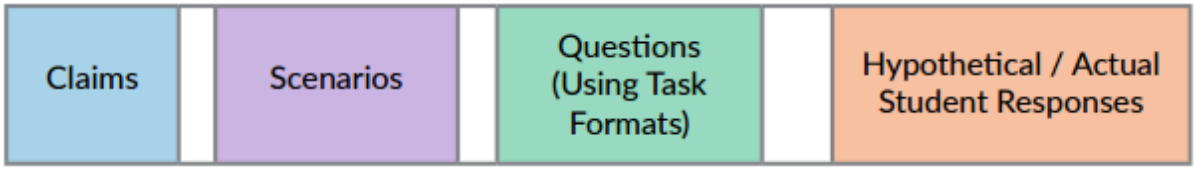
**Middle School Earth Science - Human Impact & Pollution**

## STEPS TO DESIGNING A THREE DIMENSIONAL ASSESSMENT




**Performance Expectation(s):** (Search by DCI)

**MS-ESS3-3: Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment**

**MS-ESS3-4: Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.**

**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 8:*** Human activities have significantly altered the biosphere, sometimes damaging or destroying natural habitats and causing the extinction of many other species. But changes to Earth's environments can have different impacts (negative and positive) for different living things. Typically, as human populations and per-capita consumption of natural resources increase, so do the negative impacts on Earth unless the activities and technologies involved are

engineered otherwise.

## 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.

*Students can apply their understanding of human pollution and its impact on our biosphere in order to relate how it manifests in our environment both domestically and abroad.*

## 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.

***Unintended Consequences of Insecticides, affecting food chains, newborn animals, and the biome***

Other Possibilities:

- Damning up of a water source in order to produce energy but accidentally causing the eradication of nearby wildlife (unintended consequences).
- Garbage Traveling Overseas & Washing Up on Foreign Shores (cascade effect).

For each scenario identified, identify and include 1-2 sources that can help you ensure the accuracy of your explanation (e.g., see phenomena ideas page-each target explanation is followed by 1-2 hyperlinked article helpful in explaining the phenomenon)

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

**"Unintended Consequences of Insecticides, affecting food chains, newborn animals, and the biome."**

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). [USE BRACKETS AFTER QUESTIONS TO IDENTIFY PRACTICE BEING ASSESSED]

1. Students will be asked to devise questions concerning the type of threats invasive species and plants cause in the environment they are in. This includes but is not limited to the makeup of the biome, above/underground structures, and the flora and fauna typically present on farmland. [Potential Task Formats: ***Asking Questions 3 (Science)***]

   **Example for Scenario 1:** What threats do invasive species and plants pose in their new environments? Describe a topic we covered in class.

2. Students will be presented with some information on pesticides (news article, etc…) Students will be asked what benefits using pesticides may have for humans and what drawbacks negative aspects may have on the local environment. [***Defining Problems 2 (Engineering)***]

   **Example for Scenario 2:** Using the following articles:
   http://www.nature.com/news/2010/100107/full/news.2010.4.html
   https://www.nytimes.com/2004/04/11/magazine/what-the-world-needs-now-is-ddt.html

   What are 2 benefits to humans using pesticides on crops?

   What are 2 drawbacks to environments using pesticides on crops?

3. Students will be asked to describe a solution for using pesticides considering scientific knowledge, prioritized criteria, and evidence from classroom investigations. Students will discuss trade off considerations. [***Designing Solutions 6 (Engineering)***]

   **Example for Scenario 3:** A farm has decided to begin using pesticides on their strawberry crops across from the local playground. Some parents are concerned the pesticides will harm their children and ruin their playground. As a scientist, the town council has asked you to present a solution to the problem that will make everyone happy. Consider the priorities of both sides of the arguments and discuss the tradeoffs each side will have to make.

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. [USE BRACKETS AFTER QUESTIONS TO IDENTIFY CROSSCUTTING CONCEPT BEING ASSESSED]

1. What do you predict will happen to mosquito populations that are subject to pesticides in the future? [Patterns]

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

Hypothetical Student Response: (Example 1) [Might be useful to reference Appendix E, F & G]: 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.

For each question created in Step 3, identify identify how a student with an (a) emerging, (b) proficient, and (c) exceeding understanding would respond.

**Question 1.** What threats do invasive species and plants pose in their new environments? Describe a topic we covered in class.

Emerging: New species are bad because they eat the other species and plants that are already there.

Proficient: New species may present new problems to the ecosystem and can potentially lead to a disequilibrium if the needs of the new species deeply affect the needs of the existing species.

Exceeds: Invasive species and plants can be very harmful in new environments. They pose a threat to the plants and animals that may have already been there by using the resources that others may already depend on. This can lead to extinction of some species and causes a ripple effect of damage. For example, humans are a relatively new species. With our growing human population, bees are becoming extinct. Plants that depend on bees for their survival could die and we could lose fruit, nuts, and other plant-based products we love.

**Question 2.** Using the following articles:
http://www.nature.com/news/2010/100107/full/news.2010.4.html
https://www.nytimes.com/2004/04/11/magazine/what-the-world-needs-now-is-ddt.html

What are 2 benefits to humans using pesticides on crops?

What are 2 drawbacks to environments using pesticides on crops?

Emerging:
Benefits: 1) It's good for humans because it stops malaria 2) It repels mosquitoes
Drawbacks 1) It's bad for our environment 2) It kills fish

Proficient
Benefits: 1) Pesticides can repel mosquitoes and stop malaria so it can save human lives 2) Pesticides are relatively safe for humans
Drawbacks: 1) Pesticides create higher concentrations of DDT in the oceans, killing marine life 2) Pesticides kill birds

Exceeds
Benefits: 1) Pesticides repel mosquitoes, slowing the spread of malaria, for which there is no vaccine-- saving lives. 2) Relatively safe for humans
Drawbacks 1) Eggshell thinning effects are dangerous to bird species 2) Small amounts can be toxic and deadly to smaller species and smaller marine life

**Question 3.** A farm has decided to begin using pesticides on their strawberry crops across from the local playground. Some parents are concerned the pesticides will harm their children and ruin their playground. As a scientist, the town council has asked you to present a solution to the problem that will make everyone happy. Consider the priorities of both sides of the arguments and discuss the tradeoffs each side will have to make.

Emerging: The pesticides won't hurt people so the farm should just use them.

Proficient: Research shows that pesticides are not harmful to humans, only the environment. Parents do not need to worry about their kids, but we should use precaution and make sure that other species of animals and plants in the environment are not harmed as a result of using pesticides.

Exceeds: Research has shown that pesticides are not an immediate threat to humans. They could actually benefit

the humans in our environment in that they repel mosquitoes, which can carry diseases such as malaria. They are a threat to bird species though, so some precautions should be made (use of scarecrows, etc.) to make sure that birds stay away from the farm.

**Question 4.** What do you predict will happen to mosquito populations that are subject to pesticides in the future?

Emerging: The species will likely die as a result of continued exposure to the pesticide.

Proficient It is likely that the populations subject to the pesticides that end up surviving will build resistances to the pesticide and therefore thrive.

Exceeds Based on continued exposure to the pesticides and through natural selection, many of the insect populations that do not die will become stronger over time, thus requiring an increase in the use of pesticides which will dramatically affect all other related populations and potentially begin affecting the people who consume the crops.

## Step 5: Share, Review, and Revise

**Step 5: Parts 1 & 2 Share, & Review**
Sharing revised models to work at reaching class consensus model.

Share your initial task with a colleague(s) - use this space below for them to include their feedback:

Collaborative Group Feedback:

It's pretty solid! Solid connections with the bees and potential side effects to elicit student interest

**Step 5: Part 3 Revise** After colleagues have provided their feedback, how might you incorporate that into your assessment? Remember that after you pilot this assessment, actual student responses can be included as a way to further refine your initial task.

| Plan for revising assessment task based on feedback and/or actual student responses: |
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**References**

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