



## STEM Classroom Series

The STEM Classroom series features lessons that promote understanding of STEM content knowledge, integrate STEM with non-STEM subjects, and increase students' exposure to STEM-related career options.

## About this Segment

In Mr. Clay Carter's 4th grade class at North Elementary in Cedar City, Utah, students collaboratively investigate the relationship between humidity and temperature, relating their findings to the scientific concept of lapse rate and applying their new knowledge to explain recent local weather trends.

## Application activities (complete all that meet your goals for viewing this segment)

### A. Learn more about STEM education

1. Use the table on the next page to identify the elements of effective instruction, as well as the elements of effective STEM instruction, that you observed in this lesson.
2. How could the teachers enhance or add to the elements of instruction in their lesson?
3. How could the teachers enhance or add to the elements of STEM instruction?

### C. Infuse STEM principles into your own lessons

1. Apply the six questions in the "Replicate this lesson" activity to one of your own lessons.
2. Determine challenges you might face in applying these STEM concepts to your own lesson. How can you overcome these challenges?

### B. Replicate this lesson

1. *What are the learning objectives you want your students to achieve?*  
How would you modify the lesson's objectives, outlined in the Lesson Plan below, for your own students and curriculum? What other objectives, if any, will you set?
2. *What content knowledge do you need to acquire or expand?*  
This activity teaches students about temperature, humidity, and the lapse rate. Which of these concepts do you need to learn more about? Visit the Resources to Support Content Knowledge links in the Lesson Plan section of this guidebook.
3. *How will you create the time and space to engage students in this lesson?*  
How much time will this learning activity take to plan and carry out? How can you integrate the activity into your current curriculum map?
4. *What materials and other resources do you need for this lesson?*  
What materials are needed for this lesson? See the Materials section of the Lesson Plan. What collaboration is necessary with administrators and other teachers?
5. *How will you assess student learning?*  
In this class, the teacher assesses learning through student completion of graphic organizers before and after lesson activities. What are some other ways you could assess student learning for this lesson?
6. *How can you promote a STEM focus in your instruction?*  
What STEM experiences were students engaged in during this lesson? (See the "Elements of Effective STEM Instruction" below.) What are some others that you could include?

| Elements of Effective Instruction  | Elements of Effective STEM Instruction   |
|--|--|
| <ul style="list-style-type: none"> <li>- High expectations for all students</li> <li>- Rigorous content</li> <li>- Authentic performance tasks</li> <li>- Real-time assessment adapted to student needs</li> <li>- Student-driven learning</li> <li>- Strong relationships among students and between teacher and students</li> <li>- Equitable, culturally relevant content and practices</li> <li>- Evidence of 21st century skills, e.g. critical thinking, problem solving, collaboration, creativity, communication</li> <li>- Technology that enhances learning</li> <li>- Cross-curricular (interdisciplinary) integration</li> </ul>   | <p><i>In addition to the Elements of Effective Instruction left, effective STEM instruction can include:</i></p> <ul style="list-style-type: none"> <li>- Teachers who develop solid STEM-related content knowledge</li> <li>- Hands-on problem-solving activities that have real-world relevance</li> <li>- Integration of STEM into non-STEM subjects, especially art and design</li> <li>- Use of industry-standard software, tools, and procedures such as the engineering design cycle</li> <li>- Increased awareness of STEM fields and occupations, especially among underrepresented populations</li> <li>- Enthusiasm about further STEM-related learning</li> <li>- Connections between in-school and out-of-school learning opportunities</li> <li>- Industry and higher-ed partnerships that encourage hands-on student exploration of STEM-related careers</li> </ul> |
| <p><b>Sources:</b> California Dept. of Education. (2015). Science, technology, engineering, &amp; mathematics. Retrieved February 21st, 2015, from <a href="http://www.cde.ca.gov/pd/ca/sc/stemintrod.asp">http://www.cde.ca.gov/pd/ca/sc/stemintrod.asp</a><br/>           President’s Council of Advisors on Science and Technology (PCAST). (2010). Prepare and inspire: K-12 education in science, technology, engineering, and math (STEM) for America’s future. Retrieved from the Whitehouse.gov website: <a href="http://www.whitehouse.gov/sites/default/files/microsites/ostp/pcast-stemed-report.pdf">http://www.whitehouse.gov/sites/default/files/microsites/ostp/pcast-stemed-report.pdf</a></p> |  |

| General Information About STEM/STEAM Education  |
|---|
| <p>California Department of Education (n.d.). Science, technology, engineering, and mathematics. Retrieved January 23, 2015, from <a href="http://www.cde.ca.gov/pd/ca/sc/stemintrod.asp">http://www.cde.ca.gov/pd/ca/sc/stemintrod.asp</a></p> |
| <p>Math by Design (n.d.). On your own: A STEM project. Retrieved March 12, 2015, from <a href="http://mathbydesign.thinkport.org/stem/default.aspx">http://mathbydesign.thinkport.org/stem/default.aspx</a></p>                                 |
| <p>STEM Education Coalition (n.d.). Home page. Retrieved January 23, 2015, from <a href="http://www.stemedcoalition.org/">http://www.stemedcoalition.org/</a></p>   |
| <p>STEM to STEAM (n.d.). Home page. Retrieved January 23, 2015, from <a href="http://stemtosteam.org/">http://stemtosteam.org/</a></p>  |
| <p>US Department of Education (n.d.). Science, technology, engineering, and math: Education for global leadership. Retrieved January 23, 2015, from <a href="http://www.ed.gov/stem">http://www.ed.gov/stem</a></p>                             |
| <p>Utah STEM Action Center (n.d.). STEM Utah. Retrieved January 23, 2015, from <a href="http://stem.utah.gov/">http://stem.utah.gov/</a></p>  |



# Exploring Temperature and Humidity

STEM: Science, Technology, Engineering, Mathematics

Lesson Plan

**Teacher:** Clay Carter

**Grade/Content Area:** 4th Grade Science

**School:** North Elementary, Cedar City, Utah

**Lesson Duration:** 60 min.



## Lesson Objective(s)

Students will identify and use the tools of a meteorologist to take measurements and record data, conveying their findings in scientific language.

## Key Concepts and Vocabulary

*(See below for online resources that support content knowledge)*

- Hygrometer/humidity
- Thermometer/temperature
- Lapse rate

## Standards Addressed in the Lesson

- Understand that elements of weather can be observed to make predictions.
- Conduct research investigating different aspects of a topic.

## Assessment

Teacher assesses student progress through observation and questioning during the lesson. Teacher assesses student learning by evaluating graphic organizers completed before and after the learning activities.

## Prior Knowledge and Skills

**Knowledge:** Students need basic knowledge of temperature, humidity, and the water cycle.

**Skills:** Students need to be able to use laptop computers, the “Sparkvue” app, and hygrometer/thermometer sensors to take readings of temperature and humidity. Students need to be able to manage data represented in the graphs and draw conclusions about the relationship between temperature and humidity.

## Materials

- Each student will be provided a Chromebook or other IOS device with the “Sparkvue” app installed
  - Humidity/temperature/dew point sensor
  - 2 glass beakers (250 ml)
  - Ice water and warm water
  - Science journal for reflection
  - Circle map for each student
- (<https://drive.google.com/previewtemplate?id=1mTJR9QXGT1acNE64LG1v0SkS5yxUKTKoi2XDmBiOHpU&mode=public&ddrp=1#>)



## Lesson Plan – Exploring Temperature and Humidity (cont.)



### Differentiating the Instruction

Students will work in small groups. Teacher will circulate to monitor progress and provide assistance when needed.

### Lesson Procedures

1. Students will fill out the top part of a graphic organizer (circle map), relating what they know about thermometer and hygrometer.
2. Using laptop computers in conjunction with the “Sparkvue” app and the corresponding sensors, students will be lead through an investigation to take measurements of temperature and humidity under varying conditions.
3. Students will be guided to an understanding of the relationship between air temperature and humidity. They will research the definition of “lapse rate” and will relate this to air temperature, humidity, altitude, and precipitation.
4. Students will complete the bottom part of the circle map, showing what they have learned about how the tools of a meteorologist (thermometer and hygrometer) help predict precipitation relating temperature, humidity, and the lapse rate.
5. Students will convey their findings in their journals using the appropriate scientific language (see the “Key Concepts/Vocabulary”).

### Resources to Support Content Knowledge

- Beychok, M. (2011). Atmospheric lapse rate. Retrieved March 27, 2015, from the Encyclopedia of Earth website: <http://www.eoearth.org/view/article/170859/>
- Letz, T. (n.d.). Lesson plan: Weather forecasting. Retrieved March 27, 2015, from the Teachnology website: [http://www.teach-nology.com/lessons/lsn\\_pln\\_view\\_lessons.php?action=view&cat\\_id=8&lsn\\_id=23481](http://www.teach-nology.com/lessons/lsn_pln_view_lessons.php?action=view&cat_id=8&lsn_id=23481)
- Oblack, R. (n.d.). How does a hygrometer work?. Retrieved March 27, 2015, from the About Education website: <http://weather.about.com/od/weatherinstruments/a/hygrometers.htm>
- PASCO. (n.d.). Sparkvue: Science is served. Retrieved March 27, 2015, from <http://www.pasco.com/ipad/>

### Related Video Lessons and Resources

- 4th grade: Cricket investigation. Edivate. <https://www.pd360.com/-resources/videos/5363>
- 4th grade: Motion and force. Edivate. <https://www.pd360.com/-resources/videos/5801>
- 4th grade: Main ideas and supporting details: Water striders. Edivate. <https://www.pd360.com/-resources/videos/6229>