**Saturday Science Lesson Plan**

**February 6, 2010**

**A) Learning Objectives**

* Students will be able to make a variety of observations.
* Students will be able to formulate questions from their observations.
* Students will be able to develop an initial understanding of inference and observation.
* Students will begin to develop an initial understanding of water safety, as connected to the driving question of “Is Our Water Safe?”
* Students will be able to communicate their observations in oral, artistic, and written formats.

**B) Standards**

* **National Science Education Standards**
  + K-4 Science as Inquiry: Abilities necessary to do scientific inquiry
  + K-4 Science as Inquiry: Understanding about scientific inquiry
  + K-4 Earth and Space Science: Properties of earth materials
  + K-4 History and Nature of Science: Science as a human endeavor
* **Indiana State Academic Standards**
  + K.1.1 Raise questions and the natural world
  + K.1.2 Begin to demonstrate that everybody can do science
  + 1.1.1 Observe, describe, draw, and sort objects carefully to learn about them
  + 1.1.2 Investigate and make observations to seek answers to questions about the world
  + 1.1.4 Use tools, such as rulers and magnifiers, to investigate the world and make observations
  + 2.1.5 Demonstrate the ability to work with a team but still reach and communicate one’s own conclusions about findings
  + 2.1.3 Describe, both in writing and verbally, objects as accurately as possible and compare observations with those of other people
  + K.2.2 Draw pictures and write words to describe objects and experiences
  + 1.2.5 Demonstrate that magnifiers help people see things they could not see without them
  + 1.2.7 Write brief information descriptions of a real object, person, place, or event using information from observations
  + 2.2.5 Draw pictures and write brief descriptions that correctly portray key features of an object
  + 1.3.1 Recognize and explain that water can be a liquid or a solid and can go back and forth from one form to the other. Investigate by observing that if water is turned into ice and then the ice is allowed to melt, the amount of water is the same as it was before freezing
  + 2.5.4 Begin to recognize and explain that people are more likely to believe ideas if good reasons are given for them
  + K.6.1 Describe and object by saying how it is similar to or different from another object

**C) Content Knowledge**

* Water is a vital resource to every living organism on Earth. As populations increase, the need for clean water rises. Water pollutants can arrive from a variety of sources; petroleum pipeline spills, natural gas seepage, pesticides, heavy metals, and fecal contamination are some of the most common culprits of unsafe drinking water. The Environmental Protection Agency (EPA) has outlined standards for safe drinking water1.
* Legal limits for contaminants in drinking water reflect the levels that are both safe for human consumption, as well as available through current technology. Groundwater that is used for human consumption through wells is particularly susceptible to contaminants and must be used with extra precautions for safety; Methyl Tertiary Butyl Ether (MTBE), a petroleum additive, benzene, and heavy metals, such as lead and copper, are common groundwater contaminants. Surface water, such as streams, lakes, and rivers, that is collected for consumption is highly susceptible to microbial contamination; Cryptosporidium is a common microscopic parasite that occurs from trace amount of stool and can cause illness or death in infected persons2. Bottled and tap water are the safest options for drinking water, but may contain contaminants due to their original sources.
* Children are particularly sensitive to certain contaminants in drinking water, such as nitrate, lead, copper, microbial contaminants, and disinfectants3. As the costs of water treatment continue to rise, proper education about clean, safe water is needed in all persons to ensure communal water safety4.

**D) Materials**

* 24 plastic beakers
* 2 buckets
* Water from the Jordan River
* Tap water
* 4 ice cubes of frozen tap water
* 4 ice cubes of frozen Jordan River water
* Cooler
* 4 microscopes
* 8 petri dishes
* 8 microscope slides
* 2 pipettes
* 8 plastic straws
* 8 rubber ducks
* 8 plastic boats
* 8 large bowls
* 24 composition books
* Colored pencils/crayons
* Glue

**E) Lesson Description**

1. 9:30-9:40 Introduction: introduce instructors, go over rules of classroom (raising hands for a question, how the teacher will call the class to attention, expectations for listening and working together), hand out composition books to each student and explain that this is where they will record all of their observations and experiments
2. 9:40-10:00 Icebreaker: Each student will receive ½ notecard with a ½ picture on it. Each ½ card has a match. Students will first predict what the other half of the picture will look like by drawing their prediction in their notebook (*What do you think the other half of the picture will look like?*). Then students will have time to find the missing ½ of their card; in doing this, they will meet other students and being to interact. Once the student has found his/her match, they are to sit with their partner and draw the complete picture in their notebook (*Did the picture match your predictions?*). This partner will be their ‘lab buddy’ for the rest of the morning.
3. 10:00-10:30 Water investigation: Once students are grouped in pairs, they will receive two beakers full of tap water and Jordan River water. Using colored pencils/crayons, they should draw what each water sample looks like in their notebook. If they are able, they should also write a few words about what each sample looks like (*Which water sample do you think came from the faucet? Which one came from the Jordan River? What things do you see about the water that helped you make that decision? What words would you use to describe the two different water samples?*). After 7 minutes, the students will they go to the stations located along the edges of the room; 4 groups at each of the 3 stations. The three stations are: 1) Observing 2 frozen water samples from the tap and the Jordan River, describing them/drawing them in their notebook (*Does the water look different when it is frozen? What are the changes?*), 2) Observing 2 water samples from the tap and the Jordan River under a microscope, describing them/drawing them in their notebook (*Do you see anything new that helps you to decide which location the water sample came from? How did looking at the water up-close help you?*), 3) Observing 2 water samples from the tap and the Jordan River in large bowls and deciding which water they would want to drink, play in, or have their pet swim in; these choices are to be symbolized by a straw (drinking), a toy boat (playing), and a rubber duck (pet swimming); once the students have made their decisions, they should draw each of the 2 bowls in their notebook and describe their decisions to place/not place each item into the 2 water samples *(Which water would you like to drink? Play in? Have your pet swim in? What are the reasons for your decisions? Why did you pick [X] water for [X] activity? What words would you use to describe the two water samples?*). Each of the 3 stations should last approximately 5 minutes.
4. 10:30-10:50 Snack & bathroom break
5. 10:50-11:15 Water safety collage: Using glue, students will paste together various magazine photos (already cut out) into their notebook to create a collage. The ‘theme’ of this collage is to be “What water safety means to me” (*What does water safety mean to you? What are some reasons for picking each picture?*). Students will use the observations that they made earlier in the day to draw upon what unsafe/dirty and safe/clean water is.
6. 11:15-11:40 Children’s Literature: Students will gather together in a semi-circle to listen to a children’s book about water. Possible titles of books include: *Water, Water Everywhere*, *Round the Garden*, *Follow the Water from Brook to Ocean*, or *A Drop of Water* (availability of book in library will be the deciding factor).
7. 11:40-12:00 Discussion & Reflection: As a community of learners, students will reflect on what the book meant and share their thoughts with the class (*What was one thing you liked about this book? What was one thing you learned from this book?*). After discussing the various topics in the book, students will then discuss what questions they have about water and, if able, write these questions in their notebooks (*What do you want to learn about water in the next few weeks? What kinds of activities would you like to do with water?*). Once they are finished, students will be released to their parents.
   * Parents will be given a printed letter, asking them to make sure their children wear clothing that they can wear outside (ie: no shorts/skirts, flip flops, or heels) because the students will be conducting a variety of investigations outside in the upcoming weeks.
8. 5-E Learning Cycle
   * **Engage** Context for the next 5 weeks will be given with a driving question of “Is Our Water Safe?” Students will be engaged to think about this question throughout the morning. Instructors will gauge students’ current scientific understanding of water during the water investigation and discussion and reflections. Students will communicate their knowledge of science through questions they ask, as well as through the expression of topics they would like to learn more about at the end of the morning.
   * **Explore** Students will explore the differences between “clean” and “dirty” water in pairs and compare their observations together. A variety of activities will be used to facilitate the exploration of water samples at a macro and microscopic scale.
   * **Explain** Instructors will draw upon the students’ observations from the Water Investigation to introduce new concepts of “safe” and “unsafe” water. They will lead a discussion about why each of the 2 water samples was safe/unsafe and how we know this. Vocabulary words will include “contamination” and “safe.”
   * **Elaborate** Students will apply their knowledge of water safety through the creation of a photo collage about “What Water Safety Means to Me.” This activity will provide an opportunity to extend the students’ knowledge and express their understanding in an artistic, cross-disciplinary way.
   * **Evaluate** Instructors will ask students to write/draw their thoughts, observations, evidences, and explanations in their notebooks- formative questions that will be asked are *italicized* in the above lesson description. Students will engage in formative assessment by writing/drawing their observations of the icebreaker card, liquid water samples (both macro and microscopically), and frozen water samples. Students will also assess the apparent ‘safety’ of the water and communicate their decisions by drawing the two bowls of water and the contents that they placed inside each. Formative assessment will be of a lesser focus in this session, due to its introductory nature, but the drawings, text, and collage that the students complete in their notebooks will be collected and evaluated for future session ideas.

**F) Gearing Up/Gearing Down**

* **Gearing Up** If a student is grasping the key concepts (safe/clean vs. unsafe/dirty water, the importance of observations) very quickly and/or not cognitively challenged by the activities, then the instructors can modify their formative assessment questions to challenge the student to think more critically about water safety. They can be asked engaging questions about why the water might be dirty, where this ‘dirt’ comes from, and why one water sample is clean the other is not. Additionally, extra focus could be placed on the student to relate fully justify their rationale for safe/unsafe based on their observations.
* **Gearing Down** If a student is struggling with the activities, the instructor can modify the lesson to have the child focus on only 1 or 2 of the Water Investigation stations. Extra explanation would be given about the importance of observations, and the child would be asked to describe, as best as they can, everything they can see in the water samples (overall color, variations on color, things in the water, etc.) and to describe those observations in their notebook through words or drawings. By focusing on their observations, the student will still feel a sense of accomplishment and work towards the bigger idea of water safety, without having to rush to complete all of the stations.

**G) References**

1 http://www.epa.gov/safewater/therule.html

2 http://www.epa.gov/safewater/faq/pdfs/fs\_healthseries\_bottlewater.pdf

3 http://www.epa.gov/safewater/kids/kidshealth/pdfs/brochure\_childrenstandards\_table.pdf

4 http://www.epa.gov/safewater/wot/pdfs/book\_waterontap\_full.pdf