It's a Metamorphic Life Style

Grade 3

Background:

Developing models to show visually that organisms have diverse life cycles but all share a similar pattern of birth, growth, reproduction and death. Students will review prior knowledge of animals and construct new learning for incomplete and complete metamorphosis. In my district, learning about animal adaptations is tentatively scheduled to learn in the late spring, however my class visits the local zoo and is part of Animal Ambassadors and I like for them to have a prior background on life cycles before we attend. Before you teach this lesson, students should understand ecosystems to understand the WI Frog and Toad data. April would be a good time to do this lesson because it would be before the animals start their life cycle and many animals such as the frogs go through the mating process in May -August. Having a model would allow for more exploration in 4th grade. If you had a 2nd/3rd grade class you could teach this set of lessons prior to observing and measuring egg growth as an extension activity in summer enrichment classes.

Frogs, toads, insects and butterflies are common animals that may be found around urban areas such as Milwaukee due to the proximity to Lake Michigan, lakes, rivers and tributaries. There is a large push in the city for green infrastructure and playgrounds which would allow for more animal friendly ecosystems near my school. Recording and analyzing data on frogs and toads throughout the state of WI allows students a better understanding of the different ecosystems and allows students to have a first look at how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates and reproducing. Metamorphosis is taught side by side to the egg to baby animal to adult model.

This lesson set would be an introduction to the patterns of life cycles of animals and plants. In further lessons students will compare/contrast the patterns of plants and animals. Data collection would be in class and at home. A typical subject area such as Math, Reading and Science are 45 minutes each, however in the elementary setting in our school and due to our partnerships in reading and math with a teacher college these times vary. Most days Science has 30 minutes. This is the reason I have chosen to include a chart that shows the weekly outline of activities and have stretched the 5 E lesson to be covered in five days.

Time Needed:

Approximately 30 minutes each day for 5 days, can be taught in longer or shorter format.

Standards:

Next Gen Science Standards

<u>3-LS1 From Molecules to Organisms: Structures and Processes</u>

3-LS1-1 Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction and death.

Disciplinary Core Idea

LS1.B Growth and Development of Organisms

- Reproduction is essential to the continued existence of every kind of organism. Plant and animals have unique and diverse life cycles. (3-LS1-1)

Science and Engineering Practices

Developing and Using Models

Modeling in 3-5 builds on K-2 experiences and progresses to building and revising simple models and using models to represent events and design solutions.

- Develop models to describe phenomena (3-LS-1)

Obtaining, Evaluating, and Communicating Information

- Obtain and combine information from books and other reliable media to explain phenomena
- Communicate scientific/and or technical information orally and/or in written formats, including various forms of media and may include tables, diagrams, and charts.
- Develop a diagram or simple physical prototype to convey a proposed object, tool, or process.

Cross Cutting Concepts
Patterns
Patterns of change can be used to make predictions (3LS1-1)

- Observed patterns in nature guide organization and classification and prompt questions about relationships and causes underlying them.

Patterns can be used as evidence to support an explanation

Nature of Science

Scientific Investigations Use a Variety of Methods

- Science methods are determined by questions.
- Science investigations use a variety of methods, tools, and techniques.

Scientific Knowledge is Based on Empirical Evidence

- Science findings are based on recognizing patterns.

Scientific Knowledge is Open to Revision in Light of New Evidence

- Science explanations can change based on new evidence

Scientific Models, Laws, Mechanisms, and Theories Explain Natural Phenomena

- Science explanations describe the mechanisms for natural events.

Science is a Way of Knowing

- Science is both a body of knowledge and processes that add new knowledge

Scientific Knowledge Assumes an Order and Consistency in Natural Systems

- Science assumes consistent patterns in natural systems

Science is a Human Endeavor

- Science affects everyday life.
- Creativity and imagination are important to science

Science Addresses Questions About the Natural and Material World

- Science findings are limited to what can be answered with empirical evidence.

CCSS

MP.4
Model with Mathematics
3.MD.B.3
Draw a scaled picture graph and scaled bar graph to represent a data set with several categories.
3.NBT
Number and Operations in Base Ten

ELA/Reading

RI.3.1 Ask and answer questions to demonstrate an understanding of the text, referring explicitly to the text as a basis for answers.
RI.3.2 Determine the main idea of a text, recount the key details and explain how they support the main idea.
RI.3.3 Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence and cause/effect.
RI.3.7
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).
SL. 3.4
Report on a topic or text, tell a story or recount and experience with appropriate facts and relevant, descriptive details, speaking clearly at an understandable pace.

Engaging Contexts:

Do you remember when you first learned about how chickens and baby birds hatched from eggs? What do we call an animal who hatches from an egg? How many of you have heard of the word, oviparous? What do we need to do to find out if there are other animals who are oviparous besides birds? Do all oviparous animals grow the same? How does metamorphosis work?

Justification:

The link between NGSS and CCSS/Math is something that goes together very easily when you talk about pattern and authentic data collection/graphs. Having my students create a bar graph of the data allows them to demonstrate both authentic data and meeting the requirements of 3. MD.B.3. I did not include in the rubric or assessment for the students that the graph was to be scaled correctly since this is a newer topic to them. We will use this as an introductory assessment to building bar graphs and include others during the year. CCSS/ELA is included in the lesson, but not in its own separate activities in the science time block. Students will be demonstrating components of R.I.3.1-3.3, R.I 3.7 and SL.3.4 by researching and explaining the metamorphic life cycle of an animal and use evidence to develop a model demonstrating knowledge of unique life cycles. They will also show that they have the speaking and listening CCSS skills by presenting their life cycle model and giving specific steps.

Engineering was not my intent in this lesson because we will be doing another activity this week to demonstrate a solution to a problem. (See outline of Monday-Friday) However, if you look closely at the activity of the Pattern Finder and the extension activity where the students examine the data from the frogs movement, record it and then translate it into dance moves this activity shows exploratory actions towards 3.5. ET. S1-2 Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem. This will not be assessed during the lesson, but it would be something to point out to students after the activity and show them that engineering is not just building something physical to have and hold.

Students will extend the concepts of life cycles, metamorphosis, patterns and graphing authentic data to other activities during the week this lesson will be taught. For ideas on other lessons, view the Outline of Monday-Friday document.

Student Objectives:

Students will be able to:

- Define what an oviparous animal is.
- Organize, represent and interpret data from WI Frog/Toad survey
- Graph two bar graphs after interpreting data from WI Frog/Toad survey
- Compare life cycles of a WI frog and frog from the rainforest
- Form conclusions about patterns from playing Pattern Finder game.
- Research and explain the metamorphic life cycle of an animal and use evidence to develop a model demonstrating knowledge of unique life cycles.

- Present life cycle model to class demonstrating understanding of how metamorphic life cycles occur and the specific steps in the model from birth, growth, adult and reproduction.
- Justify their definition/drawing of incomplete and complete metamorphosis

Materials

- What hatches from an egg? blank worksheet
- What hatches from an egg? animal cards
- Plastic eggs (one per student)
- Colored pencils
- Markers
- Computer with internet access
- Projector
- Life cycle of a Frog video Salle, T. (2011, April 23)
- Exit Slips for Days 1-4
- Frog Life Cycle Chart from Britannica Kids
- Gizmo Pattern Finder Game from E Learning
- Gizmo Pattern Finder Activity Sheets
- Student Science notebooks
- WI Frog and Toad Survey Site
- Blank bar graph charts
- Blank Venn Diagram
- Research of Frog/Toad Rubric
- 3rd Grade Model/Presentation Rubric

Possible misconceptions

Students have tendencies to relate the mammal reproduction and life cycle because it most common to them. They know that birds lay eggs and baby birds grow into larger birds. The concept of metamorphosis is sometimes mistaken as a sudden and quick change that happens overnight. As a teacher, I need to teach my students that this happens over a longer time frame. Some students may also assume that because one frog has a life cycle model that it fits for all frogs. Students will need to be exposed to the concept that the way an animal reproduces relates to its environment.

Prior knowledge needed

- Students will need to have a background on simple life cycles such as seed, sprout, plant or that animals all reproduce to create baby animals either in a live birth or egg.

- Ecosystems are important and may cause adaptation of an animal. Students will have learned this in the prior unit.
- Students will already know how to use Gizmo, google docs, and google search due to previous research and learning opportunities at our school.

E-learning connections

- Gizmo Pattern Finder Activity from Explore Learning https://www.explorelearning.com/index.cfm?method=cResource.dspDetail&resourceID=663
- Google docs
- Google search
- Wisconsin Frog and Toad Survey http://wiatri.net/inventory/frogtoadsurvey/SurveyInfo/anMapAll.cfm

- Life Cycle of a Frog https://www.youtube.com/watch?v=xl5wpy1vZwM

Engaging phenomena

Life Cycle of a Frog Video https://www.youtube.com/watch?v=xl5wpy1vZwM

Egg Activity and Activity Sheet
Both activities were chosen to be used together to engage students in the topic. Since my district is fully adopting NGSS this year, it was take a while for teachers to align their science curriculum to these standards, this means that students may come into my class with varying backgrounds, knowledge bases and misconceptions so I need to revisit the concept of animals that lay eggs before I move into the frog video. I have chosen this frog video because it also discusses key vocabulary terms such as metamorphosis and is narrated. Previous videos I have used had no words and only pictures, this was a problem because one of my students has a vision problem even with corrective eyewear so having auditory lessons is important to them and my auditory learners.

Lesson Plan

Day One:

Engage:

Teacher: Shows a picture of a baby chick and a chicken. “A baby chick is a young chicken, where does the chick come from? What organisms come from eggs? Does anyone know what an oviparous creature is? Does an animal who lays eggs in water have the same life cycle as one that lives on land? What animals start out life as an egg?”

As a whole class, students will brainstorm names of animals that lays eggs using a chart on the board. Be sure to have students write the animal names with a blue expo marker. Do not correct students if the animals lay eggs or not. Have students do this on their own chart at desk with a blue marker or colored pencil. When done, have the students turn their paper over at their space.

Pass out plastic eggs with oviparous creatures cards inside. Be sure to have either eggs of all one color that are labeled with letters or if you wish to make groups have multiple colors. Give students directions about how you want them to open eggs. I am choosing to have the students open eggs by calling out letters of the alphabet randomly as to who is opening them. Do not have students share the animals yet. Instruct students to record the name of their animal on their own paper using a purple marker or colored pencil. Call on students to share the names of the animals they have found. Record new animal names on the board chart and students’ pages in green.

Teacher: “Do you agree that this is all the names of animals that lay eggs? Are there any animals on our board chart that we need to remove?” Turn and talk with a neighbor about an animal we may need to remove.”

After partner talk time, have the students help and cross out non-oviparous animals in red marker. Have students follow along with recording changes.

Show students the Life cycle of a Frog Phenomenon video. (See link at end of lesson)

Teacher: “Do you know what metamorphosis is? Which of our animals on the board use metamorphosis for their life cycle besides the frog?”

Give students an exit slip with statements to answer: Define what an oviparous organism is. List one animal that you were surprised was an oviparous organism. Have students hand them to you at the door when they get ready for next class.

After you discuss several animals that use metamorphosis in class, have the students use the two-column sheet labeled complete and incomplete metamorphosis. Have students use this sheet for homework and have them draw or describe what they think a complete and incomplete metamorphosis life cycle looks like. Let students know that they will be sharing tomorrow in ELA class.

End of Day One

Day Two:

Explore:

Review with students the life cycle of a frog using the Frog Life Cycle Chart. Revisit the incomplete and complete metamorphosis drawings. Explore the meanings for incomplete and

complete. Have students share with partners and justify what they have drawn/wrote for each concept.

Teacher “How does looking at this chart help us learn about the life cycle of a frog?” How could you create a model to show me the birth, growth, reproduction and death of frog in a life cycle format?” What factors could affect the life cycle of a frog? What is the effect on the frog if it is moved or forced to move to a new ecosystem? What kind of pattern could we create about the frog’s ecosystem?”

Have students use the Gizmo application online and play the pattern finder game. Students should follow the directions on the worksheet step by step to observe the patterns. Start with the prior knowledge questions and continue till the end of Activity A. Activities B and C can be used with fast finishers or student who need a challenge after completing Activity A.

Divide students into groups by using favorite ice cream flavors. Have the groups look at the answers they have for Activity A. Have the students focus on the question, “Compare the purple and red frogs”. How did the frogs patterns vary? Can you make up a pattern using letters for how the frog moved, such as up, down, left, right, diagonal right, diagonal left (u, d, l, r, dr, dl). How might this look like if we made dance moves to match the pattern?

After students are placed in their groups, they need to take a second look at the patterns of the purple and red frogs. Groups need to everyone participating and working on the pattern and dance moves. Groups will then perform the dance moves for the class. Continue with letting groups share later in day or next class. Students should record patterns in their science notebooks.

Give students an exit slip with this question: What are the five steps for a frog’s life cycle? List them below. Have students hand them to you at the door when they get ready for next class.

End of Day Two

Day Three:

Explain:

Teacher: “What is our pattern of specials (gym, music, library, computer and lab)?” Students should be able to tell you the pattern that Mondays are always gym, etc. “What then would the pattern be for a frog’s life cycle?” Have students answer till you get the answers like: egg, tadpole with tail, tadpole with tail and legs, tadpole with legs and no tail, frog. “Is the life cycle of every frog in the world similar?” What is the relationship between frog’s life cycles and their environment?” Allow time for students to come up answers and ideas about these questions. As a class, let’s find out a frog that is native to WI and compare it to its ecosystem and then find a frog that is native to the rainforest and compare it to our WI frog. Let students use internet to look up a native WI frog and a native rainforest frog and compare the life cycles. Students should see that they do have similar life cycles, with a few variations.

Play Four Corners game with corners being “WI Frog”, “Rainforest Frog” “Unsure” and “Both”. Ask students questions about the life cycles of the two frogs. For example: Which frog starts its egg and life cycle stage in water?

Now that we have worked on patterns and comparing two frogs from different ecosystems, we are going to take data collected from the WI Frog and Toad surveys from 2010-2015 and graph it for two different types of frogs/toads. Students will do this by counting the number of frogs in pictograph for each year. Do this for each of the two frogs/toads. Students should be given multiple days to complete “Need to Do” activities at home after using class time.

Things students need to do:

-Record on the clipboard which frog/toad you are using data for.

-Check for accuracy of data count by comparing it with three to five other students who are reviewing data on the same frog/toad. See clipboard for list of students and the frog/toad choices. Have other students initial your paper after the check.

- Analyze the data for patterns. Does a change in the year mean a change in the number frogs/toads? Are there some areas that do not have any frogs/toads? Use your science notebook to record data for frogs/toads patterns and questions. You will transfer patterns and questions onto notebook paper or typed.

- Create two graphs using the blank bar graph chart showing the frog/toad name, year and number of frogs/toads observed. Students will be graphing one frog/toad per graph.

- Using technology, find a picture of the two specific frogs/toads you are collecting data about.

-Hypothesize why there are years with no frogs in some counties.

Give students an exit slip with the question: What surprised you about the life cycle of a rainforest frog? Have students hand them to you at the door when they get ready for next class.

Day Four:

Elaborate:

Part One

Students will choose one animal from the original egg chart that uses either incomplete or complete metamorphosis. Students may choose to build upon a previously researched animal from day four, or they may choose a new animal. Sample charts from online are available at end of lesson. Once all students have chosen an animal and life cycle chart, students will need to predetermine what is the best method for presenting the chart to their classmates. Students may not use original chart, instead they will need to create a model using either technology, drawing, 3D options such as clay, shapes etc., a poster, diorama, etc.

These models will be due one week from today. Give students a rubric when you assign so they know the expectations, can look over it and ask questions.

Give students an exit slip and have them ask you questions from the rubric.

Day Five:

Elaborate:

part 2

Students will choose one animal from the original egg chart (day one) that uses incomplete metamorphosis. They will use Google search and Google docs to find out which animals reproduce using incomplete metamorphosis and save an illustration of that life cycle chart. Have students record their sources. Once the life cycle of animal with incomplete metamorphosis is chosen, the student will then use a Venn Diagram to compare/contrast the two types of metamorphic life cycles using the chosen animals. If a student wishes to choose another animal besides the frog with complete metamorphosis, they can choose another and research that life cycle and chart. Students will present their findings to the kindergarten buddies when they visit. Revisit the exit slip from day four and answer any questions students may have about the rubric for the model.

Evaluate:

Formative assessment will happen throughout the lesson using the sticky note tracker for work that is done in groups to see if the student is understanding the concepts as well as used for data collected from classroom walkabouts during the pattern tracker activity. Days 1-4 have an exit slip so that I can evaluate if all the students are understanding key ideas for the lesson for the day. Day 2 has students use a partner format to justify their responses for incomplete and complete metamorphosis. Day 3 has students using the Four Corners game as an impromptu check of understanding.

Summative assessment will be done via two rubrics.

The first summative assessment will evaluate student work and understanding on the Frog/Toad Data. In this assessment, I will be checking to see that students are checking for the accuracy of their data, analyzing the data for patterns, creating two bar graphs to show data, using technology to show visual aids and illustrations, and hypothesizing why there is no frogs/data in certain counties for different years.

The second summative assessment will evaluate student work and understanding that reproduction is essential to the continued existence of every kind of organism. Plant and animals have unique and diverse life cycles. (3-LS1-1) This project also uses a model to help assess the student's learned knowledge based on NGSS 3-LS1-1 Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction and death. This is assessed in the 3rd Grade Model/Presentation Rubric.

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