Creating Models of Landforms and Water

Lesson Overview:

The purpose of this lesson is to provide students with experience creating models of landforms and bodies of water. Before students begin by playing an active game to review the types of characteristics of basic landforms and bodies of water, they look at some images of Earth taken from space. Next they take notes on some key characteristics for classifying landforms and learn how scientists use models. They use paper mache or play dough to create models of landforms and bodies of water in a guided activity. The lesson finishes with small groups of students studying maps of different continents and using either play dough or paper mache to create their group model of the landforms and bodies of water on their part of the world. Students do a gallery walk of the models and provide constructive feedback on the models of their peers. While this is intended to be the second of two lessons (see the first lesson, "Models of Land and Water- Identifying Landforms and Bodies of Water on a Map")

The students will:
- Increase their understanding of the use of models in science
- Identify the patterns that scientists use to classify landforms and bodies of water
- Create models of landforms and bodies of water

Next Generation Science Standards: (www.nextgenscience.org)
Students who demonstrate understanding can:
- 2-ESS2-2: Develop a model to represent the shapes and kinds of land and bodies of water in an area. [Assessment Boundary: Assessment does not include quantitative scaling in models.]

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Developing and Using Models Modeling in K-2 builds on prior experiences and progresses to include using and developing models (i.e. diagram, drawing, physical replica, diorama, dramatization, or storyboard) that represent concrete events or design solutions. ● Develop a model to represent patterns in the natural world (2-ESS2-2)	ESS2.B: Plate Tectonics and Large-Scale System Interactions ● Maps show where things are located. One can map the shapes and kinds of land and water in any area. (2-ESS2-2)	Patterns ● Technologies extend the measurement, exploration, modeling, and computational capacity of scientific investigations.

Common Core State Standards: (www.corestandards.org)

CCSS.ELA-LITERACY.SL.2.1: Participate in collaborative conversations with diverse partners about grade 2 topics and texts with peers and adults in small and larger groups.
CCSS.ELA-LITERACY.SL.2.1.A: Follow agreed-upon rules for discussions (e.g., gaining the floor in respectful ways, listening to others with care, speaking one at a time about the topics and texts under discussion).

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Background Information:

In this lesson, students will be learning about landforms and bodies of water as well as reinforcing their understanding of models. Landforms are simply natural features on Earth's surface; things like mountains, valleys, hills, etc. To learn more about landforms and how they were created, go to http://bit.ly/1AuHu4h.

Bodies of water generally refer to both natural and human-made areas that have water; including oceans, lakes, rivers, streams, and so on. To learn about the different types of bodies of water, go to http://bit.ly/1xK951O.

The Next Generation Science Standards help guide teachers to know what types of information and skills are developmentally appropriate for students at different age levels. In addition to the performance expectations, the NGSS offers advice to assist teachers as they instruct their students. To learn about how to teach students about models, go to http://bit.ly/1IwefQu. There is information for teaching the "Roles of Water on Earth's Surface Processes" at http://bit.ly/14zY2x9 and "Plate Tectonics and Large-scale System Interactions" at http://bit.ly/17nhfDm.

Materials:
- Models PP
- Student Capture Sheet 1
- Student Capture Sheet 2
- Pictures of landforms and bodies of water
- Cups (if using paper mache paste)
- Paper mache paste/ Play dough (or other media of your choice)
- Region maps TR

Engage (10 min.): **Classifying Landforms and Bodies of Water review** (Slides 2- 6)

Show students this image (slide 2) of Earth that was taken from space. (Credit- Visible Earth: NASA http://visibleearth.nasa.gov/view.php?id=57723) Ask them to share their observations, and help them to identify some of the landforms and bodies of water by name. Ask them where this picture was taken, and help them to understand that it was taken from space. Talk about how this might have been taken from space, and then explain it was taken from a satellite called "Terra", which is an unmanned spacecraft that is helping study Earth from space. Go to slide 3, and ask them to describe what is different now. See if they can identify any of these continents, and talk about why they can't see the other side of Earth now. Ask what type of model of the Earth they could use to see the whole Earth (a globe). Help them to identify more landforms and bodies of water. This is also a picture of Earth taken from Terra. On slide 4 they can now see the entire Earth. Show students this image, and ask how this is different from the other pictures. Help them to realize that there are no clouds in this image. Explain that sometimes scientists want to look at maps of the world without clouds to help them focus on certain things. Ask them what they think scientists might be focusing on when they put together pictures

of Earth without the clouds. Talk about their observations in this image (extent of ice, areas of vegetation) and help them understand that this is also an image taken from space. (You can learn more about this image and how it was taken by going to http://visibleearth.nasa.gov/view.php?id=74518)

Now they will activate their prior knowledge of landforms and bodies of water by playing an active game. If they have been taught the previous lesson, Landforms and Bodies of Water, they will most likely recognize the pictures and remember a few facts about the various images in the game. (slide 5) Reminding students that scientists often identify patterns in the natural world, and then classify things based on certain characteristics, or patterns, that they observe. Different types of landforms and bodies of water are classified in this manner, and they will begin by reviewing some of those key characteristics of a few of these. Each student is going to have a landform or body of water picture taped to his or her back. They will walk around the room asking questions and giving each other clues sharing the characteristics of that landform or body of water. When the student is ready to make their official guess about the name of your landform or body of water they will come to you to make their guess and tell what clues helped them make your decision. Allow the student 5 to 10 minutes to play this game. As students finish, they can begin to work on their Student Capture Sheet 1. The students will be asked to name one key characteristics of each landform on the sheet. (slide 6)

Explore (20 min.): **Models in Science** (slides 7 through 14)
Share with the class that scientists create models to represent real and concrete ideas to help them develop and design solutions. These models may represent a tool or the natural world but these models are an important part of a scientist work. Use the slide 7 to introduce this idea, and to have students identify and discuss some of the models they observe scientists using in their work.

Explain that today they will work collaboratively to model the land and water for different areas of the world (slide 8). To prepare for this, they will first practice creating models for different landforms and bodies of water using paper mache/play dough. Give each student small cup full of paper mache paste or play dough.

The next six slides (slides 9 through 14) show images of different landforms so students can practice creating models of them as you go through each slide. The landforms and bodies of water found in the PowerPoint include-mountain, river, plain, lake, island, and ocean.

--- *Depending on your time constraints, this could be a good stopping point for the day.*---

Explain (at least 30 min.)**: Making Physical Models using Maps** (slides 15 through 16)
Explain that now they are going to work collaboratively to create a model of a specific region of the world. You will divide your class into 6 groups. First, give each group a map of one region. Tell them that they will work collaboratively to identify the landforms and bodies of water on their map and will write a list of these on a sheet of paper. They need to present this information to you prior to beginning work on their model. Once you have

signed off on their list, they can collect the materials for making their model of their region (paper mache paste/play dough, a large piece of cardboard for the group). Suggest that students first mark their cardboard using pencils to show where each feature should be placed to ensure their model closely matches their assigned region. Explain that everyone will help conduct a peer critique in which their work will be shared and evaluated for accuracy by their peers. Circulate and use questioning techniques to assist students in their efforts. Provide your students time to complete this task.

Evaluate (20 min.)**: Gallery Walk and Peer Review** (slide 17)
Now that they have had time to create their group model, they are going to present their models to each other as they go through the process of peer review. They will share their process for creating the model and explain how they represented each landform and body of water represented in their region. Their peers will share what they did well and suggest what they could have done to improve their model. They will use their Student Capture Sheet 2 to complete this task. Then they will switch roles. (This may be a difficult task for such young students but it is a great way to provide closure to the lesson and remember that this is more about experiencing the process then providing each other with an effective critique.)

Elaborate/Extend: (slide 18)
Conduct a separate how to lesson on making paper mache paste. You can incorporate following and/or numbered steps in a *how to* text.

Allow the students to let the paper mache dry and paint the model they created of their region.

The students could conduct some research about their region and write a short informational text. Then you could display the models and informational text as a bulletin board or as a museum display and invite other classes to come through the museum.

You could provide the students with the opportunity to explore the landforms and bodies of water in their community by conducting a similar task with your local county or city map. They could do this as project at home to involve their families.

Teacher Notes:
While this is the second of two lessons that have been developed to teach students about landforms and bodies of water, this could also serve as a stand-alone lesson. You can see the first lesson plan at http://pmm.nasa.gov/education/lesson-plans/identifying-landforms-and-bodies-water-map. This lesson can also be divided into more than one class session, if time permits, as it is rich with activities that will reinforce the three-dimensional nature that the NGSS lessons strive to achieve.

Although using a three-dimensional art media, such as paper mache, clay, or play dough is a great opportunity for students, the models could also be made using colored pencils and paper.

http://www.instructables.com/id/Make-paper-mache-pulp/- How To Make Paper Mache Pulp

Additional Resources:

- *"Water Bodies- Where Are They?"*- In this investigation, students are introduced to types of water bodies. Seven types are defined and each is then located on NASA satellite images and maps. Students also use maps to identify and compare bodies of water in their state with those of other states, noting also how water availability in different regions impacts people, animals and plants.
http://nasawavelength.org/resource/nw-000-000-003-257/

- "How Can We Compare Maps with Images from Space"- Maps and images are examined, compared and contrasted in this introductory lesson. Beginning with the school building map typically posted in their classroom, students analyze the information it contains, describe its features, and determine its purpose. Students then examine maps at different scales to compare and contrast the amount of detail and the purposes. Maps are then compared to NASA satellite images.
http://nasawavelength.org/resource/nw-000-000-003-252/

- "Zooming In"- Students examine a series of remotely-sensed images of the US, scaling from the continent to San Francisco, and distinguish the concepts of scale and resolution. At greater resolution, students are able to identify different land classes on the map, using the color key for false color images. This lesson gives students first-hand experience in seeing how reality is represented by maps and models, determine spatial relationships between landscape features on a map, and an opportunity to design and create their own maps and models.
http://nasawavelength.org/resource/nw-000-000-002-011/