Teachers Teaching with Technology™
Professional Development from Texas Instruments

Getting Started with TI-Nspire™ Middle Grades Science

Materials for Institute Instructor*

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Nspired Learning Exploration
PD Objectives • To get participants excited about how TI-Nspire™ technology can be used in the science classroom.
Materials Needed/Set Up Requirements • Light_Me_Up.tns
Main Focus – Suggested Questions/Strategies for Accomplishing Objectives • This is intended to be the first activity on Day 1. You want to engage the participants and get them excited about the power of TI-Nspire technology. • You may want to demonstrate the TI-Nspire™ document rather than sending it to participants. This allows you to "wow" the participants without getting too bogged down in the details of how to use the TI-Nspire handheld in the first activity of Day 1. • The Student Activity and Teacher Notes for *Light Me Up* are available at Science Nspired > Chemistry > Chemical Bonding > Electrolytes & Nonelectrolytes.
Technology Tips
Summary Reflection Questions • How can this activity, and activities like this, help your students learn science? • Will this activity "wow" your students?

TI-Nspire™ CX CAS Introduction
PD Objectives • Get participants comfortable with TI-Nspire technology. • Develop an understanding of the applications present on the device. • Explore simple uses of the applications. • Develop initial understanding of the function of the top third of the handheld. • Explore page management.
Main Focus – Suggested Questions/Strategies for Accomplishing Objectives • Do not dig into the applications deeply. • Introduce the applications and avoid the menu button until near the end of the applications. • Pick one method to add pages/applications to the document at first. • Teach one method of moving between pages. • Stress that it is a touch pad not a touch screen.
Summary Reflection Questions • How would you present this activity to your students? • What other questions would you like them to focus in on? • What are discussion questions that you would hope this leads to?

Evaporation

PD Objectives

- Effective use of the Vernier® DataQuest™ applicaiton and the TI-Nspire™ Lab Cradle™.
- Exploring the nature and needs of evaporation and the changing of state from an energy perspective.
- Exploring the other applications of the TI-Nspire document environment: Lists & Spreadsheet, Data & Statistics, Notes, Calculator, and Question (pre-lab, formative Quick Polls, summative assessment.)

Materials Needed/Set Up Requirements

- Three Stainless Steel TI Temperature Probes per group
- One Vernier/TI Lab Cradle per group
- Room temperature water and various (50%, 70%, 91%) Isopropyl Alcohol, about 50 ml per group.
- Cups or containers 100-250 ml, at least 3 per group
- Paper towels
- Support systems for the probes as they hang in air to drip off the liquids. Ring Stands, tape. etc.
- Safety Glasses

Main Focus – Suggested Questions/Strategies for Accomplishing Objectives

- Spend time on experimental design.
- Let the participants explore the time needed to get to a stopping or slowing of the change in temperature.
- Rates of change and how to compare them.
- Striking data and ethical behavior.
- Bring closure to the experiment asking why we did this and what does it mean.

Technology Tips

- Start a new Document before plugging/attaching the Lab Cradle.
- If the students get non sequitur readings or displays on the Vernier DataQuest app, run a New Experiment.
- Store each Run using the File Cabinet, or create a New Problem as you move from one Target to another.
- Plug in one Temperature probe at a time and plan the order (ch 1 = Air, ch 2 = Water, etc…)
- Have the students name the file the same so that you can collect them through the TI-Nspire™ Navigator™ system, or better yet, create a blank TI-Nspire document or one with some of the instructions in it and send it to the class.

Summary Reflection Questions

- Could one do this experiment without a Control, two Controls?
- What other liquids could be used?
- Could one dilute a single concentration of Alcohol and look at 70%, 35%, etc…?
- How sophisticated would you get with your class as you explore the rate of change in temperature? Newton's Law of Cooling?
- Where is the Chemistry, the Biology, and the Physics in this lab?
- Since this Cooling event is exponential, why do many look at it as a Linear? Consider the Calculus point of view.

Walk a Line

PD Objectives

- This activity uses the Calculator-Based Ranger 2™ data collection device to collect time and distance data. The Vernier DataQuest™ application is used to collect and analyze the data.

Materials Needed/Set Up Requirements

- CBR 2™ data collection device

Main Focus – Suggested Questions/Strategies for Accomplishing Objectives

- Have the participants do this activity in groups of two. If you have an odd number of participants, you can be a partner or you can have a group of three. Encourage all participants to experience both roles in the activity—the walker and the handheld operator. Each group will need one CBR 2 with USB CBR 2™–to–handheld cable.
- Participants do not need much experience or preparation for this activity. The application will start when the CBR 2 is connected to the TI-Nspire™ CAS handheld. Point out how to start the data collection by clicking the **Play** button in the bottom-left corner of the screen.
- This activity is designed to be participant-led. Encourage them to read the directions and explore the Vernier DataQuest app. It should be pretty intuitive, especially if they have used the Vernier EasyData™ application in the past.
- Note the discussion of the difference between velocity and speed in the Teacher Notes. This activity provides an opportunity for students to explore velocity and understand that velocity involves direction as well as magnitude.
- Some participants may want to talk about the velocity graph that is displayed in the default settings of Vernier DataQuest along with the position graph. For this activity, the ideal velocity graph would be a horizontal line with a value of the velocity. Since walkers do not move at a perfectly constant rate, the velocity graph is wavy but approximately horizontal.
- An extension to the activity would be to calculate the average of the velocity data (found in the menu of the Vernier DataQuest™ app) and compare it with the slope. Participants could even graph a horizontal line with this value as a model for the velocity data to see how it fits with the data. Advanced mathematics teachers or calculus teachers may want to find the area under the velocity graph and compare it with the change in position or discuss how this activity could help explain the average value of a function.
- Using the CBR 2 with a computer requires the use of the mini-standard USB adaptor to plug the CBR 2 into a computer with TI-Nspire™ computer software. This adapter will convert your CBR 2 USB cable to a standard USB connection so that the device can be connected to the computer.

Technology Tips

- Check to make sure everyone is able to connect the CBR 2 and that the Vernier DataQuest™ app runs upon connection.

Summary Reflection Questions

- What kinds of interactions did we just experience?
- Why is it important to have students make a prediction about what the graph will look like before they collect the data?
- What is the value of real-time data collection? **Note:** Research shows that students understand graphs more when they see the graph as the data is collected rather than after the data is collected.
- What mathematics and science topics are covered in this activity?
- What are some potential extensions, questions, or assessment ideas that would help make connections between the mathematics and science in this activity?
- How could you change the experiment for different classes?
- How might you encourage students to explore further?
- How do we ensure that students have opportunities to display their understanding of the concepts explored in this activity?

Introduction to the TI-Nspire™ Navigator™ System

PD Objectives

- Introduce the TI-Nspire Navigator System to participants.
- Make participants aware of Quick Polls, sending documents, and the Live Presenter feature.

Materials Needed/Set Up Requirements

- Navigator_Introduction.tnsp
- Nav_Quick_Polls.tns
- Nav_Data_Collection.tns
- TI-Nspire™ Lab Cradle
- Temperature probe

Main Focus – Suggested Questions/Strategies for Accomplishing Objectives

- Open the PublishView™ document and use it to guide the activity.
- Send out each question in the *Nav_Quick_Polls.tns* as Quick Polls. Discuss how this could be used in their class to gather feedback.
- Ask teachers about how they get students' feedback on lessons that they have done on prior days.
- How do you assess students on a daily basis?
- How can you guide the class through an activity without touching the technology?
- Send the participants the *Nav_Data_Collection.tns* and make a participant the Live Presenter. Talk them through how to setup the handheld to collect the temperature data.

Technology Tips

Summary Reflection Questions

- How would you modify this activity for your students?
- How do you see yourself using the TI-Nspire Navigator System at this time?
- How could using the TI-Nspire Navigator System strengthen your teaching?

Radioactive Decay

PD Objectives

- Participants will become familiar with TI-Nspire™ CX technology by working with the Lists & Spreadsheet application to develop an understanding of exponential decay and the idea of half-life.

Materials Needed/Set Up Requirements

- Radioactive_Decay_MG.tns
- Bag of M&M's®
- paper towels
- paper cups

Main Focus – Suggested Questions/Strategies for Accomplishing Objectives

- Participant groups of two or three will count out the number of M&M's in a bag or cup.
- Participants will pour the M&M's onto a towel, remove any candies with an M facing up, and recount what remains. Participants will use the Lists & Spreadsheet application to record the trials and the number of M&M's remaining.
- They will graph their data using the Data & Statistics application and analyze the non-linear aspect of the function. When they have gathered their data and have their analysis, send them a Quick Poll of their analysis and gather the entire class data.
- Observe students' graphs to be sure they are calculating and interpreting their model correctly. Take Class Captures and send Quick Polls to check their understanding of the concept of age estimation.
- **Extension option**: Radioactive Dating lesson from Science Nspired (Earth Science > Earth's Surface > Earth's History)
  - In this simulation, isotopes of different atoms decompose and give off radioactivity in the process.
  - Have participants observe how the known rate at which isotopes decay is used to estimate the age of a fossil. Then they will play a game to check their understanding of radioactive dating.

Technology Tips

- Monitor participants' progress using Quick Poll, Class Capture, and Live Presenter.
- Collect and review the TI-Nspire document and save it to the Portfolio.

Summary Reflection Questions

- What is the relationship between number of candies and trials?
- What does each value in the model represent? *Y*-intercept*?* *X*-intercept*?*
- Where does this activity fit into your curriculum?
- How would you use this technology in your classroom?

Instructor Notes

- Where can you find additional support/resources?
- What questions would you ask your students during the activity to start them thinking along the correct path?
- What questions would you ask when summarizing the activity?
- What extension would go well with this activity?
- How might you encourage students to explore further?
- How can this activity assist students to better understand this topic at a higher cognitive level?

Getting Started with the TI-Nspire™ Family of Teacher Software

PD Objectives

- Participants will explore basic features of the TI-Nspire Teacher Software, such as adding applications, exploring menus and submenus, and viewing settings.

Materials Needed/Set Up Requirements

- Computer with TI-Nspire Teacher Software

Main Focus – Suggested Questions/Strategies for Accomplishing Objectives

- As participants explore the Welcome Screen, encourage them to move their cursors over each icon to see a description of the given feature. This is a universally helpful skill when exploring the TI-Nspire Teacher Software.
- As participants move from the Calculator application to the Graphs application, ask them what happens to the menus in the Documents Toolbox under the Document Tools tab. Participants should recognize that each application has its own unique menu.
- Encourage participants to explore the various menus and submenus in the Document Tools tab. Also, encourage participants to explore the Utilities, Page Sorter, TI-SmartView™ emulator for TI-Nspire, and Content Explorer tabs.
- As participants explore the various Document Views and TI-SmartView emulator views, discuss how each view might be helpful in the classroom.
- Though participants will not collect any data during this activity, they are asked to insert a page with the Vernier DataQuest™ application. The purpose is to expose participants briefly to the data collection features of the Teacher Software.
- When exploring the Document Settings, discuss the options available in each field. Make sure participants are comfortable tabbing through fields and changing the settings.

Technology Tips

- Sometimes participants do not immediately see the five icons in the Documents Toolbox. Consider emphasizing the location of these icons.

Summary Reflection Questions

- What types of features are available in the Documents Toolbox?
- How does the Documents Toolbox change when working with different applications?
- How might the various Document Views and the TI-SmartView emulator options be helpful in the classroom?