The Properties of Water and the Water Cycle  
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ED 200-Spring 2013

We have chosen to create a unit covering the properties of water and the water cycle. Both of us came into this experience aiming to teach a science unit; it was seen as a challenge because our academic interests lie largely in spheres of literature and writing. Looking at the “Science Curriculum Standards and Assessment Expectations” provided by the Connecticut Department of Education, we decided to look at stages of matter and the water cycle in a third grade classroom (Curriculum Standards, p. 15). We derived our objectives for this unit from their model. We added aspects of Gardner’s theory of multiple intelligences. Looking at science and the knowledge will enhance naturalistic knowledge. Some activities will work on logical-mathematical skills. Using teams, following a model proposed by Slavin will enhance interpersonal skills and oral presentations require linguistic abilities.

Robert Slavin’s chapter on Cooperative Learning inspired the structure of teams in our curriculum. Slavin explains, “The idea behind this form of cooperative learning is that if students want to succeed as a team, they will encourage their teammates to excel and will help them to do so” (Slavin, 4). We incorporated the concept of groups mixed by performance, level, gender, and ethnicity in order to have students fully benefit learning from one another. Students work together in our unit in heterogeneous teams to grasp concepts, help one another, and give a group presentation. Each student, however, will be individually evaluated. While the unit does not strictly follow the a strict principal Student Team Learning method presented by Slavin, the design incorporates his idea of mixed groups to encourage student cooperation and remove the negative effects of ability groups or academic tracking.
Focusing on science, the unit we designed accounts for cultural language differences by offering Spanish translations of new terms. The students learn vocabulary, such as “evaporation” and “precipitation” in this unit. On the worksheets, Spanish and English will be provided to instill a sense of equality. While the students may not know the terms in Spanish either, including them in the curriculum validates one cultural marker: language. English language students can learn the Spanish as well; this allows the English-language learners and bilingual students to help their English-speaking peers.

Guadalupe Valdés is one of many education reformers to write on the subject of language inequality. She notes that schools which do not provide adequate sources of English instruction are limiting students’ access to the curriculum and thus breaking federal law:

Key sources of federal law (Title VI of the Civil Rights Act of 1964, Lau v. Nichols, the Equal Educational Opportunities Act of 1974, Castañeda v. Pickard, in particular, makes clear that districts have a dual obligation to teach English and to provide access to academic-content instruction. (Valdés, p. 12)

In Hartford classrooms, observers note that Spanish speakers are treated unequally or as if they need more help. According to the Connecticut State Department of Education, 17.7% of students are English language learners in the Hartford School District as of 2011-2012. Over 7,000 students speak live in homes where Spanish is the primary language (English Language Learners). With larger proportions of English language learners, students that require language help should not be made to feel unequal; by giving students vocabulary in both English and Spanish, are attempting to bridge that gap, even if the teacher is not able to speak Spanish. The worksheets provide vocabulary in Spanish and English.

Context

This curriculum unit is designed for a third grade classroom in Hartford Public School District.
Class sizes range from 16-24 students. There will be larger proportions of Latino and African American students. According to the Strategic School Profile for Hartford, 18 percent of students in 2010 were not fluent in English (Strategic School Profile, p. 1). For this reason we have attempted to design our curriculum so that the basic vocabulary is provided in Spanish, to give all students a chance to learn the concepts. Conveniently, the vocabulary for the water cycle in Spanish is almost entirely comprised of cognates, which we believe will help Spanish speaking students transition into comprehension of the English terminology. The unit will be taught over the course of one week, five school days, in one hour blocks. This unit will cover the water cycle and different states of matter. The curriculum is designed to use multiple methods of conveying knowledge to the students.

**Objectives**

- Students will be able to identify stages of the water cycle (evaporation, condensation, melting and freezing).
- Students will be able to compare and contrast the properties of solids, liquids and gases.
- Students will be able to teach their peers through oral presentations.
- Students will work on interpersonal skills through working in teams.

Our objectives are derived from the “Science Curriculum Standards and Assessment Expectations” provided by the Connecticut Department of Education in terms of material that we are covering (Curriculum Standards, p. 15). Using pedagogy proposed by Slavin (1995), we also strive to touch on Gardner’s theory of multiple intelligences. Working in teams and presenting as a team will help work on interpersonal skills while mathematical and naturalistic intelligences are touched on by the content of the lesson. The chart-making activity will help students to solidify their ability to measure using
a ruler, developed in the second grade, and add how to make a chart. The objectives of distinguishing states of matter and understanding stages of the water cycle fall under Gardner’s naturalistic intelligence. The aspect of visual knowledge is incorporated into the lessons as well as the evaluation type, using visual aides (Harvard Project Zero, p. 2).

Activities

Monday

At the beginning of the day students will be assigned to a measuring cup filled ice water in heterogeneous teams of 4 to 5 students. In these teams, heterogenous refers to ability, gender, race, and socioeconomic status. They will measure the water line at the beginning of the day, after lunch, and toward the end of the day. The teacher will demonstrate with a ruler on one of the cups to show students how to measure the meniscus, the bottom of the curve of water. The students will write their measurements on index cards (one per team) to use tomorrow. Their names will go on the back of the card.

The teacher will present on the properties of water as a solid, liquid, and gas. She or he can ask the students for examples of each state of matter. The teacher will use the vocabulary handout with pictures and Spanish equivalents to help student understanding (Appendix I). The teacher can do a demonstration using a balloon; liquid fills the bottom of a container while gas fill the space equally. The teacher should bring in a balloon with water in it and a balloon with air in it. Each student will pick their “favorite” state of matter and draw a picture on a notecard to add to a poster at the front of the room (prepared by the teacher) with three columns (liquid, solid, gas).

Tuesday
The teacher will use the numbers from measuring water lines from each team. The teacher will show students how to make a basic chart, using the SmartBoard. The students will be given the axis and red stickers as well as a marker (Appendix II). Each team will make one chart. The teacher should collect the charts to hand back to students on Thursday for their posters.

The teacher will then move to a presentation on the water cycle. The resource is available online here: [http://www.epa.gov/safewater/kids/flash/flash_watercycle.html](http://www.epa.gov/safewater/kids/flash/flash_watercycle.html). This presentation will be supplemented with a vocabulary handout (Appendix III). This vocabulary handout was structured with fill-in-the-blanks and a picture that should be labeled so that students can demonstrate understanding of which vocabulary word is represented by which part of the water cycle photo. Again, this vocab sheet has both English and Spanish sentences because it is reinforcing vocabulary concepts. Students will be encouraged to ask questions for clarification; they will be asked to fill out the worksheet during the presentation to promote note-taking and aural learning as well as visual, using the presentation. The teacher may want to mute the video to go at their own personal rate that the students may be able to follow better. The text at the bottom cannot be reduced in speed, but the teacher can orally present on the information. Each stage may be selected on the left hand side. The “auto” feature may not be helpful, because the presentation moves rather quickly.

The teams will be combined to form groups of 8-10 students. These groups will be require students to communicate with a group they don’t normally gravitate towards. Combining heterogeneous teams should maintain heterogeneity, and allow students to work on interpersonal skills among new peers. Each group will create a mini water cycle, using this project design: [http://thewaterproject.org/resources/lesson-plans/create-a-mini-water-cycle.php](http://thewaterproject.org/resources/lesson-plans/create-a-mini-water-cycle.php). The mixing bowl
would ideally be glass for transparency. The coffee mug may be replaced with solo cups if budget is an issue. If teachers are willing, they can bring their own mugs. A pitcher (or two) of water should be pre-prepared for this day. The teacher should be in charge of pouring water into the bowls. The students should be supervised and guided in this activity. The projects will be left in the windowsill until the next afternoon.

**Wednesday**

Students will get their water cycles from the windowsill and check the mug, which should now have water in it. The teacher will ask students to explain evaporation and precipitation as represented in their projects. Students will make observations about how the stages of the water cycle worked in our experiments. The plastic wrap should have condensation on it as a result of evaporation. The mug or cup should have some water in it, demonstrating precipitation. The teacher should have students relate these phenomena to their experiences: cups dripping on a table, rain or snow, etc. The teacher will go over all vocabulary from the handouts on Monday and Tuesday, allowing students to ask questions.

The students will split into their teams again; there will be four tables to look at the water cycle through photos. Students fill out a fill-in-the-blank worksheet about each stage and the properties of water at each stage ([Appendix IV](#)). The teacher will rotate and make sure the groups are understanding the concepts. The students will each hand in their own worksheet to be graded.

**Thursday**

The class will discuss the answers to the fill in the blank worksheets from Wednesday. The teacher will answer any other questions the students have about the water cycle before breaking them back into their original small 4-5 person teams. Each team will have the remaining time to create a
poster about one stage of the water cycle or states of matter. Each team will have a different stage of the water cycle; one team will cover the three properties of water. Depending on the number of teams, each state of matter could be divided or stages could be duplicated. The posters will include definitions, the graphs from Tuesday, and drawn pictures. The students could include their notecard drawings from Monday if they would like. This incorporates creativity and visuals as well as pulls together activities from the lessons of the week.

**Friday**

The kids will be given a few minutes to finish their posters. Each group will present on their topic and answer questions their classmates have. It would be recommended to bring in other third grade classes for the presentations. This day will incorporate the evaluation rubric and students will be graded based on their performance and participation as well as understanding of the material. We suggest bringing in other third grade classes in order to give students more incentive to work on presentations and also to give the students the opportunity to explain material to students they don’t know as well in an academic setting. To end the unit, students will have juice popsicles to celebrate while showing the process of freezing and melting. It would be recommended to eat these outside or in the cafeteria.

**Evaluation**

The evaluation will be based on their presentations and worksheets throughout the week. The rubric for the presentation will include understanding of the stage of the water cycles or properties, oral presentation, how well each member of a team participates, and engagement in the rest of the class presentations (Appendix V). The students will be encouraged to ask each other questions after each presentation; the students will be graded on asking and answering questions from peers as well as from
the teacher. This grade will be on the basis of improvement and overall effort so that students who might be more introverted will not be penalized for lack of participation. The worksheets from each day should be collected and graded to track their understanding of the concepts. If multiple students struggle with similar questions, time should be given to go over the vocabulary. The worksheets should be graded based on effort and participation. The presentations will be graded on understanding of the concepts and if during a presentations students struggle with a concept, but can work through the answer with the help of classmates, they will not be penalized.
Works Cited


http://thewaterproject.org/resources/lesson-plans/create-a-mini-water-cycle.php


Materia: Se hace todo y ocupa espacio.
Matter: It makes up everything and takes up space.

<table>
<thead>
<tr>
<th>Estado de materia</th>
<th>Ejemplos</th>
<th>Definiciones</th>
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</thead>
<tbody>
<tr>
<td>Solids</td>
<td>(Madera/Wood)</td>
<td>La materia sólida siempre</td>
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<td></td>
<td>(Libro/Book)</td>
<td>mantiene la misma forma.</td>
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<td>(Arena/Sand)</td>
<td>Solids hold their shape.</td>
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<td>Liquids</td>
<td>(Agua/Water)</td>
<td>La materia líquida toma la</td>
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<td>(Jugo/Juice)</td>
<td>forma del recipiente en que se</td>
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<td>encuentra.</td>
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<td></td>
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<td>Liquids are an in-between state</td>
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<td></td>
<td></td>
<td>of matter. Liquids fill up the</td>
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<td></td>
<td></td>
<td>shape of a container.</td>
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<tr>
<td>Gases</td>
<td>(Aire/Air)</td>
<td>Los gases se llenan de manera</td>
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<td></td>
<td>(Viento/Wind)</td>
<td>uniforme un recipiente.</td>
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<td></td>
<td></td>
<td>Gases spread out to fill a</td>
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<tr>
<td></td>
<td></td>
<td>container equally.</td>
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</table>
Appendix II

Water Level

<table>
<thead>
<tr>
<th></th>
<th>Morning: 9AM</th>
<th>Before Lunch: 11AM</th>
<th>Early Afternoon: 1PM</th>
<th>End of the Day: 3PM</th>
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Appendix III
Vocabulario: El Ciclo del Agua
Vocabulary: Water Cycle

Evaporación
Cambio de una sustancia de la fase _____________ a la fase
___________ o de _____________. (Gaseosa, Vapor, Líquida)

Evaporation
When a substance changes from the ____________ phase to a
___________ or _____________. (Vapor, Gas, Liquid)
Condensación
Cambio de una sustancia de la fase _________ a la fase _________.
(Líquida, Gaseosa)

Condensation
When a substance changes from a __________ to a ___________.
(Gas, Liquid)

Precipitación
La precipitación es el ______________ liberada de las _____________.
(Nubes, Agua)

¿Es la precipitación de nieve?  ¿Es la lluvia?

Precipitation
Precipitation is ______________ released from _______________.
(Water, Clouds)

Is snow precipitation?  Is rain?
What makes something solid?

○ a. It holds its shape

○ b. The molecules spread out to fill a space equally.

○ c. The molecules are between gas and solid. They will mold to the shape of a container.
What makes something liquid?
  ○ a. It holds its shape
  ○ b. The molecules spread out to fill a space equally.
  ○ c. The molecules are between gas and solid. They will mold to the shape of a container.

What makes something a gas?
  ○ a. It holds its shape
  ○ b. The molecules spread out to fill a space equally.
  ○ c. The molecules are between gas and solid. They will mold to the shape of a container.
<table>
<thead>
<tr>
<th>Objective</th>
<th>1- Needs Attention</th>
<th>2- Developing</th>
<th>3- Satisfactory</th>
<th>4- Exemplary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students have an understanding of their concept (stage or state).</td>
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<td>Students can articulate their information clearly.</td>
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<tr>
<td>Students have an understandable and organized visual (poster).</td>
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<td>Students participate equally in their presentation.</td>
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<td>Students are able to answer questions from their peers and teacher.</td>
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<td>Students are engaged in the presentations of their peers.</td>
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