

Timeline and Explanation of Lessons and Corresponding NOS tenants.

Day	Objective	Activity	NOS Aspect
DECONTEXTUALIZED/EXPLICIT			
1	<ul style="list-style-type: none"> • To introduce students to observation skills and the difference between an observation and an inference. • To introduce students to the ideas that scientists' ideas are socially and culturally embedded 	<ul style="list-style-type: none"> • Read book Seven Blind Mice (Young, 1992) • Students are introduced to scientific journaling and draw a picture of themselves on the cover • Read book What Do you do with a Tail Like This? (Jenkins & Page, 2003) 	<ul style="list-style-type: none"> • Observation vs. Inference • Socially and Culturally embedded • Acting like a scientist
2	<ul style="list-style-type: none"> • To discuss the 5 senses as related to observation skills • To understand students' initial ideas of scientists • To introduce the students to ideas of how science is socially and culturally embedded and the subjective nature of science 	<ul style="list-style-type: none"> • Discussion about books from Day 1 and how scientists use 5 senses during observations • Draw-a-scientist activity (Lederman & Abd-El-Khalick, 1998) • Dog among spots activity (Lederman & Abd-El-Khalick, 1998) • Old Woman/Young Woman activity (Lederman & Abd-El-Khalick, 1998) • Tricky Tracks Activity (Lederman & Abd-El-Khalick, 1998) 	<ul style="list-style-type: none"> • Observation vs. Inference • Socially and Culturally embedded • Subjective
3	<ul style="list-style-type: none"> • To help the students learn how to predict • To practice making observations and inferences • To teach how subjectivity plays a role in idea formation 	<ul style="list-style-type: none"> • Discussion about scientists drawings • Opposite Cube Activity (Lederman & Abd-El-Khalick, 1998) • Read Dr. Xargle's Book of Earthlets (Willis, 2002) 	<ul style="list-style-type: none"> • Empirical Evidence • Observation vs. Inference • Subjective • Acting like a scientist
4	<ul style="list-style-type: none"> • To help the students learn how to predict • To practice making observations and inferences • To teach how subjectivity plays a role in idea 	<ul style="list-style-type: none"> • Cube Activity (Lederman & Abd-El-Khalick, 1998) • Think Tubes (Lederman & Abd-El-Khalick, 1998) 	<ul style="list-style-type: none"> • Empirical Evidence • Observation vs. Inference • Subjective • Acting like a scientist

	formation		
5	<ul style="list-style-type: none"> To discuss ideas of how scientists changed their minds about how dinosaurs looked To teach how scientists made predictions based on finding bones To teach how scientists still do not know how the dinosaurs became extinct To teach how students experiences with certain items may influence how they categorize them 	<ul style="list-style-type: none"> Read The Dinosaur Alphabet Book (Pallotta, 1990) Living vs. Nonliving- students sort common items into living vs. nonliving sections 	<ul style="list-style-type: none"> Tentative Empirical Evidence Subjective Social and Culture Observation vs. Inference
6	<ul style="list-style-type: none"> To provide the students with an experience in which their initial ideas changed due to new evidence 	<ul style="list-style-type: none"> Read A Mealworms Life (Himmelman, 2001) Draw pictures of mealworm Observe mealworms Rework drawings of mealworms 	<ul style="list-style-type: none"> Tentative Empirical Evidence Observation vs. Inference
7	<ul style="list-style-type: none"> To teach how scientists still do not know how the dinosaurs became extinct To practice make inferences To provide an experience so the students could understand how the scientists collected data 	<ul style="list-style-type: none"> Read The Extinct Alphabet Book (Pallotta, 1993) Draw pictures of why the dinosaurs became extinct Made fossils out of play-dough 	<ul style="list-style-type: none"> Tentative Observations vs. Inference Empirical Evidence
8	<ul style="list-style-type: none"> To introduce solids, liquids, and gases To provide an experience wherein the students used their observations to categorize items 	<ul style="list-style-type: none"> The students made observations about different common objects and categorized them into solids, liquids, and gases based on their observations 	<ul style="list-style-type: none"> Observations vs. Inference Empirical Evidence
9	<ul style="list-style-type: none"> To introduce colloids. To provide an 	<ul style="list-style-type: none"> Read Batholomew and the Oobleck (Seuss, 1949) Oobleck Activity- modified for this 	<ul style="list-style-type: none"> Observations vs. Inference Empirical Evidence Subjective

		experience for the students to make observations and inferences and categorize the data based on it.	age group by preparing the oobleck ahead of time and allowing the students to feel with oobleck in groups and then led a discussion based on observations and inferences (Sneider & Beals, 2004)	
10		<ul style="list-style-type: none"> • To provide an experience wherein the students were presented with new data that allowed them to make changes to previous inferences • To provide experience making observations and inferences 	<ul style="list-style-type: none"> • Sinking vs. floating- students experimented with cubes made of different materials 	<ul style="list-style-type: none"> • Tentative • Observation vs. inference • Subjective
CONTEXTUALIZED/EXPLICIT				
11		<ul style="list-style-type: none"> • To understand students' initial ideas of plants • To teach about variables and controls • To provide the students with an experience of creating their own experiment 	<ul style="list-style-type: none"> • Students draw a picture of a plant • Discussion of what plants need to grow • Discussion of variables to figure out what plants need to grow 	<ul style="list-style-type: none"> • Empirical Evidence
12		<ul style="list-style-type: none"> • To understand what plants need to grow • To understand how scientists collect data 	<ul style="list-style-type: none"> • Students set up plant (flowers) experiment with three variables (sun, water, air) 	<ul style="list-style-type: none"> • Empirical evidence
13		<ul style="list-style-type: none"> • To collect data • To observe • To provide the students with an experience in which their previous knowledge (plants need soil to grow) is challenged 	<ul style="list-style-type: none"> • Students draw observations of plant experiment • Students observe different types of seeds • Students plant lima beans hydroponically 	<ul style="list-style-type: none"> • Observation vs. Inference • Empirical evidence • Tentative
14-16		<ul style="list-style-type: none"> • To collect data • To observe 	<ul style="list-style-type: none"> • Students draw observations of flower experiment 	<ul style="list-style-type: none"> • Observation vs. Inference • Empirical evidence

17	<ul style="list-style-type: none"> • To describe how different cultures view planting and plant growth • To collect data • To observe 	<ul style="list-style-type: none"> • Read Bringing the Rain to Kapiti Plain (Aardema, 1992) • Students draw observations of flower experiment • Students draw observations of lima bean experiment 	<ul style="list-style-type: none"> • Socially and Culturally embedded • Subjectivity
18	<ul style="list-style-type: none"> • To describe how Carver's ideas about planting changed the way scientists viewed the purpose of soil • To collect data • To observe 	<ul style="list-style-type: none"> • Introduce George Washington Carver and his ideas about soil and purpose of soil • Plant peanut plants • Students draw observations of flower experiment • Students draw observations of lima bean experiment 	<ul style="list-style-type: none"> • Tentative
19	<ul style="list-style-type: none"> • To describe how observational data is empirical data • To describe how different cultures ideas are viewed by scientists • To draw conclusions based on data 	<ul style="list-style-type: none"> • Introduce McClintock's ideas of corn and data collection • Students finding the patterns on corn cobs • Students draw conclusions about plants based on flower and lima bean data 	<ul style="list-style-type: none"> • Observation vs. Inference • Empirical Evidence • Socially and culturally embedded • Subjective
20-29	<ul style="list-style-type: none"> • To collect data • To observe 	<ul style="list-style-type: none"> • Students draw observations of peanut plants 	<ul style="list-style-type: none"> • Observation vs. Inference • Empirical Evidence
30	<ul style="list-style-type: none"> • To make conclusions based on observations 	<ul style="list-style-type: none"> • Students make conclusions about peanut plants based on their observations 	<ul style="list-style-type: none"> • Observation vs. Inference • Empirical Evidence

Figure 1 from Buck, Akerson, Quigley, & Weiland, in review