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### **Inquiry Lesson**

**Title:** Horse poop; Look What's on it!

**Lesson Summary:** Students will compare the patterns of succession that occur on 2 different piles of Horse Manure. One that is totally fresh, and one that was scooped up 3-4 hours after falling!

**Goal:** The overall goal is for students to understand succession, by their observations and analysis without being told what succession is.

**Duration:** This activity will require 4 weeks of 10 minute observations, twice a week. Students will collect observation based data. Then, 3 days before our study of succession the students, with the facilitating help of the teacher, will synthesize the information of what was observed.

#### **Specific Learning Objectives:**

##### CONTENT GOALS:

1. Communities change through time.
2. Organismal interactions alter the sequence of that change.
3. The sequence of organisms in horse manure without herbivores is:.....The sequence of organisms in manure WITH herbivores is?
4. More complex organisms generally develop later than simple organisms (by observation).

##### PROCESS GOALS:

5. Apply the concept of succession in horse manure to other areas: Islands, etc. (which cannot directly observe but may have access to on the web or in books or magazines, examples like Krakatau.)
6. Recording Skills- diagrams, notes/organization
7. Synthesizing explanations from direct observations

##### STANDARDS:

#### **Prerequisite Knowledge / Skills for Students:**

- 1) Observation skills
  - 2) Diagramming/ drawing practice
  - 3) Know where poop comes from
- (These are not NEEDED but might be helpful)

#### **Background Information:**

- The phenomenon investigated is what changes actually take place in manure once it hits the ground and has time to sit there. (They will do this by taking notes and drawing pictures of what they see)
- Students will simply be told that they are going to observe 2 different environments of horse manure and the type of things (change) they see over a 4-week period.
- Questions such as why?... are easily anticipated and for the most part can be answered with: “To see if you can develop good observational skills” Questions you may encounter: Why do we have to look at poop? Why horse poop? Why are things happening? (We will have a better idea of questions after the test run.)
- Daily/Weekly observations with diagrams of organisms and scale (size). Developmental sequences of each. Also general observations – humidity, bugs, etc.
- Students will be told that they will need to be as specific as they can be regarding what type of changes they see. I will have them keep track of three columns in their notebooks.
- Provide an explanation of observations – big picture ....One for what they see and the corresponding one as to why they think that is happening!

**Preparation for Lesson:**

**Materials:** 2 piles of horse manure. One fresh and one 3-4 hours old. 2 aquarium tanks filled with 3-4 inches of sand to place the manure on.

In terms of maintenance, the materials will be kept moist, but otherwise simply be left alone. Saran wrap will be used to cover both aquariums and holes will be poked in it to allow air flow.

**Instructional Strategy:**

**ENGAGEMENT:** I will tell the students to take their notebooks out. (I have them use folders with 3 punch holes in them). I will pass out the observation sheets for the next 4 weeks. They will look like this:

Day 1 <u>Observation</u>	<u>What's Happening</u>
Day 4 <u>Observation</u>	Day 4 <u>What's Happening</u>

Students will also be given blank sheets of paper in which they will make drawings of the poop. I will have them grid the poop and record their observations of different grids, watching the temporal and spatial change of organisms.

**EXPLORATION:** Students will explore on a bi-weekly basis. Part of the DISCUSSION / EXPLANATION will occur on a daily basis when I have one-on-one discussion / Question—Answer sessions/ etc.

After the students make observations...within the period, or next, I will look at their notebooks and drawings and come up with questions. Here I will use the 3/5 card to assess the students as well as myself on what I could be doing to help them come up with ideas without giving them the idea. I will be able to pick up on and redirect misconceptions.

Students should be able to conclude that certain organisms succeed others in certain environments. Also, that herbivores greatly effect the overall succession of an environment. As a closure / lead in activity, students will be directed to web-sites depicting the eruptions of Krakatau (I also am pretty sure I have a (or can locate) film). Here they will be able to see how the environment was changed, (at times destroyed), and then re-built. They will apply data of organisms that came after previous organisms (succession) and why that order came to be observed. Could it have been different? Did it have to be in that order?

**ASSESSMENT:** Students will be given a pre-assessment asking questions such as: What is the role of manure in nature? What happens to it? What does this? What is in poop? (Later they can “grade” themselves, and see where they were correct and where they needed to make changes in their thinking. At the end of the activity, the students will then (in written form) need to assess how similar or different the 2 manure environments ended up being.

**Examples of Assessment:**

- 1) Completion of ALL daily observations and drawings (different organisms and changes) of the 2 systems. These will need to be kept in a neat—orderly manner in their biology folder. These drawings and notes could be kept on sheets of blank paper and whole punched to be kept in a 3 ring binder or folder.
- 2) 3x5 card quizzes will be given twice a week. I will ask what changes occurred and why they think they occurred. (Once for a grade, ONCE FOR MYSELF!!) The first one I will give will be for myself to see if the students are headed in the direction that I want them to go. Are they headed toward the Learning Objectives that I set out? The second will be for a grade and to make sure that they are getting the content that they should. I would also have the kids, at least once a week, write their BEST observation on the card to have me look at and critique.

**EXAMPLE 3x5 CARDS:**

\*\*Herbivores, or the lack of herbivores, changes the sequence of \_\_\_\_\_ organisms in the succession of horse manure... True / False... What is your evidence?

\*\*What is your evidence that there is a sequence of organisms either appearing, disappearing, or changing over time? DO you think this would ALWAYS be the case. WHY??

**Comments:**

Dog, pig, cow, etc. manure is stinky / messy, which is why we chose a horse. We will do this experiment this summer long BEFORE we try this with the kids. This will then give us good background information on how and WHEN to ask which questions!!

Extension activities: 1) This activity could be altered to look at three different types of poop, comparing horse, sheep, and rabbit manure. 2) IF we could find a horse NOT on antibiotics, (we have heard that they are hard to find), we could look at the effect of horses taking antibiotics compared to those that are not and how that effects environments / succession. 3) Look at “Dung” as an ecosystem. There is apparently a lot of information on this. For example: Elephant dung supports +/- 70 different kinds of insects. The majority of these insects found in the dung are scarabs. There could also be many other off shoot activities from this one, it may be something that the students come up with as they go along.

One of the ideas that was brought to our attention is that the students need to have good observation skills. It would be a good idea to have the students work on diagramming and looking at the big picture. Things to make sure that they can do are: enlarge objects to see small objects better; keep things in proportion, if something is “blown up 5x bigger, what ever is next to it also need to be 5x bigger. This is a skill that will have to be developed over time.

A special thanks to Dr. Hickey for all of his guidance.