Science Assessment System Through Course Task

Germinating Seeds

Grade Level:
2

Phenomena:
Effect of Heat on Seed Germination

Science & Engineering Practices:
Using Mathematics and Computational Thinking
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.

Germinating Seeds Task Annotation

After **using mathematical thinking to analyze** *data related to conditions in which seeds germinate*, **make a claim** *about the role of temperature in seed germination* using the patterns in the data **as evidence to support your claim**.

Overall intent

The overall intent of this task is to elicit evidence that students can make a claim and support the claim using patterns identified in the data through use of mathematical thinking (more/less, faster/slower).

Phenomenon within the task

All seeds require water, air (oxygen) and the appropriate temperature in order to germinate. Seeds will germinate in warm temperatures faster than in colder temperatures.

DCI related to the task

The content within this task supports foundational understanding about plant needs, growth and survival at Grades K, 1 and 2.
In kindergarten, students develop an understanding that plants need water and light to live and grow (K-LS1.C). The emphasis here is on plant growth after sprouting has occurred. This task focuses the attention on the needs of plant seeds rather than a plant after it has sprouted.

At grade 1, the foundation should have been laid to understand that plants have different parts (roots, stem, leaves, etc.) that help them survive and grow (1- LS1.A). Therefore, students should have a basic idea of the function of a seed. The content of this task relates to 1-LS1.B in that seeds are a stage in the life cycle of many plants.

In second grade, students engage in content related to how different plants survive better in different settings because they have varied needs for water, minerals and sunlight (2-LS2.A). In this task, the focus is on the basic needs of a specific type of seed. Students could be encouraged to research other seed types to gain deeper understanding of different needs of different seeds (for germination, for release, for survival, etc.).

Ideas for setting up the task with students

Prior knowledge about what it means for a seed to germinate is needed. Students should understand that the seed splits open and a root is first to appear (in a downward position). Next, a shoot will appear (an upward growth).

Students would benefit from actually participating in the planning and conducting a similar type of investigation then use their own data as part of the task. Regardless, students should engage in a conversation about things that might affect seed germination (beginning to grow). As they read through the task storyline, encourage students to think about what variables are kept the same and what variable is different (temperature). Discussing the setup of the investigation reinforces scientific thinking, which is foundational and will be built upon in future grades.

The task begins with a storyline. It is recommended that students be asked to think about what they know about different seasons (weather conditions/temperatures) since they will need to make sense of seeds being planted in late May. It might not be obvious to students that the narrative in the task takes place in a month prior to May so the temperature is most likely cooler than in May. Students must identify patterns within each column (only seeds near window OR only seeds near a vent), but they should also have experience analyzing data presented in two columns. They may need guidance identifying patterns in data that occur when comparing data between two columns (seeds near window and seeds near heat vent).

It is important that students understand that sunlight is not necessary for most types seeds to germinate. Because both sets of seed are placed inside a closed box, they receive no direct light. Both sets of seeds begin to germinate but this does not mean they will survive due to the fact that sunlight is need for most plants to grow. Students should be encouraged to think about where most seeds are sown – in the ground, in the dark.

Intent of the Task for Assessment

This task was designed to determine if students could make and support their claim with evidence based on patterns in the data they identify using mathematical thinking. Analyzing the data is scaffolded to support students in identifying patterns using mathematical thinking. Several guiding questions are provided that are designed to encourage students to use counting as one means of making comparison between the two sets of seed. It is suggested that you consider the ability level of your students when deciding how to engage students in the analysis of the data. Whole or small group or one on one analysis of the data will be dependent on your students' needs. Whatever the means you choose, you will be able to gather evidence of student ability to use

mathematical thinking when looking for patterns in the data. Consider creating a collection tool with your partner to use as you observe students engaging in this part of the task.

Students at grade 2 are expected to be able to use counting and numbers to identify and describe patterns in the natural and designed world (Appendix F – Mathematical Thinking). This task provides students with an opportunity to engage in this practice using data presented in a chart representing changes in the seeds over a week long period. Students will use counting (up to 3) to make comparisons (more/less, faster/slower) when analyzing the given data. The data provided shows changes in two different clear plastic bags of seeds (assembled identically) that were placed in different parts of a room to receive different amounts of heat (near a drafty, cooler window and on a heat vent).

Specific evidence from the data is used to support the claim or explain why the claim is true by describing a pattern using mathematical thinking. It is important to note that seeds begin to germinate in both sets, but on different days. Those seeds exposed to more heat germinated quicker and also sprouted. Those in the cooler area began to germinate but never sprouted.

Success Criteria

Evidence of Learning Desired based on Progression from Appendices

Using Mathematical and Computational Thinking:

- Using counting in numbers to identify and describe patterns in the natural world.

Engaging in Argument from Evidence

- Construct an argument with evidence to support a claim

Patterns

- Patterns in the natural world can be observed and used as evidence.

Success Criteria

- Students make a claim about the effect of heat on seed germination based on the patterns they identify in the data.
- Students support their claim by describing patterns they identify by counting outcomes in order to make comparisons between the 2 test conditions (warmer/cooler).

Possible Student Responses

Possible Claims and Evidence

C- "When seed were placed near the heat vent, more seeds germinated and they germinated in few days or faster."
E- 2 of the 3 seeds in the box by the heat vent began to germinate on Day 2 but none of the seed near the drafty window germinated. More seeds germinated if they were near the heat vent.
On day 3 none of the seeds near the window germinated but the same 2 seeds near the neat vent continued to sprout.

C- "All the seeds didn't behave the same way. The seeds in the bag near the cold window took longer to germinate than those near the heat vent."
E- When I look at the seeds in the baggie near the heat vent, I see that 2 of the 3 seeds germinated. They began to germinate on day 3 and continued to grow throughout the week. Only one seed in baggie A began to germinate and it took longer. No other seeds in baggie A changed.

C- "More seeds germinate faster when they got more heat based on what I saw in Sam's data."
E- "The seeds that got more heat started to germinate on the third day and the others did not start germinating until day 5. The seeds in near the window germinated slower. Less of them germinated.

Extensions and/or other uses after the task is implemented

- Encourage students to design further investigations to determine if Sam's data is consistent with results from other seed investigations.
- Have students investigate the effects of water on seed germination.
- Research when certain seeds should be sown by reading seed packages.
- Have students plan a garden. They will need to research when to plant certain types of seeds in KY. They could also compare when a specific type of plant is sown in KY to when it is planted in another state.

Through Course Task – Germinating Seeds

Sam and his classmates are investigating seeds and things that affect seed germination. He learns that many kinds of seeds have similar needs in order to germinate (start growing).

Sam shares with his mother what he is learning in class. Mom says she is glad that Sam is learning about seeds. He will be able to help plant the watermelon seeds in late **May**. Sam asks why they can't plant them now. His mom says that they need to wait until the ground gets warmer to plant the seeds. She suggests that they conduct their own investigation in order to get more information.

Mom and Sam get two shoe boxes with lids. They place three seeds and a damp paper towel into two baggies. Next, they place a baggie in each of the shoe boxes. Mom suggests that Sam place one box near the drafty window in the family room where it is cooler and the other near the heat vent where it is warmer.

The data Sam and his mother collected over one week is attached.

Carefully read Sam's Chart. What do you notice about the seeds in each baggie on the different days? Record your observations below.

	Seeds in Baggie	Your Observations (You should use words and numbers)
Day 1	A	
	B	
Day 3	A	
	B	
Day 5	A	
	B	
Day 7	A	
	B	

Other questions to think about when comparing the seeds placed near the window to the seeds near the heat vent:

- On which day(s) were your seed observations similar? What was similar about the seeds?

- When do the seed in the baggies A & B begin to show a difference? What difference(s) did you notice?

- Now only look only at the seeds in Baggie A. How do the seeds change over time? Describe the pattern you notice.

- Look at the seeds in Baggie B over time. How do these seeds change during the week? Describe the pattern you notice.

Sam's Seed Germination Data

Bag A (by window)	Bag B (by heat vent)
	
	
	
	

Seed Germination Student Task

1. Based on your observations, make a claim about how temperature affects seed germination.

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2. Consider the patterns you identified in the data. Describe the pattern or patterns in the data that support your claim.

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