



Advanced Manufacturing & Prototyping Integrated to Unlock Potential

Earth Science Data-Driven Decision Making (6DMS)

Snow Day

Winter Weather Challenge

<p>Module Description</p>	<p>In this module students play the role of school officials and have to decide whether to close school or keep it open based on weather forecasts. They are introduced to weather concepts and terminology and forecasting basics while learning how to read and analyze forecasts from the National Weather Service. Students learn to search for trends in the forecasts to help them determine whether to keep school open or closed and to see how much confidence the meteorologists have in the forecast. As a data-driven decision making module, students will also find that they have more data than they need for making decisions about school closures. They will have to prioritize the content in order to determine what is most helpful for making their decisions.</p> <p><i>Module will feature Will Smith, Director of Emergency Preparedness for the Georgia Tech Police Department. He monitors weather conditions year-round for potential threats to the campus and communicates these conditions to the Georgia Tech community using multiple methods.</i></p>	
<p>Related Georgia Performance Standards</p>	<p>S6E3. Obtain, evaluate, and communicate information to recognize the significant role of water in Earth processes.</p> <p>S6E4. Obtain, evaluate, and communicate information about how the sun, land, and water affect climate and weather.</p>	
<p>Module Timeline</p>	<p>50-minute class periods: 4 days</p> <p>Day 1: Section 1 Day 2: Section 1, 2, 3 Day 3: Section 3 Day 4: Section 3, 4</p>	<p>90 minute blocks: 3 days</p> <p>Day 1: Sections 1, 2 Day 2: Section 3 Day 3: Section 4</p>
<p>Documents Included in the Download</p>	<p><u>Student Materials Folder</u></p> <ul style="list-style-type: none"> • Student Edition (<i>recommended to be printed double sided</i>) • Student Worksheet Packet (<i>recommended to be printed double sided</i>) • Event Student Worksheet Packet (<i>recommended to be printed double sided</i>) • Event Group Worksheet Packet (<i>recommended to be printed double sided</i>) • Forecast Chart Handout (<i>recommended to be printed single sided</i>) <p><u>Teacher Materials Folder</u></p> <ul style="list-style-type: none"> • Materials List • Annotated Teacher's Edition • Teacher Preparation Guide • Videos 	

5E Stage	Student Activities	Teacher Activities
<p>Engage</p> <p>How does the lesson capture student interest, activate prior knowledge, and connect to a complex question, global issue, or real world problem?</p>	<ul style="list-style-type: none"> Students are introduced to the challenge (deciding whether to close school based on the weather forecasts) (1.1, 1.4) Students learn about the research being done in this field by faculty at Georgia Tech (4) 	<ul style="list-style-type: none"> Seek students' prior knowledge about the weather and school closings and how weather impacts their decisions. Discuss how a forecast for a specific day can change over time & as you get closer to the forecast date, the forecast becomes more detailed.
<p>Explore</p> <p>How does the lesson allow students to develop a common base of experiences by actively investigating the phenomenon or problem?</p>	<ul style="list-style-type: none"> Students carefully read through forecasts looking for patterns/trends. (1.2, 1.3, 3.1) They color code the forecasts to identify specific categories of information (1.3, 3.1) Students learn how to use a decision matrix to organize information and color code it based on certain criteria to help make the decision easier (3.1) 	<ul style="list-style-type: none"> Review the highlighted portions of the forecast with key. Guide students with applying knowledge of forecast categories to a new example and why meteorologists organize their data. Review how the criteria in the decision matrix affects the color they shade. Why is temperature a critical value?
<p>Explain</p> <p>How does the lesson allow students to develop, share, critique, and revise their own explanations before connecting those to accepted scientific explanations and terminology?</p>	<ul style="list-style-type: none"> Students learn more weather content to help with analyzing forecasts. They learn the significance of the freezing temperature of water and how temperature will affect the type of precipitation. (1.2, 1.3, 2.1, 2.2) Students learn how the geography and location of Georgia can make forecasting winter weather difficult (3.3) 	<ul style="list-style-type: none"> Review the details of the weather categories with students. They should understand the significance of the freezing point of temperature on precipitation. Students may mention their experiences with snowstorms in Georgia—"the schools in the north always close." Discuss the role that mountains play in the snowstorms as well as the impact from the Gulf of Mexico (moisture for precipitation)
<p>Elaborate</p> <p>How does the lesson allow students to extend their conceptual understanding of the three dimensions through opportunities to apply knowledge, skills, and abilities in new experiences?</p>	<ul style="list-style-type: none"> Students combine their weather knowledge and experience with analyzing previous forecasts to make a decision about a final event. They are given an additional hourly temperature forecast to help. (3.1, 3.2) Students use the decision matrix to aid with making decisions and write Tweets to communicate their predictions (3.1) 	<ul style="list-style-type: none"> Students will analyze individual forecasts starting 48 hours ahead of the event and will write Tweets communicating the likelihood of a school closure based on that forecast- remind them of this. They should not be given the final forecast until the very end and will then analyze the temperature forecast as well. All of this data will affect their decision.
<p>Evaluate</p> <p>How does the lesson—through both formative assessments embedded throughout the lesson and a summative assessment that might coincide with the elaborate phase—make visible students' thinking and their ability to use practices with core ideas and crosscutting concepts to make sense of phenomena and/or to design solutions?</p>	<p>Formative: Ongoing questioning and discussion (<i>all sections</i>) Analyzing the Forecast: Student Sheet #1 (1.4) Sample Decision Matrix: Student Sheet #2 (3.1)</p> <p>Summative: Making the Decision: Student Sheet #3 (3.2)</p>	

	1.1	1.2	1.3	1.4	2.1	2.2	3.1	3.2	3.3	4.1
Engage	_____			_____						_____
Explore		_____	_____							
Explain		_____	_____		_____	_____			_____	
Elaborate							_____	_____		
Evaluate				_____			_____	_____		

Section 1 – The Winter Weather Challenge (60 minutes)

The focus of Section 1 is to provide students with a background of the Winter Weather Challenge and to the different types of decisions that are made, specifically forecasts made by meteorologists. Students are introduced to the wording of forecasts and the different categories of information that they contain. They also gain experience with reading through the forecasts and learning how to identify those categories.

Preparation

Materials	Student Pages
<ul style="list-style-type: none"> Video #1: Kid Meteorologist 	<ul style="list-style-type: none"> Analyzing the Forecast: Student Sheet #1
<p>Prep the Day Before: Review text and videos. Review content of forecasts and key terms for helping students analyze the contents of a forecast. Have student sheets ready to be handed out to students.</p>	

Planning

GPS	<p><i>S6E3. Obtain, evaluate, and communicate information to recognize the significant role of water in Earth processes.</i></p> <p><i>S6E4. Obtain, evaluate, and communicate information about how the sun, land, and water affect climate and weather.</i></p>	
NGSS	<p>Performance Expectation:</p> <p>MS-ESS2-5: <i>Collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions.</i></p> <p>Disciplinary Core Idea: ESS2.D: Weather and Climate.</p> <p>Practice: Analyzing and Interpreting Data</p> <p>Crosscutting Concepts: Patterns, Cause and Effect, Systems and Models, Stability and Change</p>	
Key Terms and Concepts	Essential Questions	Assessment and Grading Opportunities
<ul style="list-style-type: none"> Trade-offs Meteorologist Forecast Temperature Probability of Precipitation Precipitation Amount Watch/ Warning/ Advisories 	<ul style="list-style-type: none"> How do meteorologists (weather forecasters) use forecasts to communicate information? What information is included in a forecast? 	<ul style="list-style-type: none"> Discussion Questions: <ul style="list-style-type: none"> Participation Student Sheet #1: <ul style="list-style-type: none"> Formative

Section 2 – Add To Your Understanding (25 minutes)

In order for students to make weather based decisions they must learn more about how meteorologists make forecasts and use computer models. They will also learn more detail about the forecast categories they previously learned how to identify including how temperature affects the type of winter weather precipitation.

Preparation

Materials	Student Pages
<ul style="list-style-type: none"> Video 2: PBS Weather Forecasting Video 3: Winter Weather Alerts 	N/A
Prep the Day Before: Locate videos and prepare them for class.	

Planning

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NGSS	<p>Performance Expectation: MS-ESS2-5: <i>Collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions.</i></p> <p>Disciplinary Core Idea: ESS2.D: Weather and Climate.</p> <p>Practice: Analyzing and Interpreting Data</p> <p>Crosscutting Concepts: Patterns, Cause and Effect, Systems and Models, Stability and Change</p>

Key Terms and Concepts	Essential Questions	Assessment and Grading Opportunities
<ul style="list-style-type: none"> Model Computer Model Meteorologist Observation Forecast Temperature Probability of Precipitation Precipitation Amount Watch/ Warning/ Advisories 	<ul style="list-style-type: none"> How do meteorologists use forecasts to communicate information? What information is included in a forecast? 	<ul style="list-style-type: none"> Discussion Questions: Class Participation

Section 3 – Winter Weather Strikes (90 minutes)

During this section students are introduced to Decision Matrices. These graphic organizers will help them to identify and analyze the content in the forecasts using a 3-color format (red, yellow and green). This will help students make a decision of whether to keep school open or close it. They will apply the Decision Matrix to the sample forecast that they have been analyzing and will then analyze and make a decision about a new event.

Preparation

Materials	Student Pages
<ul style="list-style-type: none"> Colored Pencils Forecast strips for the 3 events Uncut forecasts for the 3 events (for group analysis) Video 2: PBS Weather Forecasting Video 4: Forecast and What Really Happened Video 5: Blizzard Freak Out Video 6: Event Recaps 	<ul style="list-style-type: none"> Sample Decision Matrix: Student Sheet #2 Making the Decision: Student Sheet #3 Hourly Temperature and Precipitation Forecast: Student Sheet #4
<p>Prep the Day Before: Review the student text and videos and make sure to have student sheets ready for use. Forecast strips and event overviews for the 3 events should be organized and ready for distribution.</p>	

Planning

GPS	<p><i>S6E3. Obtain, evaluate, and communicate information to recognize the significant role of water in Earth processes.</i></p> <p><i>S6E4. Obtain, evaluate, and communicate information about how the sun, land, and water affect climate and weather.</i></p>
NGSS	<p>Performance Expectation:</p> <p>MS-ESS2-5: <i>Collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions.</i></p> <p>Disciplinary Core Idea: <i>ESS2.D: Weather and Climate.</i></p> <p>Practice: <i>Analyzing and Interpreting Data</i></p> <p>Crosscutting Concepts: <i>Patterns, Cause and Effect, Systems and Models, Stability and Change</i></p>

Key Terms and Concepts	Essential Questions	Assessment and Grading Opportunities
<ul style="list-style-type: none"> Temperature Wind Speed/ Direction Probability of Precipitation Precipitation Amount Watch/ Warning/ Advisories 	<ul style="list-style-type: none"> Why is forecasting winter weather in Georgia challenging? How did organizing information help with making decisions? 	<ul style="list-style-type: none"> Discussion Questions: Participation Student Sheet #2: Formative Student Sheet #3: Summative Student Sheet #4: Formative

Section 4 – The Impact of Weather at Georgia Tech (15 minutes)

Now that students have used weather forecasts to make decisions about school closures they will learn about Will Smith, Director of Georgia Tech’s Office of Emergency Preparedness. Part of his job includes keeping a close eye on the weather so that he can communicate threatening conditions to university officials and the Georgia Tech community.

Preparation

Materials	Student Pages
<ul style="list-style-type: none"> Video 7: Lightning and College Football 	<ul style="list-style-type: none"> N/A
Prep the Day Before: Locate video and prepare it for class.	

Planning

GPS	<i>S6E3. Obtain, evaluate, and communicate information to recognize the significant role of water in Earth processes.</i> <i>S6E4. Obtain, evaluate, and communicate information about how the sun, land, and water affect climate and weather.</i>	
NGSS	Performance Expectation: MS-ESS2-5: <i>Collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions.</i> Disciplinary Core Idea: ESS2.D: Weather and Climate. Practice: <i>Analyzing and Interpreting Data</i> Crosscutting Concepts: <i>Patterns, Cause and Effect, Systems and Models, Stability and Change</i>	
Key Terms and Concepts	Essential Questions	Assessment and Grading Opportunities
<ul style="list-style-type: none"> Computer Model Meteorologist Observation Forecast 	<ul style="list-style-type: none"> How did organizing information help with making decisions? How do meteorologists use forecasts to communicate information? 	<ul style="list-style-type: none"> Class Discussion: Participation