3rd Grade Scientific Inquiry Performance Task DRAFT
Seed Germination

Science Standards:

3.1 **Structure and Function:** Living and non-living things interact with energy and forces.

**3.2L.1** Compare and contrast the life cycles of plants and animals.

3.3 **Scientific Inquiry:** Scientific inquiry is a process used to explore the natural world using evidence from observations and investigations.

**3.3S.1** Plan a simple investigation based on a testable question, match measuring tools to their uses, and collect and record data from a scientific investigation.

**3.3S.2** Use the data collected from a scientific investigation to explain the results and draw conclusions.

**3.3S.3** Explain why when a scientific investigation is repeated, similar results are expected.

Learning Targets:

๏ I can explain that plants need sun to germinate and grow.

Language Target:

๏ I can write multi-step directions in order to design an investigation.

Language Vocabulary:

**Transition words:** First, Next, Last, Then, After that, In the end, Afterwards, Finally, In the meantime, Initially, In addition ...

Sentence Frames (examples):

**Prediction/Hypothesis:**
If the seed is put in the __________, then it will germinate and grow more.

**Procedures:**

_________ get a ziplock bag.

_________ fold a paper towel and get it wet.
_________ put the towel in the ziplock bag.
_________ get a lima bean and place it in the bag.
_________ put the bag in the window.

Results:
The seed in the light ___________________________.

Literature Connection:
What is a Scientist? by Barbara Lehn
Magic School Bus Plants Seeds: A Book About How Living Things Grow, by Patricia Relf
The Tiny Seed, by Eric Carle

Key Vocabulary:
Germinate – to begin to grow or develop, sprout
Root - the part of a plant that grows downward, usually into the soil, holds it in place, absorbs water and mineral foods from the soil, and often stores food material.
Seed - the part of a plant from which a flower, vegetable, or other plant grows
Seed coat - the outer covering of a seed
Stem - the main part of a tree, shrub, or other plant, usually above the ground that supports the branches

Materials:
Lima beans, plastic sandwich bags (two per student), paper towels, Scientific Inquiry Work Sample Template

Teacher Background:
A seed is an embryo that has all it needs to grow into a mature plant. Seed plants, like lima bean plants, begin life as embryonic plants inside the protective covering of a seed.

Germination, the sprouting of a seed, will usually begin when the embryo is exposed to water. The seed will swell and eventually the seed coat will burst, setting germination into motion. In the earliest phase the embryo will use the endosperm as its food source. Later, the seed will grow its first leaves and after approximately five days a lima bean plant will emerge from the “soil” and it will begin photosynthesizing, allowing the growing seedling to utilize its new food source, the Sun. As the young plant develops, stems and roots grow. The plant reaches maturity when it is able to reproduce by creating new seeds.
**Micropyle**—the small pore in a seed that allows water absorption

**Hilum**—the scar on a seed coat at the location where it was attached to the plant’s stalk during development

**Seed coat (testa)**—the outer, protective skin covering the seed

**Embryo**—developing plant that is inside the seed

**Cotyledon**—part of the seed that contains stored food used for initial growth

**Scientific Inquiry Defined:**

There are four components to the inquiry cycle, and it is important that students see this cycle as a process for “doing” science.

1. Forming a Question or Hypothesis
2. Designing an Investigation
3. Collecting and Presenting Data
4. Analyzing and Interpreting Results

During initial student experiences, the individual parts of the inquiry cycle need to be **explicitly** taught and modeled by the teacher. As students gain experience, teachers will gradually release control and move to a model of more learner self-direction.

**Forming a Question or Hypothesis:**

1. Ask students to privately create a list of things they know about what plants. Then have them share their lists with a partner or small group. Document key ideas on a KWL chart as a class.
2. Read “What do Illustrators Do?” and other books about plants. Ask them to be thinking of questions they have about plants. Add these questions to the KWL chart.
3. Create a Pictorial Input Chart while telling a story about the germination of seeds.
4. As students are reading (enter any plant book) and other books about plants, ask them to be thinking of questions they have about plants (continue to add those questions to the KWL chart). Some examples may include:
   *"Does it matter how much water a plant gets?"
   *"Can a plant grow in the dark?"
   *"Does the amount of sunlight affect how quickly a plant germinates?"

5. Have students work in pairs to complete a Frayer Model about the concept of germinate.

6. Select one question from the KWL Chart to investigate as a class. For example, "How does the amount of sunlight affect the germination of a seed?"

7. When students are answering the second question of the “Forming” section, encourage them to provide prior knowledge, preliminary observations, or personal interest and experience that is relevant to the investigation.

8. When stating a hypothesis, students should make sure that there is a connection between the question being investigated and their prediction. Furthermore, students should explain the reasoning behind their prediction.

**Designing an Investigation:**

9. Revisit the question, “How does the amount of sunlight affect the germination of a seed?” Ask students to think privately about how they could test this question. Then have them share their ideas with a partner or small group.

10. Move these small group discussion to a class consensus. For example, each student will grow lima beans near the window and another set in the dark.

11. As scientists, it will be important for us to see what is happening with our beans each day. One way to grow a plant without dirt is to place the seeds into a plastic bag. To keep the beans moist, we will place a wet paper towel in to each bag. Each student should label her/his two bags. Tape one to the outside window, and place the other bag in a closet.

12. Prior to students writing the procedures for the investigation on their Scientific Inquiry Template, engage students in one of the following activities or something similar to emphasize the importance of writing clear directions that other scientists can replicate.
   - Tell students to write directions for a common task such as brushing teeth. Have students then act out the directions word for word. Students then can omit, add or revise directions. An example lesson can be seen at this link: [http://etc.usf.edu/lp/jones/jones06.html](http://etc.usf.edu/lp/jones/jones06.html)
   - Have students work in pairs and sit back to back. Both partners will draw a simple picture. Then partners will take turns explaining their picture without naming specific elements. For example, “Draw a circle in the middle of the paper. Draw a line from the bottom of the circle to the bottom of the page.” Later, when students check their art against the original, they will see the importance of clear directions.

13. Each student will conduct the investigation in accordance to the procedure they have written in the “Designing” section.

**Collecting and Presenting Data:**

14. Students will use the “Collecting” section to draw a picture of their two seeds every day. Encourage them to label each picture with important information such as light or dark, measurements for plant growth etc.

**Analyzing and Interpreting Results:**

15. Have students read their answers from the “Forming” section, paying close attention to their original question and hypothesis.

16. With that in mind, did their results support their hypothesis? Why or why not? Students should refer to specific information from their investigation to support their answer. For example, My results supported my hypothesis because the seed on the window grew 3 cm, and the one in the dark only grew 1 cm. I think this happened because ...

17. Students will struggle when their results do not support their hypothesis, often wanting to erase and rewrite their hypothesis. It will be crucial for the teacher to create a safe learning community where reluctant learners feel safe to take risks and value mistakes as part of the learning process.

18. It is important that students see inquiry as a cycle. To that end, students should be thinking about one additional question they would like to explore on this topic. Encourage students to connect this new question to the original KWL Chart and/or learning from the investigation.
causes
definition
GERMINATION
pictures
effects