Unit Plan Description

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Unit Plan Description

1. Standards & Unit Goals

The following 8th grade science standards are covered in this unit:

Lesson 1	Earth Science	3.3.8.A2. Describe renewable and nonrenewable energy resources.
Lesson 2	Life Science	3.1.8.A8. CHANGE AND CONSTANCY Explain mechanisms organisms use to adapt to their environment.
Lesson 3	Earth Science	3.3.8.A6. MODELS Explain how satellite images, models, and maps are used to identify Earth's resources. 3.1.8.A9. Explain the importance of accuracy and precision in making valid measurements.
Lesson 4	Physical Science	3.2.8.B4. Compare and contrast atomic properties of conductors and insulators. 3.2.8.B7. Formulate and revise explanations and models using logic and evidence.
Lesson 5	Physical Science	3.2.8.B2. Identify situations where kinetic energy is transformed into potential energy, and vice versa. 3.2.8.B6. PATTERNS Explain how physics principles underlie everyday phenomena and important technologies.

The goals of the unit, designed around the theme of sustainable energy and climate, are as follows. Students will:

- compose a summary of renewable and nonrenewable energy resources
- compare animal adaptation and acclimation with examples
- assess how animals adapt or acclimate in the face of climate change
- classify penguin colonies using satellite images
- draw conclusions about the importance of accurate data in penguin colony mapping
- compare and contrast the properties of conductors and insulators
- revise concept maps of conductors and insulators based on observations and evidence
- identify conductors and insulators in renewable energy technologies
- illustrate the flow of energy in renewable energy technologies

2. Rationale

The theme of this interdisciplinary unit is renewable energy and climate. All three branches of science are tied in to examine how humans currently use energy, how fossil fuels are changing the climate, how energy technologies function, how animals are affected by climate change, and how scientists study animal adaptation in the face of climate change.

3. Connections

The unit includes multiple connections to real-world problems and to other content areas.

- English Language Arts: Nonfiction biographical text is integrated in Lesson 5 with *The Boy Who Harnessed the Wind* and informational text is integrated in Lesson 2 with a National Geographic article. Students are asked to write short descriptions and summaries throughout the unit. Students must communicate effectively in their lab groups throughout the unit, and present research findings in front of the class in Lesson 5.
- Social Studies: Students examine historical energy usage throughout the world. Students consider social questions about energy usage and whether we should change our energy habits as a society.
- Mathematics: Students interpret charts and graphs related to renewable and nonrenewable energy resources. Students tabulate data of penguin adults, chicks, and eggs.

4. Learner Development

WIDA Can-do Descriptors for Listening, Reading, Speaking, and Writing are used for each lesson to serve as benchmarks for English Language Learner (ELL) students. At Level 3 (Developing), for example, ELLs are expected to speak conversationally in their lab groups, convey understanding through short writing assignments, answer questions based on brief texts, and follow directions described orally.

To support ELLs at their current development level, adaptations are utilized throughout the unit. Adaptations provided include: pictorial representations with short phrases to demonstrate their understanding; lists of content vocabulary definitions are provided for support of academic language development; adapted presentations so that students can speak only briefly or perform another role in their group; and the ability to confer with classmates or translation applications as needed for assistance.

5. Learner Diversity

Lessons throughout the unit are adapted and differentiated for learner diversity. Gifted students are challenged to think critically, connect lessons to other content areas, and deepen their knowledge with further exploration. Students with cognitive needs and struggling readers are provided with vocabulary lists and graphic organizers to support their reading comprehension. Students with physical needs will be provided with technology assistance as needed. Students with behavioral challenges will be asked to be leaders in their lab groups, and will be allowed to draw diagrams to demonstrate understanding.

6. Assessment Plan

Both informal and formal assessments are included in each lesson. Informal assessments check for student understanding through class discussions, lab exercises, and short exit tickets. Lab worksheets, diagram drawings, and short compositions serve as formal assessments. Students will take a summative unit test at the conclusion of Lesson 5.

7. Instruction

Instruction throughout the unit is designed to flow from teacher-center to more student-centered. Two hands-on labs are included: the first is a computer-based lab where students classify satellite images of penguin colonies for the citizen science project Penguin Watch; and

the second is a conductivity lab where students predict and test which materials will conduct electricity. Because the unit is interdisciplinary and draws connections between multiple science content areas, each lesson is connected to the frame of "big picture" understanding. The unit ends with a student-driven research project and presentation to the class.

8. Lesson Plans

Below is the content and learning strategy for each lesson. See attached full lesson plans.

Lesson 1	Renewable and Non-renewable Resources	Lecture-Discussion
Lesson 2	Animal Adaptation and Climate Change	Guided Discovery
Lesson 3	Satellite Mapping of Penguin Colonies	Direct Instruction
Lesson 4	Conductors and Insulators	Concept Attainment
Lesson 5	Renewable Energy Technologies	Inquiry-Based Learning

9. Assessments

Assessments are weighted for the unit as follows: Class Work (22.5%), Labs (22.5%), Homework (20%), Unit Test (35%). See attached Lab worksheets and Unit Plan Test.

10. Critical Thinking

Critical thinking and the application of content knowledge is core to the unit plan. Students are challenged to come up with their own examples, make predictions, note their observations, summarize key ideas, compare concepts, and create original material from provided information. In addition, core concepts are connected to big picture ideas in each lesson. Students are asked to consider questions such as:

- How do our energy choices affect the environment?
- How can observation of satellite images help penguin conservation efforts?

- How does the energy flow through a system?
- What are the pros and cons of various renewable energy technologies?

11. Materials & Resources

A technology cart with a projector, computer, and speakers is needed throughout the unit. Students receive a lab worksheet or graphic organizer for each class activity. Lesson 2 requires markers and drawing paper. Lessons 3, 4, and 5 utilize student computers or laptops. Makey Makey kits are used for each lab group in Lesson 4. *The Boy Who Harnessed the Wind* is excerpted in Lesson 5.

12. Additional Techniques

The **Jigsaw** technique could be used for a student-centered Lesson 1, where students each learn about an energy resource from various source documents and in turn teach their lab group the content. The same graphic organizer filled out individually in Lesson 1 would instead be puzzled together in lab groups. Students would conclude with a whole-class discussion.

The **Pattern Maker** technique would allow students to create their own explanations of conductors and insulators in Lesson 4. First, students would look at textbook definitions and critique why and where the definitions are not successful or engaging. Children's books about conductors and insulators would be provided as an example of an engaging explanation. Finally, students would re-write their own definitions using pictures, metaphors, and narrative devices.

The **Circle of Knowledge** technique could serve as a follow-up lesson to Lesson 3, Satellite Mapping of Penguin Colonies. The students would reflect upon their experience of participating in citizen science, re-examine why accurate data collection is important, discuss the pros and cons of citizen science, and consider if and how people should help animals adapt to climate change.

Name: Anne Schmitt

Date: 9/12/19

Lesson Details

Lesson Title: Renewable and Non-renewable Resources using Lecture-Discussion

Content Area: Science: Earth & Space Science

Grade Level: 8

Timeline: 1 of 5

Date of Lesson: TBD

UBD Stage I: Identify Desired Results

Enduring Understandings

Recognize the natural and human-driven systems and processes that produce energy and affect the environment.
Understand that humans are using some resources, which our society relies on, faster than they can be replaced.

Essential Questions

Why is it important to know where our energy comes from?
How do our energy choices affect the environment?
How has energy use changed over time, and how should it change in the future?

PA Core Standards: Standards Aligned System (SAS)

- **Standard** - 3.3.8.A2
  - *Describe renewable and nonrenewable energy resources.*
- **Eligible Content** - S8.B.3.3.2
  - *Explain how renewable and nonrenewable resources provide for human needs (i.e., energy, food, water, clothing, and shelter).*
- **Eligible Content** - S8.B.3.3.1
  - *Explain how human activities may affect local, regional, and global environments.*

PA English Language Development (ELD) Standards

- **16.4.6-8.3W**
  - List the types of renewable and nonrenewable resources using a pictorial representation.
- **16.1.6-8.3S**
  - Exchange everyday information using conversation models with partners.

Lesson Objectives

The students will be able to:

List *(Recall)* *the main types of renewable and nonrenewable energy* *on a graphic organizer* *with* *100% accuracy*.

Compose *(Recall)* *a short summary of each energy source* *on a graphic organizer* *with* *75% accuracy*.

Infer *(Skill/Concept)* *replacement time for various energy sources* *in group discussions* *with* *25% accuracy*.

Draw Conclusions *(Strategic Thinking)* *about the usage of various energy resources over time* *on a group chart and graph worksheet* *with* *50% accuracy*.

UBD Stage II: Determine Acceptable Evidence

Assessment Tasks

The teacher will:

*Formally assess the student's ability to **list** the main types of renewable and non-renewable energy on a graphic organizer with 100% accuracy by collecting them and grading them.*

*Formally assess the student's ability to **compose** a short summary of each energy source on a graphic organizer with 75% accuracy by collecting them and grading them.*

*Informally assess the student's ability to **infer** replacement time for various energy sources in group discussions with 25% accuracy by circulating around the classroom and listening to group discussions.*

*Formally assess the student's ability to **draw conclusions** about the usage of various energy resources over time on a group chart and graph worksheet with 50% accuracy by collecting them and grading them.*

Assessment Adaptations

n/a

Rubric/Scoring Criteria

Energy graphic organizer =10 pts for list of energy sources,20 pts for definitions
Group chart/graph worksheet = 5 pts

UBD Stage III: Plan Learning Experiences and Instruction

Materials and Resources

- Teacher Computer
- Projector & Speakers
- "The Difference between a Renewable and Non-Renewable Resource" (2 min)
  https://www.youtube.com/watch?v=nKgeTvQWZaI&list=WL&index=4
- "The Formation of Fossil Fuels" (3 min)
  - https://www.youtube.com/watch?v=_8VqWKZIPrM
- "Energy Sources" website - https://www.eia.gov/kids/energy-sources/
- 1 Energy Sources Graphic Organizer for each student
- 1 writing utensil for each student
- 1 Printout "US Energy Consumption by Source" per group

If Time Materials

- Kahoot "Energy Powering Generations" https://create.kahoot.it/details/energy-powering-generations/94abd1d0-f3e9-4d06-9026-1308c3abcc25
- 1 device (phone, tablet, or computer) per student

Anticipatory Set

(T) Reminds students that humans use natural resources for energy needs and material needs. (1 min)
(T) Asks students what they think we use energy for in society and where they think this energy comes from, specifically in Pennsylvania (1 min)
(S) Discuss the two questions in small groups (4 min)
(T) Leads whole class discussion to hear what each group thought (5 min)
(T) Bridges to the topic of the day (1 min):
These are great thoughts. Today I'm going to show you all the possible ways we can get energy as a society and how some are considered renewable and some are non-renewable.

Procedures and Content

(T) Will pass out graphic organizer for the Lecture-Discussion. Will explain that the paper will help students to follow key points and take notes during today's lecture. (2 min)
(T) Will play video "The Difference between a Renewable and Non-Renewable Resource" (2 min)
(T/S) Will discuss review questions. (2 min)
Were the eggs a renewable or non-renewable resource?
What was the replacement time for eggs? Chickens?

(T) Will play video "The Formation of Fossil Fuels" (3 min)
(T/S) Will discuss review questions (4 min)
What are fossil fuels actually made of?
How long did it take for fossil fuels to form?
How does this relate to our first video?
What can you fill in on your graphic organizer?

(T) Will explain non-renewable energy sources: coal, oil, gas, and nuclear using Energy Sources website(7 min)
(S) Will complete "Non-renewable sources" section of graphic organizer
(T/S) Will discuss review questions (3 min)
What state of matter is each fossil fuel?
What type of energy is being transformed?
(T) Will explain renewable energy sources: wind, solar, hydroelectric, biomass, and geothermal (12 min)
(S) Will complete "Renewable sources" section of graphic organizer
(T/S) Will ask students to discuss and record in their groups what they think the replacement time is for each renewable source (3 min)
(T/S) Will discuss the replacement time of renewable sources. (4 min)
(T) Will ask students how the replacement time of the non-renewable sources compare to the replacement time of renewable sources (2 min)

(T) Will pass out to each group "US Energy Consumption by Source" pie chart and group. (2 min)
(S) Will work as a group to determine what percentage of each type of energy source is used in the United States. Will record notes in their graphic organizer (10 min)
(S) Will answer the following questions as a group (10 min)

What percent of US energy comes from non-renewable sources? From renewable consumption?

How has renewable energy consumption changed from 1970 – present day?

How has coal consumption changed from 2000-present day?

Which renewable energy source makes up the most of our consumption? Non-renewable consumption?

How has US **total** energy consumption changed from 1950-present day?

Closure

(S) Will complete an exit ticket answering the following questions. (6 min)
What is the difference between a renewable and non-renewable energy source?
Why is it important that we know where our energy comes from?

Homework

If the students did not finish the "US Energy Consumption by Source" pie chart and graph questions, complete at home. Students will then compose a paragraph answer to the question " How has US Energy Consumption by source changed between 2000 and 2019? Students should come to class ready to discuss their paragraph and the meaning of the pie chart and graph.

If Time Activities

(T) Will bring up Kahoot website for "Energy Powering Generations" (1 min) https://create.kahoot.it/details/energy-powering-generations/94abd1d0-f3e9-4d06-9026-1308c3abcc25

(S) Will get on devices (phones, class iPads) and type in Kahoot code (3 min)

(S) Will play Kahoot quiz (6 min)

(T) Will close with class discussion on what was learned from the quiz (5 min)

Procedural Adaptations/Differentiated Instruction

- Struggling readers – Key vocabulary words will be posted in text form as well as read
- ELLs – Will use an iPad to drag and drop images of each energy source into a graphic organizer, can type additional details as ability allows
    - WIDA Can-Do-Descriptor – Level 3, Developing – Categorize content-based examples from oral directions
- gifted students – Will draw the flow of energy of each sources on the back of their graphic organizer – noting what form of energy (chemical, light, mechanical, thermal, nuclear, electric) is transformed at each step. The more detail the better!
- students with physical needs – Will use an iPad or assistive technology device to fill out graphic organizer
- students with cognitive needs - Will draw pictures to go along with each energy source definition, Will participate in class discussion with peers
- behavioral accommodations – Will draw pictures to go along with each energy source definition

Name: Anne Schmitt

Date: 9/22/19

Lesson Details

Lesson Title: Animal Adaptation and Climate Change using Guided Discovery

Content Area: Science: Biology

Grade Level: 8

Timeline: 2 of 5

Date of Lesson: TBD

UBD Stage I: Identify Desired Results

Enduring Understandings

Our current climate change is caused by human activity - primarily the burning of fossil fuels.
Animals, plants, and other organisms are affected by climate change and will need to adapt to their environment as it changes.

Essential Questions

How do our energy choices affect the environment?
How do animals adapt and accommodate to their environment in the face of climate change?

PA Core Standards: Standards Aligned System (SAS)

3.1.8.A8: CHANGE AND CONSTANCY: Explain mechanisms organisms use to adapt to their environment.

PA English Language Development (ELD) Standards

- **16.4.6-8.3W**
  - List examples of adaptation and acclimation using a pictorial representation.
- **16.1.6-8.3S**
  - Exchange everyday information using conversation models with partners.

Lesson Objectives

The students will be able to:

Assess *(Strategic Thinking)* *the climate effects of our energy usage in the United States* *in group discussions* *with* *50% accuracy*.

Compare *(Strategic Thinking)* *animal adaptation and acclimation* *on a graphic organizer* *with* *100% accuracy*.

Create *(Extended thinking)* *examples of animal adaptation and acclimation* *in group skits or drawings* *with* *75% accuracy*.

UBD Stage II: Determine Acceptable Evidence

Assessment Tasks

The teacher will:

Informally assess the student's ability to ***assess*** *the climate effects of our energy usage in the United States* *in group discussions* *with* *50% accuracy* *by circulating around the classroom and listening to group discussions*.

Formally assess the student's ability to ***compare*** *animal adaptation and acclimation* *on a graphic organizer* *with* *100% accuracy* *by* *collecting them and grading them*.

*Informally assess the student's ability to **create** examples of animal adaptation and acclimation in group skits or drawings with 75% accuracy by observing student presentations.*

Assessment Adaptations

Students with cognitive needs and ELLs may confer with classmates and keep answers in short bullet points on their graphic organizers.

Other students will have assessment adaptations as written in their IEP as needed.

Rubric/Scoring Criteria

Comparison of adaptation and acclimation = 20 pts

UBD Stage III: Plan Learning Experiences and Instruction

Materials and Resources

- 1 Article per student, National Geographic, "Antarctica Could Lose Most of Its Penguins to Climate Change" https://www.nationalgeographic.com/news/2016/06/adelie-penguins-antarctica-climate-change-population-decline-refugia/
- Teacher Computer
- Projector & Speakers
- Video: "Causes and Effects of Climate Change" (3 min)
  - https://www.youtube.com/watch?v=_8VqWKZIPrM
- Video: "Adaptations at Animal Wonders – Field Trip" Clip (4 min)
  - https://www.youtube.com/watch?v=a85lHqFhyw4
- 1 writing utensil per student
- 1 top hat graphic organizer: Adaptation vs. Acclimation
- markers and drawing paper

Anticipatory Set

(T) Will announce purpose for video: Find the big picture causes and effects of climate change. Will play video "Causes and Effects of Climate Change" (4 min)
(T/S) Will identify and discuss as a class the broad causes and effects of climate change from the video. (3 min)
(S) Will discuss in lab groups 2 questions based on their homework from last class. (7 min)

1. How has US Energy Consumption changed by source from 2000 to 2019?
2. Do you think the changes from 2000 -2019 mean the US has less impact on the climate?

(T) Will circulate and observe discussions
(T) Will bridge to today's topic by noting "The majority of our energy still comes from fossil fuels, which are the primary driver of climate change. Today we are going to learn about how animals can adapt (or not adapt) to climate change." (2 min)

Procedures and Content

(T) Will pass out graphic organizer "Adaptation vs. Acclimation" (2 min)
(T) Will explain purpose of the video: to write down at least 2 examples of animal adaptation. Will play a clip from the video "Adaptations at Animal Wonders – Field Trip" (5 min) PHASE 1: DESCRIPTION
(S) At the same time, will jot down 2 examples of animal adaptations from the video
(T/S) Will hypothesize what an adaptation is in whole class discussion, based on the examples shown. (5 min)
(S) Will jot down 4 additional observations that describe adaptation from the class discussion (3 min)
(T) Will explain a situation where an African crested porcupine runs out of its favorite food due to drought. (2 min)
(S) Will imagine what the porcupine could do to survive and share with the class (5 min)
(T) Will explain that these are examples of acclimation (2 min)
(T/S) Will hypothesize a definition of acclimation in whole class discussion. (5 min)
(S) Will Think-Pair-Share: Compare adaptation and acclimation by writing down similarities and differences. (5 min)
(S) Will then work with a partner to discuss your comparison. (5 min) PHASE 2: COMPARISON

(T/S) Will lead "Share" of partner thinking in whole class discussion. Whole class will come to conclusions about the definitions and comparison between acclimation and adaptation. Teacher will take notes on board while students correct any errors in their definitions/examples on their graphic organizers (10 min) PHASE 3: CONCLUSION

Closure

(T) Will prompt students with more examples of adaptation and acclimation, describing how they might turn them into a quick skit. For example, one student could act as a cat while another student holds up a drawing of thermometer showing freezing temperatures. The cat will then shiver or run around to warm itself up. (2 min)
(S) Will get together in small groups to plan 1 example of adaptation and 1 example of acclimation for the rest of the class. Groups may draw or act out their examples. (I.e., a drawing of a bird with a long beak for adaptation, and a drawing of a bird flying to a new location for acclimation) (8 min) PHASE 4: APPLICATION
(T) Will circulate and assist groups in their thinking as they implement their plans
(S) Will act out examples in groups, while the remainder of the students guess whether the example is an adaptation or acclimation (10 min)

Homework

(S) Will read the 2-page National Geographic article, "Antarctica Could Lose Most of Its Penguins to Climate Change" with the purpose of answering the questions:

How is climate change affecting the Adélie penguin (be specific)?

What adaptations or acclimations do you think might help the Adélie penguin survive the new climate norms?

If Time Activities

(S) Will draw a "final copy" of one of their animal adaptations or acclimations to turn in for bonus points. The collection of drawings will be used as examples for future classes. (15 min)

Procedural Adaptations/Differentiated Instruction

- Struggling readers – Will take margin notes when reading the homework article
- ELLs – Will work side-by-side with a partner throughout class to help with writing/spelling in the graphic organizer
    - WIDA Can-Do-Descriptor – Listening Level 3, Developing – Identify everyday examples of content-based concepts described orally
- gifted students – Will be challenged to be creative and come up with additional examples for the drawing/skit activity.
- students with physical needs – Will use an iPad or assistive technology device to fill out graphic organizer
- students with cognitive needs - Will be challenged to be the leader in their drawing/skit group
- behavioral accommodations – Will sit up front near the teacher. Will draw pictures to go along with examples of the adaptations/acclimations comparison

Name: Anne Schmitt

Date: 9/22/19

Lesson Details

Lesson Title: Satellite Mapping of Penguin Colonies using Direct Instruction

Content Area: Science: Earth Sciences

Grade Level: 8

Timeline: 3 of 5

Date of Lesson: TBD

UBD Stage I: Identify Desired Results

Enduring Understandings

Recognize the usefulness of maps, models, and satellite imagery to scientific efforts.
Understand that accurate measurement and data is vital to research.
Know that everyday people can contribute to science research through citizen science efforts.

Essential Questions

How can observation of satellite images help penguin conservation efforts?
What is citizen science?
How would accurate or inaccurate data affect penguin research?

PA Core Standards: Standards Aligned System (SAS)

3.3.8.A6: MODELS: Explain how satellite images, models, and maps are used to identify Earth's resources.

3.1.8.A9: Explain the importance of accuracy and precision in making valid measurements.

PA English Language Development (ELD) Standards

- **16.4.6-8.3L**
  - Critique peer work on a rubric with icons.
- **16.1.6-8.3S**
  - Exchange everyday information using conversation models with partners.

Lesson Objectives

The students will be able to:

Identify *(Recall)* *the effects of climate change on the Adélie penguin* *in whole class discussion* *with* *75% accuracy.*

Classify *(Skill/Concept)* *satellite images of penguin colonies* *on the Penguin Watch "classify" tool* *with* *75% accuracy.*

Report *(Recall)* *results of Penguin Watch classification* *on a lab worksheet* *with* *100% accuracy.*

Draw Conclusions *(Strategic Thinking)* *about the importance of accurate data* *in whole class discussion* *with* *50% accuracy.*

UBD Stage II: Determine Acceptable Evidence

Assessment Tasks

The teacher will:

*Informally assess the student's ability to **identify** the effects of climate change on the Adélie penguin in whole class discussion with 75% accuracy by observing class discussion.*

*Informally assess the student's ability to **classify** satellite images of penguin colonies on the Penguin Watch "classify" tool with 75% accuracy by circulating around the room and observing students.*

*Formally assess the student's ability to **report** results of Penguin Watch classification on a lab worksheet with 100% accuracy by collecting them and grading them.*

*Informally assess the student's ability to **draw conclusions** about the importance of accurate data in whole class discussion with 50% accuracy y by collecting them and grading them.*

Assessment Adaptations

Students with cognitive needs will complete fewer image classifications, and gifted students will complete more.

Other students will have assessment adaptations as written in their IEP as needed.

Rubric/Scoring Criteria

Lab data sheet = 25 points

UBD Stage III: Plan Learning Experiences and Instruction

Materials and Resources

- Teacher Computer
- Projector & Speakers
- 1 lab data sheet for each student
- 1 writing utensil for each student
- 1 computer per student
- "Being a Penguinologist" Video (4 min):
  - https://drive.google.com/drive/folders/1j4SVog1qazCjFJsm_xUHE1Dp3KJywYCw?usp=sharing
- Zooniverse Penguin Watch website:
  - https://www.zooniverse.org/projects/penguintom79/penguin-watch
- HW: Zooniverse "Climate" Projects: https://www.zooniverse.org/projects

If Time Materials

- "Criminal Penguins: Frozen Planet" Video (2 min)
  - https://www.youtube.com/watch?v=M--8devfaaA
- "Antarctica's Brush-Tailed Penguins" (3 min)
  - https://www.youtube.com/watch?v=QS5jpQ6cpsg

Anticipatory Set

(T/S) Will discuss article from homework: the impact of climate change on the Adélie penguin and what adaptations or acclimations could help the penguin survive (7 min)
(T) Will bridge to today's topic "Today we are going to help scientists collect data on Adélie penguin colonies." (1 min)

Procedures and Content

(T) Will announce purpose for "Being a Penguinologist" video: Discover how scientists are trying to help penguin colonies and how we can help (4 min)
(T/S) Will discuss how the Penguin Watch project might help penguin colonies adapt to climate change (5 min)
(T) Will bring up Penguin Watch website and define citizen science as it relates to the lab today. (3 min)
(T) Will demonstrate how to tag a satellite image in the Penguin Watch "Classify" tool and record data on lab worksheet (6 min)
STEP 1: I DO

(S) Will hypothesize why accurate data collection is important for Penguin Watch (5 min)
(T/S) Will have students, as a whole class, help to tag the next satellite image by pointing out adults, chicks, and eggs and identifying data for lab sheet (6 min) STEP 2: WE DO
(S) Will sit next to a partner and log on to Penguin Watch website. (3 min)
(T) Will pass out lab report worksheet (at the same time)
(S) Will tag 1 satellite image and then switch seats with their partner to check the tagging for accuracy (8 min) STEP 3: YINZ DO
(T) Will circulate and assist students as needed (at the same time)
(S) Partners will together record the number of adults, chicks, and eggs, date & time, temperature for the satellite images (3 min)
(T) Will prompt students to being to tag at least 6 satellite images on their own and record the data for each image (25 min) STEP 4: YOU DO (If more practice is needed, will prompt students to check each other's work on a second set of satellite images)

Closure

(S) Will return to their seats and have think time on reflection questions (2 min)

- What was easy or challenging about the experience?
- Did you have any interesting or unusual satellite images?
- Would you want to participate in more citizen science?

(T) Will add up the total number of penguins counted and announce the total class impact (1 min)

(T/S) Will discuss reflection questions and share their experience of Penguin Watch (8 min)

Homework

(S) Use the Zooniverse website to choose another project to browse under the "Climate" category. Write a two-sentence description of the project and how citizen scientists can participate.

If Time Activities

(T) Will play videos "Criminal Penguins: Frozen Planet" and "Antarctica's Brush-Tailed Penguins" with the purpose of comparing what they see to what they observed during the Penguin Watch lab (5 min)

(T/S) Will discuss as a class what they noticed (5 min)

Procedural Adaptations/Differentiated Instruction

- Struggling readers – Will have no adaptations for this activity (little to no reading required)
- ELLs – Will be shown pictures (as will the rest of the class) for adult, chick, and egg along with oral description. Will have a rubric of icons to help check peer work (i.e., pictures of adult, chick, and egg if the partner is missing one)
    - WIDA Can-Do-Descriptor – Level 3, Developing – Use learning strategies described orally
- gifted students – Will be challenged to complete an additional 3 or 4 satellite image tags and data
- students with physical needs – Will use an assistive technology device to use the computer in lieu of a mouse
- students with cognitive needs – Will be required to only complete 4 satellite images
- behavioral accommodations – Will be challenged to create a drawing as a reflection instead of participate in class discussion

Name: Anne Schmitt

Date: 9/30/19

Lesson Details

Lesson Title: Conductors and Insulators using Concept Attainment

Content Area: Science: Physical Sciences

Grade Level: 8

Timeline: 4 of 5

Date of Lesson: TBD

UBD Stage I: Identify Desired Results

Enduring Understandings

Understand that materials conduct or insulate electricity due to their structure at the atomic level.
Know that the physical principles of conduction and insulation underlie our daily use of electricity in society.

Essential Questions

How do conductors and insulators differ at the atomic level?
How can we use logic and evidence to revise the definition of conductor or insulator?

PA Core Standards: Standards Aligned System (SAS)

3.2.8.B4. Compare and contrast atomic properties of conductors and insulators.

3.2.8.B7. Formulate and revise explanations and models using logic and evidence.

PA English Language Development (ELD) Standards

16.4.6-8.2S Restate the definition of conductors and insulators using visuals and notes/graphic organizers.

16.1.6-8.3S Exchange everyday information using conversation models with partners.

Lesson Objectives

The students will be able to:

Classify *(Skill/Concept) images of conductive/insulative materials in lab group discussion with 50% accuracy.*

Cite Evidence *(Strategic Thinking) of which materials conducted electricity in lab group presentations with 75% accuracy.*

Compare *(Skill/Concept) their predictions and observations about conductors on lab worksheet with 100% accuracy.*

Create *(Extended Thinking) concept maps of conductors and insulators in their science journals with 75% accuracy.*

UBD Stage II: Determine Acceptable Evidence

Assessment Tasks

The teacher will:

Informally assess the student's ability to ***classify*** *images of conductive/insulative materials in lab group discussion with 50% accuracy by observing lab group discussions.*

*Informally assess the student's ability to **cite evidence** of which materials conducted electricity in lab group presentations with 75% accuracy by observing student presentations.*

*Formally assess the student's ability to **compare** their predictions and observations about conductors on lab worksheet with 100% accuracy by collecting them and grading them.*

*Formally assess the student's ability to **create** concept maps of conductors and insulators in their science journals with 75% accuracy by collecting them and grading them.*

Assessment Adaptations

- Struggling readers – Will have reflection questions read aloud to them
- ELLs – Will be expected to produce only short phrases in response to reflection questions. Will receive a graphic organizer to assist in creating concept map
    - WIDA Can-Do-Descriptor – Level 3, Developing – Complete graphic organizers/forms
- gifted students – Will be expected to make additional connections to course content in their reflection questions and concept map
- students with physical needs – Will use assistive technology device to write or draw as needed
- students with cognitive needs – Will receive clarification if needed on reflection questions. Will receive a graphic organizer to assist in creating concept map
- behavioral accommodations – No assessment accommodations in this case

Rubric/Scoring Criteria

Lab Worksheet = 10 points
Concept map = 20 points

UBD Stage III: Plan Learning Experiences and Instruction

Materials and Resources

- Teacher Computer
- Projector & Speakers
- 1 science journal per student
- 1 writing utensil for each student
- 1 set of conductors and insulators image cards per lap group
- 1 Makey Makey kit per lab group
- 1 computer per lab group
- variety of test materials that match image cards: coins, silverware, paper clips, paper, bananas, play-dough, cotton balls, plastic toys, wooden chopsticks, cup of water, aluminum cans
- 1 button piano website:
    - https://web.archive.org/web/20160507001625/https://scratch.mit.edu/projects/59224550/

Anticipatory Set

(T) Will pass out an envelope of images to each lab group and prompt groups to sort images into any number of groups, ensuring that they have a justification for their classification (1 min)
(S) Will discuss the images with lab groups and sort the images (5 min)
(S) Lab groups will share with class their classifications and justifications (4 min)

Procedures and Content

(T) Will bridge to the topic of today, "You came up with many great ways to sort these images. For today we want to focus on two groups for the next sort: conductors and insulators" Will read students the definition of conductor and insulator (2 min)
(S) Will discuss and revise classification of conductors and insulators with their lab groups. Will record predictions of conduction on lab sheet, including **why** they think so (8 min) STEP 1: CONCEPT
(T/S) Will discuss predictions of conduction/insulation on the board, with a third category of "unknown" for items that do not have a consensus among the whole class (5 min)

(T) Will explain to students that we will be testing and measuring each of these items shown to determine if it conducts electricity using a Makey Makey kit. Will demonstrate how to set up Makey Makey kit at their lab station (10 min)
(S) Will set up Makey Makey kits with lab groups, measure each of the items for conductivity, and record results on lab sheet (20 min)
STEP 2: YES AND NO EXAMPLES
(S) Will discuss with lab groups shared characteristics of conductors and insulators (5 min)
(T/S) Each lab group will share 2 items they tested, whether they were conductors or insulators, how their predictions compared to observations, and any observations that surprised them (10 min) STEP 3: PROCESSING

Closure

(S) Will answer reflection questions on their lab worksheet. (15 min)
STEP 4: REFLECTION QUESTIONS

- How did your definition of a conductor or insulator change after the Makey Makey activity?
- What test material most surprised you as a conductor or insulator and why?
- How does a conductive or insulative material in a Makey Makey test differ from a conductor or insulator used for transporting electricity?

Homework

(S) Will draw a concept map each for conductors and insulators. Students should include properties and examples in their concept map. STEP 5: SYNTHESIS TASK

If Time Activities

(T/S) Will predict and test additional materials (found around the room) for conductivity as a whole class (7 min)
(T/S) Will discuss as a whole class what steps ensure a good connection for the Makey Makey and hypothesize how the Makey Makey works (8 min)

Procedural Adaptations/Differentiated Instruction

- Struggling readers – Will have reflection questions read aloud to them
- ELLs – Will be challenged to be a leader in the set up of the Makey Makey for their lab group (this can be picked up through observation of demo with little language needed). Will be expected to give only short answers on lab worksheet.
  - WIDA Can-Do-Descriptor – Level 3, Developing – Give opinions, preferences, and reactions along with reasons
- gifted students – Will be challenged to connect their predictions to the properties of materials at the atomic level
- students with physical needs – Will use an assistive technology device for writing and drawing as needed
- students with cognitive needs – Will make predictions with the assistance of their lab group
- behavioral accommodations – Will be challenged to be a leader in their lab group

Name: Anne Schmitt

Date: 10/3/19

Lesson Details

Lesson Title: Renewable Energy Technologies using Inquiry-Based Learning

Content Area: Science: Physical Sciences

Grade Level: 8

Timeline: 5 of 5

Date of Lesson: TBD

UBD Stage I: Identify Desired Results

Enduring Understandings

Understand the variety of ways that energy can flow through a system.
Realize that physics principles underlie technology we use every day.
Know how to find and evaluate relevant resources on the Internet.

Essential Questions

What are some ways we can create usable energy from the sun, wind, water, and biomass?
How does the energy flow through a system?
What are the pros and cons of various renewable energy technologies?

PA Core Standards: Standards Aligned System (SAS)

3.2.8.B6.PATTERNS - Explain how physics principles underlie everyday phenomena and important technologies.

3.2.8.B2. Identify situations where kinetic energy is transformed into potential energy, and vice versa.

PA English Language Development (ELD) Standards

16.4.6-8.3W List the steps of energy transfer using a pictorial representation.
16.1.6-8.3S Exchange everyday information using conversation models with partners.

Lesson Objectives

The students will be able to:

Investigate *(Strategic Thinking)* *how a renewable energy technology works* *in lab group research time* *with* *50% accuracy*.

Explain phenomena in terms of concepts *(Strategic Thinking)* *of how their energy technology works* *in lab group presentations* *with* *75% accuracy*.

Assess *(Strategic Thinking)* *the pros and cons of different renewable energy technologies* *in whole class discussion* *with* *75% accuracy*.

Summarize *(Skill/Concept)* *the energy and work concepts used in their energy technology* *in a diagram drawing* *with* *100% accuracy*.

UBD Stage II: Determine Acceptable Evidence

Assessment Tasks

The teacher will:

*Informally assess the student's ability to **investigate** how a renewable energy technology works in lab group research time with 50% accuracy by observing lab group research time.*

*Formally assess the student's ability to **explain phenomena in terms of concepts** of how their energy technology works in lab group presentations with 75% accuracy by observing student presentations and grading them on a rubric.*

*Informally assess the student's ability to **assess** the pros and cons of different renewable energy technologies in whole class discussion with 75% accuracy by observing class discussion.*

*Formally assess the student's ability to **summarize** the energy and work concepts used in their energy technology in a diagram drawing with 100% accuracy by collecting them and grading them.*

Assessment Adaptations

- Struggling readers – Will receive a list of vocabulary and definitions as an aide.
- ELLs – Will be expected to participate in oral presentation at their current level of ELD. Will receive a list of vocabulary and definitions as an aide.
    - WIDA Can-Do-Descriptor – Level 3, Developing – Complete graphic organizers/forms
- gifted students – Will be expected to present a coherent and compelling explanation and drawing of their technology.
- students with physical needs – Will use assistive technology device to draw as needed.
- students with cognitive needs – Will receive a list of vocabulary and definitions as an aide.
- behavioral accommodations – No assessment accommodations in this case.

Rubric/Scoring Criteria

Research Presentations = 10 points
Energy flow diagram drawing = 20 points

UBD Stage III: Plan Learning Experiences and Instruction

Materials and Resources

- Teacher Computer
- Projector & Speakers
- *The Boy Who Harnessed the Wind* by William Kamkwamba
- 1 writing utensil for each student
- 1 graphic organizer per student
- 1 computer per lab group

Anticipatory Set

(T) Will summarize the beginning of the story of *The Boy Who Harnessed the Wind* to give context to the reading (2 min)
(T) Will announce purpose for the reading: to listen for how William is using science to solve a problem, and connect the materials he is using to our circuitry and energy lessons (1 min)
(T) Will read aloud selection from Chapter 4 of *The Boy Who Harnessed the Wind* (7 min)
(S) Will discuss their observations of how William used science to solve a problem, and connections to recent lessons (5 min)

Procedures and Content

(T) Will bridge to the lesson for today, "William used the scientific method to make electricity for his village from wind. Today you are going to research a renewable energy technology of your own and share it with the class." Explains that the goal today is to teach the rest of this class how this technology works, including the mechanical and energy components (4 min) STEP 1: QUESTION TO BE ANSWERED
(T) Will briefly list topics lab groups may choose and allow students a minute or two to pick their topic: Wind turbine, Solar hot water heater, Solar panel, Compost Pile Heating, Landfill Gas, Solar Oven, Tidal Power, Ethanol, Crank Radio, Bicycle Powered Generator, Geothermal(3 min)
(S) Will begin researching in their lab groups with the help of the research graphic organizer. Each group must search for a credible image or diagram, 30-second video clip, and explanation of their technology. (10 min) STEP 2: GATHER THE CLUES
(S) Will work in groups to understand how their technology works and write a short summary for their presentation. Students should be sure to include key vocabulary from previous classes in their explanations (20 min) STEP 3: SOLVE THE MYSTERY
(T) At the same time, will circulate around the room and assist lab groups as needed.

(S) Will share, one group at a time, the image and video clip of their technology. Then each group will give their explanation of how the technology works. (25 min) STEP 4: PRESENT THE CLUES & STEP 5: CONCLUSION

Closure

(T/S) Will discuss as a class and record on the board in a chart the pros and cons of the renewable energy technologies presented today. (10 min)

Homework

(S) Will draw a summary diagram of their technology, labeling energy and power concepts that show how the technology works.

If Time Activities

(T) Will read an excerpt from *The Boy Who Harnessed the Wind* from Chapter 9, when William is testing his first windmill (15 min)

Procedural Adaptations/Differentiated Instruction

- Struggling readers – Will be directed to research websites at their reading level. Will receive a list of vocabulary and definitions as an aide.
- ELLs – Will receive a list of vocabulary and definitions as an aide.
    - WIDA Can-Do-Descriptor – Level 3, Developing – Answer questions about explicit information in texts
- gifted students – Will be challenged to learn the steps of how to build their technology.
- students with physical needs – Will use an assistive technology device for writing and drawing as needed
- students with cognitive needs – Will be directed to specific research websites. Will receive a list of vocabulary and definitions as an aide.
- behavioral accommodations – Will be challenged to be a leader in their lab research group.