Wind Farmer

Performance Task

Introduction

The decision of where a wind farm is located involves several steps. No site is perfect. You will research the topography and weather of each potential site. You should consider land use and impact on the environment. You can create designs to showcase wind technology. Once a location meets your scientific needs, the impact on the community should be addressed, including cost and aesthetics. A successful presentation at a community meeting involving concerned citizens is necessary to accomplish the goal of creating your plant.

Big Idea / Essential Questions

Big Idea

- A technological world requires that humans develop capabilities to solve technological challenges and improve products for the way we live.
- Limited resources and unlimited wants require choices by individuals, groups, and nations.
- Renewable energy can produce electricity with minimal harm to the environment.

Essential Questions

- What are the benefits to using alternative energy in place of fossil fuels?
- What conditions could cause a reallocation of the factors of production in regions, nations, and globally?

G.R.A.S.P.

Goal

Your task is to analyze several locations for potential wind farm plants and decide on the best location. Your challenge, along with your team, is to weigh the pros and cons of its placement. To choose the most appropriate location, you will need to decide on the size of the wind turbines that will be used for the farm. Most importantly, you will need to persuade the community that the building of a wind farm is a worthwhile and valuable project for them individually and collectively.

Role

You are part of a team working for a company that builds wind farms. You are responsible for deciding on the best placement for a wind farm, based upon physical and geographic concepts. Your most important task will be to persuade the people living in the area selected, that a wind farm is beneficial to the community and society in general.

Audience

Once the location is decided, you will prepare a presentation for a community meeting that helps convince residents that wind energy is a good method to help power their community. This presentation should justify your decision as the best one for your company, the environment, and the community.

Situation

The decision of where the wind farm is located involves several steps. No site is perfect. You will research the topography and weather of each potential site. You should consider land use and impact on the environment. You can create designs to showcase wind technology. Once a location meets your scientific needs, the impact on the community should be addressed, including safety, environmental impact and aesthetics. A successful presentation at a community meeting involving concerned citizens is necessary to accomplish the goal of creating the wind farm.

Wind Farms Kill Off Three Quarters of Predatory Birds.

https://dailym.ai/2D3Zn3u

Products

1. Multimedia Presentation

Your task is to create a multimedia presentation, incorporating graphs or charts, that compares different possible locations for the placement of a wind farm. The purpose of this is to help the audience understand why their area was selected for a wind farm. First research the different average wind velocities and air density measures at different locations. Next, use what you find in your research along with the Wind Power Generator Simulation (see Section 3: Do the Research for the link to the simulation) to find the approximate wind energy output for different locations. You may want to consider how locations with the same air density but different average wind velocities vary in their wind energy output.

Present your findings using graphs or charts that allow the viewer to easily compare the energy output in different locations and to notice any trends the data may show. As an extension, you may wish to explore the extra costs that are part of building wind farms in windier locations (i.e. on mountain tops, out in the ocean, etc.) Sometimes a windier location capable of creating more energy is not cost-effective due to the difficulty in building the turbine. Investigate this possibility and report back on the ideal location for providing cost-effective energy.

- Where are some good locations for a wind farm?
- What wind velocities and air density measures happen at different locations?

Data Chart - Wind Farmer

Achievement Levels	1	2	3	4
Organization Of Table/Chart (x1)	The data collected is unorganized and lacks appropriate units or labels. It is difficult for the viewer to draw conclusions about the data.	The data collected is somewhat organized in a table or chart containing few units or labels which only allows the viewer to draw partial conclusions about the data.	The data collected is organized in a table or chart containing accurate units and labels to allow the viewer to make appropriate conclusions about the data.	The data collected is organized in a neat, easy to read table or chart containing accurate units and labels to allow the viewer to make appropriate conclusions about the data.
		Graphic representation is	Graphic representation is	Graphic representation is

Achievement Levels	1	2	3	4
Graphic Representation (x1)	Graphic representation is not appropriate based on the type of data collected.	appropriate based on the type of data collected and contains some required labels/elements.	appropriate based on the type of data collected and contains all required labels/elements.	neat, appropriate based on the type of data collected, and contains all required labels/elements.
Cost-Effective Solutions (x1)	Product provides minimal analysis of the process of building and maintaining a wind farm in various locations.	Product provides a partial analysis of the process of building and maintaining a wind farm in various locations and compares those to potential energy outputs to determine a solution that may or may not be cost-effective.	Product provides a sufficient analysis of the process of building and maintaining a wind farm in various locations and compares those to potential energy outputs to determine the most cost-effective solution.	Product provides a thorough analysis of the process of building and maintaining a wind farm in various locations and compares those to potential energy outputs to determine the most cost-effective solution.
Persuasive Presentation (x1)	Product did not accomplish the goal of persuading the audience that the building of a wind farm is worthwhile due to minimal communication of the individual and collective benefits of this project.	Product partially accomplished the goal of persuading the audience that the building of a wind farm is worthwhile through some communication of the individual and collective benefits of this project.	Product accomplished the goal of persuading the audience that the building of a wind farm is worthwhile through sufficient communication of the individual and collective benefits of this project.	Product accomplishes the goal of persuading the audience that the building of a wind farm is worthwhile through expert communication of the individual and collective benefits of this project.
Research (x1)	Product demonstrates a lack of research conducted around the topic.	Product demonstrates that some research was conducted around the topic.	Product demonstrates that research was conducted around the topic using few credible or appropriate sources.	Product demonstrates that thorough research was conducted around the topic, using several sources that are credible and appropriate.
Using Geographical Information (x1)	Product minimally uses information acquired from a map, globe or another geospatial tool to evaluate the geography and topography of different locations and how impact the potential for a successful wind farm.	Product somewhat uses information acquired from a map, globe or another geospatial tool to evaluate the geography and topography of different locations and how they impact the potential for a successful wind farm.	Product adequately uses information acquired from a map, globe or another geospatial tool to evaluate the geography and topography of different locations and how they impact the potential for a successful wind farm.	Product expertly uses information acquired from a map, globe or another geospatial tool to evaluate the geography and topography of different locations and how they impact the potential for a successful wind farm.

2. Newspaper Advertisement/Television Commercial

Your task is to create an advertisement to promote the use of wind power. Your advertisement could take the form of a television commercial or a newspaper advertisement. Some ideas to consider investigating and perhaps promoting might include: The cost of wind energy once a turbine is built, wind power and pollution, the varying sizes of wind turbines and how they can be used by society, communities, individual households or large businesses.

- Why is wind power beneficial?
- How can you persuade people to believe this?
- What is the overall cost for building a wind turbine and the cost of wind energy?

Newspaper Article/TV commercial - Wind Farmer

Achievement Levels	1	2	3	4
Content (x1)	There is minimal accurate information and/or the message is unclear.	Some of the information included is accurate and interesting.	Most of the information is clear, accurate and interesting.	Accurate and interesting information. Clearly conveys intended message in a creative way.
Originality (x1)	Design reflects a copy of existing advertisement. Lacking required elements.	Unoriginal design that reflects or mimics a familiar advertisement. Elements included lack creativity.	Original design but reflects or mimics a familiar advertisement. Elements included are creative.	Original design that does not reflect or mimic a familiar advertisement. Elements included are creative and reflect original designs.
Graphics (x1)	Graphics selected do not enhance product. Connections to intended purpose are not apparent.	Graphics are selected in an attempt to enhance product, but are not clearly connected to the intended message.	Graphics are selected to convey intended message to the audience. Most graphics enhance the product.	Original graphics are created or selected to convey intended message to the audience. All graphics enhance the product.
	Many errors may be present	Many errors may be present	Some errors may be present	Few errors, if any, are present

Achievement Levels	1	2	3	4
Achievement (x1)	in grammar, usage, spelling, punctuation and many of those errors may interfere with meaning.	in grammar, usage, spelling, and punctuation, and some of those errors may interfere with meaning.	in grammar, usage, spelling and punctuation, but few, if any, of the errors that are present may interfere with meaning.	in grammar, usage, spelling, and punctuation, but the errors that are present do not interfere with meaning.
Effective Persuasion (x1)	Product did not accomplish the goal of persuading the audience that the building of a wind farm is worthwhile due to minimal communication of the individual and collective benefits of this project.	Product partially accomplished the goal of persuading the audience that the building of a wind farm is worthwhile through some communication of the individual and collective benefits of this project.	Product accomplished the goal of persuading the audience that the building of a wind farm is worthwhile through sufficient communication of the individual and collective benefits of this project.	Product accomplishes the goal of persuading the audience that the building of a wind farm is worthwhile through expert communication of the individual and collective benefits of this project.
Natural Resources and Human Consumption (x1)	The product demonstrates minimal understanding of the need for alternative energy sources.	The product demonstrates minimal understanding of the need for alternative energy sources based upon the population growth, energy consumption, and current effects of fossil fuels on the environment.	The product demonstrates basic understanding of the need for alternative energy sources based upon the population growth, energy consumption, and current effects of fossil fuels on the environment.	The product demonstrates strong understanding of the need for alternative energy sources based upon the population growth, energy consumption, and current effects of fossil fuels on the environment.
Research (x1)	Product demonstrates a lack of research conducted around the topic.	Product demonstrates that some research was conducted around the topic.	Product demonstrates that research was conducted around the topic using few credible or appropriate sources.	Product demonstrates that thorough research was conducted around the topic, using several sources that are credible and appropriate.

3. Models

Create a scale model of a wind turbine. Step one in this task will be to research the actual size of a wind turbine (total height, length of the blades, the circumference of the base and tower, etc.). The simulation may be helpful as you determine the most efficient size for a wind turbine based upon your location. Once you have determined the actual size, you will want to create a scale model to use in your presentation. Be sure to provide the scale factor for your teacher so that they can check your accuracy.

When determining the materials to use, be sure to consider the stability of the wind turbine. Stability may be affected by a number of factors including the size of the blades, the ground that it will be placed on, and the speed at which the blades may turn. Can you think of any other concerns?

Another key factor in a wind turbine is the generator. The generator and gears may come into play when determining how fast your turbine blades can rotate. Determine the appropriate size of the generator for your turbine and describe how electric or magnetic forces work to create an effective generator for your turbine.

- What type of materials are avaliable?
- How does the stability impact the wind turbine?
- What other concerns may come up during the building process?

Models - Wind Farmer

Achievement Levels	1	2	3	4
Model (x1)	The model is a minimally accurate with respect to the plans and the scale.	The model is a somewhat accurate reproduction of the plans including the scale. It includes some detail and critical components.	The model is a mostly accurate reproduction of the plans including the scale. It has attention to detail with most critical aspects in place.	The model is an accurate reproduction of the plans, including the scale. It has great attention to detail.
		The model meets the some of	The model meets the majority	The model meets all of the

Achievement Levels	1	2	3	4
Problem Solving (x1)	The model meets few needs and requirements set forth through the guidelines provided.	needs and requirements set forth through the guidelines provided to solve the problem of designing a stable, efficient turbine for a particular location.	of needs and requirements set forth through the guidelines provided to solve the problem of creating a stable, efficient turbine for a particular location.	needs and requirements set forth through the guidelines provided to solve the problem of creating a stable, efficient turbine for a particular location.
Research (x1)	Product demonstrates a lack of research conducted around the topic.	Product demonstrates that some research was conducted around the topic.	Product demonstrates that research was conducted around the topic using few credible or appropriate sources.	Product demonstrates that thorough research was conducted around the topic, using several sources that are credible and appropriate.
Engineering and Design (x1)	Product demonstrates minimal understanding of the criteria and constraints of the design problem with regard to size, materials, and function of the product.	Product demonstrates some understanding of the criteria and constraints of the design problem with regard to size, materials, and function of the product.	Product demonstrates adequate understanding of the criteria and constraints of the design problem with regard to size, materials, and function of the product.	Product demonstrates strong understanding of the criteria and constraints of the design problem with regard to size, materials, and function of the product.
Electric Forces (x1)	Product provides minimal evidence of data to determine the factors that affect the strength of electric or magnetic forces associated with the generator of the turbine.	Product provides some evidence of data to determine the factors that affect the strength of electric or magnetic forces associated with the generator of the turbine.	Product provides adequate evidence of data to determine the factors that affect the strength of electric or magnetic forces associated with the generator of the turbine.	Product provides strong evidence of data to determine the factors that affect the strength of electric or magnetic forces associated with the generator of the turbine.

4. Debate

This debate will have students take both sides of an argument related to the development of a wind farm in a certain region. The groups will need to critically analyze information drawing conclusions and developing arguments on both sides of the debate related to wind energy. The groups will need to listen to the competing viewpoint and respond appropriately with research-based information. Through this process the groups should develop their own opinions and engage in respectful dialogue.

Critical thinking requiring the synthesis of information will help the groups succeed in this process. Your team will need to utilize effective questioning skills to help gather information and focus ideas. One group will be on the "pro" side of the development of a wind farm, while the other side will be "con" based upon research related to issues currently brought forth by groups and communities.

- How do wind mills and wind farms impact the environment?
- Is wind energy a beneficial source of energy?
- Why is the location selected a good place to put a wind farm?

Debate - Wind Farmer

Achievement Levels	1	2	3	4
Evidence to Support an Argument (x1)	Little information presented in the debate was accurate or supported by facts which answered the guiding questions or supported the argument.	Some information presented in the debate was accurate and supported by facts which partially answered the guiding questions and supported the argument.	Most information presented in the debate was accurate and supported by facts which answered the guiding questions and supported the argument.	Information presented in the debate was thorough, accurate and supported by facts which answered the guiding questions and supported the argument.
Delivery (x1)	The presenters make little use of eye contact, articulation, and enthusiasm to keep the audience engaged.	The presenters make some use of eye contact, articulation, and enthusiasm to keep the audience engaged.	The presenters make good use of eye contact, articulation, and enthusiasm to keep the audience engaged.	The presenters make excellent use of eye contact, articulation, and enthusiasm to keep the audience engaged.
Organization (x1)	The information flows poorly which leads to a convoluted presentation of logical arguments.	The information has some flow which leads to the presentation of somewhat logical arguments brought forth.	Good flow of information which leads to the presentation of logical arguments brought forth in a clear manner.	Exceptional flow of information which leads to the presentation of logical arguments brought forth in a clear manner.
	Product minimally uses	Product somewhat uses		

Achievement Levels	1	2	3	4
Using Geographical Information (x1)	information acquired from a map, globe or another geospatial tool to evaluate the geography and topography of different locations and how impact the potential for a successful wind farm.	information acquired from a map, globe or another geospatial tool to evaluate the geography and topography of different locations and how they impact the potential for a successful wind farm.	Product adequately uses information acquired from a map, globe or another geospatial tool to evaluate the geography and topography of different locations and how they impact the potential for a successful wind farm.	Product expertly uses information acquired from a map, globe or another geospatial tool to evaluate the geography and topography of different locations and how they impact the potential for a successful wind farm.
Natural Resources and Human Consumption (x1)	The product demonstrates minimal understanding of the need for alternative energy sources.	The product demonstrates minimal understanding of the need for alternative energy sources based upon the population growth, energy consumption, and current effects of fossil fuels on the environment.	The product demonstrates basic understanding of the need for alternative energy sources based upon the population growth, energy consumption, and current effects of fossil fuels on the environment.	The product demonstrates strong understanding of the need for alternative energy sources based upon the population growth, energy consumption, and current effects of fossil fuels on the environment.
Persuasive Presentation (x1)	Product did not accomplish the goal of persuading the audience that the building of a wind farm is worthwhile due to minimal communication of the individual and collective benefits of this project.	Product partially accomplished the goal of persuading the audience that the building of a wind farm is worthwhile through some communication of the individual and collective benefits of this project.	Product accomplished the goal of persuading the audience that the building of a wind farm is worthwhile through sufficient communication of the individual and collective benefits of this project.	Product accomplishes the goal of persuading the audience that the building of a wind farm is worthwhile through expert communication of the individual and collective benefits of this project.
Cost-Effective Solutions (x1)	Product provides minimal analysis of the costs associated with building and maintaining a wind farm in various locations.	Product provides a partial analysis of the costs associated with building and maintaining a wind farm in various locations and compares those to potential energy outputs to determine whether it is a cost-effective solution.	Product provides a sufficient analysis of the costs associated with building and maintaining a wind farm in various locations and compares those to potential energy outputs to determine whether it is a cost-effective solution.	Product provides a thorough analysis of the costs associated with building and maintaining a wind farm in various locations and compares those to potential energy outputs to determine whether it is a cost-effective solution.
Research (x1)	Product demonstrates a lack of research conducted around the topic.	Product demonstrates that some research was conducted around the topic.	Product demonstrates that research was conducted around the topic using few credible or appropriate sources.	Product demonstrates that thorough research was conducted around the topic, using several sources that are credible and appropriate.

5. Virtual Field Trip

Virtual field trips are computer-generated environments that offer media-rich interactions with a particular topic. The trip you have been asked to develop focuses on various types of energy. Choose a minimum of three different energy types. Your virtual field trip should show different types of power plants around the world. The trip should inform the viewer about the type of power plant, the type of energy used, pros and cons related to this energy in terms of people, places, and the environment. Additionally, present a wind farm and provide the same information. The audience should view pictures and video resources supported by your narrative as the tour guide. The components of a virtual field trip can include content and contextualized information, multimedia resources including images, video and/or animations, sound and/or music, potential social media capabilities, additional links, and more.

- What are three different energy types and various power plants around the world?
- What are pros and cons related to this energy in terms of people, places and the environment?

Virtual Field Trip - Wind Farmer

Achievement Levels	1	2	3	4
Media Integration (x1)	The fieldtrip uses media which minimally enhances the learning experience.	The fieldtrip uses media which partially enhances the learning experience. Text is used but may not always	The fieldtrip uses a variety of media including still photographs and video, which mostly enhance engagement and the	The fieldtrip uses a variety of media including still photographs, video and audio, which all enhance engagement and deepen the learning experience. Text is

Achievement Levels	1	2	3	4
		align with the media.	learning experience. Text is used to guide the journey.	used to guide the journey and link content.
Focus/Purpose (x1)	Virtual field trip is unorganized and minimally aligned with the product goals.	Virtual field trip is somewhat organized and focused. The field trip partially aligns with the product goals.	Virtual field trip is mostly organized, focused, and aligns with product goals.	Virtual field trip is very organized, focused, and a clear purpose aligned with product goals is evident.
Energy, People, and the Environment (x1)	Presentation minimally demonstrates understanding of different forms of energy as well as the effects of those forms on people and the environment.	Presentation somewhat demonstrates understanding of different forms of energy as well as the effects of those forms on people and the environment.	Presentation adequately demonstrates understanding of different forms of energy as well as the effects of those forms on people and the environment.	Presentation strongly demonstrates understanding of different forms of energy as well as the effects of those forms on people and the environment.
Persuasive Presentation (x1)	Product did not accomplish the goal of persuading the audience that the building of a wind farm is worthwhile due to minimal communication of the individual and collective benefits of this project.	Product partially accomplished the goal of persuading the audience that the building of a wind farm is worthwhile through some communication of the individual and collective benefits of this project.	Product accomplished the goal of persuading the audience that the building of a wind farm is worthwhile through sufficient communication of the individual and collective benefits of this project.	Product accomplishes the goal of persuading the audience that the building of a wind farm is worthwhile through expert communication of the individual and collective benefits of this project.