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| **Lesson Title:**  Boxing Up the Weather |  |
| **Grade Level:** 4th  | **Quarter:**  1st  |
| **Standards:**Science**S4E4.** Obtain, evaluate, and communicate information to predict weather events and infer weather patterns using weather charts/maps and collected weather data. a. Construct an explanation of how weather instruments (thermometer, rain gauge, barometer, wind vane, and anemometer) are used in gathering weather data and making forecasts.b. Interpret data from weather maps, including fronts (warm, cold, and stationary), temperature, pressure, and precipitation to make an informed prediction about tomorrow’s weather. c. Ask questions and use observations of cloud types (cirrus, stratus, and cumulus) and data of weather conditions to predict weather events.d. Construct an explanation based on research to communicate the difference between weather and climate.Technology**4T6a2.** Students will explore and apply a variety of technology systems and resources (e.g., graphing calculators, smartphones, Internet-connected digital devices, digital cameras, probes, eBooks, student response systems, electronic white boards) to complete learning tasks.  |
| **Lesson Essential Question:** * How can I identify weather instruments and explain how each is used to gather weather data and make forecast?
* How can I make a video using technology?

  | **Vocabulary:**  Weather instrumentsthermometerrain gaugebarometerwind vaneanemometerForecast  |
| **Lesson Materials:**• boxes• plastic drink bottles• rubber bands• craft sticks• tape• paper clips• paper plates• straight pins/push pins• paper towel/tissue paper rolls• ruler• brads • yard or meter stick• paper cups• balloons• straws• dowel sticks/skewers• scissors• construction paper• Sharpie markers• iPads or video cameras  | **Lesson Assessment:** Student JournalTeacher ObservationsWeather Box |
| **STEM Challenge Overview:** Students will create a weather box showing three weather instruments and create a digital users guide by videotaping how to use it.  |
| **Teacher Background:** In our science unit on weather, we have been learning about different types of precipitation as well as the instruments that are used to collect data to forecast the weather. We’re going to put our knowledge to use by creating a weather station outside our school.Technology sites:Weather Wiz Kids- <http://www.weatherwizkids.com/weather-instruments.htm> (student friendly, has lots of information)Simple Weather Instruments- <http://www.rmets.org/sites/default/files/pdf/simweameasurements.pdf> (teacher resource) |
| **INSTRUCTION** |
| 1. **Ask/Engage (day 1)**
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|  Show a video clip of the Weather Channel and have the students listen carefully to see if they hear any of the names of the weather instruments. Ask the students how the weather reporters get their facts and information. Show pictures of weather stations and see if the students can name the instruments and their uses: <https://www.google.com/search?q=pictures+of+weather+stations&es_sm=122&tbm=isch&tbo=u&source=univ&sa=X&ved=0CB4QsARqFQoTCJCKgeOq-sYCFYYWPgodGyQArw&biw=1600&bih=799>Show the weather instrument flashcards and see if students can guess the instrument and its use: <https://quizlet.com/18547080/4th-grade-weather-instrument-vocabulary-flash-cards/> .Introduce the challenge to the class and have students complete the ask/engage part of their student journal.**Challenge:** Weather boxes are among one the new “must have” items at local elementary schools. These boxes contain the instruments needed to collect data in a weather-protective structure. It will be your responsibility as a structural engineer and weather expert to help the school create the most attractive, useful, and accurate weather box possible. To help the school learn how to use it, you will need to create a digital step-by-step user’s guide. |
| 1. **Imagine/Brainstorm (day2)**
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| **Criteria:** Your weather box must:• Contain 3 different weather instruments (thermometer, rain gauge, barometer, wind vane, or anemometer)• Fit in a space no larger than 12 X 12 X 18• Sit off the ground• Protect the instruments from the elements• Be attractive and neatly made • Use only the materials provided by the teacher• Create a digital user’s guide for operation**Constraints:*** Use the materials provided
* Complete the challenge in the time allotted

Have students individually think of a solution to the problem and draw and label their design. |
| 1. **Plan/Design (day 3)**
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| Each student will present their ideas to their team. Teams will collaborate and decide on a final design plan. Students draw and label their final design plan and make a list of needed supplies. Build their design according to their plan. |
| 1. **Create / Test (day 3 continued- day 4)**
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| Student teams build their design according to their design plan.   |
| 1. **Evaluate/Improve –** and repeat Steps 1-5 **(day 5)**
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| Students evaluate their design for success. Did it meet the established criteria? Did their final design match their planned design? How would students improve their design? |

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Boxing Up the Weather

STEM Challenge

 4th Grade

**Challenge**:

Weather boxes are among one the new “must have” items at local elementary schools. These boxes contain the instruments needed to collect data in a weather-protective structure. It will be your responsibility as a structural engineer and weather expert to help the school create the most attractive, useful, and accurate weather box possible. To help the school learn how to use it, you will need to create a digital step-by-step user’s guide.

**Criteria:**

Your weather box must:

• Contain 3 different weather instruments (thermometer, rain gauge, barometer, wind vane, or anemometer)

• Fit in a space no larger than 12 X 12 X 18

• Sit off the ground

• Protect the instruments from the elements

• Be attractive and neatly made

• Use only the materials provided by the teacher

• Create a digital user’s guide for operation

**Constraints:**

• Use the materials provided

• Complete the challenge in the time allotted

**Materials:** Various materials will be provided by your teacher.

1. **ASK / ENGAGE:** What is the problem you are being asked to solve?

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1. **IMAGINE/BRAINSTORM:** What are some possible solutions to the problem that you are trying to solve? After you brainstorm, draw and label your ideas below.

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| **Idea #1** | **Idea #2** |

1. **PLAN/DESIGN:** Share your ideas with your group and collaborate to decide on a final design plan. Draw your team’s design below and make a list of the materials that you will need to complete your design.

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| **Team Design Plan**  | **Materials List** |

1. **CREATE/TEST**: Use your Final Design Plan to create and build your solution. Test your design. Did it work? Why or Why not?

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1. **EVAULATE/IMPROVE:**  How well did your design work? Did your solution solve the problem within the given constraints?

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How can you improve your design? How can you make it better? Draw and label your improved design below.

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| **Improved Design Plan** |