Action Research Project: Models and Water Sources

Abstract

This action research project was designed to discover the students’ prior knowledge and address students’ misconceptions about water sources and how those water sources reach the house while using the unifying theme of models. After pre-assessing students in a second grade classroom, we found that students had misconceptions/lack of knowledge about what models are, where water comes from, and how it travels. Therefore, for this research project, we have taught two lessons: one about models and the other about water sources. When comparing the pre and post assessments, we found that the students had an improvement in their understanding of both concepts. In the pre-assessment, 100% of the students were unable to answer what a model is or give an example of a model correctly. However, after teaching a lesson about models, 83% of the students were able to answer the exact same questions correctly. As for the questions about water sources, in the pre-assessment, 16% of the students were able to describe where the water in their house come from and how it gets there. On the other hand, in the post assessment, 83% were able to describe the processes correctly. In the end, we concluded that using models to address misconceptions in an inquiry lesson is beneficial for the students and should be used in the classroom when teaching about water sources.
Introduction

As a group, we have completed our last semester at the University of Michigan Dearborn’s Elementary Undergraduate program. The members of this group have been enrolled in a Science Capstone class where we have focused on understanding scientific models, which is our ‘Big Idea’ in the course. Models can be concrete/functional, pictorial, or mathematical models. The benefits of using scientific models while teaching a science inquiry lesson is that they help students understand important concepts that may not be physically available in the classroom. Models also help “students to understand the use of evidence in science, to make and test predictions, to use logic, and to assemble their own understanding of how things work” (Gilbert & Ireton, 2003, p. vii). As a requirement of the class, we completed a research project on water sources, which uses models to teach a concept or lesson. Therefore, for our action research project, we explored, discovered, and asked “What do the Dearborn Academy second grade students know about major bodies of water sources on Earth, and how does our teaching affect what they know about water sources?” We used models to teach our science concept of water sources because it is a big concept that may not be visible and can not be brought into the classroom. Models make the science concept simpler and take away any difficulties that may occur when learning about water sources because they help students visualize this complex science concept.

After researching prior studies about students’ misconception and knowledge about water sources, we found articles that were related to the topic that we were exploring. One of the articles was called Young Students’ Conceptions of the Marine Environment and Their Role in the Development of Aquaria Exhibits by Roy Ballantyne (2004). According to Ballantyne (2004), it is very important for teachers to take students on field trips to environmental exhibits as a way
to develop or extend students’ knowledge of the topic. By taking students on field trips to places such as national parks, wildlife centers, and zoos and aquaria, students will be able to interactively learn by physically seeing real life examples. Furthermore, he discussed the importance of exploring students’ conceptions using constructivist perspective so that educators could design a meaningful learning environment. Researchers interviewed fifty-four students from three different elementary schools in Cape Town that were about the ages of 10 and 11 years. The students lived close to the sea and about fifty of the students visited an aquarium. Also, the students all knew how to swim in the sea. The interviewers asked students questions that would prompt them to give responses about their “knowledge about the sea, its origins, its inhabitants, and ocean movements such as tides, currents and waves. The students’ responses were then probed to elicit further information about their understanding of specific topics such as tides, currents and salinity” (Ballantyne, 2004, p.160). The study found that even though students contained an interest in marine life and are aware of key terms such as waves, tides, and currents, their knowledge about these ideas are incomplete and confused. Ballantyne’s (2004) research paper relates to our project because we want to find out what students know about the major bodies of water sources on Earth, and how our teaching will affect what they know about water sources.

Another article we came across called Developing A Learning Progression For Students’ Understanding of Water in Environmental System by, Kristin Gunckel, Beth Covitt, Tammy Dionise, Rebecca Dudek, and Charles Anderson (2009) stated that students who begin to go to school have an understanding of the world that is influenced by their loved ones, environment, and personal experiences. However, the education of science is intended to prepare students in becoming literate in the environment so that they are able to take part in the decision making
process that is required in order for them to “maintain and protect adequate fresh water quality and quantity for people and the natural ecosystems on which humans depend” (Gunckel and et al, 2009, p.1). Students who have gained knowledge about scientific discourse(s) should be able to describe what happens to water and the substances that move along through human and natural systems. The authors of this article researched studies regarding students’ understanding about water systems. Afterwards, they developed their own research by designing short answer questions to assess students from second through twelfth grade. They wanted to know what students know about water in environmental systems. The students were allowed to draw and/or write their responses. After analyzing their data, the researchers found that the students in primary, as well as, secondary school do not completely understand certain characteristics of water (Gunckel et al., 2009, p.1). The research article by Gunckel et al. (2009) also relates to our research question because the research paper discusses what students know about the sources of water, as we will be researching in our research question.

We also came across another article called Students Developing Understanding of Water in Environmental Systems by Beth Covitt, Kristin Gunckel, and Charles Anderson (2009). This article talked about how students think about water and what happens to the water and other substances as they move through human and natural systems (Covitt, Gunckel, and Anderson, 2009, p.1). To figure this out, the authors had gathered their data from students ranging from elementary through high school. They then distributed assessment tests that consisted of open-ended questions to the students to learn what they knew and what they didn’t know. Afterwards, they analyzed the data and found that students had a hard time understanding some aspects of water such as where it comes from, where it goes, and how it moves. The authors also found that even the older students had difficulty with the concept too.
Next, our group found research by Tytler, Peterson, & Prain (2006) who emphasizes the importance of learning science literacy through representations of different science concepts (p.12). Tytler et al. (2006) article, *Picturing evaporation: Learning science literacy through a particle representation* focuses on research that took place in a 5th grade elementary classroom, where the students “explored the use of a particle model in conjunction with a range of representational modes, to explain evaporation phenomena” (Tytler et al., 2006, p. 12). The students were asked to create particle representations to help them in advancing their explanations as they are learning about evaporation. For example, the students observed the evaporation of a drop of alcohol on a slide. The students were then asked to draw what they think was happening to the alcohol drop. The students were also required to make a separate drawing on where the drop of alcohol was now in order to see if they will be able to “develop a representation of a distribution of alcohol molecules in the air” (Tytler et al., 2006, p. 14).

According to Tytler et al. (2006), The goal of having the students make representations along with their explanations is so that they are able to “produce a coherent explanation between what they said, experienced, and what they had drawn” (p. 14). Tytler et al. (2006) concluded that the students in the interview “had advanced in their thinking about the distribution of molecules in explaining the alcohol smell, and their developing drawings” (p. 14). The representations made it easier for the students to imagine what was happening to the alcohol drop as it evaporated which also expanded their way of thinking about this science concept. This article is very relevant to our action research project because it helped our group see that having students complete a representation, whether a drawing, tables, diagrams or graphs, will allow students “the opportunity to explore and negotiate their meaning” (Tytler et al., 2006, p. 15).
Finally, we found a very informative article that relates to our action research is called *Students’ conceptions of scale regarding groundwater* by Dickerson et al. (2005). The study was conducted to examine children and adults’ understandings of groundwater principles and processes. The study group consisted of secondary and postsecondary students. The secondary group of students consisted of twenty-nine twelfth-grade public high school students. The post-secondary students consisted of two groups. The first group was thirty-two students in a university; the other group also consisted of twelve students in a university. Seven of the students are undergraduates while the other five were graduate students. Participants completed a groundwater survey, which includes background information. The survey consists of multiple choice and short answers that deal with issues of the structure, scale and perceived importance of groundwater.

The results show that the secondary participants provided “responses that indicate a much lower perceived importance of knowing about groundwater than either of the post-secondary hydrology-oriented participants” (Dickerson et al., 2005, p. 376). Dickerson et al. (2005) state that the “participants held inappropriate conceptions of hydrogeologic principles despite groundwater’s importance to their health and economic well-being; they describe groundwater storage using multiple structures other than pores and cracks” (p. 376). The study assessed participants’ conception of scale directly. For example, they were asked about the depth of most human drinking water-wells in the United States. The results showed that the majority of group one participants answered that the depth of most wells are less than 5,000 feet deep while 34% of secondary participants thought wells were deeper than 10,000 feet deep. This shows a great difference in the different groups’ conception of scale.
We expanded this research by assessing a different population (African American, Middle-Eastern, and Hispanics) which were in 2nd grade. This was a different grade level from all the existing research we had found. The students we observed were U.S urban students, while the students in Ballantyne’s (2004) case study were students from African rural areas in Cape Town. We also expanded on the article by Gunckel et al. (2009) by creating prompting questions that asked students to make drawings of how water travels to their house. We expanded our research on the other Gunckel et al. (2009) article by asking similar questions in our pre and post assessment as the ones mentioned in the article which helped us figure out what our students know about major bodies of water sources on Earth. For pre and post assessment questions, we asked students to create a representation of how water ends up at their house as an extension to the article by Tytler et al. (2006) because representations make it easier for the students to expand their thinking.

**Methods/Procedures**

For this research, we observed and studied a second grade classroom at The Dearborn Academy located in Dearborn, MI. In the class, there are 28 students that sit in groups of five. According to the cooperating classroom teacher, the demographics of the class are two African American students, five Hispanic students, and twenty-one Middle Eastern students. All of the students in the classroom are able to read and write English, however, there is a range of reading levels present. There are also about nine students who are English language learners and three students with special needs. The teacher suggested that we make special accommodations for the students with special needs. For instance, she suggested shortening assignments, asking more simple questions, reading assessment questions to students, and giving directions step by step.
As for the classroom setting, there are two teacher desks with one at each corner near the windows, one belonging to the teacher and the other belonging to the paraprofessional of the classroom. The students’ desks are in the middle of the room and against the walls are shelves, posters, and books. There are also a projector, Elmo, laptop, PC, and stereo available in the classroom. Also, according to the teacher, she usually teaches science to her students for forty minutes at 2:30 p.m. on Tuesdays and Thursdays, but sometimes if she needs more time to cover a lesson she will teach it on Fridays. The topic we covered in class has not been covered by the teacher. We were advised to look at the first grade Michigan Grade Level Content Expectations to get an idea of students’ prior knowledge of the topic. She mentioned that in first grade, students learned about the three states of matter. The teacher plans to cover the topic we will be teaching after we do our assessments.

We conducted our research project by pre-assessing second grade students on their prior knowledge about major bodies of water sources on Earth. The pre-assessment allowed us to observe what misconceptions the students had and what their struggles were in this topic. After piloting the pre-assessment questions, we analyzed their answers and formulated two explore, explain, engage and apply, and evaluate. The inquiry model served to develop students’ inquiry based lesson plans using the 5E model. The components of the model are engage, understanding about the major bodies of water sources on Earth. After we taught our two inquiry lesson plans, we gave our students post-assessment questions to see if what we taught affected what they know about water sources. We used the results from the post-assessment and compared it to the results from the pre-assessment to find out what has stayed the same or changed in their understanding of the topic.
As for our process of assessing, we have decided to assess six students in the class of the classroom teacher’s choosing to represent the knowledge of the class as a whole. We decided to do this because we found that assessing and analyzing twenty-eight students’ responses would be too complex. Instead, we will choose two students that are academically advanced, two students that are academically intermediate, and two students that are academically low making a total of six students. This gave us an idea of what students of different academic levels in the class may be thinking when pertaining to water sources. Next, we distributed the pre-assessment worksheets to the students and read and explained the questions aloud in case the students had any difficulties. Afterwards, we observed the students, asked questions, and listened to the students’ responses so they may elaborate if needed. Students will be given the opportunity to draw their answers if they choose to, but each drawing will have to be accompanied with an explanation. This was done so we could gain a better understanding of what the students were thinking.

We created a pre-assessment sheet consisting of four questions about water sources. The questions are:

- What is a scientific model?
- Can you give an example of a scientific model?
- Draw a picture of how water ends up in your house.
- Where does the water from the rain go after it hits the grass?

The members of the group collectively chose these questions because we believed it would give us an idea of where to start teaching for our future lessons. The first and second questions were created for us to discover whether the students understand what a scientific model is and why it is used since it is one of our focuses in class. According to Gilbert and Ireton
“The National Science Education Standards (NSES) emphasize the use of models in science instruction by making it one of the five unifying concepts of science, applicable to all grade levels” (vii). They also go on to say that models help “students to understand the use of evidence in science, to make and test predictions, to use logic, and to assemble their own understanding of how things work” (Gilbert & Ireton, 2003, p. vii). Therefore, since we used models in our instruction, we want to ensure that the students are familiar with what scientific models are. The third question “Draw a picture of how water ends up in your house” is related to our research because according to Gunckel, Covitt, Dionise, Dudek, and Anderson (2009), they asked students to “Draw a picture of what you think it looks like underground where there’s water” and “How does water get into a river”? Because the authors ask these questions by asking students to draw and about the path water takes to get somewhere, we were able to adapt their idea and formulate questions that were geared more towards second graders. As for the fourth question about what happens to the rain after it hits the grass, we adapted the idea based on a question asked by Gunckel, et al. (2009), who asks students “Where does water in a puddle on a soccer field go?” (p. 8). Instead of using the words exactly, we made the question a little broader so we may see if students will be able answer with a variety of possible answers. Finally, we chose to give the students an opportunity to draw their answers for all the questions after reading the research by Tytler et al. (2006), who says “to develop a scientific literacy students need to be able to interpret and construct science texts such as tables, graphs, diagrams, and science reports” (p. 12). We also thought that in case a student was unable to simply write their thoughts in words since they are still learning how to do that, they may be able to explain better when drawing.

After conducting the pre-assessment and teaching our inquiry lessons, we decided to modify the post-assessment questions from the pre-assessment questions. We did that by adding
one additional question which asked “What are water sources?” while the other questions remained the same. We found that we had neglected to ask what the students knew about water sources, which was one of our main focuses in this project besides models. We also wanted to ensure they knew what water sources were because the concept was connected to other ideas addressed in our second lesson such as how does water get to our house. The additional question was placed third on the assessment because the question introduced the idea of water sources before moving onto more questions that elaborate more on the topic.

Results

After analyzing the data from the pre-assessment test, we learned what the students knew and did not know about scientific models and water sources. As seen in Figure 1 (below), we found that none of the students were able to define what a scientific model was or even give an example of a scientific model which were the first and second questions on the pre-assessment. For the third question, the students were asked to draw a picture of how water ends up in their house. We found that one student had a correct representation of how water ends up in their house because the student showed a water source (ocean), getting cleaned by a water cleaning facility, and then pipes taking the water to the house. Only four of the six students were able to draw a partially correct representation of how water ends up in their house. We concluded that their representations were partially correct because their representations showed that water reaches their house through pipes from underground water directly underneath their house. The students had an understanding of groundwater and knew that pipes help take water to their houses. One of the six students drew an incorrect answer that showed that rain falls directly into a pipe outside her house and that’s how water ends up at her house. For the fourth question, we
had asked the students where they thought the rainwater went after it hit the ground. Two of the six students answered correctly by stating through words and representations that the rain goes underground after it hits the grass. The other four students provided us with partially correct answers. An example of a partially correct answer is “the rain goes into the mud,” then verbally stated that after mixing in with the mud, it evaporates. All four students came up with the same conclusion that water mixes with muds then directly goes back to the clouds. We believe that their answers contained a pre-conceived misconception because they stated that water mixes with mud then goes back (evaporates) to the clouds. This shows that they have an understanding of the water cycle but included their own beliefs of where rain goes after it hits the ground.

**Figure 1: Students’ Responses to Pre-assessment:**

![Figure 1: Students’ Responses to Pre-assessment](image)

During our first inquiry-based lesson, we gave each group a set of four models along with their targets. They were asked to fill out a Venn diagram to compare the characteristics of each model to its target. Our lesson objectives for our first lesson will be:

- Students should be able to identify a scientific model.
- Students should be able to define what a scientific model is.
Students should be able to give an example of a scientific model.

As a group, we decided to focus our first lesson on scientific models. This is because based on the pre-assessment, the students did not know very much about models at all. Students were not able to define a model, identify a model, or give an example of a model. This was a problem because we found it important for students to be able to understand models in general, so they understand major water sources on Earth with minimum misconceptions. Instead, they had given answers such as “a scientific model is a model that knows science” or “a smart model that walks on stage”. By teaching a lesson about scientific models, students should be able to develop a better understanding of what a model is in science.

As for linking our lesson objectives to Michigan’s Grade Level Content Expectations (GLCE’s), the following GLCE’s pertain to our lesson:

- **S.RS.02.11** Demonstrate scientific concepts through various illustrations, performances, models, exhibits, and activities.
- **S.IA.02.13** Communicate and present findings of observations.

When analyzing the data we collected in the pre-assessment, we evaluated each question based on how the student answered the question. We had categorized the responses in levels.

For our second inquiry-based lesson, we focused on water sources and how the water travels to their house. The lesson consisted of filling out a KWL chart as a class, separating a variety of pictures into two groups based on whether they were water sources or non-water sources, and creating a poster board about how water travels to their house. The objectives for this lesson were:

- Students will be able to define water sources.
- Students will be able to give examples of water sources.
● Students will be able to describe how water gets to their house.

● Students will be able to describe how water gets into the ground after it rains.

Based on the pre-assessment test the students had taken, we found that students had an idea of how water travels from the water sources to their house, but their ideas were not entirely correct or were missing important points in its process. For example, one student believed water from the rain fell directly into pipes that sent water into the house. The student had believed that that the water in their house came directly from the rain and not a water source such as a lake, river, or ocean. This showed us that the students may not know what water sources were or how we use them. Our last question on our pre-assessment and our last objective of this lesson plan addressed groundwater. We wanted to see whether students were aware of groundwater and how the water gets in the ground. After administering the pre-assessment test, we found that groundwater needed to also be addressed. This showed us that the students may not know what water sources were or how we use them.

As for linking our lesson objectives to Michigan’s Grade Level Content Expectations (GLCE’s), the following GLCE’s pertain to our lesson:

- **E.FE.02.11** Identify water sources (wells, springs, lakes, rivers, oceans).
- Identify water sources (wells, springs, lakes, rivers, oceans).
- **E.FE.02.21** Describe how rain collects on the surface of the Earth and flows downhill into bodies of water (streams, rivers, lakes, oceans) or into the ground.
- **E.FE.02.22** Describe the major bodies of water on the Earth’s surface (lakes, ponds, oceans, rivers, streams).

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*Figure 2: Students’ Responses to Post-assessment:*
We analyzed the results from the post assessment questions and learned how our teachings about scientific models and major bodies of water affected the learning of the second grade students at Dearborn Academy. As seen in Figure 2, we found that five out of the six students were able to define what a scientific model is and provide an example of it. Some examples of students’ answers on what scientific models are the following: “a scientific model is a fake thing” and “a model is a project that you can use like a mountain” and the student drew a framed picture of a mountain (pictorial model). Only one student was not able to correctly answer the question because the student believes that “a scientific model is someone that [knows] a lot of [scientists] and a lot of modeling.” The student even drew a picture of female model standing on the runway as his example of a scientific model. As for question number three, we received a variety of answers. Four students answered correctly, one students was partially correct while one student was incorrect. This question asked students to state what are water sources. Four of the six students answered that water sources are “oceans”, “lakes”, “rivers”, “streams,” “rain”, “ponds”, and “underground water.” The student who answered partially incorrect had an idea
about water sources but it was not correct. The student answered “flor” as a water source. The classroom teacher had informed us that this student was an English Language Learner (ELL). Due to her limited English proficiency, we believe it limited her verbal ability to fully explain her answer or remember all the terms for the different water sources. Her answer “flor”, which we later recognized as meaning floor, was also meant to mean the ground as in ground water. The student who answered incorrectly stated “water sources are different water that people drink.” This student understands we need to drink water but fails to mention any water sources. As for question number four, the students were asked to draw a picture of how water ends up at their house. Five students were correct in drawing a correct representation of how water comes from a water source through pipes to the cleaning facility and then through pipes again to get to their house. One of the six students had an incorrect answer, which was the ELL student. The student drew the same representation as the one in the pre-assessment answers, which showed that rain falls directly into a pipe outside her house and that’s how water ends up at her house. As for question number five, there were five students with correct answers while one student had an incorrect response. Question number five asked students to state where water goes after it hits the grass. Five students stated the term “underground” and drew pictures to show it. One student stated that water goes to the “ground” but did not specify that it goes underground, therefore the answer is incorrect.

**Conclusion**

In conclusion, as a group, we found that the Dearborn Academy second grade students showed lack of knowledge or misconceptions about models, water sources, and how water from those sources reach their house. In our pre-assessment, the students were provided with four questions. We found that out of the four questions, all of the students answered questions one
and two incorrectly, which were questions about scientific models. Questions three and four were about water sources, majority of the students’ answers were partially correct or incorrect. Therefore, we decided to create our first lesson on models (big idea) and our second lesson on water sources. The lessons’ purpose was to address the students’ misconceptions/lack of knowledge and increase their knowledge on both ideas based upon the pre-assessment questions.

When comparing the three categories (correct, partially correct, incorrect) results from the pre-assessment questions to the results of the post-assessment questions, we found significant improvements in students’ knowledge and understandings of models and water sources. During the pre-assessment, none of the students knew what a model is and did not provide a correct example of it. On the other hand, we found out that five of the six students that were post-assessed were able to define what a model is and provide an example of a model. For the questions about models, none of the students fit into the category of correct or partially correct. When the students were asked to draw a picture of how water ends up in their house during the pre-assessment, only one student was able to do so correctly. However, during the post assessment, we found that five students were able to provide us with a correct drawing of how water ends up in their house. As for the partial answer category for this question, only four students had an idea of how water ended up in their house, but did not fully understand the concept during the pre-assessment. After we post-assessed the students, we found that one student remained in the partial correct category. In the category of incorrect answer, we discovered that one out of the six students gave an incorrect answer. After taking the post assessment, we found that none of the students gave an incorrect answer for that question.

When the students were asked where the water from the rain goes after it hits the grass, two students in the pre-assessments provided us with a correct answer, while in the post
assessment five students provided us with an correct answer. In addition, there were four students that had a partial correct answer of where the water from the rain goes after it hits the grass in the pre-assessment. While in the post assessment we found that there were not any students who fit into the category or gave a partial correct answer. There were not any students who fit into the category of “incorrect” answer during the pre-assessment, but in the post-assessment only one student answered the question incorrectly.

We have also expanded on the existing research about students’ understanding of water sources. For example, in two of the previous research done on the topic, the students observed grade level were ranging from third grade to high school. Our research, instead, focused on second grade students and their misconceptions about models and water sources. We had wanted to see if the second grade students would have the same misconceptions as those students in the higher grades. Also, in one of the research journals, Tytler, et.al (2006) had fifth grade Australian students draw and explain their answers when conducting their research. Therefore, we used the same idea for our students who live in the US and were in second grade. We found that we were able to get an idea of what students were thinking better compared to having them simply write their answers in words. Furthermore, none of the research studies we read used models to teach students about water sources, while we focused both of our lessons on using models (pictorial and computer models) to instruct our students. Also, all of the different articles suggested engaging students in learning science concepts, but none of the articles suggested using science inquiry as a way to teach students. Therefore, we expanded on the existing research by using the science inquiry method to teach our lessons on scientific models and water sources.

In the end, when looking at the results of our pre-assessment and post-assessment, we have concluded that our lessons helped the students understand models and water sources. The
students are now aware of what models are, can give an example of a model, different types of water sources, and how those water sources travel to their house. Also, after teaching the students using the 5E inquiry lesson method they now have a better understanding of the unifying theme or big idea of models.
References


**Time Schedule**

- **Observation:** February 14, 2012  
  Time Duration: 40 minutes

- **Research:** February 15-22, 2012  
  Time Duration: 24 hours

- **Pre-assessment Completed:** March 20, 2012  
  Time Duration: 35 minutes

**Analysis of Data:** March 21, 2012  
Time Duration: 3 hours

**Created First Inquiry Lesson:** March 22, 2012  
Time Duration: 8 hours

**First Inquiry Lesson (Taught):** April 5, 2012  
Time Duration: 55 minutes

**Created Second Inquiry Lesson:** April 10, 2012  
Time Duration: 7 hours

**Second Inquiry Lesson (Taught):** April 19, 2012  
Time Duration: 1 hour

**Post Assessment Completed:** April 23, 2012  
Time Duration: 35 minutes

**Analysis of Post Assessment:** April 23, 2012  
Time Duration: 3 hours
Appendix B

Name: _______________________________ Date: __________________

What I know about Water Sources!
(Pre-assessment Questions)

Answer the following questions the best you can. If you choose to draw a picture to answer the question, make sure to write an explanation too.

1. What is a scientific model?

2. Can you give an example of a scientific model?

3. Draw a picture of how water ends up in your house.

4. Where does the water from the rain go after it hits the grass?
Lesson Plan #1

Title: What are scientific Models?

Grade level: 2nd Grade

Concept: Scientific Models

Objectives:
• Students should be able to identify a scientific model.
• Students should be able to define what a scientific model is.
• Students should be able to give an example of a scientific model.

Standard/Benchmark:
• S.RS.02.11 Demonstrate scientific concepts through various illustrations, performances, models, exhibits, and activities.
• S.IA.02.13 Communicate and present findings of observations.
• S.IA.02.14 Develop strategies and skills for information gathering and problem solving (books, internet, ask an expert, observation, investigation, technology tools).

Materials:
○ 5 flowers
○ 5 plastic flowers
○ 2 bananas
○ 2 plastic bananas
○ 5 boiled eggs
○ 2 plastic eggs
○ 3 pictures of eggs
○ 5 crayons
○ 5 pictures of crayons
○ 10 pieces of fries
○ 5 plastic pieces of fries
○ 2 phones
○ 2 plastic phones
○ 1 teddy bear
○ 1 giraffe
Safety Concerns (if any):  
Students should be informed that they are able to use their senses when observing the objects, but not to put any of the objects in their mouth.

Engage:

● Ask students:
  ○ What do you think when you hear about a scientific model? (Anticipate responses such as ‘a smart model that walks on stage’, ‘something like a microscope’, prior knowledge of science topics)
  ○ The explorable question will be: how are the objects similar and different from each other?

Explore:

● Students will be grouped into 5 groups. Each group will be provided with an model and its target.
● Students will observe the objects by touching them, looking at them, smelling (when needed), and hearing (when needed).
● They will be provided with a worksheet chart and fill them out as a group. They will observe the differences and similarities of each model and target.
● Teacher will walk around to each group and check on student’s progress.
● Teacher will make a chart on the board. Students will fill out the chart on the board.

Explain:

● The class will discuss the information the students observed and wrote on the chart on the board.
● Each group will discuss what they found, the models they observed, and the differences and similarities between them.
● Teacher will then ask students ‘Based on the observations you made and the discussions we had, What do you think a scientific model is now?’ (Anticipated answers: “A model
of something is different from the real thing but can be used to learn something about the real thing” (American Association for the Advancement of Science, 2009)

- Ask what characteristics of the model help us understand the real thing.
- Some kinds of models are on the computer.
- Explain that models can also be pictures, charts, mathematical, computerized or concrete.

Extend and Apply:
- Each group will be given a model (teddy bear, toy car, giraffe, plastic chicken, and animation video about rain) without its target.
- First ask the students if it is a scientific model? If it is a model, what does it represent?

Performance Assessment:
The teacher will assess the students by showing an object that is not a model to the class (bottle of water, paper, and orange). Students will then write on a sheet of paper whether they think it is a model or not a model. They will then hold up their paper so that the teacher can assess how many of the students know whether the object is a model or not. The teacher will then show another object that is a model, and students will vote once again.

Source(s):
Scientific Models

Group Member Names:

___________________________________________________

__________________________________________________

What objects were you given?

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What we are observing:
What we are observing:

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What we are observing:

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What we are observing:
Title: How Does the Water Reach My House?

Grade level: 2nd Grade

Concept: Water Sources

Objectives:
- Students will be able to define water sources.
- Students will be able to give examples of water sources.
- Students will be able to describe how water gets to their house.
- Students will be able to describe how water gets into the ground after it rains.

Standard/Benchmark:
- E.FE.02.11 Identify water sources (wells, springs, lakes, rivers, oceans).
- Identify water sources (wells, springs, lakes, rivers, oceans).
- E.FE.02.21 Describe how rain collects on the surface of the Earth and flows downhill into bodies of water (streams, rivers, lakes, oceans) or into the ground.
- E.FE.02.22 Describe the major bodies of water on the Earth’s surface (lakes, ponds, oceans, rivers, streams).

Materials:
- Board
- Poster boards
- Tape
- Ziplock bag containing pictures of different water sources
- Pencils
- Crayons, markers, or colored pencils.
- Computer
- Projector
- Elmo Projector

Safety Concerns (if any): Students should not put anything in their mouths. It may also be a good idea for the teacher to provide students with the tape as they need it to prevent harm from tape dispenser blade.
**Engage:**
1. Teacher will draw a KWL chart on the board and label it “Water sources” on top. They will then ask the students what they know about water sources and what they want to know about them. Make sure to leave the “L” for later.
2. Teacher will ask students: Does anyone have an idea of what water sources are?
3. The explorative question is: What areas in the world can we find water collecting? How does it get to our house?

**Explore:**
1. Students will sit in groups. The teacher will provide each group with a pile of pictures.
2. Students will then be asked to take the pictures and group them into “water sources” and “non-water sources”.
3. Teacher will monitor the students in their groups as they work.

**Explain:**
1. Each group will discuss their findings and explain their thinking.
2. Teacher will tell students that: Water source is any water that occurs on the Earth which has potential (possible) use for humans. These resources include waters from the oceans, rivers, lakes, groundwater, glaciers, and snowfields (Water source, 2012).
3. Students will watch a short video about water sources called “Sources of Water” by Ikenedu.
4. Students will then be asked questions about the video such as: What water sources did you see in the video? What did the video say about rivers? ground water? lakes?
   Teacher will explain to the students that when it rains, water falls from the sky and hits the ground, sometimes running down mountains, into lakes, rivers, and streams, or even seeps into the ground.
5. Groundwater is water that comes from the ground. “Groundwater comes from rain, snow, sleet, and hail that seeps into the ground. The water moves down into the ground because of gravity, passing between particles of soil, sand, gravel, or rock until it reaches a depth where the ground is filled, or saturated, with water” (The Groundwater Foundation, 2012). Also, the water that seeps into the ground is stored in the gravel, rocks, and sand beneath the Earth. To get the water from the ground, people use wells or pumps.

**Explore**

1. Teacher will tell students: Now that you have identified the water sources, how do you think the water gets to your house?

2. Students will be provided tape (teacher will provide when needed), a poster board, and a Ziploc bag containing pictures which include lakes, rivers, ocean, pipes, water cleaning facilities, groundwater, hand pumps, and a house.

3. Students will be asked to place the pictures in the order from where water starts to where it ends based on their prior knowledge and pictures provided. They will then stick the pictures onto the board provided in the order they chose. Teacher will ask students to arrange surface water first. Second, they will arrange the ground water and how it gets to their house.

4. Teacher will monitor the students in their groups.

**Explain**

1. Each group will discuss their boards with the class and explain their thinking. Teacher may also make their own board after discussion to show the model that was expected.

2. First it rains. When the water falls, it hits the ground, or falls into a collection of water such as lakes, river, ocean, etc. From there, it is collected and taken to water facilities to be cleaned.
After it is cleaned, it is sent to your house which is used for drinking, taking a shower, cooking, etc.

3. Teacher will explain that when it rains or snows, water falls into the oceans, lakes, rivers, streams, ponds and on the ground. When a good amount of water falls on the ground, it can seep into the ground and becomes stored as groundwater.

**Extend and Apply:**

Students will be asked if they know which water sources give us drinking water. Based on their answers, the teacher will ask why would we get drinking water from certain water sources and not others (expect answers such as salty water).

**Performance Assessment:**

After class discussion, the teacher and students will complete the KWL chart on what they’ve learned. The teacher will write student responses on the ‘L’ part of the chart on the board. The teacher will assess students based on the answers given.

**Source(s):**

