Teacher Survey

Instructions: Please complete the following evaluation.

1. Did you make any adjustments to the learning module? If so, what did you change or omit?

2. From your observations, are the students more interested in atmospheric science?

3. What part of the lesson was most effective or interesting to them?

4. What concept did the students have most trouble understanding or applying?

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Student Survey

Please distribute this survey to the students before and after completing the module.

Instructions: Circle the answer that best describes your feelings about science.

1. I like science.
   a. I strongly disagree.
   b. I disagree.
   c. I am indifferent or unsure.
   d. I agree.
   e. I strongly agree.

2. How often do you talk to your *family* about what you do in science class?
   a. Never
   b. Rarely (less than once a week)
   c. Once a week
   d. A few times a week
   e. Every day

3. How often do you talk to your *friends* about what you do in science class?
   a. Never
   b. Rarely (less than once a week)
   c. Once a week
   d. A few times a week
   e. Every day

4. I think science will be useful when I am older.
   a. I strongly disagree.
   b. I disagree.
   c. I am indifferent or unsure.
   d. I agree.
   e. I strongly agree.

5. I would like to be a scientist when I am older.
   a. I strongly disagree.
   b. I disagree.
   c. I am indifferent or unsure.
   d. I agree.
   e. I strongly agree.

Effectiveness Assessment

Part 1: Pre and Post Assessment (Student Evaluation)

Instructions: Please distribute and score the **Student Evaluation** for each student before and after completing the module. Each question is worth 1 point.

Student Evaluation

Instructions: After completing the lesson on pressure, please have the students answer the following questions below.

1. Changes in air pressure can cause
   a. changes in air temperature.
   b. clouds to form.
   c. the wind to blow.
   d. all of the above

2. Which of the following is not a unit for pressure?
   a. Millibars (mb)
   b. Pounds per square inch (lbs/in^2)
   c. Inches of Mercury (in Hg)
   d. Knots (kts)
   e. Pascal (Pa)
   f. Atmosphere (atm)

3. A hurricane is associated with
   a. a low pressure system
   b. a high pressure system
   c. clear skies
   d. average sea-level pressure

4. Air pressure
   a. increases rapidly with height
   b. is caused by the winds
   c. decreases rapidly with height
   d. is the same everywhere
   e. only varies in the horizontal

5. A change in pressure over a distance is
    a. an isobar
    b. a barometer
    c. a low pressure system
    d. a high pressure system
    e. a pressure gradient

6. Air always moves
    a. from higher pressure to lower pressure
    b. from lower pressure to higher pressure
    c. faster around high pressure systems than low pressure systems
    d. slower around low pressure systems than high pressure systems
    e. from west to east

7. Which of the following is true?
    a. There are less air molecules in a high pressure system than in a low pressure system.
    b. There are less air molecules when the wind blows.
    c. There are less air molecules at the surface than at 800 mb.
    d. There are less air molecules at 800 mb than at the surface.

8. You are flying in an airplane at 30,000 feet. How will the pressure change as the airplane lands at the airport?
    a. Pressure will decrease.
    b. Pressure will increase.
    c. Pressure will stay the same as you land on the ground.

9. Why are the horizontal winds much stronger than vertical winds? Which two forces cause this balance in vertical motion? Draw a diagram to help explain.

10. Calculate how the vertical pressure gradient in the lowest 5 kilometers of the atmosphere using the following equation:

$$PG = \Delta P / \Delta D$$

$$P_{0km} = 1013.25 \text{ mb}$$
$$P_{5km} = 500 \text{ mb}$$

    a. PG = -102.65 mb/km
    b. PG = +102.65 mb/km
    c. PG = -0.1026 mb/km
    d. PG = +0.1026 mb/km
    e. PG = -0.0097 mb/km
    f. PG = +0.0097 mb/km

Part 2: Math & Science Proficiency (Take Home Assignment: Part 2)

Please score **Take Home Assignment**: **Part 2** for each student using the rubric below. This problem is aligned with the following academic standard:

NGSS.MS-ESS2.5
MS-ESS2-5. Weather and Climate: Provide evidence for air pressure systems and resulting weather conditions.

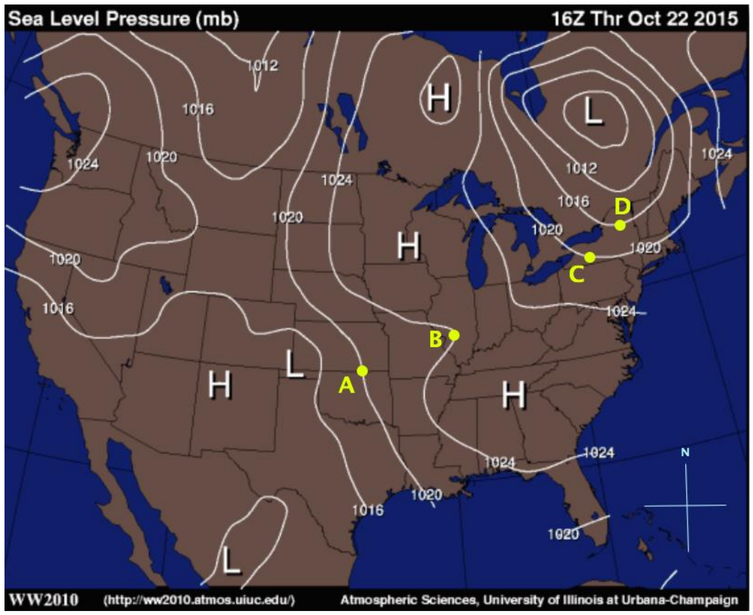
Scoring Rubric

Questions	Score (0 – 3)
Did the student demonstrate knowledge in converting distance (Step 1)?	
Did the student demonstrate knowledge of reading isobars on a map (Step 2)?	
Did the student demonstrate knowledge of calculating the pressure gradient (Step 3)?	
Did the student include the correct units in each step (Steps 1 – 3)?	
Did the student demonstrate knowledge of relating pressure gradients to the wind speed (Q2)?	
Did the student demonstrate knowledge of relating high and low pressure systems to the weather (Q3)?	

0 – Incomplete
1 – Completed with incorrect answer
2 – Complete with small errors
3 – Complete with correct answer

Take Home Assignment: Part 2. Calculating the Pressure Gradient

Instructions: A pressure gradient (PG) is defined as a change in pressure (ΔP) over a change in horizontal distance (ΔD). Using the sea-level pressure map below, calculate the pressure gradient in millibars per kilometer between Points A and B. Do the same calculation for Points C and D and answer the questions below.



Distance between Points A and B ($\Delta D_{A,B}$) = 385 miles
Distance between Points C and D ($\Delta D_{C,D}$) = 190 miles

Step 1: Convert the change in distances from miles to kilometers (1 mile = 1.609 km).

$\Delta D_{A,B}$	
$\Delta D_{C,D}$	

Step 2: Use the map to determine the change in pressure between the two points.

$\Delta P_{A,B}$	
$\Delta P_{C,D}$	

Step 3: Use the following equation to calculate the pressure gradient.

$$PG = \Delta P / \Delta D$$

$PG_{A,B}$	
$PG_{C,D}$	

Questions

1. Between which two points is there a stronger pressure gradient?

2. Between which two points would you expect there to be faster wind speeds? Why?

3. What weather conditions would you expect in Illinois today? Why?