Science Assessment System Through Course Task

Going Viral

Grade Level:
9, 10, 11, 12

Phenomena:
Characteristics of Living Things

Science & Engineering Practices:
Analyzing and interpreting Data
Engaging in Argument from Evidence

Crosscutting Concepts:
Patterns

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in collaboration with teachers from Kentucky schools and districts.

Preparing to implement Through Course Tasks in the Classroom

What is a TCT?

- TCTs are 3-dimensional tasks specifically designed to get evidence of student competency in two dimensions, Science and Engineering Processes (SEPs) and Crosscutting Concepts (CCC), untethered from Performance Expectations (PEs)/standards. Tasks are sense-making experiences.
- Tasks are to be used formatively. The goal is for both students and teachers to understand areas of strength and improvement for the SEP(s) and CCC assessed within the task.

How do I facilitate a Through Course Task (TCT)?

- TCT facilitation is a collaborative process in which teacher teams calibrate understanding of the expectations of the task and refine strategies to be used during task facilitation.

Before the task:

1. Complete the TCT as a learner – compare understanding of task through the lens of success criteria (identified in the task) in order to understand expectations.
   Success criteria include:
   - What is this task designed to get evidence of?
   - What is the task asking the students to do?
   - What might a student response look like?
2. Identify the phenomenon within the task. Consult resources to assure teacher teams have a deep understanding of associated science concepts.
3. Collaborate to generate, review and refine feedback questions during facilitation.
4. Identify potential "trouble spots" and plan for possible misconceptions.

During the task:

5. Collect defensible evidence of each student's competencies in 3-dimensional sense-making for the task.
6. Ask appropriate feedback questions to support student access and engagement with the task in order to elicit accurate evidence of student capacities.

After the task:

7. Reflect on the task as a collaborative team.
8. Review student work samples to identify areas of strength and areas of need.
9. Determine/plan next steps to move 3-D sense making forward through the strengthening of the use of SEPs and CCCs.

Using the materials included in this packet:

- **Task Annotation:**
  - The task annotation is a teacher guide for using the task in the classroom. Additionally, the annotation gives insight into the thinking of developers and the task overall.

    - Each task has science and engineering practices, disciplinary core ideas, and crosscutting concepts designated with both color and text style:
        - **Science and Engineering Practices**
        - *Disciplinary Core Ideas*
        - Crosscutting Concepts
- **Student Task:** The materials to be used by students to complete the TCT.

Going Viral Task Annotation

After analyzing and interpreting data *about characteristics of living and nonliving things*, **make a claim** *about whether the Influenza A virus is living or not* using patterns in the data as evidence **to support your claim**.

Phenomenon within the task

Viruses share many characteristics with living things, but also have some traits that align more closely with nonliving things. Data is provided for students to analyze and compare the characteristics of a typical virus to an assortment of living and nonliving things.

How the phenomenon relates to DCI

This task primarily relates to LS1.A -- Structure and Function and LS1.B -- Growth and Development of Organisms. Specifically, characteristics of life are considered with topics including reproduction, energy use, evolution and adaptation and information storage (genetics).

What information/data will students use within this task?

Students will be provided with a:

- chart comparing characteristics of several living and nonliving organisms, including Influenza A virus
- table with descriptions of each thing listed in the first chart
- simple diagram modeling viral replication
- table with definitions for possibly confusing terms from the diagram

Additionally, students should be able to identify which organisms are living (bacteria, nematode, fruit fly, mouse). Finally, students should know that all living organisms are composed of cells according to cell theory.

Ideas for setting up the task with students

Because this task is designed to elicit student analysis of what makes something living, it is not necessary that students know a list of characteristics of life prior to the task. It would be a good idea to introduce biotic versus abiotic factors in order to prepare students for the task. They should know that abiotic means nonliving and be able to identify some examples of abiotic factors. They should also understand that biotic means living, so all organisms are biotic. It would be helpful for students to know that bacteria are living

organisms. Finally, a discussion of the controversy over whether viruses are living or not could be a helpful introduction, as long as it was done in a way that avoided giving students any preconceived notions or canned answers to the task.

Intent of the Task for Assessment

The primary intent of this task in terms of assessment is looking at the logic behind a student's response in terms of their analysis of the data and successful defense of their claim using evidence from the figures. **Whether they claim viruses are living or not is secondary in importance to the rationale behind their choice.** The task is set up in such a way that, although it may lean towards indicating viruses are not living, there is not a clear-cut answer. Students will need to understand that for any argument there should be a claim, evidence and reasoning. They should understand that evidence is simply facts, data, statistics and their explanation. Students should also understand the amount of evidence that they need to support their claim. (This may vary from topic to topic and class to class.) They should also understand that reasoning must show how the evidence supports the claim. As a possible extension for high achieving students, addressing counterclaims within an argument could be addressed.

Success Criteria

Evidence of Learning Desired based on Progression from Appendices

Analyzing & Interpreting Data

- Analyze data using tools, technologies, and/or models in order to make valid and reliable scientific claims.

Engaging in Argument from Evidence

- Make and defend a claim based on evidence about the natural world that reflects scientific knowledge and student-generated evidence.

Patterns

- Empirical evidence is needed to identify patterns.

Success Criteria

- Students use the resources in a rigorous way; that is, they think critically about all the evidence provided with a lens towards how it would support a specific claim. (Note - evidence of this SEP will be visible in the student product, but is also much more present in the work that leads to a product.)
- Students make a distinct claim regarding whether the influenza A virus is living or not. Furthermore, they use multiple pieces of evidence from the resources provided to support this claim and these pieces of evidence do not contradict each other.
- Students correctly identify commonalities in the data that could be used to defend their claim. Rather than simply discussing

viruses, they draw comparisons in various characteristics between the virus and other living or nonliving things.

Possible Student Responses

Note - the sample responses below are simplified for brevity. Good, complete responses should include multiple pieces of evidence and well-explained reasoning to support the claim. Also, remember that the focus is on the line of thought, not a "correct" claim.

- Viruses are living because they are capable of evolving or adapting, which is a characteristic that only the living things in Emily's table have.
- Viruses are not living because the table and model both show that viruses cannot reproduce on their own.
- Viruses are not living since they are not made of cells like every other living thing shown in Emily's table.
- Viruses are not living since two of their characteristics that are shared with living things are also shared with some of the nonliving things as well.

Other information teacher teams might find useful when preparing to use this task in the TCT process

- Some students demonstrated a misconception that viruses and bacteria were interchangeable terms. As such, their interpretation of the data was flawed. It might be helpful to briefly review/teach the various classifications and fact that viruses are different than bacteria.
- Although students may focus too much on prior knowledge if this is the case, it could be helpful to begin discussing characteristics of living organisms so student will use that lens when looking for patterns.

Extensions and/or other uses after the task is implemented

This task lends itself to introducing the general idea of "characteristics of life" or delving more deeply into specific characteristics such as cellular growth and division, DNA as information storage, homeostasis, levels of biological organization, etc.

Through Course Task – Going Viral

Name:_____

Background: A high school class is studying various reasons that people get sick. The teacher, Mr. Martinez, has assigned a project in which students research common illnesses and give a short presentation. Two students, Emily and Jared, are working together to research the flu virus when they discover that there is some debate about whether viruses are actually living or not. Mr. Martinez suggests that they investigate this topic more deeply and present evidence for other students in the class to decide what they think. Emily made a table comparing the flu virus to several living and nonliving things her class had studied. Jared made a simple diagram modeling how a virus reproduces. Emily and Jared presented the resources and gave their classmates the task below.

Your Task: Assume you are a student in Emily and Jared's class. Carefully analyze and interpret the figures they have provided below, then make a claim about whether the Influenza A virus is living or not and support your claim with evidence and reasoning based on patterns in the data that Emily and Jared provided.

Claim - State your basic claim in a single sentence.

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Evidence & Reasoning - Be sure to use evidence from Figure 1 and Figure 2. Your reasoning should explain why each piece of evidence supports your claim. Focus only on evidence provided; don't use evidence from outside sources or background knowledge.

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Emily & Jared's Resources:

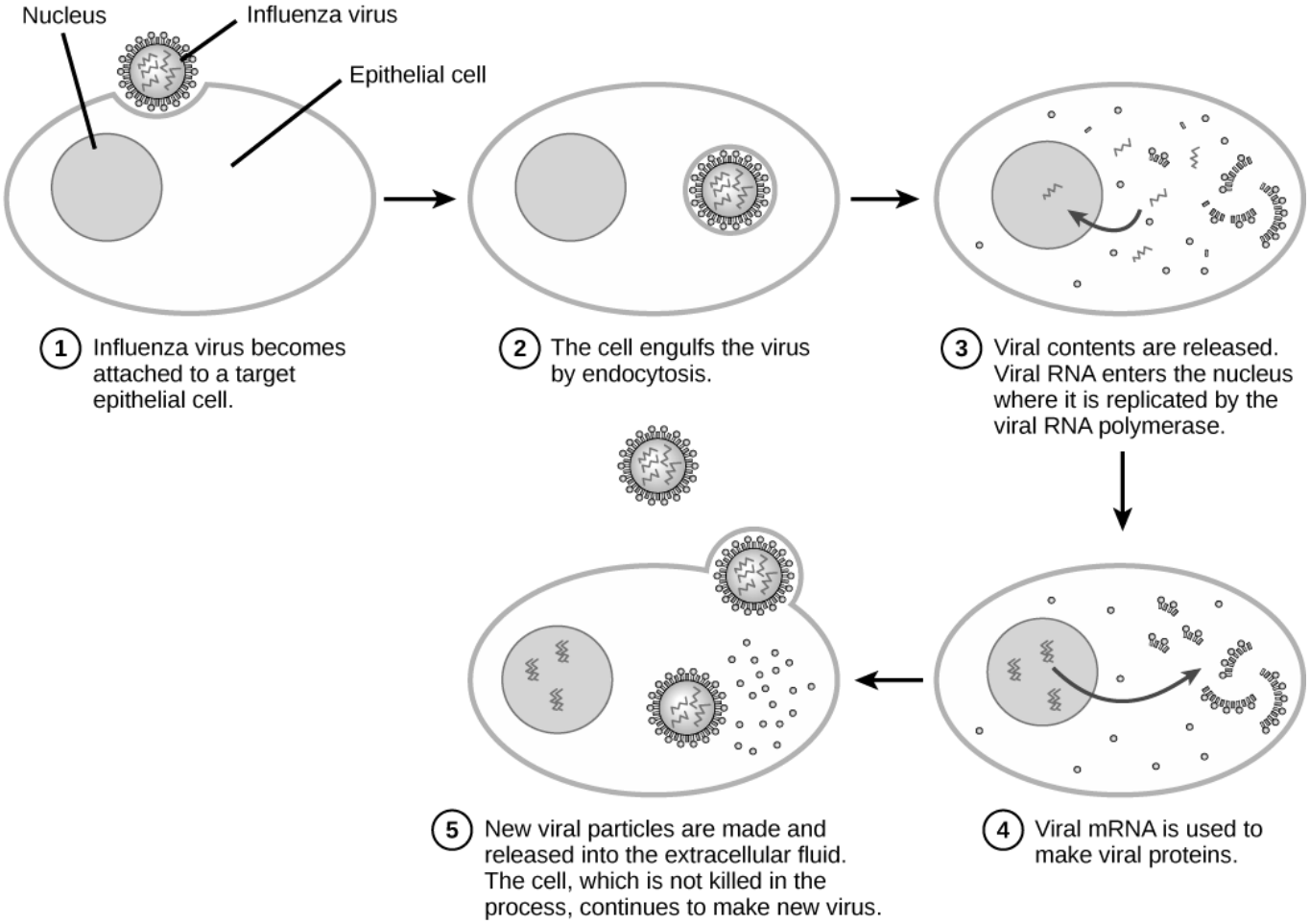
Figure 1 - Emily's Table

	Made of one or more cells	Uses energy	Reproduces independently	Capable of evolving or adapting	Has structures for movement	Stores information	Typical Size
Influenza A Virus	No	**Yes**	No	**Yes**	No	**Yes**	0.00010 mm
Human Ribosome	No	**Yes**	No	No	No	No	0.000027 mm
Streptococcus pyogenes	**Yes**	**Yes**	**Yes**	**Yes**	No	**Yes**	0.0020 mm
Caenorhabditis elegans	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	1.0 mm
Drosophila melanogaster	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	3.2 mm
Cell phone	No	**Yes**	No	No	No	**Yes**	130 mm
Mus musculus	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	220 mm
Bicycle	No	**Yes**	No	No	**Yes**	No	1700 mm

Explanation of Labels from Figure 1

Influenza A	One type of virus that causes the flu in humans
Human ribosome	Part of a typical human cell that builds proteins
Streptococcus pyogenes	Bacteria that causes strep throat
Caenorhabditis elegans	Nematode that lives in the soil
Drosophila melanogaster	Scientific name for a fruit fly
Mus musculus	Scientific name for a house mouse

Figure 2 - Jared's Model



Explanation of Terms from Figure 2

Epithelial cell	For example, cells that line the inside of the mouth in humans
Endocytosis	Process of a cell taking in some material
Viral RNA	Genetic information of a virus
Extracellular Fluid	Environment outside the epithelial cell