Science Assessment System
Through Course Task

Delivering the Dung

Grade Level:
6, 7

Phenomena:
Celestial Navigation by Dung Beetles

Science & Engineering Practices:
Engaging in Argument from Evidence
Obtaining, Evaluating, and Communicating Information

Crosscutting Concepts:
Cause and Effect

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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.

Delivering the Dung Task Annotation

After evaluating information from articles describing how *dung beetles navigate*, students will **construct an argument** as to which article shows a stronger cause and effect relationship of *dung beetle navigation*.

Phenomenon within the task

The phenomenon this TCT task focuses on is the ability of dung beetles to navigate to safety or home after they collect dung. Dung beetles must travel long distances to find a meal. Then they must journey home or to a safe place to enjoy their meal. They may also encounter issues such as lazy dung beetles, who are ready to steal dung from those that did all the work, and predators waiting for a meal of dung beetles. Recent studies have shown that dung beetles use the Milky Way Galaxy as a navigation tool. Taking it one step further, they are actually able to take a snapshot of a constellation in the sky to use as a guide.

How the phenomenon relates to DCI

Students may draw on content knowledge that is connected to:

- LS1.D (Information Processing)—Dung beetles take in information through their senses in order to navigate with their dung.
- LS2.A (Interdependent relationships in ecosystems)—A reason for the behavior in dung beetles can be related to competition for resources within ecosystems as well as the interactions of organisms within that ecosystem (i.e., predation, mutualism, competition).

In addition, students may pull from previous knowledge as they relate the dung beetle behavior to the use of patterns in the sky (ESS1.B as described in grade 5).

What information/data will students use within this task?

Students are presented with a brief background explanation of how a dung beetle gathers food. There are two articles from NPR included in the task that discuss two ideas of how dung beetles navigate their dung balls home or to a safe location. The task also includes an outline of requirements and a graphic organizer to help students arrange their thoughts and ideas about the cause and effect relationship. Besides the given information in the task, students need basic knowledge of the world around them. By this age

students should have experiences with identifying cause/effect relationships, as well as taking information from sources in order to develop an argument.

Ideas for setting up the task with students

A great way to introduce this task is by presenting questions to the class such as:

"When you travel around your town, how do you know your way back home?"
"What methods can you use to navigate from one place to another?"
"How do you prevent getting lost on a trip?"

With technology heavily relied upon in today's world, students do not usually have an understanding of other ways to navigate that do not involve a phone or electronic device. I would even incorporate a road atlas and see if students could locate a specific city using the atlas.

Introduce the topic of dung beetles by showing short video clips of dung beetles in action, such as Kung Fu Dung Beetles & Flight of the Dung Beetle. These are from BBC Earth and can be found on YouTube. Videos such as these are a great attention getter for the task.

It is also always good to consider the individuals in the class that require any modifications. You can choose to allow your students to read the articles, or you read the articles aloud. The population in your room can help you determine what is best for your situation. Students are asked to show that they can make claims, determine cause and effect and produce something showing that they can do this. Whatever measures need to be taken to give all students a fair chance to do so should also be considered.
Using highlighters to highlight cause and effect, data and any key material in each article is a suggestion as well.

Intent of the Task for Assessment

The intent of this task is to elicit evidence that when students are given information, they can evaluate and analyze it, then communicate specific findings about the information. In this specific task, students are analyzing two articles for cause and effect relationships. Furthermore, this task also should provide evidence that students can use the identified cause and effect relationships in order to explain dung beetle behavior. This task also requires students to compare and/or critique two arguments (in the form of articles) on the same topic, analyze the similarities or differences. This SEP is introduced in the 6th grade and by the end of the 8th

grade they should have mastered this practice. Students need to start somewhere with this SEP and this is a great introduction to that.

Components of Tasks and Resources

1. Two articles from NPR:
   Dung Beetles Navigate Poop-Pile Getaways Using Celestial 'Snapshots'
   Why Dung Beetles Dance

Note about permissions from NPR: **K-12 Use: K-12 teachers may make up to 30 copies of transcripts of NPR content for one-time classroom use. NPR's copyright notice must be legible.**

Success Criteria

Evidence of Learning Desired based on Progression from Appendices

Obtaining, Evaluating, and Communicating Information

- Evaluate data, hypotheses and/or conclusions in scientific and technical texts in light of competing information or accounts.

Engaging in Argument from Evidence

- Compare and critique two arguments on the same topic and analyze whether they emphasize similar or different evidence and/or interpretations of facts.

Cause and Effect

- Cause and Effect relationships may be used to predict phenomena in natural or designed systems.

Success Criteria

- *Synthesize the bullets from the appendices (column to the left) in the context of the task into "evidence of success" with the task .*
  Comparison of the two articles identifies similarities and/or differences in the information provided, and the strength of those explanations, using specific language from the article(s).
- Explanation of stronger relationship shows through the identification of the stimulus (the cause) in dung beetle behavior and the results (effect) of that stimulus. Evidence for stronger relationship provided through the use of specific language from the article(s).

Possible Student Responses

- The claims in the article are different. One article suggests that the beetles do a dance on top of a dung ball to get reoriented on their path. The other article takes it further and says that they are actually taking snapshots of the night sky and using those as a navigation tool when on top of the dung ball.
- Both articles explain the steps taken by each research team to test their theory and back up their claim with evidence. Each team conducted an experiment.
- Both articles show a cause and effect relationship. The Dancing article's cause is the dance on the dung ball and the effect is the beetle's ability to navigate to their destination. The Snapshots article's cause is the beetle using snapshots they stored in their memory of the night sky and the effect is their ability to navigate to their destination.
- Both articles show a cause and effect relationship with dung beetle navigation. I feel that the stronger explanation would be the snapshot article. This article did a better job of explaining the steps taken to test their theory and carry out an investigation. The evidence presented was more thorough as well.

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

One thing that I chose to do was give students the option to use highlighters to highlight information they would like to use for each section of the graphic organizer. I tried to do this without interfering in the process. I use this strategy during class so they are familiar with it. Some chose to do so, some did not. This task also took longer than I thought, which is totally fine. I think breaking it up into sections, a day for reading articles, a day for the graphic organizer and a day for the last section. I feel like my students may have felt rushed and therefore did not give as great of quality of work. The students were very interested in the topic so we did decide to watch several short YouTube videos about the dung beetles. The BBC Planet Earth series have a few posted. It also shows the predators of the dung beetles preying on them, so that gives insight as to why the beetles must navigate safely.

This task requires a lot of reading. I did read it to students who perform at a lower level.

Extensions and/or other uses after the task is implemented

This task could be referenced when teaching space systems. When discussing constellations and the night sky, the Snapshots article could be incorporated. Also, this task includes informational text and reading in the content area, cause and effect and claims, which are all taught in the intermediate/middle levels. The task also teaches about predator/prey, survival and habitats and interdependent relationships among organisms.

Through Course Task – Delivering the Dung

A dung beetle is an insect that definitely doesn't mind getting a little dirty when searching for a great meal. Their mission in life is finding that perfect, fresh, glorious pile of poop. Dung beetles are strong fliers who fly around using their super sensitive antennae to get whiffs of manure from herbivores (think cows and elephants). Once they locate an appealing pile, they roll pieces of it into small, manageable balls and begin the daunting task of getting it home safely. Once home, the dung is actually used in a few ways. One way is for food. The beetle's use the leftover plant material in the dung as nutrition. Herbivores aren't great digesters, so there are plant materials that create a smelly liquid that the beetles actually feed upon. Yum! Sometimes, a female will even use the dung to lay her eggs in. In certain situations, a male dung beetle may meet the love of his life at the manure pile. If a bond is formed, the pair will roll their ball together, with the female riding on top of the ball, off into the sunset.

For a dung beetle, it's a dog-eat-dog world. Lurking around every corner is a lazy dung beetle ready to snatch up another beetle's prized pile. Dung beetles also often face predators who like to eat insects. Some predators even hang out around areas where dung piles are. In recent years, researchers in Sweden have been researching ways that dung beetles navigate their dung back home. You may just be a little impressed with their sense of direction!

Task

Both articles about dung beetles explain a cause and effect relationship. The effect in this relationship is a dung beetle navigating to its desired location. The cause of this navigation is explained in each article. Read both of these articles prior to beginning the task.

STEP ONE:

Complete the graphic organizer included to compare the two articles. Determine if the articles have similar or different explanations/evidence of a cause and effect relationship with the dung beetles and their ability to navigate.

STEP TWO:

Using the graphic organizer you completed in step one, explain which article you think shows a stronger explanation of a cause and effect relationship for the dung beetle's navigation.

Article References

Wagner, L. (2016) Dung Beetles Navigate Poop-Pile Getaways Using Celestial 'Snapshots'. *NPR.* Retrieved from http://www.npr.org/sections/thetwo-way/2016/05/13/477963290/dung-beetles-navigate-poop-pile-getaways-using-celestial-snapshots.

Coleman, K. (2012) Why Dung Beetles Dance. *NPR*. Retrieved from http://www.npr.org/sections/thetwo-way/2012/01/19/145463191/why-dung-beetles-dance.

Delivering the Dung Graphic Organizer

Use this graphic organizer to assist you with Step 1 of the task.

Article "Why Dung Beetles Dance"	**Article** "Dung Beetles Navigate Poop-Pile Getaways Using Celestial 'Snapshots'"
What claim do the researchers make that can explain how dung beetles navigate to their destination?	What claim do the researchers make that can explain how dung beetles navigate to their destination?
How do they know this? What evidence do they have to support their claim?	How do they know this? What evidence do they have to support their claim?
Does the evidence the researchers present show a cause and effect relationship between the dung beetle and its navigation? How?	Does the evidence the researchers present show a cause and effect relationship between the dung beetle and its navigation? How?

Step 2

Explain which article you think shows a stronger explanation of a cause and effect relationship for the dung beetle's navigation using claims and evidence from the articles.