Monarch Mystic Migration

Author	Ana Parra
Grade Level	3-4
Duration	2 class periods

National Standards	AZ Standards	Arizona Social Science Standards
GEOGRAPHY **Element 1: The World in Spatial Terms** 1. How to use maps and other geographical representations, geospatial technologies, and special thinking to understand and communicate information. **NEXT GENERATION OF SCIENCE STANDARDS** **3-PS2 Motion and Stability: Forces and Interactions** 3-PS2-4. Define a simple design problem that can be solved by applying scientific ideas about magnets.	**ELA** **Reading** **Craft and Structure** 3.RI.4 Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a grade 3 topic or subject area. 4.RI.4 Determine the meaning of general academic and domain-specific words or phrases in a text relevant to a grade 4 topic or subject area. **Integration of Knowledge and Ideas** 3.RI.7 Use information gained from illustrations (e.g., maps, photographs) and the words in a text to demonstrate understanding of the text (e.g., where, when, why, and how key events occur). 4.RI.7 Interpret information presented visually, orally, or quantitatively (e.g., in charts, graphs, diagrams, timelines, animations, or interactive elements on Web pages) and explain how the information contributes to an understanding of the text in which it appears. **Writing** **Research to Build and Present Knowledge** 3.W.7 Conduct short research projects that build knowledge about a topic. 3.W.8 Recall information from experiences or gather information from print and digital sources; take brief notes on sources and sort evidence into provided categories. 4.W.7 Conduct short research projects that build knowledge through investigation of different aspects of a topic. 4.W.8 Recall relevant information from experiences or gather relevant information from print and digital sources; take notes, categorize information, and provide a list of sources. **SCIENCE** **Life Science** 3.L2U1.5 Develop and use models to explain that plants and animals (including humans) have internal and external structures that serve various functions that aid in growth, survival, behavior, and reproduction.	**GEOGRAPHY** **The use of geographic representations and tools helps individuals understand their world.** 3.G1.1 Use and construct maps and graphs to represent changes in Arizona over time. **The use of geographic representations and tools help individuals understand their world.** 4.G1.1 Use and construct maps and graphs to represent changes in the Americas over time. **Human-environment interactions are essential aspects of human life in all societies.** 4.G2.1 Compare the diverse ways people or groups of people have impacted, modified, or adapted to the environment of the Americas.

3.L2U1.6 Plan and carry out investigations to demonstrate ways plants and animals react to stimuli.
4.L4U1.11 Analyze and interpret environmental data to demonstrate that species either adapt and survive or go extinct over time.
Physical Science
4.P4U1.3 Develop and use a model to demonstrate magnetic forces.

SIOP Elements

Preparation	**Scaffolding**	**Grouping Option**
Adapting content **Linking to background** Linking to past learning Strategies used	Modeling **Guided practice** **Independent practice** **Comprehensible input**	Whole class **Small groups** Partners Independent
Integrating Processes	**Application**	**Assessment**
Reading Writing **Speaking** **Listening**	**Hands on** Meaningful Linked to objectives **Promotes engagement**	**Individual** **Group** **Written** Oral

Arizona English Language Proficiency Standards

Stage III
Listening and Speaking
Standard 2: The student will express orally his or her own thinking and ideas.
B-5: asking and responding to academic questions (who, what, where, when, why, how) using complete sentences (*e.g., making comparisons and describing events, etc.*) with instructional support.
Reading
Comprehending Text
Standard 4: The student will analyze text for expression, enjoyment, and response to other related content areas. The student will demonstrate reading comprehension by:
B-20: identifying content vocabulary within math, science, and social studies texts.
B-21: following two-to-three step written directions to complete task/procedure.
Writing
Standard 5: The student will demonstrate research skills by using a variety of reference materials to complete a variety of writing tasks. The student will demonstrate research skills by using a variety of reference materials to complete a variety of writing tasks as evidenced by:
B-1: recording and organizing information, observations or questions on a familiar topic from one or two sources (experiment, textbook, guest speaker, video, Internet, etc.) for report/research purposes.

Overview

Every fall a mysterious event takes place, the annual monarch butterfly migration to Mexico. Millions of Monarchs fly across eastern North America to an astonishing small region in Mexico in the "oyamel" ("*o-ee-ya-mel*"). How the butterfly finds this place

that the butterfly has it's never been before is one of nature's greatest wonders.

Purpose

In this lesson students will investigate the mystery of how the monarch finds its way to Mexico each year. Students will explore a hypothesis that scientists use to theorize, explore, and ponder this mystery. Students will learn how the earth's magnetic pull plays a part in monarch navigation, by exploring and creating compasses with magnets. This lesson includes strategies for diverse learners (ELLs).

Key Vocabulary

compass: an instrument with a magnetic needle that always points north
navigate: to find the way to get to a place when traveling
migrate: to move from one area to another at different times of the year (animal)
magnet: a piece of material (such as iron or steel) that is able to attract certain metals
instinct: something you know without learning it or thinking about it

Materials

- Science journal (if applicable)
- Compass (can be very nice one)
- Student compasses
- Chart paper
- Monarch Navigation Mystery—Student K-W-L Chart
- Monarch Navigation Mystery--Bubble Map
- Compass Challenge Cards
- Sticky notes
- Clear plastic cup
- Needles
- Magnets
- Floating material--flat cork or the base of a Styrofoam cup
- Monarch Butterfly Fall Migration Path map
- Vocabulary Cards
- Vocabulary Test and Answer Key

Objectives

The student will be able to:

1. Formulate questions and hypothesis about monarch migration by discussing ideas in small groups.
2. Identify the meaning of the vocabulary words by application of the word in context with Science Labs.
3. Apply scientific ideas about magnets by using a magnet to magnetize a needle to function as a compass.
4. Use a compass to find north and south in a real-world experience.
5. Use spatial thinking by locating the path of a monarch's migration south to Mexico using a map with monarch migration sightings.

Procedures

Prerequisites to this lesson: Students have been introduced to the basic concept of the butterfly life cycle and why butterflies migrate. Students should have basic knowledge of map skills such as finding mountains and bodies of water, and using the compass rose. It is helpful to provide prior exploration time with magnets.

SESSION ONE

Engage:
a. Divide students into groups of 2-4; mixing abilities and including ELL students with English proficient students. **(Grouping Options: Small Groups)**
b. Inform students that when there isn't access to satellites for GPS or Wi-Fi to ask Siri for directions, there is tool that uses the Earth as guidance. Sea captains have been using it for hundreds of years. It is a form of a special technology that they can create themselves. It is called a *compass*. Walk around showing students a compass.
c. Introduce the vocabulary words: *compass* and *navigate*. Give each group a copy of the vocabulary cards for compass and navigate. Also post the vocabulary cards on the board or on a word wall. Students may also define the words in their science journals. **(Scaffolding: Comprehensible input)**
d. Ask students to share any experiences they may have had with a compass. **(Preparation: Linking to Background)**
e. Begin a K-W-L poster. Divide chart paper into 3 parts with columns labeled K, W, and L. In the K column list the information of what students already know about a compass. They may include some of their experiences on the chart. **(Integrating Process: Listening& Speaking)**
f. Provide the small groups with at least one compass. Tell the groups that this is a time for them to explore their compass. Encourage students to share the compass and touch, turn, flip, rotate, etc. Allow for a few minutes for all students to explore and manipulate the tool. **(Application: Hands on)**

g. Ask students to share their observations. What could the letters mean? What could the numbers mean? What is making it move? Add their contributions to the K-W-L chart. **(Integrating Process: Listening& Speaking)**
h. Now proceed to filling out the W (what do they want to learn) column or what questions they may have about compasses. Record their questions. **(Integrating Process: Listening& Speaking)**
i. Provide groups with Compass Challenge Cards. Use these tasks as an informal assessment of groups' ability to use the compass. (Assessment: Group and Individual)
j. Provide each student with their own K-W-L chart so that they can record their own thoughts and questions. Students may also include information from class chart. Students should save their individual K-W-L chart in their science journals. **(Scaffolding: Independent practice)**
k. Conclude this session with a *review of the* K-W-L chart and the day's vocabulary words. **(Scaffolding: Comprehensible input)**

SESSION TWO

Explore:
a. Begin this session by defining the vocabulary words of migrate and instinct. Give each group a copy of the vocabulary cards for these words. Also post the vocabulary cards on the board or on a word wall. Students may also define the words in their science journals. **(Scaffolding: Comprehensible input)**
b. Watch the slide show on Monarch's Migration from Journey North https://journeynorth.org/tm/monarch/jr/IntroMig1K.html
c. Ask the students: "I wonder how the Monarch knows where to go?" Then say, "Nature is so majestic, and it has secrets for us to ponder."
d. In the same groups as Session 1, have students brainstorm ideas on the Bubble Map as to how the butterfly knows where to go in Mexico. Give students time to generate ideas and add illustrations to their bubble maps.
e. On chart paper have groups come up and add to the class's Bubble Map or give each group a sticky note and they can place it on the class bubble map. It is acceptable to post the same idea several times. **(Application: Promotes Engagement)**
f. Ask groups to share out their ideas. **(Integrating Process: Listening)** Let students know that we will be exploring what scientists believe is the reason monarchs can find their way.

Explain:
a. Explain to students that we don't know for sure how the monarch knows where to go each year when they migrate. We do know that they don't learn where to go but instead have an instinct to go to the right place at the right time.
b. Now say, "Scientists brainstormed just as you have to help them think of the ways as to how a monarch may find its way. The scientists then tested their ideas. They have narrowed down the possibilities to two main ideas as to how monarchs navigate. One is a **sun compass,** and the other is a **magnetic compass**.

The **sun compass** idea suggests since monarchs migrate during the day, the sun points the way. The monarchs may use the angle of the sun along the horizon as well as an internal clock to keep them going south. Some researchers saw butterflies flying in random patterns on cloudy days. So they thought that is proved they were right. BUT…Other researchers found that even thought it was cloudy, monarchs were still able to migrate in the correct direction. Proving that the sun was not the only way monarchs navigate.

The **magnetic compass** theory suggests that monarchs may use a magnetic compass to guide them. It is possibly used in addition to a sun compass or as a "back-up" guide on cloudy days when they cannot see the sun. This can be best described as an internal compass that can feel the Earth's magnetic field.
b. Introduce the vocabulary word *magnet*. Add it to the word wall, and student science journals. Then explain how the Earth's core acts like a magnet.
c. This leads us to several discussion points: How does a compass work? Have students do a think-pair-share. What do magnets have to do with it? Have students do a think-pair-share. How would magnetism work in a butterfly? Have students do a think-pair-share. **(Application: Promotes Engagement)**
d. Show YouTube video, "How a compass works" by MikeMegenius.
http://www.youtube.com/watch?v=MqCiY7MAT2U

Elaborate:
a. Provide students with the following materials: a clear plastic cup, a magnet, a needle, a piece of floatable material, and water.
b. Explain to students that now it is their turn to conduct an experiment to see if they can find north like compass. Use Step by step directions provided on Where is North? The Compass Can TellUs...http://www.nasa.gov/pdf/205714main_Where_Is_North.pdf **(Application: Hands on)**

c. Students will complete the steps 1-7

1. On the bottom of a clear plastic cup with water write the letter N for North, and then fill cup with water.
2. Cut the bottom out of a Styrofoam cup and float it on the water.
3. Place a drop of liquid soap in the water. This will reduce the surface tension friction and will keep the Styrofoam disk from attaching itself to the container wall (this step is optional).
4. Magnetize the compass "needle" by rubbing it in one direction on a small magnet.
5. Place the magnetized compass needle on the floating Styrofoam disk.
6 Ask students to observe the compass needle as it aligns parallel with the invisible magnetic field.
7. Discuss ways to verify which end of the needle is pointing north and which end is pointing south. Students may ask for the real compass they used in Session 1. Make these available.

d. Introduce the vocabulary words *migrate and instinct*. Add them to the word wall and student science journals.
e. Tell students they are to imagine that they are butterflies and it is time to "migrate" thousands of miles south to Mexico. To do this, they will use their handmade compasses.
f. Pass out to students the Monarch Butterfly Fall Migration Path map. Have students locate and label North and South on the map.
g. Tell students that they are going to "migrate" south to Mexico. They will start by placing their compass on the map on letter A, the Monarch's starting place in North America. Make sure they have lined up their N arrow on their compass with North on the map. Keeping their compass steady they are to glide their compass over the path (letters B-F). Students should be able to see the map and letters through the bottom of the cup.
h. Ask students if they could keep their compasses pointing North as they "traveled" south to Mexico. They should find that they can.

Evaluate:
a. Students will need to re-visit their K-W-L chart in their journals and fill out the final column L for what they have learned about compass. This can be done as a whole group and then they fill out their own KWL chart. (Grouping option: Group and individual) (This final activity can be used as an Exit Ticket by providing each student with a sticky note to add to the class K-W-L chart in the L column.)
b. Give Vocabulary Test.

Assessment

Science and ELA
K-W-L charts in science journals can be graded for correctness and completeness. Mastery will be considered having at least 5 correct comments in each column.

Reading
Students will score 80% or higher on the Vocabulary Test to be considered mastery.

Science, Geography, and Reading
Students will follow directions to make the compass and use the compass to find north and south in a real-world experience. This will be assessed by teacher observation and recorded as satisfactory or unsatisfactory.

Extensions

- The cultural traditions of Mexico relate to monarch migration. An interesting fact is that for a long time, scientists didn't know where the monarchs went to when they migrated. While at the same time, Mexicans had long held traditions tied to the arrival of the monarchs around Dia de Los Muertos (Day of the Dead) celebrations. There is also a social and political aspect of seeing monarchs as a symbol for Mexican immigrants in the United States.
- The conservation of Monarchs is related to the depletion of milkweed, the primary food source for butterfly larvae. After researching the problem, students can help engineer a solution.
- The personal side of a family's immigrant story can be read in books such as Migration-The Human Journey part of the National Geographic Education & Children's Programs.

Sources

Compass making directions:
Where is North? The Compass Can Tell Us….
http://www.nasa.gov/pdf/205714main_Where_Is_North.pdf

Slide show on Monarch's Migration from Journey North:
https://journeynorth.org/tm/monarch/jr/IntroMig1K.html

How a compass works
http://www.youtube.com/watch?v=MqCiY7MAT2U

Follow the Butterflies Map
http://teacher.scholastic.com/lessonrepro/reproducibles/images/mb3.gif

Extra info for teachers

Dr. Biology
http://askabiologist.asu.edu/migration
Monarch Lab
http://www.monarchlab.org/Lab/Research/Topics/Migration/Overwintering.aspx

Classroom Materials

Magnets and More, 24 piece set by Toysmith found on Amazon.com for $7.83

Magnetic Compass by American Scientific, 50mm, Set of 10 found on Amazon.com for $17.46

Clip art provided copyright free from http://office.microsoft.com/en-us/images/