NGSS Lesson Planning Template

E.8.9BStudents will demonstrate an understanding of natural hazards (volcanic eruptions, severe weather, earthquakes) and construct explanations for why some hazards are predictable and others are not.
E.8.9B.1Research and map various types of natural hazards to determine their impact on society.
E.8.9B.2Compare and contrast technologies that predict natural hazards to identify which types of technologies are most effective. (other tech will be discussed in future lessons to compare and contrast).
Building towards this standard
E.8.9B.3Using an engineering design process, create mechanisms to improve community resilience, which safeguard against natural hazards (e.g., building restrictions in flood or tidal zones, regional watershed management, Firewise construction).*

Grade/ Grade Band: 8th Grade Science	**Topic:** Natural Hazards and their impact	**Lesson # ____ in a series of ____ lessons**
Brief Lesson Description: students will learn about fronts and pressure systems then use their knowledge and research to explain human impact. Students will then predict weather based on observations from historical averages and current models. The purpose of this lesson will be for students to apply weather knowledge to explain today, predict tomorrow, and forecast for next week. All of this building to hurricanes and eventually our EBD lesson to create a structure to aid in community preservation when faced with a natural disaster.		
Performance Expectation(s): Students will accurately predict within a tolerable accuracy the average monthly temperature and precipitation.		
Specific Learning Outcomes:		
Narrative / Background Information		
Prior Student Knowledge: Students will have just finished a lesson on plate tectonics and will have mastered density as the driving force for plate tectonics but will not have applied this concept to weather. Students know key terms about weather but only at a DOK 1 level.		
Science & Engineering Practices: 1. Asking questions (for science) and defining problems (for engineering) 2. Developing and using models 3. Planning and carrying out investigations 4. Analyzing and interpreting data 5. Using mathematics and computational thinking 6. Constructing explanations (for science) and designing solutions (for engineering) 7. Engaging in argument from evidence 8. Obtaining, evaluating, and communicating information	**Disciplinary Core Ideas:** **MS-ESS3-2.** Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects. **MS-ESS2-5.** Collect data to provide evidence for how the motions and complex interactions of air masses result in changes in weather conditions.	**Crosscutting Concepts:** Math: Students will use graphs and averages to analyze climate and predict weather. ELA: Students will create a brochure using complete sentences and expository writing. Students will use expository writing to create a hurricane preparedness procedure. Explain importance, when to prepare, lists of items to stockpile or make sure you have extras.
Possible Preconceptions/Misconceptions:		
LESSON PLAN – 5-E Model		
ENGAGE: Opening Activity – Access Prior Learning / Stimulate Interest / Generate Questions: (Note to self or others: I usually like to start a lesson like this with a video of real life storms…may still. There are plenty on you tube but the last lesson had one and not sure if it will have same impact this close. If lesson is taught out of sequence do find a you tube video of storm forecasts or storms) TTW ask students to draw convection currents inside the earth. TTW ask students to recall the driving force behind convection currents TLW respond with density and specifically what is happening at each stage of the process. TTW then ask students to, in groups, discuss what they know about weather. TTW ask students, what is the driving force behind weather. Based on lead in students should answer density. TTW then ask why? Let them discuss. Use Socratic questioning to get them in the ball park.		

TLW then fill out a KWL on weather.
TT & TLW then discuss K and W

EXPLORE: Lesson Description – Materials Needed / Probing or Clarifying Questions:
TLW explore the Nearpod presentations on high and low pressure as well as weather patterns https://nearpod.com/s/science/6th-grade/high-pressure-vs-low-pressure-weather-systems-L2364974 (formative assessment will be score on quiz at end of interactive)
TLW take notes using the Cornell Method
TLW then explore Pearson interactive
http://www.phschool.com/atschool/phsciexp/active_art/weather_fronts/weather_fronts.swf
TLW then create a power point on fronts (see link to rubric below).
TLW then (in groups) use the following interactives to master the formation of thunderstorms and snowstorms (exclude hurricanes).
TTW and TLW discuss formations and severity of different scenarios and major influences. UCAR Center for Science
https://scied.ucar.edu/interactives

EXPLAIN: Concepts Explained and Vocabulary Defined:
TTW will pose the question, can we predict weather?
TLW explore Scijinks https://scijinks.gov/goes-r/ to introduce the GOES satellites and the role they play in forecasting.
TLW explore forecasting on the same site.
TT and TLW examine images from NOAA https://www.nesdis.noaa.gov/goes-r-series-satellite-animations
and NWS https://www.weather.gov/forecastmaps to examine and analyze causes of current weather and past weather phenomena (hoping I can get a local forecaster to record a few sentences about the past images…we will watch local weather forecasts for current).
TTW will display standard images (tbd daily) but students may request other images (except actual forecast) to help analyze data.
TTW daily during bellwork (first 15 minutes of class) display images from above. Each day students (in groups) will try to explain today's weather and why. Predict tomorrows weather and why. Then project next weeks weather and why. We will record predictions with the closest group getting points for actual temp and precipitation amounts. After week 2, we will compare actuals with climate averages (to be done after elaborate) groups will then predict the next months average temp and precipitation and explain why. Groups will get a sliding scale of points down from 6 with reference to who is closest. Overall winning group gets a prize while class will get a treat of "observing clouds" for 5 or 10 minutes during class one day.

TLW during the first few days of forecasting to fill out the L on the KWL and then create a brochure based on local severe weather phenomena and the dangers associated with these storms (see pages below).
TTW use the following ppt. to address any lapses in learning on a small group or individual basis. The ppt. will also be made available as a resource.
TLW get extra credit for taking notes using the Cornell Method. https://www.madison-schools.com/Page/10114

Vocabulary:

ELABORATE: Applications and Extensions:
TLW use data sets from NASA's site https://www.jpl.nasa.gov/edu/teach/activity/graphing-global-temperature-trends/ and create graphs in math class.
TTW will pose the question: Is global warming affecting our weather? Are we experiencing climate change?
TT and TLW explore https://www.nasa.gov/mission_pages/hurricanes/main/index.html and compare hurricanes from the past to global temperature trends. This is the teaser to lead into our next lesson which will be the NASA hurricane lesson https://mynasadata.larc.nasa.gov/lesson-plans/hurricanes-heat-engines-story-map. Only thing lacking in this lesson is pressure…be sure to relate pressure as it applies esp. when coming ashore). This will end with global warming and then our EBD.
In ELA TLW create an expository paper explaining why, when, and what to do for hurricane preparedness. Our students are very familiar with hurricanes as we live not far from the Gulf Coast in Mississippi. This will be used

EVALUATE:

Formative Monitoring (Questioning / Discussion): Ask learners what role does density play in weather patterns. Which type of fronts cause the most severe weather? What type of weather occurs before, after, and at each front as they move and interact.

Formative assessments: https://spaceplace.nasa.gov/wild-weather-adventure/en/#/review/wild-weather-adventure/game.html
Students can play this game during any down time against one another in their groups. Peer review performance and work to elevate all group members to prepare for an inter-group competition. I will insert group competition as/if time allows.

Summative Assessment (Quiz / Project / Report): rubric for brochure attached below
Rubric for fronts ppt.
Rubric: Weather Fronts

Elaborate Further / Reflect: Enrichment:

K-W-L Chart Sample

What I Know	**What I Wonder** (or want to know)	**What I have Learned**

Name _____ Grade ____/100

Severe Weather Project Directions

You are the LOCAL severe weather expert- Your job is to create an informational pamphlet that could be used to save a life (excluding hurricanes)!

* Tornadoes * Landslides * Lightning * Flooding *

1. You must have **5 weather phenomena** that are **causes** of your storm. This will inform the reader how to anticipate a storm. The reader should have a greater understanding of the weather ingredients for the storm. Include the following key terms in your writing.
   Key Terms: temperature, low pressure, high pressure, cyclone, anticyclone, front, and air mass.
2. Show **5 effects** that are **caused by your storm**. What damages or problems can this type of weather cause for our environment, humans, animals etc…? What can the reader expect if this storm hits their area and what can they do to stay safe.
3. Include REAL WORLD examples of storms that occurred.
4. Draw, sketch, print or illustrate **4 pictures/diagrams** with information about your severe weather. Each picture MUST have a caption or explanation. These can go along with the 5 causes/effects or be additional “interesting facts”.
5. You must write in complete sentences, with proper grammar, punctuation and spelling.
6. You must include 2 or more resources.

Severe Weather Pamphlet Rubric

Category	4 points	3 points	2 point	1 point	0 Points
Causes Show the causes of your severe weather system using the key terms: *Temperature, low pressure, high pressure, cyclone, anticyclone, front, and air mass.* *(What happens BEFORE the storm)*	Describes the causes of a storm using **at least 5 relevant facts** found in research (including ALL or MOST key terms)	Describes the causes of a storm using at least **4 relevant facts** found in research (including MOST key terms)	Describes the causes of a storm using at least **3 relevant facts** found in research (including some of the key terms)	Describes the causes of a storm using **2 or less** facts found in research (including only a few key terms)	Does not describe the cause of the storm.
Effects Show the effects of each weather system on humans/animals and their environment. Provide appropriate safety precautions. (What happens DURING and AFTER the storm)	Describes **5 effects of a storm**. Uses many real world examples in explanation. Many safety tips included.	Describes **4-5 effects** of a storm. Uses some real world examples in explanation. Some safety tips included.	Describes **3-4 effects** of a storm. Uses a few real world examples in explanation. A few safety tips included.	Describes **2 effects** of a storm. Uses very few real world examples in explanation. No safety tips included.	Does not describe the effects of the storm.
Pictures/Diagrams (Image Quest) Must have 4 high quality pictures or diagrams complete with captions or explanations. (Can be before, during or after- include a severity scale if possible)	Contains 4 or more pictures, complete with **excellent** captions or explanation for using the pictures.	Contains 3 or more pictures, complete with **good** captions or explanation for using the pictures.	Contains 2 or more pictures, complete with a **few** captions or explanation for using the pictures.	Contains a few pictures with **no** captions or explanations for using the pictures.	Does not include pictures and/or captions.
Grammar/Spelling/Punctuation Must use complete sentences, proper punctuation and correct spelling on all words.	No errors, complete sentences and proper punctuation.	1 or 2 errors, in spelling, punctuation, and/or complete sentences.	3-5 errors in spelling, punctuation, and/or complete sentences.	6 errors in spelling, punctuation, and/or complete sentences.	Over 6 errors in spelling, punctuation, and/or complete sentences.
Effort Overall appearance, Quality of work, Quality of graphics, Neatness.	**Excellent effort.** Typed or handwritten neatly, time and care taken in picture quality and placement.	**Good Effort**. Project neatly handwritten, graphics are quality.	**Not Final copy quality**. Difficult to read and/or pictures are poorly placed.	**Not Final copy quality.** Difficult to read and/or looks like student did not attempt to make final copy quality.	**Poor Quality** Difficult to read and/or looks like student did not attempt to make final copy quality.
Resources Follow Works Cited Style	Includes **2 or more** resources from **book and magazines**. Followed works cited style. (MLA)	Includes 1-**2** resources from **books and magazines**. Followed works cited style (MLA)	Includes 2 resources **but does not follow works cited style**.	**1 resource** but does not follow works cited style (MLA)	**Does not include resources.**

Materials Required for This Lesson/Activity			
Quantity	**Description**	**Potential Supplier (item #)**	**Estimated Price**