

WEATHER, CLIMATE AND AIR QUALITY!!



In this STEM Problem-based learning unit, you will be investigating the questions: ***How are weather and climate related to air quality? And How does air quality impact humans?***

Background: On our Earth, there are a variety of climates found on all continents. Within these climates there are certain factors that give that climate its own unique characteristics. Factors such as precipitation levels, cloud type and humidity provide information about the current weather in an area. For instance, if Grand Junction has a daily temperature of 8 degrees Fahrenheit we refer to this factor as weather. If Grand Junction had 8 degrees Fahrenheit for 8 months in a row, we refer to this as climate. The difference then is weather relies on current trends, while climate describes the long term data trends for a given area. Air quality for particular regions can change based on a variety of factors. Local air quality can differ from regional air quality. Seasonal effects can impact air quality such as increased temperature inversions in winter months, while increased seasonal ozone can occur during other times of the year.

Task: In this project, you will be asked to answer the question: “How are weather and climate related to air quality? And How does air quality impact humans?” In working towards an evidence-based answer to this giant question, your team will have several opportunities to collect data, think about air quality, design and even build an air quality invention. Your team will consist of 4 roles with specific objectives including: Climatologist, Engineer, Cartographer, and Air Quality Specialist. These 4 roles will lead you in creating a final presentation, which you will

present at your ***Air Quality Invention Convention MakerFair Exhibition.***

In science class: You will investigate how air quality relates to weather and climate. You will research how human lives are impacted by air quality. Using tools such as ArcGIS and data collection, you will analyze patterns of weather/climate and air quality, seasonal effects and air quality impacts in a particular geographic location.

In your teams: On shared documents, you will pull together resources for an informational presentation on how weather/climate and air quality are related for a particular geographic location.

Weather vs. Climate

<i>Weather</i>	<i>Climate</i>
The state of the atmosphere - temperature, precipitation, wind, cloudiness, pressure and more.	Average or typical weather for a given area over a relatively long period of time.

WEATHER OR NOT: Project Fast FAQ's

IMPORTANT DATES!

Dates	Due
4/24-4/28	BACKGROUND RESEARCH TIME
5/1-5/8	Team workday in science 5/1 Location Due 5/2 Initial map Due 5/8 Presentation Outline Due
5/9	Peer Presentation and Critique
5/10	EXHIBITION PRESENTATION DAY

RESPONSIBILITIES!

<i>Individual Responsibility</i>	<i>Group Responsibility</i>
<ol style="list-style-type: none"> 1. Data recording and sampling 2. Weather topic experts 3. Ability to use technology efficiently. 4. Team member responsibility. 5. Full attendance and presence during workdays/times. 	<ol style="list-style-type: none"> 1. Map 2. Invention Convention Invention 3. Hold each other accountable for all decisions within the group. 4. Completion of Group documents 5. Group Presentation to peer and professional audiences 5/9-5/10

PRESENTATION INFO!

May 9th	May 10th
Peer Presentation	Professional Presentation
<u>Details:</u> <ul style="list-style-type: none"> • Present to Peers in Science Classes • 5-7 minutes long • Casual Dress • Evaluation by self, team, peers and teacher. • Feedback for 5/10. 	<u>Details:</u> <ul style="list-style-type: none"> • Present to Professionals • 7-10 minutes long • Professional Dress <ul style="list-style-type: none"> ◦ (Dresses, skirts, black pants and dress shirt and/or tie. • Evaluation by Professionals

ROLE	TEAM MEMBER
Climatologist	
Engineer	
Air Quality Specialist	
Geographer/ Cartographer	

Weather Experts (in groups):

Who's the expert?	TOPIC	Questions to answer and share with your groupmates!					
	Weather vs. Climate	What is the definition of weather? Climate?	What does climate have to do with altitude? Latitude?	How are weather and climate similar/different?	What are the climates of the world?	In what climate do most humans live?	What is one way you could demonstrate this idea with objects?
	Air Quality	What is Air Quality?	How is AQ measured?	Why is AQ important?	How does AQ impact humans?	What is AQ in winter vs. summer?	What chemical changes occur in AQ? Smog? Ozone?
	Where does weather come from?	How is weather formed?	How does elevation affect weather?	Where does wind come from?	How are land and ocean heated differently?	What is the driving force of all our weather?	What is one way you could demonstrate this idea with objects?
	Air Masses (Fronts) and Reading Weather Maps	What is an air mass and how are they formed?	What are the types of air masses?	What happens when air masses meet?	How do we show fronts on a weather map? How do you read a weather map?	How does temperature/pressure affect air mass behavior?	What is one way you could demonstrate this idea with objects?
	Weather Tools Engineer	What tools do we use to forecast the weather?	Which tools work best? Why?	How have weather tools changed over time?	What weather tools and software are used by NOAA?	What is one tool that you could invent to help study the weather?	What is one way you could demonstrate this idea with objects?
	All about pressure!	What is pressure?	Why is air pressure important with weather?	Why do we have different air pressure?	How does air pressure affect local weather patterns?	How can we use air pressure to predict upcoming weather forecasts?	What is one way you could demonstrate this idea with objects?
	Severe Weather Events and Weather Safety	What is the definition of severe weather?	What are local severe weather events?	What is a safety plan for lightening? Tornado? Blizzard? Hurricane?	Why is weather safety important?	How can technology help people stay safe in a severe weather event?	What is one way you could demonstrate this idea with objects?
	Location & Geography	How does geography determine weather/climate?	How do mountains impact air quality?	How do valleys impact air quality?	How does geography impact air quality?	Are certain geographic climates more prone to poor air quality?	How does weather/climate tell us about factors of air quality?
	Seasons and Earth's Tilt	Why do we have seasons?	How does the tilt of the earth affect our seasons?	Do all locations have seasons?	What are some typical season characteristics for US vs. Greenland?	What season is it based on where the earth and sun are?	What is one way you could demonstrate this idea with objects?

How are weather and climate related to air quality and how does air quality impact humans?

CLASS: _____ TEAM # _____ TEAM MEMBERS: _____

Location :	PRODUCT 1:	PRODUCT 2:	PRODUCT 3:
	Presentation	MAP WITH DATA INTERPRETATION	AIR QUALITY INVENTION
INVENTION CONVENTION IDEA:	Presentation outline:		

Stage of Project Management	Outcome
Defining	Define roles, background research necessary, project objectives.
Planning	Ensure you have all aspects of mission content covered/reviewed. Objectives are identified and known by all members.
Doing	Complete individual and team objectives. Present project outcomes to your audience (Presentation with Map, Data, and Invention)
Reviewing	Review your team's understanding of Air Quality and Weather/Climate. Reflect on your team's overall presentation.

ROLE	Team Member	Objectives
Climatologist		<ol style="list-style-type: none"> 1. Identify and explain the historical data on the climate of your selected location. 2. Support the engineer with research on what inventions exist in certain climates for measuring/managing air quality and W/C. 3. Work with your Geographer to identify and display the climate trends within this area. 4. Work with Engineer to design an invention specific to weather/climate in your selected area. 5. Be able to give 8-10 examples of how air quality and weather/climate are related and the chemistry involved in this process. 6. Your choice: _____
ENGINEER		<ol style="list-style-type: none"> 1. Research already engineered inventions which manage/evaluate air quality and W/C. 2. Facilitate your team's invention idea into one team design. 3. Complete a design draft (Google Drawing or hand drawn), which shows how your invention will work. 4. Work with your team to design and build your invention. 5. Use feedback from your team to improve your team's design prior to presentation day and share design strengths/weaknesses. 6. Explain and demonstrate how your invention works 7. Your choice: _____
Air Quality Specialist		<ol style="list-style-type: none"> 1. Identify and explain the current and historical air quality data on the weather/climate of your selected location. 2. Work with your Geographer to identify and display the air quality map data for your team's selected selected area. 3. Be able to identify how air quality is measured and reported, locally and nationally. 4. Explain what factors make for good air quality/bad air quality within different seasons. 5. Support Engineer with design of <i>region specific</i> invention. 6. Help your team investigate/measure air quality with the air quality PODs and regional data for outdoor air quality. (Experiment)
Geographer/ Cartographer		<ol style="list-style-type: none"> 1. Build a map/StoryMap to display your group data for a specific location/region/climate. 2. Work with the AirQuality Specialist and Climatologist to identify map data needed to "tell your story" of your location. 3. Explain the reasons for weather/climate and air quality within this area. (Inverions? Geography? Population?, etc) 4. Be familiar with your map database in order to explain data, location examples, map features, etc. 5. Explain why your team's invention is specific/necessary/important to this given location. 6. Bonus* Build a QR code to showcase where your Map lives online. 7. Bonus* See Teacher if you want to enter your team's map into a Colorado Map Competition. (Some outside GIS work needed).

Name: _____

Presenting Team: _____

Block: _____

	Advanced	Proficient	Developing	Emerging
Science	<ul style="list-style-type: none"> Students can predict the weather patterns for a series of given locations based on historical trends in data. Students can identify the source of all energy on Earth and the transfers of energy within the atmospheric layers. 	<ul style="list-style-type: none"> Team demonstrates an understanding of key weather patterns for multiple locations/ geographic areas. Team can identify how energy transfers through convection and radiation within a given scenario. Team can identify severe weather scenarios for given locations. 	<ul style="list-style-type: none"> Students identify 2-3 key weather factors for 1 location: (wind, precipitation, pressure, cloud type) Students identify that there can be severe weather events on Earth. 	<ul style="list-style-type: none"> Students can identify 1 key weather factor. Students identifies that weather can be different based on location on Earth.
Technology	<ul style="list-style-type: none"> Students comfortably navigate the geographical mapping technology with ease in explaining their map. 	<ul style="list-style-type: none"> Team identifies how to model geographical information using a mapping application with multiple sets of data. 	<ul style="list-style-type: none"> Students use online mapping applications to show weather/climate for an area. 	<ul style="list-style-type: none"> Students refer to but does not utilize a supporting technology.
Engineering - Innovation (see rubric on BIE)	<ul style="list-style-type: none"> Team designs and builds an invention which demonstrates a practical application to evaluating/managing air quality for their given region.. Product is actually marketable, made from unique materials, and/or can withstand natural elements founds in nature (rain, etc) 	<ul style="list-style-type: none"> Team designs and builds an invention which demonstrates a practical application to evaluating/managing air quality for their given region. 	<ul style="list-style-type: none"> Team shows a model of their invention, which is a theoretical invention, with the capability of evaluating/managing air quality or weather/climate features. 	<ul style="list-style-type: none"> Students talk about model but model is limited or off topic.
Communication	<ul style="list-style-type: none"> All members come to discussions prepared, having read and/or researched information with evidence to share and lead inclusive discussions. 	<ul style="list-style-type: none"> All members come to discussions prepared, having read and/or researched information with evidence to share and reflect and/or probe. 	<ul style="list-style-type: none"> Members come to discussions prepared, having read and/or researched information and share information with group. 	<ul style="list-style-type: none"> Members have discussion with shared information with one member sharing exclusively.
Presentation	<ul style="list-style-type: none"> All team members have a part in the general presentation using practices of prepared professionalism, including answering judge questions. The presentation is within the given time frame of 7-8 minutes. 	<ul style="list-style-type: none"> All team members have a part in the general presentation using practices of prepared professionalism. The presentation is within the given time frame of 5-7 minutes. 	<ul style="list-style-type: none"> Most members have a part in the physical presentation. Presentation is between 3-5 minutes. 	<ul style="list-style-type: none"> Less than half members have a part in speaking part of the physical presentation. Presentation is less than 3 minutes.
Collaboration (LB)	<ul style="list-style-type: none"> All members of the group have a voice in decisions affecting all project decisions. All members share ideas and content with the team and teachers. Team members share workload equally and fluidly (with all working towards standards mastery. 	<ul style="list-style-type: none"> All members of the group have a voice in decisions affecting the project. All members share ideas and content with the team. Team members share workload equally. 	<ul style="list-style-type: none"> More than half of group members of the group have a voice in decisions affecting the project. More than half of group members share ideas and content with the team. Team members share workload with one or more people doing a higher % of workload. 	<ul style="list-style-type: none"> Less than half of group members of the group have a voice in decisions affecting the project. Less than half of group members share ideas and content with the team. Team members share some workload with one

				person doing a higher % of workload.
--	--	--	--	--------------------------------------

Peer Grading Sheet:

WHO	WHAT DID THIS PERSON WORK ON?	WHAT % OF TEAM WORK DID THIS PERSON DO?	Academic Grade (4,3,2,1)	Learning Behavior Grade (4,3,2,1)	Comments

NAME: _____ BLOCK: _____

Directions: Use www.scienceforstudents.com → Weather and Climate → “April 24-May 10th PBL Project” Activites #1-4 and More!

<p>HOW ARE WEATHER AND CLIMATE RELATED TO AIR QUALITY?</p>	<table border="1"><tr><td> </td></tr><tr><td> </td></tr><tr><td> </td></tr><tr><td> </td></tr><tr><td> </td></tr><tr><td> </td></tr><tr><td> </td></tr><tr><td> </td></tr><tr><td> </td></tr><tr><td> </td></tr><tr><td> </td></tr></table>											
<p>HOW DOES AIR QUALITY IMPACT</p>	<table border="1"><tr><td> </td></tr><tr><td> </td></tr><tr><td> </td></tr><tr><td> </td></tr></table>											

HUMANS?	
HOW CAN HUMANS HELP WITH IMPROVE AIR QUALITY?	

ENGINEERING IDEAS:

Welcome!

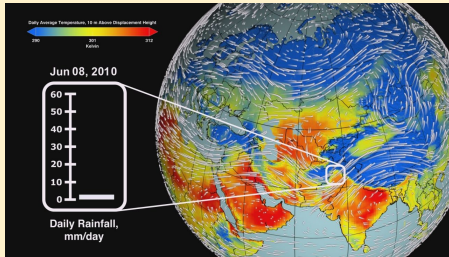
Thank you for helping to be an audience for our students. We appreciate your time and look forward to having you spend time with our students and their research projects.

DRIVING QUESTION:

1. How are weather and climate related to air quality?
2. How are humans impacted by air quality?

Long Term Learning Target:

Students will identify how weather and climate factors relate to air quality and how air quality impacts humans.



Project Description:

Students were asked to answer the driving question with a research focus in math and science classes. Students used a variety of media, technology and digital tools to collaborate with their teams to answer the driving question. Student teams selected their own topics and set goals as teams within the project timeframe.

Potential Post Presentation ?'s

Try to ask 2-3 questions per team.

- *I see you used ___ in your presentation, why did you choose to include this in your research?*
- *Why did you select this location?*
- *What kind of data did you use for your research?*
- *What did you do with this data?*
- *How does the weather or climate impact ___?*
- *If you were to do more research on this topic, what else would you research?*
- *If you were given \$100K to solve an air quality problem related to your research, what would you spend your \$\$\$ on?*

2 Presentation Products

Product 1: Story Map

Map should have:

1. a specific location picked by the team.
2. Slides to show weather/climate factors
3. Slides should include additional data other than weather/climate
4. Team should be able to describe data around their chosen location.

Product 2: Air Quality Invention

1. Explanation of Product
2. Model (working or not)
3. Team could describe why this product is important.
4. Design draft or blueprint could be included as well.



Dress for Success:

Students wear outfits that are more professional than traditional daily classroom clothing choice, and/or they wear clothing appropriate to theme of project.

Have feedback for us after the presentations?

Heidi.Ragsdale@d51schools.org

Brian.Roddiger@d51schools.org

Transfers and Transformation of Energy Weather/Climate/Ecosystems

