

Building Weather Modulators for NOAA

Problem What weather instruments are utilized when predicting weather?

Lesson Summary *Students will construct a weather modulator that includes several weather instruments to measure different aspects of the atmosphere. Students will be able to locate low pressure systems on a weather map and using weather forecasting, decide where the proper distribution of their modulator.*

Major Topic and SOL

Science SOL (2010) ES. 2 a) Predicts the interactions and dynamics of complex Earth
ES 12 a) Observation and collection of weather data
ES 12 b) Prediction of weather patterns

Length of Time 3 x 90 Min Class Periods

Student Objectives

- Students will be able to identify weather instruments and their purpose
- Students will be able to predict inclement weather using an isobar maps
- Students will be able to construct, using hummingbird board, a working modulator
- Students will be able to assess which instrument is needed in certain conditions

21st Century Skills

- Critical-Thinking and Problem Solving
- Communication
- Creativity and Innovation
- Collaboration
- Information and Media Literacy
- Contextual Learning

Assessment Evidence

- Students will be assessed using a modulator rubric. (Attached)
- Students will give oral account of project and present idea to class.
- Students will pair with teacher and map out which location best suits their device.

Supplies/Materials/Technology

- Students are to supply their own materials from home.
- Materials that were provided to the students include
 - Coloring paper
 - Hot Glue Sticks
 - Tongue depressors
 - Foam Paper
 - Straws
 - Tape
 - Computers for [Visual Programmer](#) software
 - [Hummingbird Robotics Kits](#)

Lesson 1

- Air Masses, Fronts and Air movement. (A lesson of the Atmosphere – not included)
- Tie in the need for forecasting and the instruments that are used in forecasting weather.

Lesson 2

- Lesson on using Isotherms and Isobars to predict weather (not included).
- High pressure/Low pressure and wind gradients.
- Students have lesson on visual programmer and robot components ([see website tutorials](#)).

Lesson 3

- Brainstorm what a modulator would need to help predict weather conditions.
- Introduce project and set guidelines for what can be used in the design.
- Students develop rough draft drawing of what they would like to include in their design.

Lesson 4

- Students construct modulators and program movements using [Visual Programmer](#).
- Students present their modulators and the location to which dispersed the modulator.
- Students peer review the modulators and provide ideas for Modulator 2.0.



NOAA Needs You!

NOAA needs some young engineers to design and build a model weather modulator that will take weather readings and send that data back to headquarters. You are to design, build and present your weather modulator to the chosen party to decide who gets the contract. The following rubric will explain your criteria.

Grading System	Design 25 points	Build 25 Points	Presentation 25 Points	Feedback 25 Points
Poor 0 - 9	Little to No initial design specs. The project shows lack of planning and the evidence of plan or thought.	The model doesn't have any moving pieces. The model shows little evidence of design and lacks weather instruments needed for the modulator to perform its tasks.	The presentation lacked information on how the modulator would perform the necessary duties that are required. The presentation did not include any media.	The individual did not help with design, building, or presentation of the module. The individual was not an active member within their group.
Needs Work 10 - 14	There was some aspect of design preparation. The project had little evidence of planning and showed some level of preparation.	The model has 1 – 2 moving components or sensors. The model shows some weather tools that would benefit the organization.	The presentation was on a acceptable medium. There was a lack of a detailed plan included and the presenter did not know the material.	The individual had very little interaction with the group. The individual did not stay on task but offered some assistance while working.
Satisfactory 15 – 21	There was a design document present and the team did take the area into account. The team showed planning and was prepared for construction.	The model had 3-4 moving components and showed 3-4 weather instruments it could implement in its construction.	The presentation was clean and concise. The presenter had knowledge of the build and its mission. The presenter did however need assistance from either note cards or the presentation itself.	The individual worked most of the time and stayed on task for the most part. The individual worked well with others and showed teamwork.
Above and Beyond 22 - 25	There was a clear design for the build. The planning was detailed and precise. The team showed excellent preparation.	The model has 5 moving components. The implementation of 5 weather tools along with a sensor showed mastery coding abilities.	The presentation was designed perfectly. The presenter knew the information without any assistance and was attentive to his/her audience.	The individual showed absolute teamwork. The team stayed focused the entire time and worked diligently to perfect their project.