



Getting Started with TI-Nspire™ Navigator™ in Secondary Mathematics

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Materials for Workshop Instructor*

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Student Login**PD Objectives**

- Participants will log in to the TI-Nspire™ Navigator™ network as students in an existing class.

Materials Needed/Set Up Requirements

- Two TI-Nspire™ CX handhelds for each participant

Main Focus – Suggested Questions/Strategies for Accomplishing Objectives

- Distribute the loaner TI-Nspire CX handhelds to participants.
- Provide information to participants regarding his/her User Name.
- Have participants log in to the TI-Navigator class.
- If participants brought their own TI-Nspire handhelds, you will have opportunities later to help them update the operating system on each of their handhelds. It is suggested that you not spend time updating on the first morning of the workshop.
- Consider setting up a “parking lot” so that participants can list any questions or concerns.

Technology Tips

- Prior to the start of the workshop, create a TI-Nspire Navigator class using participants' names.
- If the names of the participants are not available prior to the workshop, use an existing class in your TI-Nspire™ Navigator™ Teacher Software or use the practice class provided with the workshop loan equipment. Or if time permits, set up a new class, and have each participant **Add a student to current class**, entering First Name, Last Name, and User Name.
- Inform participants that a network only needs to be selected once, not every time a handheld is logged in.

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| The TI-Nspire™ Navigator™ Experience |
| <p>PD Objectives</p> <ul style="list-style-type: none"> • This activity will give participants the opportunity to experience a pre-made TI-Nspire™ document through TI-Nspire™ Navigator™. • The participants will experience the TI-Navigator and its main tools as a student. |
| <p>Materials Needed/Set Up Requirements</p> <ul style="list-style-type: none"> • Growing_Patterns.tns • Growing Patterns Student Activity |
| <p>Main Focus – Suggested Questions/Strategies for Accomplishing Objectives</p> <ul style="list-style-type: none"> • During the activity, model components of an interactive mathematics classroom in order to set the stage for some of the key discussion points over the course of the workshop. • Send the TI-Nspire document to the class. Open the document with the participants. They have a copy of the student handout in their binders. • Use the Teacher Notes for the activity as a guide for letting the participants experience the document as it might be used in a classroom. Use Live Presenter, Class Capture, and Quick Polls throughout the activity. Save the Quick Poll results to the Portfolio at the end of the lesson for later review. Participants will have the opportunity to practice the TI-Navigator components from the teacher's perspective later in the workshop; encourage them to focus on experiencing the document as a student. • After they have completed this activity, discuss how they might use the TI-Nspire document with their students. Focus on the kinds of interactions they would like to see in their classrooms, what kinds of communication they might expect, the level of engagement this activity might produce, and opportunities where their students would demonstrate their reasoning and sense-making of the mathematics in the activity. |
| <p>Technology Tips</p> <ul style="list-style-type: none"> • You might need to assist participants when they first navigate the cursor on the screen. Make sure participants can grab and drag a point/object and also move from one page to another. • Provide troubleshooting help (for example, grabbing the wrong object, Undo), as needed. • Action/Consequence documents are saved as Read Only (File > Document Properties > Protection). Users who want to save changes to a Read Only document will be prompted to save the document with a new name. |
| <p>Summary Reflection Questions</p> <ul style="list-style-type: none"> • What are the advantages of using a pre-made TI-Nspire document? • Discuss the concepts. What types of questions could be asked? |



Math Objectives

- Students will use symbols to represent unknowns and variables.
- Students will look for patterns and represent generalizations
- Students will represent relationships among quantities using visual models, tables, graphs, and words.
- Students will define, evaluate and compare functions.
- Students will reason abstractly and quantitatively (CCSS Mathematical Practice).
- Students will look for and make use of structure (CCSS Mathematical Practice).

Vocabulary

- function
- growth rate
- constant rate
- linear function

About the Lesson


- This lesson involves using pattern growth to construct functions.
- As a result, students will:
 - Explore growing tile patterns pictorially, graphically and in tabular form.
 - Examine the relationship between the stage number and the number of tiles.
 - Determine a rule for the number of tiles as a function of the stage number.

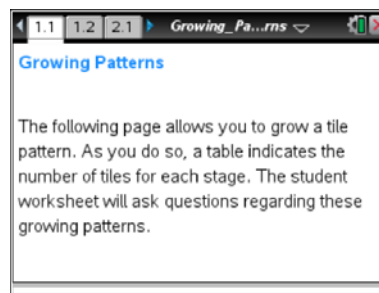


TI-Nspire™ Navigator™

- Send a document.
- Use Class Capture to formerly assess students' understanding.
- Use Live Presenter to demonstrate and provide a means for students to share their thinking.
- Use Quick Poll to assess students' understanding.

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

- Growing_Patterns_Student.pdf
- Growing_Patterns_Student.doc


TI-Nspire document

- Growing_Patterns.tns



Discussion Points and Possible Answers



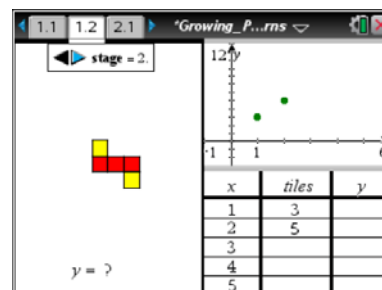
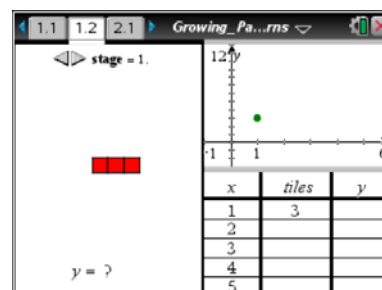
Tech Tip: If students experience difficulty with the sliders, check to make sure that they have moved the arrow until it becomes a hand () . When finished with a slider, press **esc** to release it.

Move to page 1.2.

1. On page 1.2, the first stage of a tile pattern is shown. Use the slider for stage to 'grow' the pattern.

- a. What remains the same **in the pattern**, and what changes as it grows?

Answer: The three horizontal tiles are always there and two tiles are added vertically to the middle each time.



- b. In the table, what do the variables x and y represent?

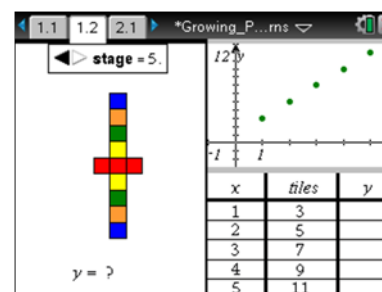
Answer: x represents the pattern number, and y represents the number of tiles.

- c. What remains the same, and what changes **in the table** as the pattern grows?

Answer: Although the numbers change in both columns, what stays the same is the amount they change. As the x column changes by 1, the y column changes by 2.

- d. In the graph, what do the x - and y - coordinates of the ordered pairs represent?

Answer: The x -coordinate represents the stage number, and the y -coordinate represents the number of tiles.





- e. What remains the same, and what changes **in the graph** as the pattern grows?

Answer: The points are 1 unit apart horizontally and 2 units apart vertically which reflects the change in the number of tiles for each stage.

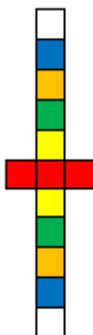
Teacher Tip: You might want to be sure that students are paying attention to the graph and table at the right hand side of the screen as they use the slider.



TI-Nspire Navigator Opportunity: *Quick Poll*

See Note 1 at the end of this lesson.

2. On page 1.2, you are limited to showing 5 or fewer stages of growth for the pattern.
- a. If the pattern continued to grow in the same way, draw the 6th stage, and determine the number of tiles needed.



Answer:

13 tiles are needed.

- b. How many tiles would be in the 10th stage? How do you know?

Answer: 21

- c. Write an algebraic rule to state the number of tiles in the xth stage.

Answer: $2x + 1$

- d. Would there ever be a stage in which there were 58 tiles? Why or why not?

Answer: No. There will always be an odd number of tiles because you start with odd number and then increase by an even. An odd number plus an even number is always odd.



TI-Nspire Navigator Opportunity: *Quick Poll*

See Note 2 at the end of this lesson.

3. When you write the rule from part 2c as an equation in which, y , the number of tiles, is related to x , the stage number, you are writing y as a function of x .
- a. Write the function that represents this pattern.

Answer: $y = 2x + 1$.

Teacher Tip: Students might state the function in various equivalent forms, such as $y = 2(x - 1) + 3$. A good time to discuss the equivalence of these forms would be now or after problem 2 b where you could take a Class Capture of student handhelds.

- b. Check that your function is correct by typing it in the box after " $y =$ ". Select **enter**. How can you tell if your rule is correct or incorrect by looking at the table and graph?

Answer: In the graph, the line should pass through all of the points. In the table, the values in the third column, the y -column, should match the values in the second column, the tiles column.



Tech Tip: To modify the text on screen, double-tap the text and the keyboard will open.

Teacher Tip: You might want to discuss with students the fact that our model is a discrete model but the graph of the line represents a continuous function. To clarify this, you could ask the students if it makes sense to have a stage number of 2.25 with 5.5 tiles.

- c. If your rule was correct, move on to Question 3d. If your rule was incorrect, find a new rule to relate the stage number and number of tiles. Check your rule.

Sample Answers: Student answers will vary.

- d. The growth rate of the pattern is the change in the amount of tiles needed per stage. What is the growth rate for this pattern?

Answer: The growth rate is 2 tiles per stage.



Growing Patterns

TEACHER NOTES

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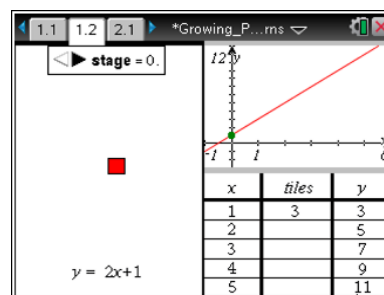


- e. Where does the growth rate appear in the function? In the table? In the graph?

Answer: The growth rate appears in the function as a multiplier of the variable. In the table it shows up as the constant change across the stages. The growth rate is the slope of the linear function.

- f. Move to stage zero. Where does the number of tiles in this stage show up in your function? In the growing pattern? In the graph?

Answer: The number of tiles in stage zero is the 1 that is being added (or the constant term in the function). In the graph, the number of tiles in stage zero corresponds to the y-intercept.



Teacher Tip: You might want to discuss the definition of the constant term in a linear function.



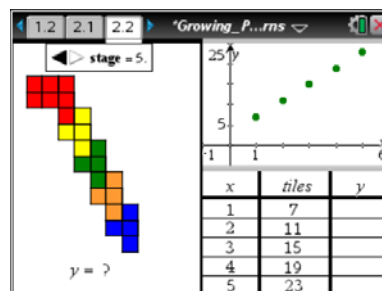
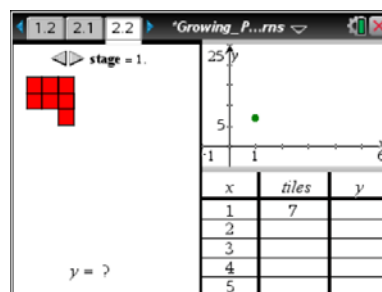
TI-Nspire Navigator Opportunity: *Quick Poll and Class Capture*

See Note 3 at the end of this lesson.

Move to page 2.2.

4. On page 2.2, use the slider for stage to grow a second pattern. Determine the growth rate, and write a function that represents the number of tiles in relation to the stage number.

Answer: The growth rate is 4 tiles per stage, and the function is $y = 4x + 3$.



TI-Nspire Navigator Opportunity: *Quick Poll*

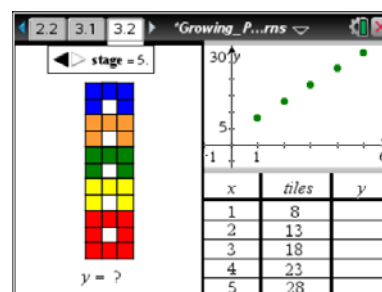
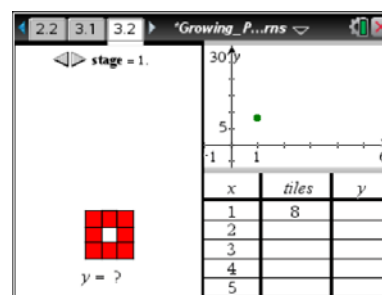
See Note 4 at the end of this lesson.



Move to page 3.2.

5. On page 3.2, use the slider for stage to grow a third pattern. Determine the growth rate, and write a function that represents the number of tiles in relation to the stage number.

Answer: The growth rate is 5 tiles per stage, and the function is $y = 5x + 3$.

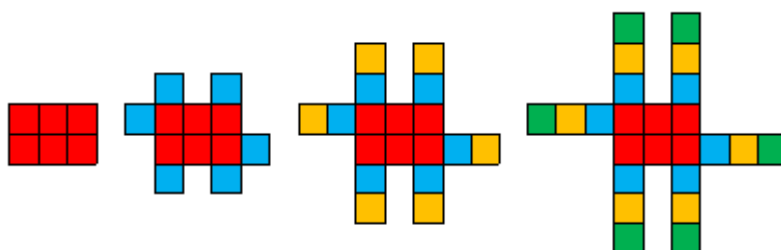


TI-Nspire Navigator Opportunity: *Quick Poll*

See Note 5 at the end of this lesson.

6. Design a pattern that grows at a constant rate but more quickly than all of the previous patterns. Draw the first 4 stages of your pattern, and write a function that represents the number of tiles in relation to the stage number.

Sample Answers: Student answers will vary. The function that represents the pattern depicted is $y = 6x$.



Teacher Tip: You might need to make sure that students created a linear function.



TI-Nspire Navigator Opportunity: *Quick Poll*

See Note 4 at the end of this lesson.



Wrap Up

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

- A linear function can model a relationship between two quantities.
- The rate of change and initial value of a linear function can be determined from a description of a relationship or from two (x, y) values, including reading these from a table or from a graph.
- The rate of change and initial value of a linear function can be interpreted in terms of the situation it models and in terms of its graph or a table of values.



TI-Nspire Navigator

Note 1

Question 1 Quick Poll (*Open Response*)

Send an Open Response Quick Poll, asking students to submit their answers to questions 1 a – f.

Note 2

Question 2 Quick Poll (*Open Response*)

Send an Open Response Quick Poll, asking students to submit their answers to questions 2 b – d.

Note 3

Question 3 Quick Poll (*Open Response*)

Send an Open Response Quick Poll, asking students to submit their answers to questions 3 a, d and e.

Question 3 Class Capture

Take a Class Capture of Page 1.2 where students have graphed the function that they have created. As a class, discuss the various cases that occur.

Note 4

Question 4 Quick Poll (*Open Response*):

Send an Open Response Quick Poll, asking students to submit their answer to questions 4 and 6.

Note 5

Question 5 Quick Poll

Send an Open Response Quick Poll, asking students to submit their answer to question 5.

The Calculator Application**PD Objectives**

- Participants will explore various templates, symbols, and menu options of the Calculator application.

Main Focus – Suggested Questions/Strategies for Accomplishing Objectives

- Consider giving participants a fixed amount of time for this activity (about 15 to 20 minutes).
- Throughout the activity, participants should recognize the possibilities of the various Menu options. Encourage the group to share their findings.
- Do not cover all features or show them how to do every type of calculation. Be careful of time.

Technology Tips

- Consider making someone the Live Presenter so that you can lead participants through part of the activity or so that a participant can share how to do a calculation with the group.
- Consider using Class Capture set to Auto-Refresh every 30 seconds so that you can monitor the group and so that participants can learn from what others are doing.

Summary Reflection Questions

- What advantages are gained for classroom instruction with the TI-Nspire™ Calculator application and the Touchpad?
- What templates and menu options did you find that will be helpful in your classroom?
- How does “pretty print” encourage students to use proper notation when working with fractions or exponents?

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| Demonstration – Formative Assessment |
| PD Objectives <ul style="list-style-type: none"> The focus of this demonstration activity is the use of the TI-Nspire™ Navigator™ System for assessment. |
| Materials Needed/Set Up Requirements <ul style="list-style-type: none"> Demo_FA_Math.tns, or Demo_FA_MG_Science.tns, or Demo_FA_HS_Science.tns |
| Main Focus – Suggested Questions/Strategies for Accomplishing Objectives <ul style="list-style-type: none"> Participants will play the role of students who respond to questions in an assessment document sent to their handhelds by the TI-Nspire Navigator System. The instructor acts as the class teacher. The instructor again demonstrates how to send a document to a class. Use the Auto-Refresh feature of Class Capture to demonstrate the monitoring of student work during a class. Demonstrate how to collect a document, save it to Portfolio, and show the Class Results in the Review Workspace. Compare this assessment to the Quick Polls that were sent during other activities. The participant materials for this activity are designed to serve as a guide for the demonstration. Ask the participants to NOT follow along with the print materials while you are giving the demonstration, but assure them all the steps to perform the TI-Navigator tasks are in the materials. They will have many opportunities to discuss and practice various assessment options available with the TI-Nspire Navigator System. |
| Technology Tips <ul style="list-style-type: none"> Remind the participants that they do not submit their responses as they did for Quick Polls. |
| Summary Reflection Questions <ul style="list-style-type: none"> How does the ability to compare a previous assessment of the same concept in the Portfolio enable you to more easily gauge the growth of student? What benefits does the use of the Auto-Refresh feature of Class Capture provide when students are working on an assessment or any other assignments? |

The Graphs Application – Parts One and Two

PD Objectives

- Participants graph a linear function, display a table of values for the function, and transform the function. They also graph two functions and determine the point(s) of intersection.

Main Focus – Suggested Questions/Strategies for Accomplishing Objectives

- When the Graphs application is selected, the Standard window is displayed. Discuss the dimensions of this window.
- If a participant graphs two functions that have two points of intersection and one or both of those points are outside of the current window, the Window/Zoom menu could be discussed. However, this would also be a good opportunity to demonstrate what happens when the Analyze Graph (Intersection) or Point of Intersection(s) tool is used in this context.
- Use Class Capture with an automatic refresh of 30 seconds to view the participants' progress.
- At the completion of this activity, consider demonstrating the 3D Graphing option. In the Graphs application, select 3D Graphing by pressing **Menu > View > 3D Graphing**. Press the arrow keys to rotate the graph. Press **A** for Auto Rotation. Press **Esc** to exit Auto Rotation.

Technology Tips

- Participants might need some assistance with “grabbing” and dragging the graph of the function.
- A table can be inserted on a separate page rather than to the right of the Graphs page by adding a Lists & Spreadsheet page.
- When participants first opened a Graphs application page, the entry line was displayed. It is hidden after a function is graphed. Press **Tab** or **Ctrl+G** to show the entry line.
- With two functions graphed, show participants how to display the list of function definitions. Open the entry line to display $f_3(x)$ and then click on the Expand Entry Line icon in the bottom right corner of the screen.
- Provide troubleshooting help particularly for the following:
 - Moving function labels.
 - Selecting the functions by clicking on them to determine the point(s) of intersection.
 - Pressing **Esc** if the graph of a function or a label is selected accidentally.
 - The use of the Undo command, if needed.

Summary Reflection Questions

- How can the use of the same color for the graph, the graph's label, and the function definition in the table help students better connect the algebraic, geometric, and numeric representations of the function?
- How can the **Transformation** tools help students understand transformations of linear functions?
- What other strategies could be used to determine the point(s) of intersection of two graphs?

The TI-Nspire™ Navigator™ Classroom

PD Objectives

- During this activity, participants will role-play and perform various TI-Nspire Navigator skills.

Materials Needed/Set Up Requirements

- Each pair of participants will need at least two TI-Nspire documents for this activity. You can send the documents to them through TI-Navigator and have them transfer from their handhelds to the computers they are using; you can provide the documents on a jump drive for each participant to load onto the computers during a break; or you can have them download the TI-Nspire documents from the Math Nspired or Science Nspired websites.

| MG Math | HS Math | MG & HS Science |
|-------------------------------|----------------------------|-----------------------|
| Multiple_Representations.tns | Domain_and_Range.tns | Density_of_Metals.tns |
| Solving_Percent_Problems.tns | Arc_Length_and_Sectors.tns | |
| Variables_and_Expressions.tns | Families_of_Functions.tns | |

Main Focus – Suggested Questions/Strategies for Accomplishing Objectives

- The participants will work in pairs during this activity. One participant will play the role of the “teacher” and operate the computer. One participant will play the role of “students” and operate the TI-Nspire handhelds. After they complete the activity, they should change roles and repeat the activity using different files.
- Give the participants a brief overview of the various workspaces in the software. The overview of the workspaces should be just detailed enough so that they understand directions such as “Go to the Documents Workspace”. A more detailed overview will be given in another activity.
- Be sure to monitor the groups to be certain they are stopping to discuss the various “Reflection” components of the activity.

Technology Tips

- The class is created manually. If a teacher is interested in knowing how to upload a CSV file to create classes, they should be directed to the tip sheet.
- When logging in to the system, inform participants that handheld screens slightly differ depending on whether USB connection cables or wireless modules are used. The screens in the activity result when connected via the USB connection cable, so screens may be slightly different when using wireless modules in the classroom.

Summary Reflection Questions

- How can the TI-Nspire Navigator skills explored in this activity be used to facilitate the teaching and learning of mathematical concepts?
- How can the TI-Nspire Navigator skills explored in this activity be used to engage your students?

Instructor Notes

Creating a Question Document

PD Objectives

- Participants will use the Question application of the TI-Nspire™ Teacher Software to create a question document that includes the six question types.

Materials Needed/Set Up Requirements

- TI-Nspire™ Teacher Software or TI-Nspire™ Navigator™ Teacher Software

Main Focus – Suggested Questions/Strategies for Accomplishing Objectives

- Participants will create a question document and explore the properties of each of the six question types: Multiple Choice, Open Response, Equations, Coordinate Points & Lists, Image, and Chemistry.
- Clarify that documents with the Question application can only be created using the Teacher Software. Therefore, the Question application does not appear in the handheld menu or in TI-SmartView's list of applications or in the Student Software.
- Show participants that when they are choosing the question type, a brief description of the question type appears at the bottom of the window.
- Encourage the use of Expression Boxes when typing questions and answers.
- Distinguish between the application-specific Insert command in the Document Tools pane and the document-level Insert command in the Documents ribbon.
- The Configuration panel in the Document Tools (in the Documents Toolbox pane) contains properties and options specific to each question type. Encourage participants to explore the Configuration panel for each question type.

Technology Tips

- Remind participants that the Document Type applies to all questions in the current document. Therefore, all questions in a document are Self-Check questions if one question in the document is changed to Self-Check.
- Discuss the appropriate use of the Scratchpad by students when they are working on questions.

Summary Reflection Questions

- How can a Self-Check Question document be used to help students assess their understanding of lesson concepts?
- How does the Configuration panel guide the available options for each question type?

Reflection – Day 1**PD Objectives**

- This time is provided for the participants to reflect on the day's activities.

Materials Needed/Set Up Requirements

- Skills Rating Checklist – Appendix
- Ticket Outta Here – Appendix

Main Focus – Suggested Questions/Strategies for Accomplishing Objectives

- Participants will reflect on the day's activities.
- To help monitor the progress of each participant on the various TI-Nspire™ Navigator™ skills, you will find a "Skills Rating Checklist" at the end of the participant binder materials. Use this checklist at the end of each day so that participants can think through what they have learned and what they still need to know and/or practice.
- Ask participants to complete the "Ticket Outta Here."

Summary Reflection Questions

- Was today's pace all right?
- Is there any activity that you would like to review briefly tomorrow?
- What was your favorite activity today?

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| Class Capture Features |
| PD Objectives <ul style="list-style-type: none"> The focus of this demonstration activity is to showcase many of the features of the Class Capture tool of the TI-Nspire™ Navigator™ System by teaching a lesson on graphs of linear functions. |
| Materials Needed/Set Up Requirements <ul style="list-style-type: none"> Class_Capture_Features_QP.tns |
| Main Focus – Suggested Questions/Strategies for Accomplishing Objectives <ul style="list-style-type: none"> During the activity, the instructor provides various prompts and uses Class Capture to lead a discussion of transformations of linear functions. Use Live Presenter so that a participant can demonstrate various steps. If something interesting occurs when using Class Capture, let that participant be the Live Presenter to showcase his or her graph. The participant materials for this activity are to serve as a guide for the demonstration. Ask the participants to NOT follow the materials while you are giving the demonstration, but assure them all the steps to perform the TI-Nspire Navigator tasks are in the materials. Be sure to Click Add to Stack whenever an interesting set of captures are displayed. There are many opportunities to stop and discuss various situations and display interesting patterns. |
| Technology Tips <ul style="list-style-type: none"> Participants might need assistance when first attempting to “grab and drag” as they rotate or translate the graph of the linear function. In the Class workspace, go to File > Settings > Teacher Preferences to select or deselect Randomize order in Screen Capture. |
| Summary Reflection Questions <ul style="list-style-type: none"> How can Class Capture and Live Presenter be used to engage students in a lesson? How can Class Capture, Screen Stacks, and Live Presenter be used to assist students who might be unsure about how to interact with a TI-Nspire document? How can Class Capture and Live Presenter be used to encourage students to “talk about” the mathematics in a lesson? How can you use Screen Stacks during and after a lesson? |

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| Demonstration – Function Match on Image |
| PD Objectives <ul style="list-style-type: none"> The intent of the activity is to demonstrate the use of a y= Quick Poll question where students will match a function to an object in an image. |
| Materials Needed/Set Up Requirements <ul style="list-style-type: none"> Function_Match.tns |
| Main Focus – Suggested Questions/Strategies for Accomplishing Objectives <ul style="list-style-type: none"> You will send participants a y= Quick Poll with an inserted image. Choose the image in the TI-Nspire document that works best for the mathematical content areas of your participants: Fountain (quadratic function), Fence (linear functions). Participants will have an opportunity to experience, as students, entering quadratic functions to match various streams of water in the image or entering linear functions to match a brace on the fence. During the activity, be sure to demonstrate how to engage students who quickly complete a task by asking them to proceed to a more challenging task. The participant materials for this activity are to serve as a guide for the demonstration. Ask the participants to NOT follow the materials while they are participating as students, but assure them all the steps to perform the TI-Navigator activity are in the materials. Participants will have an opportunity to experience the activity as teachers when they role play later in the workshop. |
| Summary Reflection Questions <ul style="list-style-type: none"> How can images that are included in questions be used to engage students as you teach or review various functions? How can the use of images help students make “real world” connections between mathematical concepts and their applications? What types of images could you use with your students to teach or assess other types of functions? |

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| Navigator Performance Reflection |
| PD Objectives <ul style="list-style-type: none"> The purpose of this activity is for participants to discuss the information on student understanding provided by Quick Poll student data. |
| Materials Needed/Set Up Requirements <ul style="list-style-type: none"> A TI-Nspire™ document, <i>Navigator_Performance_Reflection.tns</i>, has been created so that participants can use these questions with their students if they choose to do so. It is not necessary to send the document to the participants for this activity. |
| Main Focus – Suggested Questions/Strategies for Accomplishing Objectives <ul style="list-style-type: none"> The intent of the activity is for participants to examine response data and attempt to understand the errors students have made. Have them examine the sets of Quick Poll responses and share their thoughts on the questions in the activity. As participants consider the errors that students made, encourage them to think about the information about student thinking that can be gained from incorrect responses to a question. |
| Summary Reflection Questions <ul style="list-style-type: none"> How can asking students to explain their thinking about a problem provide information that could help improve other students' problem solving skills? How can good distractors in multiple choice questions provide valuable information on student misconceptions? How can considering possible student errors when we write test questions help us plan follow-up questions that could be asked to help students remedy their errors or misconceptions? |

Graphing a Scatter Plot

PD Objectives

- In this activity, participants will enter data into a spreadsheet and create a scatter plot using Quick Graph.

Main Focus – Suggested Questions/Strategies for Accomplishing Objectives

- The Quick Graph is initially created without selecting both lists. This allows for discussion about how to change a list that is currently graphed and how to add a second list to be graphed.
- You might want to demonstrate a different way to select a variable for each axis: after Quick Graph is selected or a Data & Statistics application page is added, press Tab. The cursor moves to the region of the screen where the horizontal axis variable is selected. Additionally, the list names stored in the Variables menu are displayed. After selecting a list, press Tab a second time to move to the region where the vertical axis variable is selected. The list names are displayed, and a list can be selected.
- Information is provided on selecting both lists before selecting Quick Graph.
- Directions for graphing the scatter plot on a separate page using the Data & Statistics application are included.
- If time permits, you might want to let participants explore entering more data into the spreadsheet and viewing the changes in the scatter plot. They might need to resize the window.
- Optional: Create a scatter plot in a Graphs application page using the scatter plot graph type. (Determine if this is an appropriate time to explore or even mention this alternative.)

Technology Tips

- Participants might need to move very close to the edge of the screen to see the “Click or Enter to add variable” message.

Summary Reflection Questions

- What are the advantages and disadvantages of creating the scatter plot on the same page with the Quick Graph command as opposed to graphing the scatter plot on a separate page?
- Discuss the mathematics in the activity, and brainstorm types of questions that could be asked in a classroom.
- What steps might be taken next to verify predictions related to the number of layers for a certain number of folds?

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| Demonstration – Travel Distance |
| PD Objectives <ul style="list-style-type: none"> The focus of this demonstration activity is to have the participants experience aggregating data with the TI-Nspire™ Navigator™ System or TI-Nspire™ Navigator™ NC System from the student perspective. |
| Materials Needed/Set Up Requirements <ul style="list-style-type: none"> Travel_Distance_QP.tns |
| Main Focus – Suggested Questions/Strategies for Accomplishing Objectives <ul style="list-style-type: none"> The participant materials for this activity are to serve as a guide for the demonstration. Ask the participants to NOT follow the materials while you are giving the demonstration, but assure them all the steps to perform the TI-Navigator tasks are in the materials Participants should be encouraged to consider how the various TI-Navigator components are used throughout this lesson. Ask participants to note those features that “stood out to them” and allow them time to discuss the potential use of these features in their classrooms. |
| Technology Tips <ul style="list-style-type: none"> Add one extra student to the class. This “absent” student is useful for demonstrating the meaning of the numbers displayed with the transfers in the Class Record. For example, if the TI-Nspire document is not sent to “Logged in only,” at least one student - the “absent” student - will not have received the document. Assist participants in setting up a scatter plot on a Data & Statistics page as needed. You might want to make one participant the Live Presenter to demonstrate the steps in this process. |
| Summary Reflection Questions <ul style="list-style-type: none"> How was the instructor able to interact with the class using the TI-Nspire Navigator System? How could these interactions engage students? |

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| Practice Assessment Documents |
| <p>PD Objectives</p> <ul style="list-style-type: none"> The intent of this activity is for participants to become more familiar with the types of assessment questions available for TI-Nspire™ documents, to practice sending and collecting documents, to practice saving documents containing assessment questions to the Portfolio, and to practice reviewing student data. |
| <p>Materials Needed/Set Up Requirements</p> <ul style="list-style-type: none"> Math_A.tns Math_B.tns You can send the documents using the TI-Nspire Navigator System and have them transfer them from their handhelds to the computers they are using; you can provide the files on a jump drive for each participant to load onto the computers during a break; or you can have the participants use the question documents they created in a previous activity. |
| <p>Main Focus – Suggested Questions/Strategies for Accomplishing Objectives</p> <ul style="list-style-type: none"> The participants will work in pairs during this activity. One participant will play the role of the “teacher” and operate the TI-Nspire™ Navigator™ Teacher Software. The other participant will play the role of “student” and will operate two TI-Nspire™ handhelds connected to the computer to simulate two students logged into a class. Once the activity is complete, the participants will change roles and repeat the activity using a different TI-Nspire document for assessment. The activity starts with a review and practice of operations the participants performed previously as “students” so that they can gain confidence with the components of the software. The purpose of this activity is not to create the documents but to use them once they are created. The creation of a TI-Nspire document with questions will be covered in another activity. Be sure to monitor the groups to be certain they are stopping to discuss the various “Questions for Thought” provided in the activity. |
| <p>Summary Reflection Questions</p> <ul style="list-style-type: none"> How can the use of pre-made TI-Nspire assessment documents provide insight into student thinking? How could these pre-made TI-Nspire documents be used for both formative and summative assessment in your classroom? |

Inserting an Image into a TI-Nspire™ Document

PD Objectives

- Participants will use the TI-Nspire™ Teacher Software to insert images into the Graphs and Geometry applications.

Materials Needed/Set Up Requirements

- TI-Nspire Teacher Software or TI-Nspire™ Navigator™ Teacher Software

Main Focus – Suggested Questions/Strategies for Accomplishing Objectives

- Participants will insert an image that has been automatically pre-loaded in the **My Documents > TI-Nspire > Images** folder. Emphasize that all jpg, jpeg, bmp, and png formats are supported, so participants and students can load their own images.
- Images can be easily moved and resized within a TI-Nspire document. Though images can also be vertically and horizontally compressed and stretched, tell participants to consider cropping images as necessary before inserting them into a TI-Nspire document.
- Images seen in the Teacher Software may have a slightly different appearance than an image viewed on a handheld. Encourage participants to preview images on a handheld before utilizing them in the classroom.
- For TI-Nspire™ Touchpad and TI-Nspire™ Clickpad handhelds with the latest operating system, images appear in gray scale. Consider previewing an image for the participants in the Teacher Software's TI-SmartView™ emulator using the Touchpad or Clickpad display.

Technology Tips

- If a TI-Nspire document requires students to plot points or graph functions on an image, consider increasing the transparency of the image. To do this, insert the image in a Geometry application and change the page to a Graphs application by selecting **View > Graphing**.
- To delete an image in the Teacher Software, select the image and press the Backspace key.

Summary Reflection Questions

- How can images be used to make connections between real-world objects and mathematical concepts?
- What types of images might be particularly useful to promote these connections?
- How might the use of student-generated images promote engagement?
- What issues should be considered when inserting images?

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| Resources |
| PD Objectives <ul style="list-style-type: none"> In this activity, participants explore the Content Workspace of the TI-Nspire™ Navigator™ Teacher Software and investigate the resources available to support the use of the technology in their classrooms. |
| Materials Needed/Set Up Requirements <ul style="list-style-type: none"> TI-Nspire™ Navigator™ Teacher Software or TI-Nspire™ Teacher Software Internet access |
| Main Focus – Suggested Questions/Strategies for Accomplishing Objectives <ul style="list-style-type: none"> Before participants explore the Content Workspace, discuss the different workspaces available with the TI-Nspire Navigator Teacher Software to ensure that they understand each one's use(s). Discuss the preview options in the Content Workspace and how to preview TI-Nspire™ documents. Encourage teachers to explore various TI websites and the lessons available for different content areas. Be sure that they explore the Video Tutorials as well as the Alignment tools. In this activity, participants will be instructed to select a lesson from the Math Nspired website and download the TI-Nspire document, Student Activity, and Teacher Notes separately. They will then practice transferring a TI-Nspire document from the computer to a handheld. If time permits, ask participants to briefly share information on the activity that they chose to download. |
| Technology Tips <ul style="list-style-type: none"> If participants explore the Archives section of the TI Math website, remind them that they must select TI-Nspire to review activities created for the TI-Nspire rather than the TI-84. |
| Summary Reflection Questions <ul style="list-style-type: none"> How can the resources available on the TI websites help you prepare to use the TI-Nspire in your classroom? How can the activities available at the various websites be used in conjunction with your curriculum? |

Reflection – Day 2**PD Objectives**

- This time is provided for the participants to reflect on the day's activities.

Main Focus – Suggested Questions/Strategies for Accomplishing Objectives

- Participants will reflect on the day's activities.
- To help monitor the progress of each participant on the various TI-Nspire™ Navigator™ skills, you will find a "Skills Rating Checklist" at the end of the participant binder materials. Use this check list at the end of each day so that participants can think through what they have learned and what they still need to know and/or practice.
- Ask participants to complete the "Ticket Outta Here."

Advanced Questioning

PD Objectives

- The intent of this activity is for participants to create more Advanced Questions (Equations and Expressions, Coordinate Points and Lists, and Image) within a TI-Nspire™ document and to work with the student data in the Review Workspace.

Materials Needed/Set Up Requirements

- The TI-Nspire document, *Advanced_Questioning_Demonstration.tns*, is for the instructor demonstration at the beginning of the activity.
- An image file, *triangles.jpg*, is included for the participants which can be provided on a jump drive for each participant to load onto the computers during a break.

Main Focus – Suggested Questions/Strategies for Accomplishing Objectives

- The first part of the activity is a demonstration to allow the participants to experience more advanced questions as a student only. The questions from the *Advanced_Questioning_Demonstration.tns* should be sent individually as Quick Poll questions and reviewed immediately. Be sure to discuss the uses of the different data views for each question.
- After the demonstration, the participants should work in pairs to help each other, changing roles for each new question type, and, if there is time, repeating.
- The instructor should monitor the participants closely when they are creating questions, especially when working with an image.
- The location of the standard TI-Nspire pre-loaded images is **My Documents > TI-Nspire > Images**.

Summary Reflection Questions

- How can these types of questions be used to engage students and teach mathematical concepts?
- How can these types of questions turn a Quick Poll question into a class exploration?

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| The Portfolio Workspace |
| PD Objectives <ul style="list-style-type: none"> The intent of this activity is for participants to become more familiar with the Portfolio Workspace and its various grade-related features such as changing the answer key, grading student work from the Portfolio Workspace, and exporting assignment data. |
| Materials Needed/Set Up Requirements <ul style="list-style-type: none"> Understanding_Slope_PW.tns Slope_From_Graph_PW.tns Slope_From_Two_Points_PW.tns Send the documents to the participants through TI-Nspire Navigator and have them transfer them from their handhelds to the computers. Alternatively, provide the files on a jump drive for each participant to load onto the computers during a break. |
| Main Focus – Suggested Questions/Strategies for Accomplishing Objectives <ul style="list-style-type: none"> The first part of the activity is to “Prepare the Portfolio Workspace”. This might not be necessary if participants have been saving assignments to the portfolio throughout their training. But it might be easier to have similar data and information to use throughout the activity. Be sure to discuss the importance of the Portfolio Workspace for teachers in their classroom. The Portfolio allows the teacher to easily manage TI-Nspire documents for absent students and gives the teacher a “picture over time” of student understanding if used regularly to assess student knowledge. |
| Summary Reflection Questions <ul style="list-style-type: none"> Why are the skills explored in this activity important? How do the Portfolio and Class Record options make it easy to include all students’ work in the analysis of class data? |

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| Data Aggregation |
| PD Objectives <ul style="list-style-type: none"> The goal of the activity is for participants to gain experience with the data aggregation capabilities of the TI-Nspire™ Navigator™ System. |
| Materials Needed/Set Up Requirements <ul style="list-style-type: none"> Data_Aggregation_QP.tns (Instructor use only) |
| Main Focus – Suggested Questions/Strategies for Accomplishing Objectives <ul style="list-style-type: none"> Participants have seen a demonstration of how a Quick Poll question can be used to collect student data that can be aggregated and then sent to all students. Participants will practice the data aggregation process. The participants will work in pairs during this activity. One participant will play the role of the “teacher” and operate the computer. The “student” will operate two TI-Nspire handhelds. Participants should alternate roles for the different question types. The TI-Nspire document for this activity demonstrates the Quick Poll question types (<i>Data Aggregation_QP.tns</i>) used to collect data for the examples. |
| Technology Tips <ul style="list-style-type: none"> To delete the column of student names from a Lists & Spreadsheet page, use the up arrow on the keyboard to highlight the entire column. Then right-click on the highlighted column, and select “Delete Column”. |
| Summary Reflection Questions <ul style="list-style-type: none"> How can aggregated data activities be used to explore various functions? How can data aggregation techniques help us spend more class time on concept development and less time on data entry? What other possible data aggregation activities did you share in your group? |

Creating Split-Screen Questions**PD Objectives**

- This lesson has two parts. Part one is creating a split-screen question led by the instructor. This is followed by part two which has the participants practice with two prepared questions.

Materials Needed/Set Up Requirements

- Split_Screen_Questions.tns (Instructor use only)

Main Focus – Suggested Questions/Strategies for Accomplishing Objectives

- After leading the participants in writing a split-screen question, allow time for the participants to practice. During the practice time, monitor the progress of the participants as they create questions and assist them when needed.
- During the instructor-led part of the activity, ensure that participants understand that all menu options for a particular application are located in the Document Tools in the Documents Toolbox.
- The TI-Nspire document *Split_Screen_Questions.tns* contains the questions described in the activity. It is included, but participants will be creating their own TI-Nspire documents.

Summary Reflection Questions

- How can the use of split screens enhance questions created with the Teacher Software?
- How can the use of color help students make connections between answer choices and the graphs of the answer choices?

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| Demonstration of the PublishView™ Feature |
| Overview <ul style="list-style-type: none"> Provide a brief overview of PublishView™ features using pre-made PublishView documents. |
| Materials Needed/Set Up Requirements <ul style="list-style-type: none"> If_a_Tree_Falls_english.tnsp (automatically pre-loaded in My Documents\TI-Nspire\Examples) Stopping_Distance.tnsp (instructor use only) |
| Main Focus – Suggested Questions/Strategies for Accomplishing Objectives <ul style="list-style-type: none"> When the software is installed, a sample PublishView document (<i>If_a_Tree_Falls_english.tnsp</i>) is loaded in My Documents\TI-Nspire\Examples. When Open Document is selected, the TI-Nspire folder is the default location. Participants should open <i>If_a_Tree_Falls_english.tnsp</i> in the TI-Nspire™ Teacher Software. Allow participants to investigate the document without instruction. Answer any questions regarding PublishView features that participants have while exploring <i>If_a_Tree_Falls_english.tnsp</i>. Demo <i>Stopping_Distance.tnsp</i> for participants. |
| Technology Tips |
| Summary Reflection Questions <ul style="list-style-type: none"> How do you foresee using the PublishView feature? How does PublishView facilitate multiple representations and interconnectivity of problem situations? How does PublishView assist teachers in planning lessons and organizing lesson components? How can PublishView be used to engage students (the hook)? How could your students use PublishView? |

Weaving in TI-Nspire™ Navigator™**PD Objectives**

- The primary goal of the activity is give participants time to think about how to use TI-Nspire Navigator to administer and enhance an activity.

Materials Needed/Set Up Requirements

- If Internet access is not available, the following activities are provided in the folder for the workshop.
- All lessons are from Math Nspired unless otherwise noted.

MG Math

- Middle Grades > The Number System > Addition and Subtraction of Rational Numbers: Pt 1
- Middle Grades > Expressions and Equations > Words for Algebra
- Middle Grades > Statistics and Probability > Exploring Bivariate Data
- Middle Grades > Statistics and Probability > Linear Modeling
- Algebra 1 > Linear Functions > Multiple Representations

HS Math

- Algebra 1 > Equations > From Expressions to Equations
- Algebra 1 > Linear Functions > Multiple Representations
- Geometry > Transformational Geometry > Exploring Transformations
- Geometry > Points, Lines, and Angles > Points, Lines, and Planes
- Algebra 2 > Quadratics > Modeling with a Quadratic Function
- Algebra 2 > Powers, Roots, and Radical Functions > Exploring Power Functions 1
- Precalculus > Functions and Graphs > The Classic Box Problem - Exploration
- Precalculus > Polynomial, Power and Rational Functions > Polynomial Rollercoaster
- Precalculus > Trigonometry > The Unit Circle

Main Focus – Suggested Questions/Strategies for Accomplishing Objectives

- Participants can work in pairs or individually if they choose. If colleagues are taking the workshop, then this activity is a great opportunity for them to collaborate on a concept of mutual interest.
- Some of the activities the participants download will already have tips referencing TI-Nspire Navigator usage, but they will most likely be general references. Have participants think very specifically about TI-Nspire Navigator usage for the activity.
- The instructor role for this activity is to walk around and observe. Be sure the participants are not trying to perform the TI-Navigator actions; this activity is for planning a lesson using TI-Nspire Navigator.

Technology Tips

- When downloading activities from the Content Workspace using the “Save this Activity to the Computer” button, the files are saved as a lesson bundle with the extension .TILB. A lesson bundle is a packaged file that contains **all** of the documents for the activity.

Reflection – Day 3**PD Objectives**

- Participants will reflect on how their classroom practice will change based on what they have learned in the workshop.

Main Focus – Suggested Questions/Strategies for Accomplishing Objectives

- As a closure/wrap-up discussion, ask participants to think about their current practice in the classroom and how their classroom practice will change based on what they have learned in the workshop.
- Ask them to do a pair/share with a partner. They should share a goal with their partner. Then, the partner would share that goal with the larger group. For example, if Alice shared her goal with Chris, Chris would report to the group: Alice's goal is to increase the use of technology in her classroom by first incorporating Quick Polls and Class Captures. (Note: If time does not permit sharing with the larger group, at least have participants share with their partners.)
- To help participants monitor their progress on the various TI-Nspire™ Navigator™ skills, you will find a "Skills Rating Checklist" at the end of the participant binder materials. Use this check list at the end of each day so that participants can think through what they have learned and what they still need to know and/or practice.
- Provide an opportunity for participants to share contact information.