



Grade 5, Unit 1: Traits and Variation Lesson Plans

Unit Driving Questions:

1. How are traits passed from one generation to the next?
2. How can a change in the environment affect the development of traits in a population of organisms?

Unit Standard(s):

- 5.L3U1.9 Obtain, evaluate, and communicate information about patterns between the offspring of plants, and the offspring of animals (including humans); construct an explanation of how genetic information is passed from one generation to the next.
- 5.L3U1.10 Construct an explanation based on evidence that the changes in an environment can affect the development of the traits in a population of organisms.

Pre-Lesson Set-up Lesson Plan: 2 weeks prior to Engage (30 minutes)

Materials: Teacher Slide Deck, Unit 1 Traits and Variation Student Handout # 1, seeds and containers to plant seeds, soil, magnifying glasses, area to keep plants. You will need Student Handout #2 when traits are clearly evident.

With Wisconsin Fast Plants™:

Growth and Development Kit Components = 1 pack of 200 Standard Wisconsin Fast Plants™ Seeds
• 1 oz pelleted fertilizer • 2 watering trays • 2 watering mats • wicks (package of 70) • 1 packet anti-algal square (2 squares per packet) • 8 watering pipettes • 1 L potting soil • 1 package of dried bees • our 4-cell quads • 16 support stakes • 16 support rings • Growing instructions

If you have Wisconsin Fast Plants, watching the video links is very helpful. If you explore the website, Wisconsin Fast Plants has many informative videos that will help with the growing process. [Wisconsin Fast Plants](#)

Without Wisconsin Fast Plants™:

Use garden seeds (fast growing, seasonally appropriate) OR tepary bean seeds (3 or more different colored bean seeds), paper plates (to place seeds on for pre-planting observations), soil, containers to plant seeds (great upcycling opportunity - have students bring in recycled food containers, cut plastic water bottles, etc), post its, Traits and Variation Student Handout #1. (Save Handout #2 when different traits are clearly visible - about 7-10 days), magnifying glasses, area to put plants, Teacher Slide Deck.

Please note, the fast plants grow much faster if **fairly close to the light** in the Grow Lab. If the plants are not warm enough, the growth takes a much longer time. Traits are visible around 7-10 days, but it takes much longer for the plants to flower. [Recommended Lighting for Fast Plants: High vs Low Intensity](#)

Also, if you just have the **quads float in the water directly on the watering mat or even directly on the water surface** - **NOT** on the lids - the plant grows MUCH MORE QUICKLY!



Instead of this set up, like in the video:

Do not use the lid - just put a watering mat directly in the water with quads on top. Teachers have also just floated the quads directly in the water.

If you do not have time to plant seeds, you can modify lessons and choose plants that are around your school. Look for the same species of plant found in different environmental conditions, i.e. in full sun and in shade, or plants that get different amounts of water.

Things to Consider: Post Driving ?s, need area to put plants, Science Groups often work best with 3 or 4 students, for the next 2 weeks students need to record observations and water plants at some point during the day.

WISCONSIN FAST PLANTS GENERAL TIMELINE AT A GLANCE FOR PLANNING PURPOSES:

- 2 weeks prior to beginning Unit #1 lessons, plant seeds. Students need daily time to water plants and make observations.
- Days 0-2 - Germination. Students begin recording growth and development observations in lower table on Student Handout #1.
- Days 3-12 - Plants grow & develop. When plant traits are clearly visible, students move to Handout #2. Begin teaching Unit #1 starting with Engage.
- Days 13-15 - Plants flower (Teacher decides to assemble Bee Sticks ahead of time or have students assemble Bee Sticks). When flowers on more than two Fast Plants are open, your students should begin to pollinate their flowers and continue pollinating every day or two among all open flowers for up to 7 days.
- Days 15-17 - Students pollinate flowers.
- Days 18-35 - Teacher is now into Unit 3 - Students can continue to monitor plants. After students have pollinated plants, if the teacher has time and wishes to pursue more lessons, go to https://www.fastplants.org/pdf/activities/WFP_growth-development-06web.pdf. Scroll down to Days 18-35 Flowering and Development.

Lesson: Share Driving ?s with Students. It is very helpful to post Driving ?s on or near the WonderWall. Pass out seeds to Student Groups with Student Handout #1. Make sure that students know the seeds come from the same kind (species) of plant. You will want to emphasize this more than once. Have students use magnifying glasses and make observations of their seeds, drawing and labeling what they see on the Traits and Variation Student Handout #1. They are also to draw what they think the mature plant will look like and predict if the mature plants that emerge will look the same or different from each other.

Go to Your Corner:

1. Discuss with students how the seeds clearly look different from each other even though they came from the same species of plant. Have students put their Heads Together in their groups and share their predictions on if the mature plants will all look the same or different when they mature.
2. Designate 2 corners in the room: one will be the "ALL THE MATURE PLANTS WILL LOOK THE SAME" corner, the other the "ALL THE MATURE PLANTS WILL NOT LOOK THE SAME" corner. Have students go stand in the corner that matches their prediction.
3. Get students to think about how they could test their predictions. They should conclude that they need to plant the seeds to see the features of the plants that emerge.

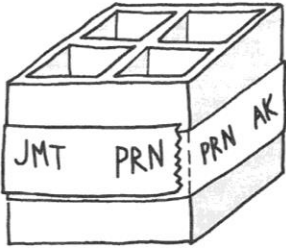
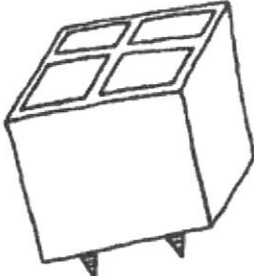
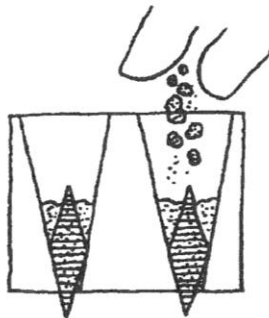
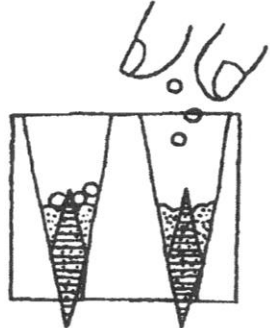
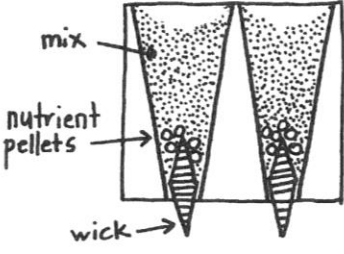
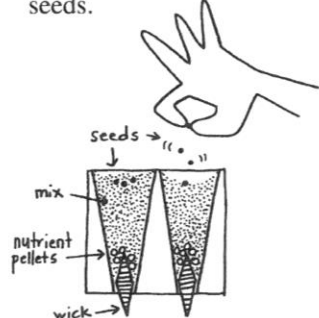
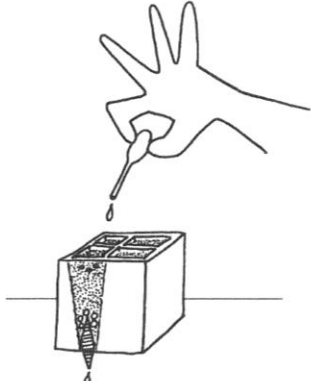
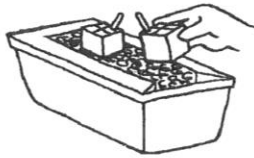
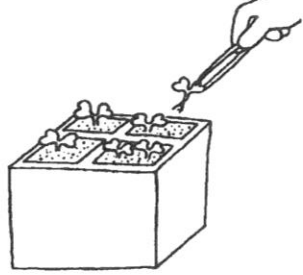
Planting Seeds: Following your Seed Supplier's instructions, have students plant their seeds then place them in the area you designate. Students make observations on Student Handout #1 UNTIL plant traits begin to emerge. When the traits show, students need Student Handout #2. Ensure that students understand that they must:

- A. Keep watering their plants and recording their observations.

B. Draw (with labels) what they observe. On Student Handout #1 there is space to do 4 days of observations. Decide the best time of day for students to record their observations. **Give out Student Handout #2 when traits are clearly evident.**

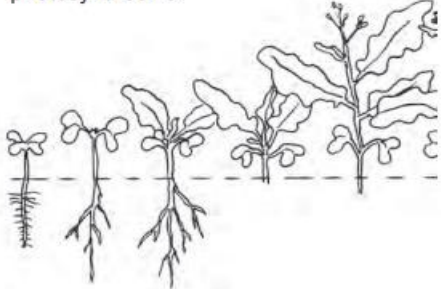


Fast Plants Quad Planting Protocol

<p>1. Label each cell as your teacher directs so that every student will know which plant is hers or his.</p> 	<p>2. Drop one wet wick into each cell so that the tip extends 2 cm out of the hole in the bottom.</p> 	<p>3. Fill each cell halfway with slightly moistened planting mix.</p> 
<p>4. Add 3 pellets of fertilizer to each cell.</p> 	<p>5. Fill each cell nearly to the top with planting mix.</p> 	<p>6. Drop 3 seeds on top of the planting mix.</p> <ul style="list-style-type: none"> Fill to the top of each cell with mix to just cover the seeds. 
<p>7. Water very gently with a pipette or dropper.</p>  <p>Water gently until water begins to drip from each wick.</p>	<p>8. Put your group's quad on a water reservoir as your teacher directs.</p> <ul style="list-style-type: none"> The class quads (on their reservoirs) will all be placed under fluorescent lights that are on 24 hours/day and kept 5–10 cm from the top of the plants. 	<p>9. Use tweezers or scissors to thin to one plant per cell when your plants have just pushed through the planting mix.</p> 



Days 0 – 2 Germination starts with the structure of a seed and goes through the first days of the life of a new plant. Germination is the beginning of growth of a plant from the seed, which contains the embryo. The seed swells, a root and shoot emerge, and cotyledons (first leaves) begin to photosynthesize.



Days 3 – 12 Growth and Development

follows Wisconsin Fast Plants from the seedling stage through to flowering. As plants increase in size (up to 20 cm) and develop into mature plants, individual differences can be observed. The plant height, number of leaves, number of hairs on leaf margins, and number of flower buds are all examples of measurable traits that can be observed, recorded, and analyzed to learn about individual plant development and diversity among individuals in a population.



Days 13 – 15

Flowering is the time when the flower structures can be observed directly and their functions are introduced. Learning about flower anatomy and each structure's purpose is important for preparing students to understand and conduct pollination.

Engage: Lesson Plan (10 minutes)

Materials: Teacher Slide Deck, WonderWall area ready, student plants, Teacher Created Chart with students' names from Probe listed so students can place their name on a post-it underneath the student's name they believe is correct, post-its, Probe worksheet or just use Slide Deck (slide 6)

Things to Consider: Students still need a time to record plant observations during week.

Probe: Students look at a photo of a jack rabbit and read several students' opinions on how the jack rabbit got its long ears. After deciding which student they agree with, each student in the class writes their name on a post-it and places their post-it underneath the name of the student from the Probe that they agree with. Teacher leads class discussion on students' ideas and thoughts.

Explore 1: Lesson Plan (15 minutes)

Materials: seedlings, Traits and Variation Student Handout #2, magnifying glasses, Teacher Slide Deck

Things to Consider: Students still need a time each day where they can record plant observations.

Lesson: By now the Fast Plants should be exhibiting a clear variation of traits. Have your students get their plants and discuss the changes and the traits that they observed emerge over the 2 weeks. Remind them of Go to Your Corner and have them confirm or adjust their predictions about the mature plants all looking the same or different. Lead the class in a discussion as to why they think having a variety of traits is a good thing for a species. You may have to guide them to think about adapting to a changing environment over time. Show students the vocabulary word 'variation' and discuss its meaning (slide 10.)

Explain: Lesson Plan (30 minutes)

Materials: Teacher Slide Deck, Traits and Variation Vocabulary Cards, Unit 1 Traits and Variation Student Handout #2

Things to Consider: Students still need a time each day where they can record plant observations.

Lesson: Remind your students that all the plants are the same species, but that there is considerable variation of traits. Ask your students how they think scientists determine what organisms belong to which species. Students will likely bring up that scientists would look for how the organisms looked similar. Introduce the vocabulary cards "species" and "traits." Explain that scientists look for similar traits in species. Traits are characteristics like fur color, feathers, scales, 2 legs, fins, branches, flowers, leaves, etc. Given 2 images in the Teacher Slide Deck (slide 13) of a skunk and a bee on a flower, have the students practice with a partner listing traits they see. Students then practice looking at photos of animals (slide 15-20) and, based on their traits, determine if the images are all of the same species or not. Students look at given images, put their Heads Together in their group and give a Thumbs Up if they think the images are all of the same species, or a Thumbs Down if they think the images are not of the same species. Students must explain their thinking and point out what traits the organism has that helped them decide to give a Thumbs up or a Thumbs Down. Impart that species identification is NOT an easy task. Knowing that offspring look like their parents, show the short Clarendon video (slide 21) to explain heredity, chromosomes, genes and DNA. To process the video, recap the content with a couple of slides in the Teacher Slide Deck. Students then practice applying what they learned about traits and species by working together to match a pup to their Poochy Parents on the Traits and Variation Handout #2. Students end the lesson by working with a partner to learn the eight vocabulary words from the unit.

2 Fun, Quick Vocabulary Strategies:

- A. Have students work with partners. One is the Teacher in Round 1, and the other is the Student. In Round 2, students switch roles. The Teacher goes over the cards with the Student. When the Student gives the correct definition of the card, the Student gets to hold onto the card. Any cards they don't know go to the bottom of the deck to be reviewed again. Students then switch roles. After 10 minutes, quiz your entire class. Give the definition aloud and have the students write the appropriate vocabulary word on their slates.
- B. Have students play Win, Lose or Draw. Students can work in partners or small groups. One student draws a card without showing the card to the group. They then draw a representation of the word on their slates. The group tries to guess which word the student has represented on their slate. The winner becomes the next person to draw a card and draw the word.

You may choose to copy a Student Set of Vocab Cards to have an option for students to review on their own time. If you have options for students when classwork is complete, students could choose to study their vocab cards or practice with a Learning Buddy.

Elaborate: Lesson Plan (30 minutes)

Materials: Teacher Slide Deck, Traits Variation Sort Cards

Things to Consider: Students still need a time each day where they can record plant observations.

Lesson: Open the lesson with the image of 3 butterfly species (slide 28.) The images show incredible variation in wing pattern and color. Ask the students to put their Heads Together and discuss what they think caused such great variation within the species. After listening to student responses, reveal the reason why there is great variation: the butterflies were born at different times of year. Lead students to consider the variables that would be different seasonally such as hours of sunlight during the day and temperatures. Different amounts of sunlight affects plants and therefore the diet of the butterflies. Students should conclude that the environment can affect traits. Then give students Traits & Variation Sort cards. With a partner students sort the cards into 2 groups. One student writes DNA to stand for Inherited Traits on their slate, the other student writes ENV to stand for Traits Affected by the Environment on their slate. Students then read cards and place them onto the slate they believe the card belongs to. After students have done their first round of sorting, you can lead the class in questions to find out they grouped their cards. Questions to consider at the end: Why did you place your cards where you did? Did you get stuck on any examples? Why? Can you think of other examples of inherited traits? Can you think of other examples of traits affected by the environment?

Show students the Fuse School video on Traits Affected by the Environment (link on slide 35.) Students then re-visit their Sort and decide if any cards should be moved. Lead the class in a discussion of what cards they moved and why they changed their thinking. Then reveals the correct answers (slide 37.)

Explore 2: Lesson Plan (25 minutes)

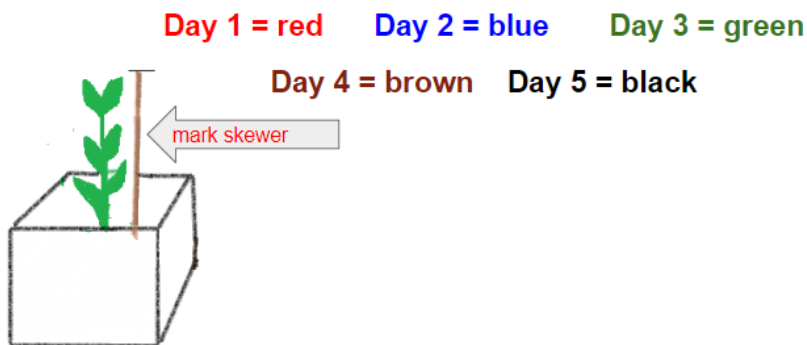
Materials: Teacher Slide Deck, Student Handout #2, seedlings, skewer, different colored markers

Things to Consider: Students still need a time each day where they can record plant observations.

Lesson: Students have explored that inherited traits are only a part of the trait puzzle. Traits affected by the environment affect an organism's traits. Now lead students to come up with an environmental variable the class could test to monitor the effects the environmental variable has on the plants' traits. Listen to students' thinking. In the Slide Deck and lesson, light is the variable that students manipulate. It really is up to you if you would rather have some student groups explore the amount of water or temperature. Light is an easy variable in a classroom to manipulate. If there is a place in the classroom where the plant would receive no light, the plant may die. You will need enough plants to cross pollinate in Unit 2. Low light or significantly less light may be the best option, or only put very few plants in a completely dark environment while others are in a lower light environment. **Having enough plants to cross pollinate in Unit 2 is important.**

Once you have decided upon a variable they will manipulate (i.e. light), have half of the student groups designate their plants to this new regimen (i.e. half put their seedlings somewhere in the room where they get much less light exposure than the other groups' plants.) If students are testing other variables, instruct students accordingly.

To measure growth, have the students put a wooden skewer by the tallest plant in their group's container. Each day that they observe, they will carefully hold the tallest plant, fully stretched, up against the skewer. They will then use the designated color of the day to mark the height of the plant on the skewer. Students are not drawing any more observations - just watering and marking skewers. They will use a ruler to measure lines on skewers in the next unit. Make a decision about how many days to mark the skewers based on time and schedule. There are 5 days of colors as shown below:



WARNING: Be mindful of skewers and distance from light. Consider fire safety.

Evaluate: Lesson Plan (25 minutes)

Materials: Teacher Slide Deck, Student Handout #2

Things to Consider: Students still need a time each day where they can mark the skewer with the appropriate color. Students will be caring for and observing plants for the entire Module.

Lesson: Revisit the Probe from the Engage lesson (slide 6 or Probe Unit 1: Traits and Variation sheet. Have students discuss in their groups if they still agree with where they placed their post-it notes, or if they want to move them. Students move post-it notes if they have changed their thinking. Lead the class in a discussion to have the students share their current thinking and how and why their thinking did or did not change. Students then answer final question on their Student Handout #2. Encourage them to use content vocabulary and detailed answers.

Teacher Key: The best response is from Gloria. We hope students will move toward that response by the end of the unit. It is common for students to think Beatrice's is the correct response. She is expressing the idea that use or disuse results in the passing on or reduction of a trait. Cat is expressing an idea that is common in literature where a story or fable might explain the appearance of a unique trait. The key idea here is that individuals do not evolve on their own; only a population changes over time - over a long period of time. There is variation in traits of a population and some variations can be passed on more than others based on the environment and pressures in that specific system.