Science Assessment System Through Course Task

Seed Dispersal

Grade Level:
2
Phenomena:
Seed structures support dispersal

Science & Engineering Practices:
Analyzing and interpreting Data
Constructing Explanations and Designing Solutions

Crosscutting Concepts:
Cause and Effect
Structure and Function

Designed and revised by Kentucky Department of Education staff
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.

Seed Dispersal Task Annotation

After **analyzing data** related to the *relationship between seed structure and dispersal methods*, **provide possible explanations** *for how seeds get to new locations* using cause and effect (structure/function) reasoning.

Overall intent

The overall intent of this task is to elicit evidence of student ability to use cause and effect (structure/function) reasoning in order to explain how seed structures/characteristics are related to various types of seed dispersal and to support their explanation using evidence from provided data (diagram and chart). The distinction between cause and effect or structure and function in this instance is not critical to obtaining useful evidence of student understanding in reasoning. The task prompts students to specifically consider the structure of the seeds. It is the seed's structure that causes the function (effect).

Phenomenon within the task

All plants reproduce, and many reproduce by making seeds (not all). Plants often depend on wind, water and animals to carry their seeds to aid in reproduction. Seed structure plays an important role in the location of the new generation of plant germination.

How the phenomenon relates to DCI, if applicable

Wind, water and animals are all helpful in dispersing seeds. This is important so that plants will have enough space, sunlight, water and nutrients to grow. Lightweight seeds are blown by the wind to places far from the parent plant. Seeds with hooks or sticky seeds get stuck to hair, fur, clothing and get moved to new places before they fall off. Running water also helps move seeds to new places. Animals ingest fruit that contains seeds and deposit them after they pass through the digestive tract. The context for this task reinforces the idea that plants have external parts that help them survive, grow and produce more plants (LS1.A at grade 1). It is also directly related to LS2.A at grade 2 which states that plants often depend on animals for pollination or to move their seed around.

What information/data will students use within this task?

Essential background information:

- understand structure and function of seeds (variety of seed structures/how seeds are protected by fruit)

- basic understanding of seed dispersal
- experience reading diagrams - small grain detail are important in the corresponding diagram (i.e. birds flying, dog in one yard, info related to normal wind direction)
- ability to make comparisons
- experience providing explanations based on scientific reasoning (very basic scientific explanations at this grade)
- prior experience identifying cause and effect relationships

Ideas for setting up the task with students

Prior to engagement in this task, teachers could provide experiences for students so that they would have some information on how a seed moves away from the parent plant to survive, such as the optional card sort. Students worked in small groups to sort seed picture cards according to the way that particular seed may travel in the natural world. Students were given multiple copies of the seed pictures because some seeds fit in more than one category. After working in groups, students came together whole group to create a 3-column organizer to record findings. Misconceptions related to seed structure and dispersal methods were clarified at this point through group discussion and research. One misconception was that birds eat sunflower seeds that are then deposited through their droppings. Although a sunflower seed could very likely be dropped from a bird's beak, if it were to be eaten by the bird, the 'poop' would contain the remains of the hull and any fiber left from the embryo. The carbohydrates and fat in the cotyledon would have been digested for energy and the embryo certainly crushed. The same is not true for blackberries. Their seeds can survive through the digestive system.

It is recommended that students are provided opportunities to observe real seeds. Students should be made aware that all seeds may not take root even though they travel to a new location. Seed structure does not ensure seed germination or plant growth. Not all seeds will behave the same under different environmental conditions.

Even though the pictures provided will help students visualize different seed structures, it would benefit students to go on a "**Sock Walk**" or collect seeds from previously "Sock Walks" to observe seeds from the real world.

> **Sock Walk Activity**
>
> Students are asked to bring socks from home. Athletic tube socks work best. It's a good idea to have extra socks for students who do not have or forget to bring socks. Students will put a sock on over their shoe and go on a nature walk around the schoolyard or through a

nature park if available. Guide students to walk through weeds and as many different type plants as possible. When students have several seeds stuck to their socks, return to the classroom.

Students will work in small groups to observe the various types of seeds they have collected on their socks. Using the "Seed Sort" and "Seed Chart" they have been given, discuss structures of the seeds they have collected and possible method of dispersal. Students might share stories of real world seed dispersal (pet animals coming home with cockle burrs under their fur, finding a watermelon growing by their mailbox, etc.)

Intent of the Task for Assessment

This task was designed to elicit evidence of student ability explain how specific plant types were transported to areas through various dispersal methods and support their explanation with evidence based on analysis of seed structures/characteristics and seed dispersal methods, as well as evidence they find as they analyze a scene diagram. The diagram includes a variety of plants growing near two homes and in the field between the homes as well as animals that are found in the neighborhood. Specific evidence from the diagram is used to support the claim. This activity does not address every seed type or dispersal method.

Success Criteria

Evidence of Learning Desired based on Progression from Appendices

Analyzing and Interpreting Data

- Use observations to describe patterns or relationships in the natural world in order to answer scientific questions.

Constructing Explanations and Designing Solutions

- Use information from observations (first-hand and from media) to construct an evidence-based account for natural phenomena.

Cause and Effect:

- Events have causes that generate observable patterns**.**

Structure/Function:

- The shape of structures of natural objects are related to their functions.

Success Criteria

Students construct an explanation for finding different plants in various areas and support their explanation based on:

- analysis of information provided in a diagram and a chart,

- relationships between seed structure/characteristics and seed dispersal,
- cause and effect reasoning

Possible Student Responses

- "Max's yard has a dog who plays in the field by the house. The chart tells me that Cocklebur seeds have spikes. The spikes cause them to stick to the dog's fur and fall off when the dogs plays in Max's yard. Then the seed grows into a new plant in Max's yard."
- "The neighborhood diagram shows birds flying around. Birds eat bright colored fruit. The chart tells that berries are brightly colored and that animals and humans eat them. I think a bird ate some seeds and as they flew over Max's yard, bird droppings landed in the yard which led to a blackberry plant growing from a seed deposited in the bird droppings."
- "The neighborhood diagram shows birds flying around. Birds eat sunflower seeds. As the birds flew over Teresa's yard, birds dropped sunflower seeds in the yard which led to sunflowers growing.
- "Teresa's yard is covered in dandelions which are very light seeds and can travel by wind. The neighborhood diagram shows the wind normally blows in the direction of Teresa's yard. The field has dandelions growing in it already. Because the dandelion seed is light and has feather-like parts it can travel in the wind. The wind can carry it anywhere like in Teresa's yard."
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Extensions and/or other uses after the task is implemented

- Teachers could have students make a chart of the conditions and factors in their own yards, catalogue types of plants growing and consider possible reasons those plants are growing in their yard.
- To make connections to writing standards, W2.5 and W2.6, students can write and illustrate a story about seeds and their dispersal using either a "writing to inform" or "writing to entertain" format.
- Students could plant some of the seeds they collected on their sock walk and observe the growth process over a period of weeks.

Image Attributions:

A) Optional Sorting Activity
   a. Cocklebur: "Asteraceae" by Dinesh Valke is licensed under Creative Commons Attribution-Share Alike 2.0 Generic license

b. Berries: "Burnham Beeches" by James Petts is licensed under Creative Commons Attribution-Share Alike 2.0 Generic license
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h. Walnuts: Licensed under Common Domain CCO
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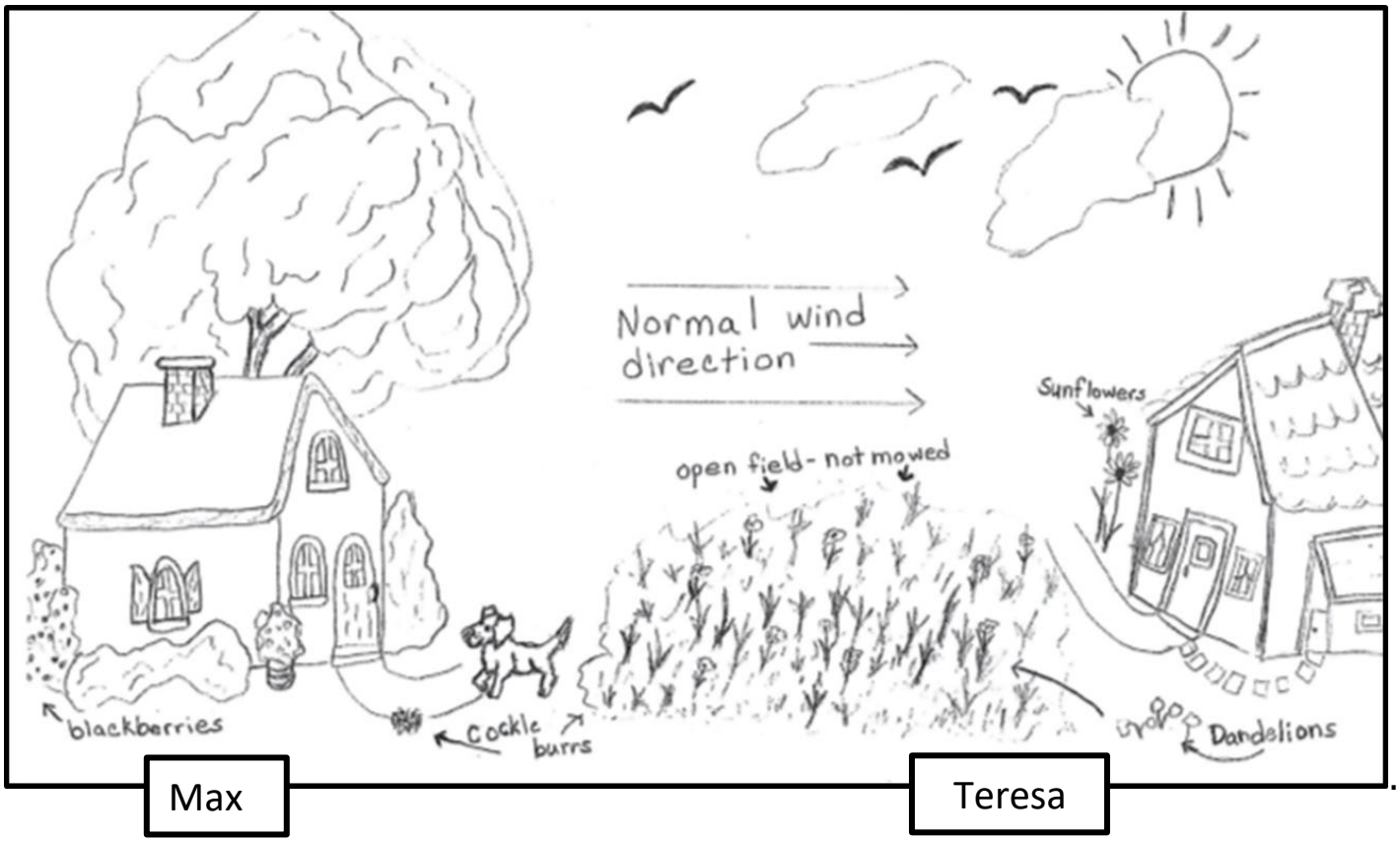
B) Student Task
a. Sunflower Seeds is licensed under Common Domain CCO
b. Dandelion is licensed under Common Domain CCO

Through Course Task – Seed Dispersal

Name_____

Max and Teresa are neighbors. They live on the same street. There is an open area between their homes that is never mowed. Both Max and Teresa are puzzled by the types of plants that grow in their yards each summer. They question where these plants come from since they did not plant them.

Max has cockleburs and blackberry plants growing in his yard. Teresa has dandelions and sunflowers growing in her yard. Carefully observe the diagram of the neighborhood and record your observations.



Observations things in **Max's yard**	Observations of things in **Teresa's yard**
Other things you notice in the diagram:	

Both neighbors are curious about the differences in the plants they have growing in their yards. They know that most plants begin as seeds so they do research to learn more about the structure of different types of seeds.

Max locates a chart on seeds and shares it with Teresa. Together they learn that seeds are moved from one place to another in different ways.

***Read carefully the information in each column on the chart found below.**

Seed Types

Seed Type	Method of Dispersal	Structure	Other Information
Blackberries 	**Animals**	Round, surrounded by small clumps of fruit that protect the seed	● Begin as bright red ● Food for many different animals and humans ● Grow on bushes making them easy to get to
Cockle Burrs 	**Animals**	Needle-like covering that protects the seeds	● Found growing wild ● Stick to clothing or fur ● Hard to remove
Sunflowers 	**Wind** **Animals**	Flat protective shell covering seed	 ● Many can be found on a colorful flower head ● Food for families and animals
Dandelions 	**Wind** **Water**	Featherlike attachment to each seed	● Light ● White ● Many seeds on one plant

Based on **all** the information in the chart, compare the seeds.

List some ways that the seeds are the **same**? What do they have in common?	In what way or ways are the seeds **different**?

Now, think about the structures of the seeds. How does their structure affect how they are dispersed?

Circle two different seeds to compare based on their structure and how the structure affects how they get to different places.

Blackberry Cocklebur Sunflower Seed Dandelion

How are their seed structures **alike**?_____

_____

How are they **different**? _____

_____

How does their **structure** affect how they are dispersed?_____

_____

Seed Dispersal Task

Name _____ Date _____

Choose one plant found in Max's yard and one found growing in Teresa's yard.

Explain why the plant you chose can be found growing in Teresa's and Max's yard even though he did not plant it. Use information from the **Seed chart** and the **Neighborhood Diagram** to support your explanation. Be sure to talk about the seed structure and any other characteristic that supports your answer.

Max's Yard	Teresa's Yard
The plant I chose is	The plant I chose is
The reason this plant is growing in Max's yard and not in Teresa's yard is I know this because	The reason this plant is growing in Teresa's yard and not in Max's is I know this because

Sorting Seeds by Structures

1) **Cut out pictures of seeds.**
2) **Sort seeds based on their seed structure which aids in their ability to travel.**
3) **Glue the seeds under the correct heading (some seeds may fit in more than one column).**

Wind	Water	Animals/Humans

Optional neighborhood graphic for use in task