Teachers Teaching with Technology™
Professional Development from Texas Instruments

Chemistry with TI-Nspire™ and TI-Nspire™ Navigator™ – Day 3

Materials for Workshop Participant*

T^3 Professional Development Categories and Learning Objectives

There are three categories of T^3 Professional Development, each with a unique set of learning objectives. This workshop is focused on technology integration, and its objectives are as follows:

Technology Integration

- Emphasis on learning to use TI technology, with broad "how-to" coverage highlighting a wide range of features
- Subject/content-focused training on appropriate usage of TI technology in the classroom
  - I am comfortable with essential technology skills for exploring math and science content.
  - I can design opportunities for students to use technology as a tool to deepen their understanding of mathematics and science.
  - I can locate and download TI activities that align to my standards.
  - I can describe the role technology should play in the successful implementation of my standards, and I can implement a vision of a classroom where students routinely use technology to engage in the practice and content standards.

Workshops focused on instructional practices and content knowledge have the following objectives:

Instructional Practices

- Emphasis on classroom practices with technology as a tool to enhance student learning
- Models CCSS, TEKS, and NGSS tasks using in-depth discussions, reflective practices, and essential technology skills
  - I can demonstrate the importance of teacher actions for students' engagement in the Practices, and I can take actions that will enable students to become mathematical and scientific practitioners.
  - I can describe the role that technology should play in the successful implementation of my standards, and I can implement a vision of a classroom where students routinely use technology to engage in practice and content standards.
  - I can design tasks for students to employ the Practices, using technology as a tool to deepen their understanding of mathematics and science.
  - I can ask questions designed to make student thinking visible – to push them to think about connections, make comparisons, or probe their understanding.

Content Knowledge

- Emphasis on content with technology as support
- Addresses critical, tough-to-teach topics and new content standards for CCSS or TEKS
  - I have a deeper understanding of the mathematics and science in my content area, and I am aware of the shifts in content that affect what I teach.
  - I can design opportunities for students to use technology as a tool to deepen their understanding of mathematics and science.
  - I can locate and download TI activities that align to my standards.
  - I can describe the role technology should play in the successful implementation of my standards, and I can implement a vision of a classroom where students routinely use technology to engage in the practice and content standards.

TI-Nspire™ and TI-Nspire™ Navigator™ "I Can…" Statements Day 3

TI PROFESSIONAL DEVELOPMENT

I can…	HH/Nav/DC
Create a TI-Nspire document that includes questions.	Nav
Collect a document that included questions.	Nav
Review Quick Polls and question documents.	Nav
Practice the skills I have learned using the practice classes I have created.	Nav
Effectively do the *Fun with Fizzy Tablets* data collection activity.	DC
Adjust data collection parameters, gather data, and analyze data.	DC
Collect data from the TI-Nspire handheld and save the results to the Portfolio.	DC
Save a document on the TI-Nspire handheld.	DC
Prepare a lesson that will be taught; create a new TI-Nspire document that will include formative assessment questions.	Nav/HH
Start a class, send the TI-Nspire document, answer the questions, retrieve the document, open it in the Review Workspace, and save it to the Portfolio.	Nav/HH
Review and change answers in the Portfolio Workspace.	Nav/HH

Online Resources

TI PROFESSIONAL DEVELOPMENT

Activity Overview

In this activity, you will explore resources available at education.ti.com. You will browse for activities at Math Nspired or Science Nspired. You will search for activities using the Standards Search and Textbook Search, and you will explore additional information regarding professional development.

Materials

- Computer with Internet connection

Step 1:

Go to **education.ti.com > Activities**. Select **Math Nspired** or **Science Nspired**, which can also be accessed directly at mathnspired.com and sciencenspired.com. Select a subject on the left.

Step 2:

Select a unit from the list. When a unit is selected, a table appears with an image from each activity. The table contains links to download, recommend, and save each activity. It also identifies each activity type:

Icon	Type	Description
	Bell Ringer	Bell ringers are short lessons designed to help transition quickly into class after the bell rings.
	Action Consequence Simulation	Interactive, engaging lessons allow students to perform actions on a mathematical object or scientific simulation, observe consequences, and make conjectures. Each lesson contains a pre-made TI-Nspire™ document, a Student Activity, and Teacher Notes.
	Create Your Own	In addition to the Student Activity and Teacher Notes, the lesson also includes step-by-step instructions on how to create the TI-Nspire document.
	Data Collection with Probes	Data Collection Labs give students the opportunity to collect and analyze real-world data with more than 50 data collection sensors from Vernier Software and Technology™.
	TI-Nspire™ Navigator™ Compatible	The Teacher Notes identify opportunities to use the TI-Nspire Navigator System, including opportunities for Quick Polls, Class Captures, and Live Presenter.

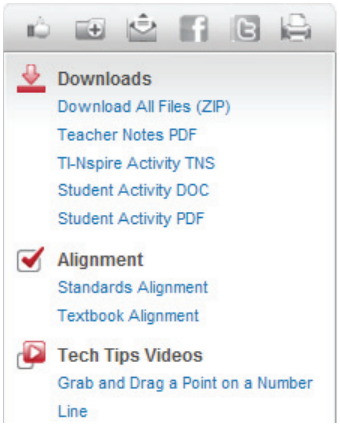
Online Resources

TI PROFESSIONAL DEVELOPMENT

Step 3:

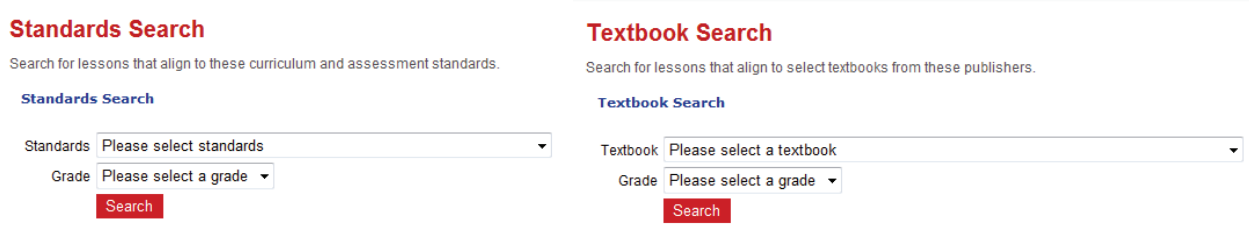
Select an activity from the list. The activity page shows objectives, relevant vocabulary, and additional information. A video offers a preview of the lesson, and related lessons are recommended below.

Icons above the Downloads section allow you to recommend, save, email, and print an activity. Links to Facebook® and Twitter® are also available. The Downloads section contains links to activity files. Links for Standards Alignment, Textbook Alignment, and relevant Tech Tip Videos are also available.



Step 4:

Explore the Standards and Textbook Search channels on the left. Select a set of standards or a textbook from the drop-down box, select a grade, and click **Search**.



Step 6:

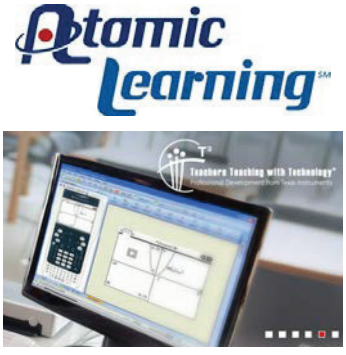
Click the **Solutions** tab and select Common Core State Standards or Science Tools. Content and activities, technology resources, and information on professional development opportunities are provided.

Step 7:

Go to **Professional Development > Online Learning**.

The Tutorials page contains link to free Atomic Learning[SM] video tutorials. There are video tutorials for the TI-Nspire™ handheld, the TI-Nspire™ software, the TI-Nspire™ Navigator™ System, and the TI-Nspire™ Apps for iPad®.

The Upcoming page contains links to upcoming, free PD webinars. The On-Demand page contains recordings of past webinars, and associated webinar documents are available for download.



Step 8:

Explore each of the following pages by clicking the appropriate tab: Products, Downloads, Activities, Professional Development, Solutions, Support, and Where to buy.

Periodicity of Properties

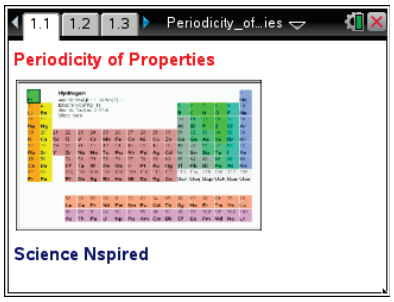
Student Activity

Name _____

Class _____

Open the TI-Nspire document *Periodicity_of_Properties.tns.*

In this activity, you will learn how certain properties of elements tend toward a periodic similarity when the elements are arranged in order of increasing atomic number. You will also note the intervals between similarities and the relationship between similar elements.



Move to page 1.2.

Page 1.2 contains a Periodic Table that you can use.

Move to pages 1.3 – 1.7.

Early in the Nineteenth Century, scientists noted similarities between elements and tried to find a pattern or relationship between them.

In 1869, Dmitri Mendeleev of Russia and Lothar Meyer of Germany independently arranged the elements in order of increasing atomic mass and noted that these similarities appeared in predictable intervals. At this time, nothing was known of the structure of atoms, and no reasons could be given for the periodic similarities. In 1913, Henry Moseley determined the nuclear charge (atomic number) of the elements, and pointed out that the fundamental order of arrangement of the elements should be based on increasing atomic numbers (Z) instead of increasing atomic mass. In the next few years, theories of atomic structure founded on the work of Rutherford, Bohr, and many other scientists explained the repeated similarities of behavior within the Periodic Table.

The modern Periodic Law can be stated as follows: When the elements are arranged in order of increasing atomic number, similarities of properties occur periodically.

Move to pages 1.8 – 1.11.

1. Who is given credit for creating the first Periodic Table?

2. The first Periodic Table was arranged by _____.

3. Who rearranged the Periodic Table into its current order?

4. When the element are arranged in order of increasing atomic number, similarities of properties _____.

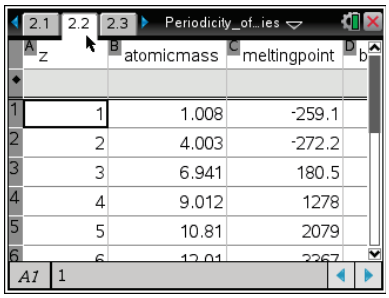
Periodicity of Properties

Student Activity

Name _____

Class _____

Move to page 2.2.



On page 2.2 observe the following data:

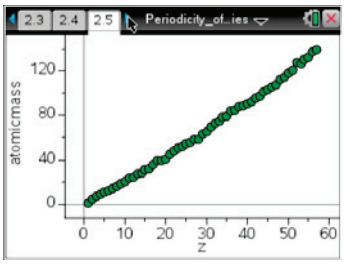
- atomic number(Z);
- atomic mass;
- melting point;
- boiling point;
- density;
- electronegativity;
- first ionization energy; and
- atomic radius.

Move to page 2.3.

5. The atomic trends in the Lists & Spreadsheets page _____.

Move to pages 2.4 – 2.7.

Move to the Data & Statistics page (page 2.5). The atomic number (Z) is graphed on the *x*-axis; atomic mass is graphed on the *y*-axis. Observe the trend, and answer the following questions (from pages 2.6 and 2.7).

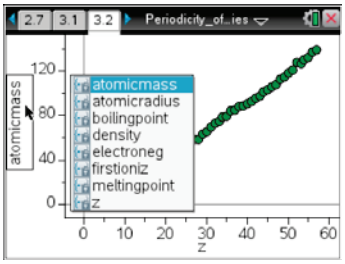


6. The relationship between atomic mass and atomic number is _____.

7. The atomic mass increases as the atomic number increases because of the addition of _____.

Move to pages 3.2 – 3.11.

Select the *y*-axis, and choose **electroneg**. Observe the trend, and answer the following questions (from pages 3.3 through 3.10).



8. There are no electronegativity values for elements 2, 10, 18, 36, and 54 because they are _____.

9. Locate the 'peaks' on the graph. The elements that are found on the peaks are part of what group on the Periodic Table?

10. These elements have the highest electronegativity values because they have _____.

11. What elements are found in the 'valleys' of the graph?

12. Why would these elements have the lowest electronegativity values?

13. What happens to the electronegativity values as you go down a group?

14. What causes the trend from the previous question?

15. If this graph were turned one quarter turn clockwise, the pattern would mimic _____.

Move to pages 4.1 – 4.11.

Select the *y*-axis, and choose first ionization energy (**firstioniz**). Observe the trend on page 4.2, and answer the following questions (from pages 4.3 through 4.10) before moving on to the next procedure.

Tech Tip: You may need to scroll down through the list of variables to find **firstioniz**. After selecting the *y*-axis, select any location within the list of variables and drag your finger to scroll through the list.

16. The peaks on this graph are elements from what group of elements?

17. This group of elements have the highest first ionization energy because they have the largest _____.

18. The elements found in the valleys on this graph represent what group of elements?

19. This group of elements has the smallest ionization energy because they have the smallest _____.

20. As you move across a period from left to right, the first ionization energy _____.

21. This trend occurs because of increasing _____.

Name _____

Class _____

22. As you go down a group, the ionization energy _____.

23. This trend occurs because the electrons are farther from the nucleus causing Zeff to _____.

Move to pages 5.1 – 5.3.

24. The relationships observed in this activity were not evident until 1913 because of the work of _____.

25. In 1913, the Periodic Table was rearranged in order of increasing _____.

26. From studying the graphs of various periodic properties versus the atomic number, it can be stated that these properties _____.

Periodicity of Properties

SCIENCE NSPIRED

Science Objectives

- Students will learn how certain properties of the elements tend toward a periodic similarity when the elements are arranged in order of increasing atomic number.
- Students will note the intervals between similarities and the relationship between similar elements.

Vocabulary

- atomic mass
- atomic number
- ionization energy
- Periodic Law
- periodic table
- Z
- Z_{eff}

About the Lesson

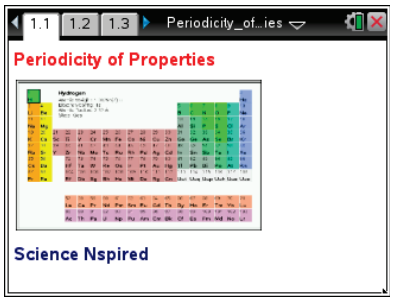
- This lesson involves the periodic trends of certain properties of atoms
- As a result, students will:
  - Graph pertinent data and observe the trends that occur.
  - Answer questions to demonstrate their understanding of the periodic trends.
  - Learn the Periodic Law.

TI-Nspire™ Navigator™

- Send *Periodicity_of_Properties.tns* file to students.
- Use class capture to monitor student progress.
- Collect and grade *Periodicity_of_Properties.tns* file
- Use slide show to review student work.

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

- Periodicity_of_Properties_Student.pdf
- Periodicity_of_Properties_Student.doc

TI-Nspire document

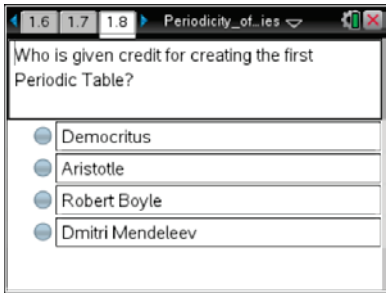
- Periodicity_of_Properties.tns

Discussion Points and Possible Answers

Move to pages 1.2.-1.7

Page 1.2 contains an interactive Periodic Table for students to use in this activity. Pages 1.3-1.7 contain background information on the structure of the table.

Move to page 1.8.



1. Who is given credit for creating the first Periodic Table?

   Answer: Dmitri Mendeleev

Move to page 1.9.

2. The first Periodic Table was arranged by _____.

   Answer: increasing atomic mass

Move to page 1.10.

3. Who rearranged the Periodic Table into its current order?

   Answer: Henry Moseley

Move to page 1.11.

4. When the element are arranged in order of increasing atomic number, similarities of properties _____.

   Answer: occur periodically

Move to page 2.3.

5. The atomic trends in the Lists & Spreadsheets page _____.

   Answer: repeat in a periodic fashion

Move to page 2.6.

6. The relationship between atomic mass and atomic number is _____.

   Answer: direct

Move to page 2.7.

7. The atomic mass increases as the atomic number increases because of the addition of _____.

   Answer: protons and neutrons

Move to page 3.3.

8. There are no electronegativity values for elements 2, 10, 18, 36, and 54 because they are _____.

   Answer: practically inert

Move to page 3.4.

9. Locate the 'peaks' on the graph. The elements that are found on the peaks are part of what group on the Periodic Table?

   Answer: halogens

Move to page 3.5.

10. These elements have the highest electronegativity values because they have _____.

    Answer: greater Z_{eff} (effective nuclear charge)

Move to page 3.6.

11. What elements are found in the 'valleys' of the graph?

    Answer: alkali metals

Move to page 3.7.

12. Why would these elements have the lowest electronegativity values?

Answer: low Z_{eff} (effective nuclear charge)

Move to page 3.8.

13. What happens to the electronegativity values as you go down a group?

Answer: decrease

Move to page 3.9.

14. What causes the trend from the previous question?

Answer: decreasing Z_{eff}

Move to page 3.10.

15. If this graph were turned one quarter turn clockwise, the pattern would mimic _____.

Answer: the Periodic Table

Move to page 4.2.

Tech Tip: Students may need to scroll down through the list of variables to find **firstioniz**. After selecting the *y*-axis, they can select any location within the list of variables and scroll through the list.

Move to page 4.3.

16. The peaks on this graph are elements from what group of elements?

Answer: noble gases

Move to page 4.4.

17. This group of elements have the highest first ionization energy because they have the largest _____.

    Answer: Z_{eff}

Move to page 4.5.

18. The elements found in the valleys on this graph represent what group of elements?

    Answer: alkali metals

Move to page 4.6.

19. This group of elements has the smallest ionization energy because they have the smallest _____.

    Answer: Z_{eff}

Move to page 4.7.

20. As you move across a period from left to right, the first ionization energy _____.

    Answer: increases

Move to page 4.8.

21. This trend occurs because of increasing _____.

    Answer: Z_{eff}

Move to page 4.9.

22. As you go down a group, the ionization energy _____.

    Answer: decreases

Move to page 4.10.

23. This trend occurs because the electrons are farther from the nucleus causing Z_{eff} to _____.

    Answer: decrease

Move to page 5.1.

24. The relationships observed in this activity were not evident until 1913 because of the work of _____.

    Answer: Moseley

Move to page 5.2.

25. In 1913, the Periodic Table was rearranged in order of increasing _____.

    Answer: atomic number

Move to page 5.3.

26. From studying the graphs of various periodic properties versus the atomic number, it can be stated that these properties _____.

    Answer: repeat periodically

TI-Nspire Navigator Opportunity

Use the TI-Nspire Navigator to collect, grade, and save the .tns files to the Portfolio. Use Slide Show to view student responses.

Wrap Up

Upon completion of the discussion, the teacher should ensure that students are able to understand:

- How to use the TI-Nspire technology.
- How to manipulate data in the Data & Statistics App to observe trends on the Periodic Table.
- The various trends of periodic data.

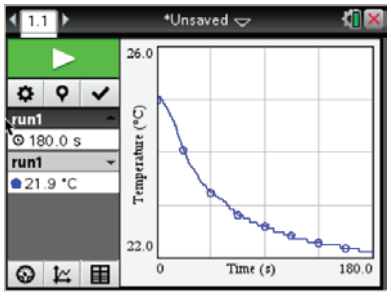
Assessment

Students will complete the embedded multiple choice questions in the *Periodicity_of_Properties.tns* file.

Fun with Fizzy Tablets

TI PROFESSIONAL DEVELOPMENT

In this lesson you will conduct a simple experiment to determine the rate of chemical reaction of an effervescent tablet added to water. You will then choose a researchable question, design a new experiment to test that question and draw conclusions about how various factors affect the rate of reaction. Finally, you will discuss how this activity relates to the Science and Engineering Practices.



1. Before your team collects data about the reaction of an effervescent tablet added to water, discuss the following pre-lab questions within your group and then with the whole class.
   - How can we know how fast the reaction is going?
   - What are some variables that we can measure to know how fast the reaction is taking place?
   - Will the reaction rate be constant throughout the time that the tablet is reacting?

2. Now let's collect some data. To allow for easy comparison between teams, let's agree to a few parameters.
   - Obtain 50 mL of room temperature water in a 200 or 250 mL beaker.
   - Obtain one effervescent tablet for reaction in the water in the beaker.
   - Following the details from your instructor, prepare a TI-Nspire to collect temperature vs. time data for a total of 180 seconds.
   - When ready, begin data collection. Do NOT put the tablet in the water until 10 seconds have elapsed. Then, add the tablet to the water without stirring. When the temperature has dropped to a minimum value and then starts to increase again, stop the data collection. This should take no longer than 3 minutes to collect the appropriate data.

3. Your instructor will use Live Presenter to help you see and discuss the data collected from different groups. Your instructor will show you how to analyze the data to determine the average rate of reaction of the tablet in water.

4. Now that your group has collected one trial of data, it is time to design an experiment that will help you answer one of the following researchable questions. (Your instructor will determine which question your group will investigate.)
   1) Does the reaction rate increase with an increase in surface area?
   2) Does the reaction rate increase with an increase in reactant concentration?
   3) Does the reaction rate increase when the solution is stirred (vs. no stirring)?
   4) Does the reaction rate increase with an increase of water temperature?

5. Discuss how your group will carry out the investigation to answer your team's researchable question. There will be a few parameters to allow for easier discussion amongst groups.
    - Use the same beaker as in step 2 and exactly 50 mL of water for each trial.
    - Establish a baseline initial temperature by waiting 10 seconds after pressing 'PLAY' to add the effervescent tablet.
    - Do not stir the tablet in the water unless that is the variable that you are studying.
    - Continue collecting temperature vs. time data until the temperature begins to rise again after the initial drop. This should take no longer than 180 seconds maximum for any one trial.

6. Now that you have collected another set of data discuss the implications of this new data and how it relates to your researchable question. The instructor will ask each group to report their findings to the rest of the participants and will use Live Presenter to enable your group to display and discuss the graph of your new data.

7. Now it's time to make connections between this activity and the Science and Engineering Practices. Your group's task is to discuss how this activity relates to (or **could** relate to) the Science and Engineering Practices listed below. Be sure that someone is recording the group's ideas. You will be asked to share your findings with the rest of the participant groups. Here are a few questions to guide your group discussion:
    - Which practices most closely match this activity?
    - If you did this activity with your students how would you make that practice explicit with your students? What language would you have to use so that your students would be aware of and understand this science and engineering practice?
    - What extensions could you add to this activity to help engage your students in other Science and Engineering Practices?

Science and Engineering Practices
1. Asking Questions and Defining Problems
2. Developing and Using Models
3. Planning and Carrying Out Investigations
4. Analyzing and Interpreting Data
5. Using Mathematics and Computational Thinking
6. Constructing Explanations and Designing Solutions
7. Engaging in Argument from Evidence
8. Obtaining, Evaluating, and Communicating Information

8. Finally, we will conclude this activity by watching and discussing a video of an effervescent tablet being added to water in a micro-gravity environment on the International Space Station. As you watch the video, think about which Science and Engineering Practices are evident. After the video your instructor will lead you in a brief discussion of how the practices are related to the video. The video is available at: http://www.youtube.com/watch?v=bgC-ocnTTto.

Create a Science Activity

TI PROFESSIONAL DEVELOPMENT

About the Activity

- You have seen a number of sources for TI-Nspire™ activities. To allow you to make the most relevant use of the remainder of this workshop, you will have time to explore activities that are of particular interest to you for your classroom use.
- Some activities are contained in your workshop binder, some are available online through the Teacher Software, or you might have found something on your own that you would like to explore. You will share your findings with the whole group.

Sources for Activity Materials:

- Workshop binder
- TI-Nspire™ Teacher Software content links

TI-Nspire™ Navigator™ System

If you want, you can use the TI-Nspire™ Navigator™ System to practice enhancing your activity presentation, engage your fellow participants, and share any TI-Nspire documents you found useful. The T^3™ Instructor will be happy to help you with the system.

Discussion Points

Please work through an activity or two in the time provided. While completing the activity, consider:

- How does it add new TI-Nspire skills to your repertoire?
- What are some pedagogical implications of the activity and its technology use?
- What is the content relevance?
- How might it engage and motivate your students?
- You are encouraged to work in small groups and discuss as you go.
- Each group will give a short presentation on an activity and the results of the discussions surrounding it.

Tech Tip: Try using any TI-Nspire documents on both the TI-Nspire Teacher Software and the TI-Nspire handheld. Transfer any documents from one to the other and back again.

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