Renewable Energy: "Let it Shine"

Dr. David L. Turner

William T. Tilden Middle School

Abstract:

Renewable Energy: "Let it Shine" is a unit that will aid teachers in the growth and development of student understanding around the area of renewable energy. The lessons will focus on the benefits of renewable energy towards the health of the Earth and society. Two lessons with multiple sessions were development to engage children in the classroom and hopefully in society. Each lesson allows teachers to engage their students through standard base instruction, essential questions, videos, and SMART Learning tools. Small and large group activities will allow students to delve deeper into to the topic being discussed in class. Differentiated instruction will be utilized to infuse flexible and cooperative learning groups to address the academic needs of the student as well as address them at their own level of learning and to promote discovery amongst the students as they dive deeper into the subject matter. This unit will have teachers, students, and the community to appreciate the environment and think about supporting the use of renewable resources. It is the researchers hope to generate conversation amongst, teachers, students, schools, parents, and community to push and support transition to renewable energy by 2050. This unit will allow my students see the renewable energy is the direction that many cities and states across the United States are moving toward to reduce our carbon footprint.

Keyword:

"Let it Shine", carbon emission, carbon footprint, renewable energy, wind energy, and solar cell, solar energy, and wind turbines.

Rationale

I am a 6th grade math and science teacher at Tilden Middle School in Southwest Philadelphia. I service students who are an at-risk student population within Philadelphia. Many of my students are immigrants from countries all over the world, with a number of them from third world countries. My students (native born and immigrants) have been exposed to rising crime in their low-income community. Also, my student who are immigrants are familiar with the use of the nature as a part of their life. However, living in an urban city has altered their way life as it was in their native country. In this case, science now plays a minor role to them because of the disconnection to nature. Therefore, it is difficult teaching all of my students the application and conceptual knowledge about renewable energy.

Educators and the citizens of Philadelphia has taken every effort to provide the best possible educational setting to service children in this city. I service an at-risk student population, which receives free lunch because of their poor economic status. Special education teachers service about 20% of the student population at my school. This student body also, consist of transient students, which diminishes the quality of education of delivered to some of them. I am provided little to no resources to educate my student in the field of science. This population of students is falling behind due to the reasons mentioned above.

The United States has been dependent on fossil fuels for many years, which has increased our carbon signature. "Renewable Energy" would have great impact on the economics of this society because fossil fuels play such vital role in this country and have the greatest impact in the emission of carbon into the air. Walerk and Cass states "to reduce carbon emission and mitigate climate change renewable energy needs to be instrumental in cleaning our environment" (Walker, G. & Cass, N, 2007). Global warming effects on society and high cost of fossil fuel has caused the United States and the city of Philadelphia to develop plans to transfer from fossil fuel to "renewable energy," which is a quest for our society to clean our environment (Ranalli, J. & Alhamwi, A., 2020).

The use of fossil fuel on the Earth has been used by people for centuries with both benefits and consequences. The benefit of fossil is its ability to be a major supply to businesses and people of America. Fossil does come with a price, which is its rising cost and climate change around the world. The emission of carbon has caused heat waves, floods, drought and rise in natural disasters as well as climate, which can be seen by citizens all over the world (Panwwar, Kaushik & Kothar, 2010). The consequences (high carbon emissions and depleting resources) are causing many countries to find alternatives to fossil fuels. The industries manufacturing fossils fuel and companies that produce products using fossil fuels are working together keep the world addicted to fossil fuel. Fossil fuel is widely used around the world.

Renewable energy is a source that can replace the use of fossil fuel (Henrik, 2021). Many countries are seriously concerned by the consequences of fossil fuel and they are turning towards renewable energy as source for their businesses and people. I have uncovered the belief that Renewable energy is best way to reduce our carbon footprint to replace fossil fuel (Bull, 2001). Countries from all over the world are seeking ways to reduce carbon emissions. Scientists believe the reduction of carbon emission may mitigate future climate change as the world moves to renewable energy (Walker & Cass, 2007).

What is renewable energy? Renewable energy can be derived from "self-renewing energy such as sunlight, wind, flowing water" (Bull, 2001, Panwwar, Kaushik & Kothar, 2010). The Earth reproduces certain energy, which does very little or no harm to itself.

Renewable energy is generated by the Sun and is restored naturally. Renewable energy is effective in suppling energy to the inhabitants of Earth without depleting its sources. Renewable energy is source of energy that does not harm the Earth and its' inhabitant.

Solar Energy (Sunlight energy) is one of the many major sources of unlimited renewable resources in this world (Bull, 2001). Solar energy is harness using solar cells to aid in the collecting of sun light as energy and transferring this energy into electric. Solar cells are a part of various businesses and homes throughout the world. Solar energy is growing in United States and in Philadelphia. For instance, The Lincoln Financial Field stadium (Linc), which is the home of Philadelphia Eagles is the hub of a sustainable source of renewable energy while recycling trash made by its' guest.

The Linc is one the few green stadium is the country of the United States. Solar energy is harnessed to power the Linc during football season and the off season while excess energy is sold to local electric companies and wind farms (Cummin, 2020). The Linc is a big fan of trash produced fans. Workers at the Linc collect trash to collect recyclable material such as plastic waste. The recyclable plastics is resold to transform into plastic pellets to create a new product (Cummins, 2020). Aluminum cans are collected from the trash to recycle and sell to businesses. The Linc has its own equipment used for the baling of aluminum. The Linc resell aluminum in the form of sheets for about $800-$1,200 a ton to recycle into a new product (Cummin, 2020). The Linc is one of the greenest stadiums in the National Football League (NFL) thanks to its ability to use solar energy and to reuse of its own trash.

Wind energy is one the of few unlimited resources in the world that provides a safe source of energy to people (Bull, 2001). Wind as resource is available throughout the world. Its availability allows for the United States and other country to avail themselves to this rich and renewable resource. The creation of wind turbines to generate electricity for use in cities or towns allows countries to harness energy for their basic needs (Ellabban, Abu-Rub & Blaabjerg, 2014). The expensive turbine is so cost effective because it has an unlimited source of free and clean energy to supply electric to cities and towns around the world.

Wind farming is growing in United States and in Philadelphia. The state of Pennsylvania has already started harnessing wind energy in rural sections of the state. The Linc stadium, which is the home of Philadelphia Eagles was powered by wind energy for over ten years. The usage of harnessing wind energy has established the Linc as a model for NFL and other sport teams to go green. The owners of this great stadium utilize the funds to light the stadium and push to develop this stadium into a greener stadium.

Solar energy and wind energy is an unlimited resource in this world (Bull, 2001). This form of renewable energy is a great resource that America can avail to fuel its

energy needs for years as well as reduce its carbon footprint. The federal government has launched a campaign to be fully decrease its dependency on nonrenewable to renewable resources. The automobile industry has announced that they will no longer reproduce cars using nonrenewable energy to renewable energy (fully electric cars). Ford and Buick have recently showcase their electric vehicles for consumers to purchase. The information discussed in detail in the "Renewable Energy" workshop surrounding the move to reduce our carbon print gave me the idea for this unit.

"Renewable Energy" a TIP course has introduced participates the benefits of renewable energy, which is vital to the survival of our country's economy. This TIP course discussed the movement of this city of Philadelphia and the country of the United States to embrace the concept of "Renewable Energy". The city of Philadelphia has pledged to reduce carbon emission by 80% and increase carbon-free electricity to 100% by 2050 (Ranalie & Alhamwi, 2020). Professor Jorge J. Santiago teachings about renewable energy has sparked an interest in me to develop lessons centering on "renewable energy" in Philadelphia to teach my students in science my classroom. This science unit will provide engaging lessons throughout the unit which centers on "renewable energy" in Philadelphia. This unit will explore nonrenewable energy source of the city and how Philadelphians negatively impact today's society. This unit enhances instruction by engaging students in interactive lessons on the process of change to "renewable energy" and recycling in their community.

Content Objectives

I service students who are an at-risk student population (low-income, poor academic performance, various languages and various ethnic backgrounds) and have few resources within their community. Many of my students care about the environment but are unsure of how to care for the environment while living in an urban setting. In this case, renewable energy plays a minor role to them because of the lack of understanding on how human is affecting the environment. Throughout the year, I struggle with teaching all of my students how to apply practical application and knowledge about renewable energy into their daily lives.

Presently HMH Science Program is used to teach the various science topics assigned to the sixth grade at my school. This online science program provides text to cover the content along with comprehension questions and experiments to enrich the discussion of the content being covered. Also, I provide slides to increase student engagement and to make my lessons more interactive. Students answer text-dependent questions along with visual projects to illustrate their understanding of the subject matter. The lack luster of the program and the great teaching of Professor Jorge encouraged me to develop an interactive unit to teach the benefits of renewable energy.

Professor Jorge introduced the idea of renewable energy as one concept, which can be taught in the classroom. His lecture suggests the present energy systems and systems integration should merge into one system. He discussed renewable schemes as PV, Eolic (wind turbines) and low head hydroelectric the most widely used as renewable energy. Professor Jorge suggest the education of the community would aid in the support and use of renewable energy within this country. Professor Jorge suggest the best way to teach children about nonrenewable and renewable resources is to provide visuals for them to associate with the concept being taught to them in the classroom. The visuals should be of items from their community or within their city for them to make the connection needed to understand what is being discussed in class.

The class discussion led me to the selection of renewable energy, which seems to be the best topic to teach sixth graders for them to become advocates for renewable energy use in this city. This unit allows students to connect to their surrounding by thinking about how we harm the environment. This unit also, allows students to connect how we can support needs without harming the environment in which we love and need. The city of Philadelphia and introduce citizens to hybrid buses, electric buses and stations, lighting using electric energy through SEPTA and their comment to be dependent on renewable energy by 2050. The purpose of my curriculum unit is to enhance student understanding of nonrenewable and renewable energy and to apply approaches discuss in class to aid in the reduction of our carbon footprint within the city of Philadelphia, Pa as well as the United States.

The creation of Renewable Energy: "Let the Shine" unit was developed to educate children on the idea of renewable energy is needed to eliminate our carbon footprint. This unit is comprised of two lessons, but many sessions to cover renewable and nonrenewable available to our society. It is my hope that my student will create an exhibit to share with the class, school, parents, and community to educate everyone on the benefits of renewable sources.

Lesson 1 of this unit will introduce the concept renewable energy and nonrenewable energy to the students within in the classroom. This portion of the unit begins with students illustrating their general knowledge of renewable and nonrenewable energy. This lesson is used to link student understanding and the meaning of renewable and nonrenewable energy. This lesson will aid in increase understanding of "renewable energy". Students in small and large group will be able to explain and discuss their thinking. The interactive lesson will keep students engaged in the content being discussed in class. Also, the usage of poems and drawing will allow students to express their understanding of the topic being taught.

Lesson 2 of this unit involves the application and conceptual understanding of the usage of renewable energy in this society. The lesson provides videos and experiments utilizing solar and wind energy for students to understand these resources are accessible and

renewable. Students in small and large group will be able to explain and discuss their thinking. The interactive lesson will keep students engaged in the content being discussed in class. Also, the usage of poems and drawing will allow students to express their understanding of the topic being taught. The culminating activity will allow students to show case their work to their peers, teachers, parents, community, and society with the hopes of everyone understanding that we must invest in renewable energy to reduce our carbon footprint.

Teaching Strategies

This curriculum unit was designed to incorporate many strategies to align with science standards while utilizing purposeful learning and cooperative learning. I have learned through Student-At-The-Center, Teachers Institute of Philadelphia, and professional development crafted by School District of Philadelphia to differentiate instruction based on my students learning abilities. Many of the strategies I have learned throughout my teaching career will be applied in teaching this unit. Through my years of teaching, Students will immerse themselves in the lessons in this unit because of various teaching methods used to address my students' diverse learning styles in the classroom.

Each lesson was designed to start with an opening task or exercise, which will activate student's prior knowledge by asking them a question from their past. The opening task will provide the teacher with a snapshot of their student's understanding of the topic. The opening task may include skills they already know or are aligned to the topic being discussed in the lesson. The teacher may allow their students to work individually, in a large group, or in their flexible groups to complete their assignment. Students will generate a response to meet the requirements of the assigned question. The teacher will do a status of the class to ask if there are any questions or seek students' responses to the task assigned to them for the lesson.

An essential question will be presented to students after the opening task. The purpose of the essential question is to lay the foundation for student engagement or involvement throughout the lesson. The essential question will be an open-ended question to guide the teacher and the student in each lesson or session. Also, the essential question is to set a purpose for the lesson. Students in the classroom will be focused or engaged on the activities to clearly and concisely answer the essential questions by the closed of the lesson.

The teacher will begin the lesson using a video to discuss concepts and theories needed to be explored to better understand the information being disseminated throughout the unit. The teacher may model an idea during a lecture to show their thinking process and how a problem can be solved. The teacher will provide a short lecture to provide the student with background information to increase their knowledge base. The student will copy notes assigned to them by the teacher from a SMART board

or textbook into their notebooks provided during the lecture. The teacher will instruct students to study their notes daily to recall information discussed in previous sessions or develop clarifying questions to ask during upcoming lessons.

Students working in cooperative groups is one way for students to conduct an experiment and do research. Cooperative learning is a process learned at Student-at-the-Center. The student glean more from their peers than from the teacher. The teacher will include flexible grouping, which allows the teacher to teach children who have similar needs or on the same level. The teacher may use student data to formulate flexible groups to present material at their ability level. Cooperative learning groups and flexible grouping will allow the teacher to meet the students' needs by addressing their needs. Also, differentiate instruction will employ instruction to teach the students in the classroom. This technique involves various teaching styles to address the needs of the class, group, or individual. The teacher will use differentiated instruction during the flexible grouping of students.

Finally, the lesson will conclude by a student applying what they have learned during the lesson to all their projects on the computer and in the classroom. Students will complete assessments aligned to the standard and lesson objective. This unit will highlight the work being done by the city and the country to reduce are carbon footprint and the usage of renewable resources. The student will complete the experiment, poems, painting and plans for the community to support and us renewable energy to illustrate and justify their learning.

Classroom Activities

Lesson 1: Non-Renewable and Renewable Energy

Objectives:

- Student will be able to read the text titled, "Earth's Energy Resources" **in order to** apply scientific principles to design a method of monitoring and minimizing impact on the environment.
- Student will be able to read the text titled, "(Day 2) Chapter 3-Nonrenewable Resources in Human Environment Impact" **in order to** cite textual evidence to support analysis of what the text says explicitly, as well as inferences and/or generalizations drawn from the text.
- Student will be able to select to read the text titled, "Getting to know the world's greatest artists": Mary Cassatt, Edgar Degas, Frida Kalo, Henri Matisse, Monet, Picasso, Horace Pippins, Jackson Pollock, Georgia O'Keeffe and Vincent Van Gogh **in order to** recognize, know, use and demonstrate a variety of appropriate

arts elements and principles to produce, review and revise original works in the arts. Visual Arts: paint; draw; craft; sculpt; print; design for environment, communication and multi-media.

Science Standards:

- **MS-ESS3-3** Apply scientific principles to design a method of monitoring and minimizing impact on the environment.
- **S8.D.1.3.1** Describe the water cycle and the physical processes on which it depends (i.e., evaporation, condensation, precipitation, transpiration, runoff, infiltration, energy inputs, and phase changes).
- **S8.D.1.3.2** Compare and contrast characteristics of freshwater and saltwater systems on the basis of their physical characteristics (i.e., composition, density, and electrical conductivity) and their use as natural resources.

English Language Arts Standards:

- **CC.1.3.6.B** Cite textual evidence to support analysis of what the text says explicitly, as well as inferences and/or generalizations drawn from the text.
- **CC.1.4.6.E** Write with an awareness of the stylistic aspects of composition. • Use precise language and domain-specific vocabulary to inform about or explain the topic. • Use sentences of varying lengths and complexities. • Develop and maintain a consistent voice. • Establish and maintain a formal style.

Art Standards:

- **9.1.8.B.4.** Recognize, know, use and demonstrate a variety of appropriate arts elements and principles to produce, review and revise original works in the arts. Visual Arts: paint; draw; craft; sculpt; print; design for environment, communication, multi-media.

Essential Question:

- How does human activities (use of renewable and nonrenewable resources) affect the Earth?

Materials:

- Smartboard and document camera

- Google Meet or Zoom
- SMART Learning Account **Creating Interactive Lessons and Activities with**
  - **SMART Learning Online**:

    https://www.youtube.com/watch?v=mBmMqjUltZs

  - **Hello Smart: Creating Presentation Part 1:**

    https://www.youtube.com/watch?v=Bj4yF-hcMuM&list=PLXf7MGaYmlkVy3aJfY-9naWOp4AlF0Z6o&index=2

  - **Hello Smart: Creating Presentation Part 2:**

    https://www.youtube.com/watch?v=lH4HftoULBQ&list=PLXf7MGaYmlkVy3aJfY-9naWOp4AlF0Z6o&index=3

- Chromebooks
- (Day 2) Chapter 3-Nonrenewable Resources in Human Environment Impact…
  https://filecabinet5.eschoolview.com/733A041B-884A-4001-A0AA-0CC57C145DA2/Chapter3_NonrenewableResourcesinHumanEnvironmentalImpact.pdf
- Article Titled, "Earth's Energy Resources":
  https://newpathworksheets.com/science/grade-6/earth-s-energy-resources-1
- Construction Paper, paint, markers, paint brushes.

Session 1:

- **Warmup** (10 minutes):Teacher will develop a game in the SMART Learning Suite (SEE GAME SECTION). Go to the SMART Learning Suite and Log on. Follow this process to set up a game: (1) Select Add Activities (2) Select Game Base Response (3) Select Super Sort and develop the game.(4) Select preview to play. Have fun with the class.

- **Task** (30 Minutes): Teacher will put students in their cooperative learning/flexible group for today's discussion. The teacher will explain to each group to read the text titled, "Earth's Energy Resources". Students in their groups will discuss renewables resources, nonrenewable resources, fossil fuels and carbon footprint. Then, students will place information into a Venn Diagram in Smart Learning. Students will put nonrenewable information in left portion of the circle. Students will put renewable information in right portion of the circle. The portion the two circles share, students will put information that nonrenewable, and renewable have in common. Students will share out their results with their group and with the class.

- **Lesson Closure** (10 Minutes): student write 3 facts, 2 questions, 1 opinion about the class lesson (renewable, nonrenewable and carbon footprint). The exit tickets will be created in Smart Learning. Students can share out their response.

Session 2: (60 Minutes)

- **Warm up (10 Minutes)** Teacher will tell students to tell what they want to learn about renewable energy in Smart Learning (Activating Prior Knowledge Activity

Application) or down on a piece a paper that they learned yesterday. Students will share with their group and then with the class.

- **Task** (40 Minutes): Students in their small groups will read and discuss "(Day 2) Chapter 3-Nonrenewable Resources in Human Environment Impact" and "Earth's Energy Resources". Students in groups will complete their Carnell Notes. The teacher will set-up lessons in SMART-Learning (Graphic Organizer Activity Application) using Carnell Notes. Students will discuss as class what they have learned.

Topic/Objective:	Student will be able to read the text titled, "(Day 2) Chapter 3-Nonrenewable Resources in Human Environment Impact in order to cite textual evidence to support analysis of what the text says explicitly, as well as inferences and/or generalizations drawn from the text.	Name: Date:

Essential Question: How does human activities (use of renewable and Nonrenewable resources) affect the Earth?

Questions:

Notes:

Summary:

- **Lesson Closure** (10 Minutes): The teacher will set-up lessons in SMART-Learning (Graphic Organizer Activity Application) using Countdown for the student to write 3 facts, 2 questions, 1 Big Idea about the class. Students can share out their response

Session 3:

- **Warm up** (10 Minutes): Teacher will tell students to tell what they want to learn about effects of nonrenewable and renewable energy in Smart Learning (Activating Prior Knowledge Activity Application) on Entrance Ticket or down on a piece a paper that they learned yesterday. Students will share with their group and then with the class.

- **Task** (60 minutes): Student will write a "Lemonade" poem to about nonrenewable and renewable energy-based reading, research and their own personal experiences while living in this country or their homeland. The poem should be between "eight to twelve verses, alternating between a worst-case

scenario and a best-case (It was the best and the worst of…) scenario for the same event (Weaver, 2002).

Session 4:

▪ **Warm up** (10 Minutes): Teacher will tell students to tell how renewable energy is great for society in Smart Learning (Activating Prior Knowledge Activity Application) on Entrance Ticket or down on a piece a paper that they learned yesterday. Students will share with their group and then with the class.

▪ **Task** (60 minutes): Student will select a book to read the text titled, "Getting to know the world's greatest artists": Mary Cassatt, Edgar Degas, Frida Kalo, Henri Matisse, Monet, Picasso, Horace Pippins, Jackson Pollock, Georgia O'Keeffe and Vincent Van Gogh **in order to** paint; draw; craft; sculpt; print; design for environment, communication and multi-media. Their illustrate should correspond to their poem.

▪ **Gallery Walk** (60 Minutes): Students and will do a Gallery walk to review finish product.

Lesson 3 Renewable Resources - Energy

Objectives:

• Student will be able to read the text titled, "Earth's Energy Resources" **in order to** apply scientific principles to design a method of monitoring and minimizing impact on the environment.
• Student will be able to read the text titled, "Earth's Energy Resources" **in order to** cite textual evidence to support analysis of what the text says explicitly, as well as inferences and/or generalizations drawn from the text.
• Student will be able to select to read the text titled, "Getting to know the world's greatest artists": Mary Cassatt, Edgar Degas, Frida Kalo, Henri Matisse, Monet, Picasso, Horace Pippins, Jackson Pollock, Georgia O'Keeffe and Vincent Van Gogh **in order to** recognize, know, use and demonstrate a variety of appropriate arts elements and principles to produce, review and revise original works in the arts. Visual Arts: paint; draw; craft; sculpt; print; design for environment, communication and multi-media.

Science Standards:

MS-ESS3-3 Apply scientific principles to design a method of monitoring and minimizing impact on the environment.

S8.D.1.3.1 Describe the water cycle and the physical processes on which it depends (i.e., evaporation, condensation, precipitation, transpiration, runoff, infiltration, energy inputs, and phase changes).

S8.D.1.3.2 Compare and contrast characteristics of freshwater and saltwater systems on the basis of their physical characteristics (i.e., composition, density, and electrical conductivity) and their use as natural resources.

English Language Arts Standards:

CC.1.3.6.B Cite textual evidence to support analysis of what the text says explicitly, as well as inferences and/or generalizations drawn from the text.

CC.1.4.6.E Write with an awareness of the stylistic aspects of composition. • Use precise language and domain-specific vocabulary to inform about or explain the topic. • Use sentences of varying lengths and complexities. • Develop and maintain a consistent voice. • Establish and maintain a formal style.

Art Standards:

9.1.8.B.4. Recognize, know, use and demonstrate a variety of appropriate arts elements and principles to produce, review and revise original works in the arts. Visual Arts: paint; draw; craft; sculpt; print; design for environment, communication, multi-media.

Essential Question:

- How does human activities (use of renewable and nonrenewable resources) affect the Earth?

Materials:

- Smartboard and document camera
- Google Meet or Zoom
- SMART Learning Account **Creating Interactive Lessons and Activities with**
  - **SMART Learning Online**:

    https://www.youtube.com/watch?v=mBmMqjUltZs

  - **Hello Smart: Creating Presentation Part 1:**

https://www.youtube.com/watch?v=Bj4yF-hcMuM&list=PLXf7MGaYmlkVy3aJfY-9naWOp4AlF0Z6o&index=2

- o **Hello Smart: Creating Presentation Part 2:**

  https://www.youtube.com/watch?v=lH4HftoULBQ&list=PLXf7MGaYmlkVy3aJfY-9naWOp4AlF0Z6o&index=3

- Chromebooks
- Renewable Energy Video:
  https://www.alliantenergykids.com/RenewableEnergy/RenewableEnergyHome
- YouTube titled, "Difference between Renewable and Nonrenewable Resources":
  https://www.youtube.com/watch?v=PLBK1ux5b7U&list=RDCMUCE_WiQFez8FZcICpbwblyyg&start_radio=1&t=0
- Article: https://kids.kiddle.co/Renewable_resource
- Construction Paper, paint, markers, paint brushes.
- Solar Cell Demonstration Kit by American Educational Products, LLC
- TurbineKit

Session 1:

- **Warm up (25 Minutes):** Student will watch this YouTube video: "Ocean Maker" **https://www.youtube.com/watch?v=0umI5yPcHFY** Teacher will ask students, What is the purpose of the movie? The teacher will set-up lesson in SMART-Learning (Activating Prior Knowledge Application) using Entrance Ticket. Students in groups will complete their Entrance Ticket, which states "How does the movie apply to nonrenewable or renewable resources". Students will share their responses in a small group and then as a class.

- **Task (**35 Minutes): YouTube titled, "Difference between Renewable and Nonrenewable Resources":
  https://www.youtube.com/watch?v=PLBK1ux5b7U&list=RDCMUCE_WiQFez8FZcICpbwblyyg&start_radio=1&t=0 The teacher will set-up lessons in SMART-Learning (Graphic Organizer Application) using Notes: 2 Column. Based on the video, student will create a 2 Column Chart to display information for Renewable

and nonrenewable resources. Students will share their responses in a small group and then as a class.

Session 2:

- **Warm-up** (10minutes): Student will watch this YouRube video: Eukun's Dairy-On Hydro Energy **https://www.youtube.com/watch?v=0umI5yPcHFY** .Teacher will ask students, What is the purpose of the movie? The teacher will set-up lesson in SMART-Learning (Activating Prior Knowledge Application) using Entrance Ticket. Students in groups will complete their Entrance Ticket, which states "How does the movie apply to nonrenewable or renewable resources". Students will share their responses in a small group and then as a class.

- **Task (**50 Minutes): The teacher will set-up lessons in SMART-Learning (Graphic Organizer Application) using Thinking Frame". Student will work with a partner to do a mini research non-renewable and renewable usage in Philadelphia along with their effects on the Earth. Based on their research, student will create a "Thinking Frame" to display information for Renewable and nonrenewable resources used in Philadelphia along with their effects on the Earth. Partners will share their responses in a small group and then as a class.

Session 3:

- **Warm-up** (10 minutes): Student will watch this YouRube video: Eukun's Dairy-On Hydro Energy **https://www.youtube.com/watch?v=0umI5yPcHFY** .Teacher will ask students, What is the purpose of the movie? The teacher will set-up lesson in SMART-Learning (Activating Prior Knowledge Application) using Entrance Ticket. Students in groups will complete their Entrance Ticket, which states "How does the movie apply to nonrenewable or renewable resources". Students will share their responses in a small group and then as a class.

- **Task** (50 Minutes)**:** student in their groups will put together their wind turbine and conduct an experiment. Student will assemble the Solar Cell Demonstration Kit by American Educational Products, LLC. Student will use light from a flashlight as the sun. Also, student will how light from different positions and length to demonstration the movement of the sun to determine best position to power solar cells. The teacher will set-up lesson in SMART-Learning (Graphic Organizer Application) using Scientific Method worksheet. Students in groups

will complete their Scientific Method, which document their experiment Students will share their responses in a small group and then as a class.

Session 3:

- **Warm up** (10 Minutes)**:** Student will watch this YouTube video: **"Wind"** **https://www.youtube.com/watch?v=EpaLbYFVfbQ&t=31s**.Teacher will ask students, What is the purpose of the movie? The teacher will set-up lesson in SMART-Learning (Activating Prior Knowledge Application) using Entrance Ticket. Students in groups will complete their Entrance Ticket, which states "How does the movie apply to nonrenewable or renewable resources". Students will share their responses in a small group and then as a class.

- **Task** (50 Minutes)**:** student in their groups will put together their wind turbine and conduct an experiment. Teacher will ask students, to conduct an experiment using their wind turbine. The teacher will set-up lesson in SMART-Learning (Graphic Organizer Application) using Scientific Method worksheet. Students in groups will complete their Scientific Method, which document their experiment Students will share their responses in a small group and then as a class.
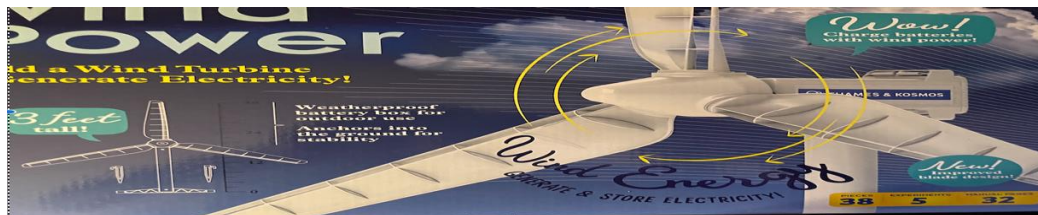
Session 4:

- **Task** (60 minutes): Student will select to read the text titled, "Getting to know the world's greatest artists": Mary Cassatt, Edgar Degas, Frida Kalo, Henri Matisse, Monet, Picasso, Horace Pippins, Jackson Pollock, Georgia O'Keeffe and Vincent Van Gogh **in order to** paint; draw; craft; sculpt; print; design for environment, communication and multi-media. Students will create a picture symbolizing the use of renewable energy in the city of Philadelphia.

- **Task** (60 minutes): Student will create a Pantoum poem for about renewable energy in your community. Pantoum poems consists of interrelated stanza using a rhyming pattern (Weaver, 2002).

Session 5:

- Exhibition (120 Minutes): The teacher will invite other classes, parents, school staff, and the community to show case of their work. The exhibition will be the student's artwork, reading of poems and proposed plans to use renewable energy in the city of Philadelphia.

Resources

Bibliography:

Bull, S. R. (2001). Renewable energy today and tomorrow. *Proceedings of the IEEE*, *89*(8), 1216-1226.

This article explains and provide a clear and concise definition of what is renewable energy. The article discusses the in-depth uses of today's energy and renewable energy in the United States. The article suggests the best path the United States should go in order to implement renewable energy as placement for current energy sources.

Cummins, E., (2020). The Philadelphia Eagles are driving the NFL toward a greener future. *Popular Science.*
This article discusses how Lincoln Financial Stadium (The Linc)is unique because of usage of renewable energy. The Linc was known for harnessing energy from its' fancy wind turbines for over ten years which is explained in the article. The article further suggest the Linc has transition to a greener stadium. The article highlights The Linc usage of solar energy to assist in the powering of the stadium. Most importantly, the article explains how workers collect the trash and recycle the material for future usage.

Ellabban, O., Abu-Rub, H., & Blaabjerg, F. (2014). Renewable energy resources: Current status, future prospects and their enabling technology. *Renewable and Sustainable Energy Reviews*, *39*, 748-764.
The article provides and introduction to renewable resources for the ease into the subject matter. The article provides a descriptive meaning of renewable energy sources. It also mentions the benefits, growth, investment and development of renewable energy sources.

Lund, H. (2007). Renewable energy strategies for sustainable development development. *Energy*, *32*(6), 912-919.
The article discusses strategies to transition from fossil fuel to renewable within the United States. The article highlights that renewable energy is important to countries all over the world but very few countries are taking the advantage of this source of energy. The article implies the push to gain support of renewable energy should focus on savings,

efficiency, flexible technologies and the many renewable energy resource available today.

Panwar, N. L., Kaushik, S. C., & Kothari, S. (2011). Role of renewable energy sources in environmental protection: A review. *Renewable and sustainable energy reviews*, *15*(3), 1513-1524.
This article discusses the importance of using the natural resources to promote renewable energy. The article focuses on the sun, wind and water as a vital part of renewable energy. The article mentions the use of renewable technologies to aid in the fight to mitigate carbon emission .

Ranalli, J., & Alhamwi, A. (2020). Configurations of renewable power generation in cities using open source approaches: With Philadelphia case study. *Applied Energy*, *269*, 115027.
The article looks at the current uses of fossil fuel in Philadelphia. The examines the sources of energy in Philadelphia to determine the be possible mix of renewable sources to handle the city's energy usage. It compares other areas of the world that are similar to Philadelphia to justify its recommendations.

Walker, G., & Devine-Wright, P. (2008). Community renewable energy: What should it mean?. *Energy policy*, *36*(2), 497-500.
The article compares the public's beliefs and technological beliefs of renewable usage in the United Kingdom. The article discusses the renewable technologies and their capabilities to service the pubic. The article correlates the United Kinddoms' infrastructure to the socio-technical systems.

Classroom Materials:

Baid, A. (2019). How to draw: Easy Techniques and Step-by-step drawings.

This book explores various techniques teach a person how to draw various items. This book provides the individual with a step-by-step process to draw people, nature and other things. The process used in the book is presented in such a way that kids will love to read and use the step-by-step process to drawing.

Hart, C. (2017). Drawing cartoons letters by letters: Create fun characters from a to z.

This book provides students with a juvenile approach to drawing. The author illustrates and explain to the read how draw using the letters of the alphabet. This approach allows the student explores and process that will allow them to create a work of art.

Lee, J. (1974). Draw 50 animals: The step-by-step way to draw.

Venezia, M. (1993). Getting to know the world's greatest artists: Mary Cassatt

This book illustrates how Mary Cassatt learned from other painters. She modeled her work after impressionist. Her painting show how light can add to the beauty of the person or thing that is being painted.

Venezia, M. (2017). Getting to know the world's greatest artists: Edgar Degas

This book illustrates how Edgar Degas as a painter. His painting captured the essence of the time period in which he lived. He also used a camera to capture the beauty of various objects. He would use his photos to paint a picture which gave him a different lens or perspective.

Venezia, M. (1999). Getting to know the world's greatest artists: Frida Kahlo

This book illustrates how Frida Kahlo as a mural artist. Her painting captured the rich history of people. Her painting are colorful and shows her feelings of joy and sadness.

Venezia, M. (1997). Getting to know the world's greatest artists: Henri Matisse.

This book illustrates how Henry Matisse uses color in an aggressive for to capture the essence of a particular place or thing. The book provides an overview of many works throughout his life. It offers children various ways to express themselves through out.

Venezia, M. (1993). Getting to know the world's greatest artists: Monet

This book illustrates how used vibrant colors in his painting. Monet paintings tend to be of water and boats. Monet would draw his subjects with huge heads. His painting were like an actual picture of his life at that moment.

Venezia, M. (2008). Getting to know the world's greatest artists: Picasso

This book illustrates how Picasso painting were influence by the things he learned throughout his life. His works is very detail with a slight darkness surrounding people. He later moves uses bright colors and shapes to create image in his paper. Later in his life many of paint center on cubism.

Venezia, M. (2008). Getting to know the world's greatest artists: Horace Pippin

This book illustrates how Horace Pippins as a self-taught painter. Pippins used lines to capture the person or places he is illustrating in his paintings. Pippins would spend a lot time and details when working on a his paintings. He is known for his use of red in his paintings and capture his life experiences.

Venezia, M. (1994). Getting to know the world's greatest artists: Jackson Pollock

This book illustrates how Jackson Pollock saw things through his eyes. He was an abstract painter. His painting shows how energy (light and darkness) convey his thoughts at a particular time and moment.

Venezia, M. (2015). Getting to know the world's greatest artists: Georgia O'Keeffe

This book illustrates how Georgia O'Keeffe as a painter used lines to capture the person or places she was illustrating in her paintings. Georgia paintings were of large flowers, country and city scenes that captivate the eye of viewer.

Venezia, M. (2015). Getting to know the world's greatest artists: Vincent Van Gogh

This book illustrates how Vincent Van Gogh growth as a painter flourished when he traveled to various countries. Van Gogh tend to use dark colors until he visited Japan where he was exposed to colorful Japanese painting.

Weaver, H. C. (2002). Poetry a la carte.

This book centers teacher people how to write poems that are written all over the world. This book teaches the writer how make their poem into a symbol of nature. The writer of the poetry will be able to illustrate through words their thoughts on artwork.

Website for teachers and students:

Sustainability of water: https://www.youtube.com/watch?v=b4YPtgJw0QU

The Water Cycle-Khan Academy: https://www.youtube.com/watch?v=jFjI6y46QRk

Hydropower: https://www.youtube.com/watch?v=q8HmRLCgDAI

Reading: https://www.generationgenius.com/videolessons/water-cycle-video-for-middle-school/?utm_source=bing&utm_medium=cpc&utm_term=water%20cycle%20lessons&msclkid=7e629375e6ac164ed738f320b8232af1

Mystery Science: https://mysteryscience.com/

Creating Interactive Lessons and Activities with SMART Learning Online:

https://www.youtube.com/watch?v=mBmMqjUltZs

Hello Smart: Creating Presentation Part 1:

https://www.youtube.com/watch?v=Bj4yF-hcMuM&list=PLXf7MGaYmlkVy3aJfY-9naWOp4AlF0Z6o&index=2

Hello Smart: Creating Presentation Part 2:

https://www.youtube.com/watch?v=lH4HftoULBQ&list=PLXf7MGaYmlkVy3aJfY-9naWOp4AlF0Z6o&index=3

Document from the School District of Philadelphia Math Training Sessions:

Asynchronous and Synchronous Lesson Activities				
Activity	**Display Options**	**Question Type**	**Details**	**Ideas + *Level Up Ideas***
Fill In the Blanks	Works On: - Classroom Display - Teacher Device - Student Device	Fill in the Blank Check answers: Instantly, When prompted, Don't check	Up to 300 characters Up to 10 Blanks Supports Text Only	Skills: Deduction, Composition, Memory Quotes to introduce topic, character quotes, theories, rules, laws *LU: use Shout it Out for students to write fill in the blank content (blanks in CAPS), Construct opinion statements with blanks and let them discuss* recall, identify, manipulate, infer, arrange
Flip Out	Works On: - Classroom Display - Teacher Device - Student Device	Flash Card interface	Up to 150 characters Supports images Determine which face is up Supports lists from: Match'em Up	Skills: 1 to 1 Correspondence, Memory, Vocabulary Flashcards: vocab, facts, examples w pics, *LU: add text boxes for sorting or classifying after practice, classify ideas, motivation, ethics. Project choice boards* recognize, classify, practice, differentiate, categorize, interpret

	Works On:	Multiple Choice	150 characters	Skill: Review content, prior knowledge
Game Show	- Classroom Display - Teacher Device - Student Device	True/False Check Answers: Instantly 2 teams or players	Some data collected on team performance and how questions were answered Supports Non-Image Questions From: Response 2, Monster Quiz, Speed Up	*LU: Use Shout Out to collect questions for Game Show, add timer to limit discussion for teams, add randomized to call on students* recall, review, compute, question , interpret
Label Reveal	Works On: - Classroom Display - Teacher Device - Student Device	Picture or Diagram with hidden labels	Up to 10 labels Optional notes for each label (up to 150 characters) Supports lists from: Rank Order, Super Sort	Skills: Memory, Deduction, Parts of Systems Diagrams, Processes, vocabulary label pics, study tool, students to check work *LU: Add tasks under hot spots, turn study tool into an assignment, differentiate assigning different student groups different reveal tasks* recall, classify, practice, differentiate, categorize, interpret
Match'em Up	Works On: - Classroom Display - Teacher Device - Student Device	Matching two things together, one right answer	Optional Category Name Supports images Supports lists from: Flip Out	Skills: 1 to 1 correspondence, Memory Vocabulary, concepts and examples, quotes and characters, *LU: solve or answer questions to match up one right hint. (i.e. 2^2+5^3 matches an odd number more than 110), cause & effect, parallel concepts* recognize, locate, solve, categorize, relate,

Rank Order	Works On: - Classroom Display - Teacher Device - Student Device	Order or Rank Optional bookends (i.e., smallest to largest) Check Answers: Instantly, When prompted, or Don't check	Supports Images Supports lists from: Super Sort	Skills: Comparison, deduction, sequencing, arrangement Smallest largest, first to last, most _ to least _, *LU: Rank ideas (no check), rank most influential, most significant to least, share screenshot in Shout Out and discuss* order, describe, relate, appraise, arrange, justify
Super Sort	Works On: - Classroom Display - Teacher Device - Student Device	Sorting into 2 categories Checks answers: Instantly Customize your background	2 Required category names 10 items per list Supports Lists from: Rank Order Images supported, Customize Graphics	Skills: Classification & Grouping Sort, classify, group, sort by True or False *LU: Solve before sorting, sort by range (dates, number range, cause & effect* recognize, locate, solve, categorize, relate
Memory Match	Works On: - Classroom Display - Teacher Device - Student Device	Match cards Checks Answers: Instantly	*Available only in SMART Learning Suite Online* Up to 10 pairs Images supported 1 or 2 players	Skills: 1 to 1 Correspondence, Memory, Vocabulary vocabulary, facts, examples, *LU: predict possible matches, match questions to answers* recognize, classify, practice, differentiate, categorize, interpret

Speed Up	Works On: - Classroom Display - Teacher Device - Student Device	Multiple Choice True/False Checks answers: Instantly	Supports non-image questions from: Monster Quiz, Response 2, Game Show Up to 4 players or teams Some data shown for students on performance and how questions were answered	Skills: Encourages quick thinking, competition, memory recall Review memorized skills *LU: Choose the best answer, which is not correct, what answer would you get if you made this mistake?* recall, review, compute, question, interpret

Synchronous Lesson Activities

Monster Quiz **Team Quiz**	Works On: - Classroom Display - Teacher Device - Student Device (required) Team results shown on display Individual results shown on student devices	Multiple Choice True/False Check Answers: Instantly Multiple attempts	Doesn't support images Some data collected on team performance and how questions were answered Run Live	Skills: Review content, activate prior knowledge Introduce vocabulary, review assigned reading, *LU: students submit questions in Shout it Out for quiz after assigned reading, lesson, video…* recall, review, compute, question, interpret
	Works On: - Classroom Display - Teacher Device - Student Device (required)	Multiple Answer Multiple Choice True/False Poll/opinion Short Answer (up to 25 characters)	Supports Images Detailed data exported to Excel spreadsheet	Skills: Review content, activate prior knowledge Quick: 5 ?s review or prior knowledge check, exit ticket, warm-up, check for understanding, scaffolding, create word cloud of ideas with short answer Assessment: Chapter quiz, test, review or prior

Response 2	Questions on Student Devices Progress & results available on Teacher Device	Check Answers: Upon Completion	Supports Non-Image Questions from: Monster quiz, Speed Up, Game Show Run Live	learning check, track growth, grade, export to gradebook *LU: Use as a pretest to create 2 or 3 differentiated activities* recall, review, compute, question, interpret
Shout It Out	Works On: - Classroom Display - Teacher Device - Student Device (required) Responses shown on board and teacher devices.	Open Ended Short Answer	Response space: Randomize or Up to 4 categories Up to 150 characters per response Supports images OR texts Run Live	Skills: Brainstorming, Personal Connections, Questioning, Conclusions and Connections Brainstorm, collect responses, quotes, personal connections, questions, back channel connections & questions, KWL, Review, schema *LU: students create categories for responses by adding text boxes and sorting, use images to symbolize big idea of lessons, 6 word conclusions & summary, ask & answer board* list, express, predict, question, categorize, contrast

Appendix

The lessons for this unit utilize the standards below to drive instruction:

Science Standards:

MS-ESS3-3 Apply scientific principles to design a method of monitoring and minimizing impact on the environment.

S8.D.1.3.1 Describe the water cycle and the physical processes on which it depends (i.e., evaporation, condensation, precipitation, transpiration, runoff, infiltration, energy inputs, and phase changes).

S8.D.1.3.2 Compare and contrast characteristics of freshwater and saltwater systems on

the basis of their physical characteristics (i.e., composition, density, and electrical conductivity) and their use as natural resources.

English Language Arts Standards:

CC.1.3.6.B Cite textual evidence to support analysis of what the text says explicitly, as well as inferences and/or generalizations drawn from the text.

CC.1.4.6.E Write with an awareness of the stylistic aspects of composition. • Use precise language and domain-specific vocabulary to inform about or explain the topic. • Use sentences of varying lengths and complexities. • Develop and maintain a consistent voice. • Establish and maintain a formal style.

Art Standards:

9.1.8.B.4. Recognize, know, use and demonstrate a variety of appropriate arts elements and principles to produce, review and revise original works in the arts. Visual Arts: paint; draw; craft; sculpt; print; design for environment, communication, multi-media.