Air Movement in Pressure Systems

MIDDLE GRADES SCIENCE NSPIRED

TEACHER NOTES

Science Objectives

- Students will observe the effect of the earth's rotation on wind direction in the northern and southern hemispheres.
- Students will understand how air movement relates to pressure systems in the atmosphere.

Vocabulary

- pressure
- air
- atmosphere
- hemisphere
- rotation
- Westerlies
- wind

About the Lesson

- In this lesson students will observe air movement in high and low pressure systems. Students will use observations to determine wind direction in a specific region and recognize how the rotation of the earth affects air circulation.
- As a result, students will understand that:
  - Wind direction is a result of pressure differences.
  - The rotation of the earth causes winds to curve inward or outward from a pressure system.

TI-Nspire™ Navigator™

- Send out the *Air_Movement_in_Pressure_Systems.tns* file.
- Monitor student progress using Class Capture.
- Use Live Presenter to spotlight student answers.

Activity Materials

- Compatible TI Technologies: TI- Nspire™ CX Handhelds, TI-Nspire™ Apps for iPad®, TI-Nspire™ Software

Tech Tips:

- This activity includes screen captures taken from the TI-Nspire CX handheld. It is also appropriate for use with the TI-Nspire family of products including TI-Nspire software and TI-Nspire App. Slight variations to these directions may be required if using other technologies besides the handheld.
- Watch for additional Tech Tips throughout the activity for the specific technology you are using.
- Access free tutorials at http://education.ti.com/calculators/pd/US/Online-Learning/Tutorials

Lesson Files:

Student Activity

- Air_Movement_in Pressure_Systems _Student.doc
- Air_Movement_in Pressure_Systems _Student.pdf

TI-Nspire document

- Air_Movement_in Pressure_Systems.tns

Discussion Points and Possible Answers

Have students read the background information on the student activity sheet or on page 1.2 of the .tns.

Move to pages 1.3 - 1.4.

Have students answer questions 1 and 2 in the .tns file, activity sheet, or both.

Q1. The air in a high pressure system moves

Answer: B. towards low pressure systems

Q2. There is a low pressure system at point A. There is a high pressure system at point B, which is 10 miles north of point A. In which direction will the wind blow?

Answer: B. south

Move to page 1.5.

1.. Have students begin by selecting High Pressure, leaving the Earth Rotation box unchecked. They should select the Play button and observe the motion of the air molecules in the system. (Air molecules are represented by white dots in the simulation).

2. Students should then select the Reset button and change the pressure to Low Pressure. Then, they should observe the motion of the air molecules in this system.

3. Have students repeat this process with Normal Pressure.

Tech Tip: To access the Directions again, select menu or **Document Tools ( ) > Air Movement in Pressure Systems > Directions.**

Tech Tip: To access the Directions again, select > **Air Movement in Pressure Systems > Directions.**

Move to pages 1.6 - 1.8. Have students answer questions 3-5 in the .tns file, activity sheet, or both.

Q3. If the earth did not rotate, in what direction would the air move in a high pressure system?

Answer: C. move outward in a straight line

Q4. If the earth did not rotate, in what direction would the air move in a low pressure system?

Answer: A. move inward in a straight line

Q5. Describe the air circulation in the normal pressure system. Propose a reason for your observation.

Sample Answer: There is little to no wind observed in the simulation. This would be due to the absence of a high or low pressure area. Wind is a result of a difference in air pressure.

Return to page 1.5.

5. Check the Earth Rotation box and repeat the simulation for all three pressure systems. Observe the motion of the air molecules.

Move to pages 1.9 - 1.15. Have students answer questions 6 - 12 in the .tns file, activity sheet, or both.

Q6. How does the rotation of the earth affect the movement of the air in the northern hemisphere?

Sample Answer: The air curves instead of moving in a straight line. It curves into the center of low pressure systems and curves out of the center of high pressure systems.

Q7. In what direction does the air move in a high pressure system in the northern hemisphere?

Answer: D. curves outward

Q8. In what direction does the air move in a low pressure system in the northern hemisphere?

Answer: B. curves inward

Q9. Looking at the high pressure system, what is the wind direction in Denver?

Answer: B. northwest

Q10. Looking at the high pressure system, what is the wind direction in Nashville?

Answer: C. southeast

Q11. Looking at the low pressure system, what is the wind direction in Minneapolis?

Answer: D. southwest

Q12. Looking at the low pressure system, what is the wind direction in Salt Lake City?

Answer: C. southeast

Move to page 1.16. Have students observe the graphic shown. **Move to pages 1.17 and 1.18.** Have students answer questions 13 - 14 in the .tns file, activity sheet, or both.

Q13. In what direction would the air move in a low pressure system in the southern hemisphere?

Answer: C. curves counterclockwise inward

Q14. Predict the approximate locations of the center of the system as it moves across the USA.

Answer: D. Chicago, Cleveland, Boston

TI-Nspire Navigator Opportunities

Make a student a Live Presenter to illustrate show how to move the sliders. Throughout the activity, monitor student progress. At the end of the activity, collect the .tns file and save to Portfolio.

Wrap Up

When students are finished with the activity, retrieve the .tns file using TI-Nspire Navigator. Save grades to Portfolio. Discuss activity questions using Slide Show.

Assessment

- Formative assessment will consist of questions embedded in the .tns file. The questions will be graded when the .tns file is retrieved. The Slide Show will be utilized to give students immediate feedback on their assessment.
- Summative assessment could consist of questions/problems on the chapter test or a performance assessment involving students diagraming the motions of the earth's atmosphere in both hemispheres for low and high pressure systems.