Leader Notes: Name Your Source!

Engage Phase

Purpose:
Provide participants the opportunity to investigate a variety of data sources. *Assess participants' experience and comfort with various avenues and tools for collecting data.* Compare and contrast technology-based data sources with technology-free data sources.

Descriptor:
Participants will rotate through four stations to gather data:
- Internet data sources
- Printed data sources, such as an almanac
- Calculator-based data collection tools
- Technology-free data collection tools

Upon completion of the activities at each station, participants will compare and contrast their experiences with Internet data sources and printed data sources. They will also compare and contrast their experiences with calculator-based data collection tools and technology-free data collection tools. Introduce participants to the formulation of questions that will spark data collection and investigation.

Duration:
1.5 hours

TEKS:
2A.1 (A) Identify the mathematical domains and ranges of functions and determine reasonable domain and range values for continuous and discrete situations.

2A.1 (B) Collect and organize data, make and interpret scatterplots, fit the graph of a function to the data, interpret the results, and proceed to model, predict, and make decisions and critical judgments.

TAKS Objectives Supported by these Algebra 2 TEKS:
- Objective 1: Functional Relationships
- Objective 10: Mathematical Processes and Tools

Technology:
- Internet Website:
  http://exploringdata.cqu.edu.au/datasets/oil_prod.xls
- Calculator-based ranger (CBR) and graphing calculator

Materials:

Advanced Preparation:

- ✓ Create survey statements on chart paper for the recording of individual responses.
- ✓ Print Data Station Cards using a color printer.
- ✓ Recreate Venn diagrams from the Reflections on Data activity sheet on large chart paper.
- ✓ Create one set of Venn diagrams for every 12 participants.
- ✓ Cut out 36 one-inch squares for each Data Station D that will be made available to participants.
- ✓ Copy "Planning for Intentional Use of Data in the Classroom" activity sheets on green paper.

Presenter Materials: Internet access and projection device, overhead graphing calculator, PowerPoint slides or transparencies of transparencies and activity sheets

Per group: *Data Station A:* Computers with internet access
Data Station B: 1 *Time Almanac 2005* for each group of 4 participants that at this station.
Data Station C: CBR, graphing calculator, and different sized beach balls for each group of 4 participants at this station.
Data Station D: One-inch cubes and yard stick for each group of 4 participants at this station

Per participant: activity sheets

Leader Notes:

*The goal of the Engage phase is to begin conversations about data. As teachers see the value of data and the mathematics that can be explored and reinforced through the use of data, they will begin to seek out data. Technology offers the tools to efficiently make sense of data. Technology also offers effective means for representing data so that analysis may take place. Encourage participants to interact with each other. The presenter(s) should move around the room facilitating the activity. Use the **Facilitation Questions** to guide and redirect participants, as needed.*

Engage

1. *Record the following statements on chart paper. Post these statements around the room.*

Technology offers the opportunity to strengthen mathematical learning in my classroom.

| Strongly | Strongly |
| Disagree | Agree |

Students should learn first with paper-and-pencil methods and then with technology.

| Strongly | Strongly |
| Disagree | Agree |

My students know how to discern which of these methods best serves the purposes of a given problem: mental strategies, paper-and-pencil techniques, and technology applications.

| Strongly | Strongly |
| Disagree | Agree |

The best technology tool for the mathematics classroom is the graphing calculator.

| Strongly | Strongly |
| Disagree | Agree |

2. *As participants enter the session, direct them to respond to the posted statements by placing a marker, such as a sticky dot, in the location that best corresponds to their response. Use only one color of sticky dot for this activity.*

3. *As you provide a welcome and introduction to this professional development session, direct the participants' attention to the posted statements, sharing that continued reflection about these statements will be explored in greater detail during the course of this professional development.*

4. *Distribute a **Data Station Card** to each participant. Direct the participants to move to the station described on his or her card.*

> **Archival data** *are data that are not, under normal circumstances, subject to change. Examples of archival data include results from concluded research, medical records, and historical data.*
> **Dynamic data** *are data that are, under normal circumstances, subject to change. The data may be updated routinely or on request. An example of dynamic data is survey results that update based on each new response.*
> **Categorical data** *reflect data organized by category rather than by number. The frequencies of the categorical data are counted. Examples of categorical data include favorite color, voting, males/females, etc.*
> **Numerical data** *are data that reflect measurable, quantifiable attributes. The measures, rather than the attributes, form the data. Examples of numerical data include measures of length, measures of radio frequency, measures of time, etc.*

5. *After participants have moved to the appropriate station, model the activity at Station A for the whole group using a projection system so that participants understand the intent of the activity. Avoid walking the participants through the entire activity sheet so that the groups at Station A still have a meaningful learning experience. Demonstrate using* http://exploringdata.cqu.edu.au/datasets/oil_prod.xls.

> **Facilitation Questions**
> - What data are provided by this webpage? How would we record this information on the **Data Station A Recording Sheet**?
>   *Answers may vary.*
> - Are the data numerical, categorical, or both? How would we record this on the **Data Station A Recording Sheet**?
>   *Answers may vary.*
> - What relationships are described by this data? Why? How would we record this information on the **Data Station A Recording Sheet**?
>   *Answers may vary.*

6. *Explain that the time allotted for each data station is 12 minutes. In these 12 minute segments, the participants should explore the given data source while recording observations and notes on the station's recording sheet. A count-down timer is a beneficial tool for keeping participants on task.*

7. *Walk to each data station, clarifying directions as necessary and prompting discussion as necessary.*

8. *After 12 minutes have passed, direct the participants to rotate to the next data station. Data Station D participants should move to Data Station A, Data Station A participants should move to Data Station B, etc. Allow approximately 3 minutes to transition between groups.*

9. *Repeat the rotation until each group as been at each data station. Continue to use the facilitation questions as needed.*

Facilitation Questions

Data Station A
- What numerical data have you found?
  The number of barrels of oil produced in given years.
- What relationships are found within the numerical data?
  Answers may vary.
- What trends do you notice?
  Answers may vary.
- How might you prompt students to represent the data?
  Answers may vary. Plot the data on a coordinate grid with or without technology.
- What questions might you pose to your students about the students' representations of the data?
  Answers may vary. Does the data appear to be linear? Can you draw a trend line? Can you find the line of best fit (regression line)?

Data Station B
- What numerical data have you found?
  Answers may vary. Lengths of general coastlines and tidal shorelines.
- What relationships are found within the numerical data?
  Answers may vary.
- What trends do you notice?
  Answers may vary.
- How might you prompt students to represent the data?
  Answers may vary. Plot the data on a coordinate grid with or without technology.
- What questions might you pose to your students about their representations of the data?
  Answers may vary. Does the data appear to be linear? Does the data appear to be non-linear?

Data Station C
- What numerical data did you generate?
  Answers may vary.
- What relationships are found within the numerical data? Why?
  Answers may vary.
- How might you summarize the data generated by your group?
  Answers may vary.
- How might you represent the data generated by your group?
  Answers may vary.
- How might you use these tools to generate two sets of data for comparison purposes?
  Answers may vary.
- To what real-life experiences might our students relate this data collection activity?
  Answers may vary.

Facilitation Questions

Data Station D

- What numerical data did you generate?
  Answers may vary.
- What categorical data did you generate?
  Answers may vary.
- What relationships are found within the numerical data? Why?
  Answers may vary.
- What relationships are found within the categorical data? Why?
  Answers may vary.
- How might you summarize the data generated by your group?
  Answers may vary.
- How might you represent the data generated by your group?
  Answers may vary.
- How might you use these tools to generate two sets of data for comparison purposes?
  Answers may vary.
- To what real-life experiences might our students relate this data collection activity?
  Answers may vary.

10. *Upon completing rotation through each station, reorganize participants into groups of 4. If using the **Data Station Cards,** regroup by color. Prompt the participants to complete the **Reflections on Data** activity sheet individually. Remind the participants that archival data are data that are preexisting in some form of document. Dynamic data are generated and updated as new data are collected. Allow approximately 5 minutes for the completion of these activity sheets.*

11. *While the participants are completing their individual **Reflections on Data** activity sheets, post 1 set of Venn Diagrams for every 12 participants.*

12. *Prompt participants to move to the chart paper Venn diagrams in groups of 12 by combining 3 existing groups of 4 participants. Tell participants that they will work silently in these groups of 12 to create summary Venn diagrams of the three groups' discussions.*

13. *Prompt the group to identify the person with the longest hair. This person will be the first recorder. Prompt this person to record one statement on the large chart paper Venn diagrams. The statement may be a personal observation or an observation from the group's Venn diagrams.*

14. *Prompt the participant to pass the marker to a new recorder, preferably a person who was not a member of his or her discussion group. This person will record a new statement on the Venn diagram. Prompt participants to continue this process until each participant has had an opportunity to record a statement. Participants may record new observations or statements that occur as a result of seeing the reflections of others. **Note**: Depending on time,*

you may choose to have multiple participants recording on the Venn diagrams at the same time.

Facilitation Questions
- Which similarities did each group note?
  Answers may vary.
- Which similarities were new to you?
  Answers may vary.
- Which differences did each group note?
  Answers may vary.
- Which differences were new to you?
  Answers may vary.
- What are the benefits of an archival data source?
  Answers may vary. The teacher is able to prepare models of representations to which students can compare their efforts.
- What are the benefits of a CBR data source over a technology-free data source?
  Answers may vary. The CBR provides dynamic data in a graphical representation.
- What are the benefits over a technology-free data source over a CBR data source?
  Answers may vary. Availability of technology doesn't determine what learning a teacher offers at what time.

15. Distribute the **Debriefing the Exploration of Data** *activity sheet. Prompt participants to reflect upon the discussions summarized by the Venn diagrams and record their responses to each of the questions posed on the activity sheet. After a few minutes of recording time, prompt the participants to share their responses with another participant. Debrief the responses in whole-group setting, keeping in mind that the goal of this phase of the professional development is to consider data.*

Facilitation Questions
- When might an internet data source support the learning of the math TEKS?
  Answers may vary.
- When might an almanac data source support the learning of the math TEKS?
  Answers may vary.
- Are trends more apparent in data resulting from an Internet or an almanac data source? Why?
  Answers may vary.
- What are the limitations of an Internet data source?
  Answers may vary.
- What are the limitations of an almanac data source?
  Answers may vary.
- How might these limitations impact the learning of the math TEKS?
  Answers may vary.
- What topics in Algebra 2 lend themselves to archival data?
  Answers may vary.

Facilitation Questions
- How do internet-based data sources serve to engage students in the learning process?
  Answers may vary.
- How might you use internet-based data sources to assess student learning?
  Answers may vary.
- Looking at the two Venn diagrams, how are the data sources related?
  Answers may vary.
- Looking at the two Venn diagrams, how are the data sources different?
  Answers may vary.

16. *Pose the questions listed below to the whole group. Explain to the participants that these questions serve as "filtering questions" when seeking to incorporate the use of data into classroom instruction.*
    a. *What TEKS in a particular unit of study are enhanced through the use of data?*
    b. *What data are required to enhance the study of these TEKS?*
    c. *What question(s) may be answered using this data?*
    d. *How does using data allow one to increase the rigor of the learning experience? How might using data move the learner from remembering, understanding, and applying to analyzing and evaluating?*
    e. *What type of data would be most useful for the stated TEKS?*
    f. *What setting will be available during instruction related to these mathematical goals?*
    g. *What actual data source(s) may prove helpful in enhancing mathematical learning related to these TEKS?*

17. *Distribute the **Planning for Intentional Use of Data in the Classroom** activity sheet to each participant. Share with the participants that these reflective questions form the basis for the **Planning for Intentional Use of Data in the Classroom** activity. Share with the participants that these filtering questions helped to develop each of the activities contained within this professional development. This template will serve as a reflection tool to summarize each activity that follows in order to identify elements that support the judicious use of technology.*

Data Station Cards

**Print in color.

Station A	Station B	Station C	Station D
Station A	Station B	Station C	Station D
Station A	Station B	Station C	Station D
Station A	Station B	Station C	Station D
Station A	Station B	Station C	Station D
Station A	Station B	Station C	Station D
Station A	Station B	Station C	Station D
Station A	Station B	Station C	Station D

Data Station A Recording Sheet

| Data Source	http://exploringdata.cqu.edu.au/datasets/oil_prod.xls
How would you describe this set of data? Why?	
What relationships are found within this set of data? Why?	
How would you represent this data? Why?	
What question(s) can we pose to students that this set of data helps to answer?	
How might this data be used to extend what students already understand about our course content?	

Data Station B Recording Sheet

Data Source	*Time Almanac 2005*, "Coastline of the United States," page 502.
How would you describe this set of data? Why?	
What relationships are found within this set of data? Why?	
How would you represent this data? Why?	
What question(s) can we pose to students that this set of data helps to answer?	
How might this data be used to extend what students already understand about our course content?	

Data Station C Recording Sheet

Data Source	CBR, graphing calculator, different sized beach balls
What set of data can you generate with these tools?	
What relationships are found within this set of data? Why?	
How would you represent this data? Why?	
What question(s) can we pose to students that this set of data helps to answer?	
How might this data be used to extend what students already understand about our course content?	

Data Station D Recording Sheet

Data Source	One-inch cubes, yard sticks
What set of data can you generate with these tools?	
What relationships are found within this set of data? Why?	
How would you represent this data? Why?	
What question(s) can we pose to students that this set of data helps to answer?	
How might this data be used to extend what students already understand about our course content?	

Reflections on Data

Complete the following Venn Diagram to compare and contrast the uses of the internet and an almanac as data sources.

Internet Data Source   Almanac Data Source
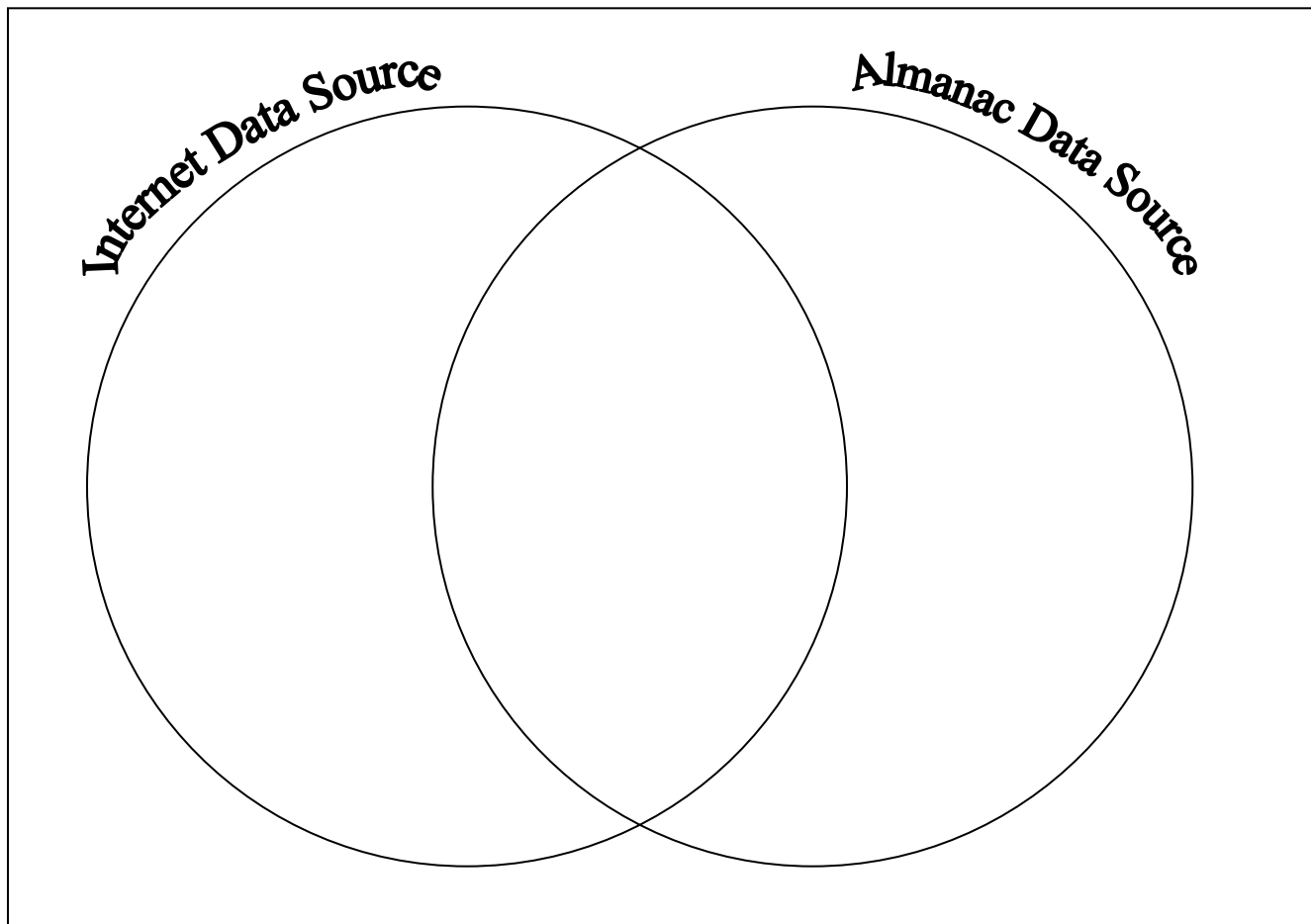
What are the benefits of using data found on the Internet?

What are the benefits of using data found in print sources such as an almanac?

How might teachers use these data sources in an Algebra 2 classroom?

Reflections on Data

Complete the following Venn Diagram to compare and contrast the uses of the graphing calculator tools and hands-on activities as data sources.

Graphing Calculator Tools

Hands-On Activities
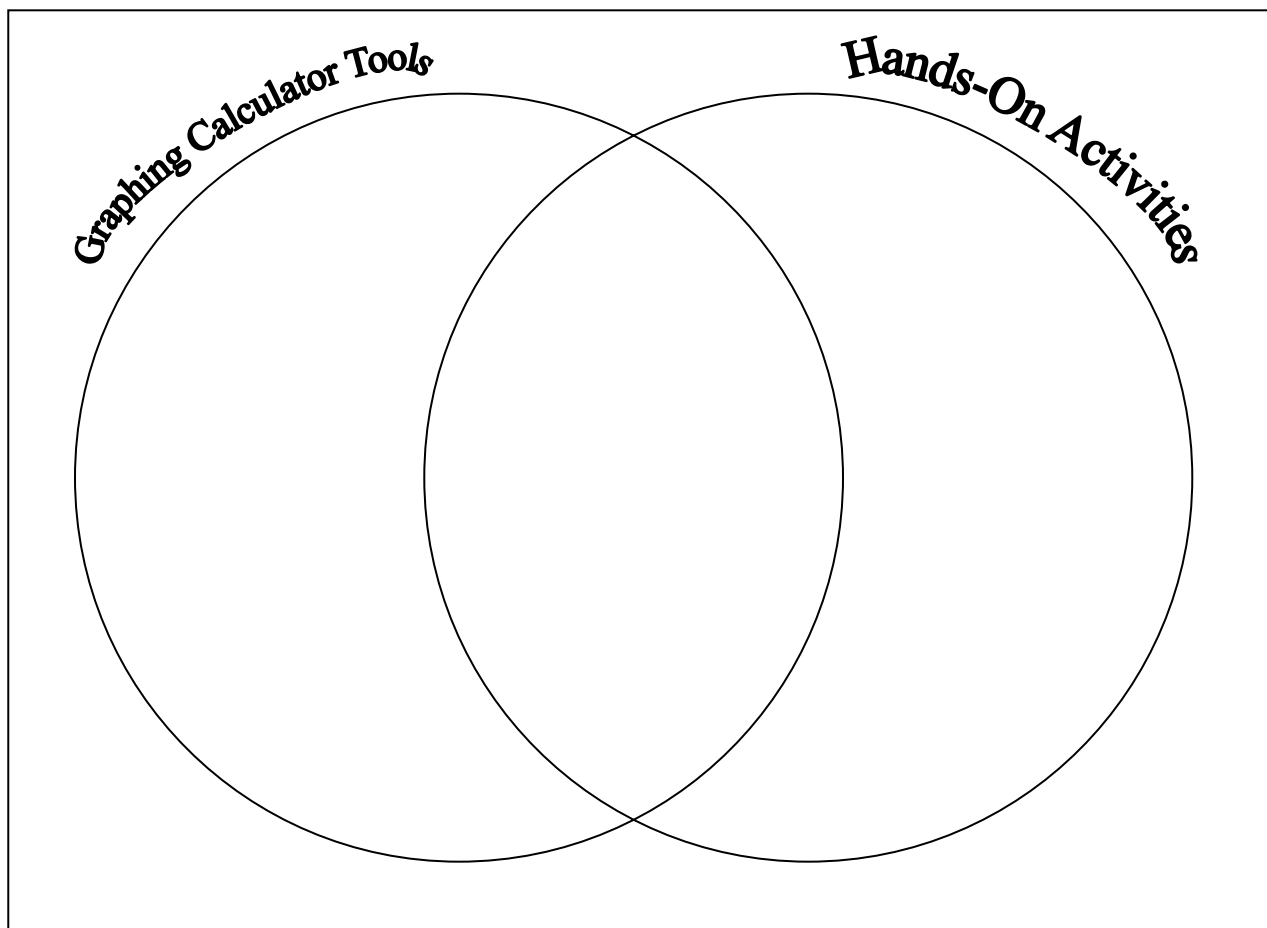
What are the benefits of using data resulting from graphing calculator tools?

What are the benefits of using data derived from hands-on activities?

How might teachers use these data sources in an Algebra 2 classroom?

Debriefing the Exploration of Data

1. What questions can we ask as reflective practitioners to determine the appropriateness of a data source for promoting mathematical learning?

2. How does the technology-based data offer an opportunity to strengthen mathematical learning?

3. How might hands-on activities complement the judicious use of technology?

4. What paper-and-pencil methods do students need to know to make sense of the data we explored?

Planning for Intentional Use of Data in the Classroom

TEKS		
Question(s) to Pose to Students	**Math**	
	Tech	
Cognitive Rigor	Knowledge	
	Understanding	
	Application	
	Analysis	
	Evaluation	
	Creation	
Data Source(s)	Real-Time	
	Archival	
	Categorical	
	Numerical	
Setting	Computer Lab	
	Mini-Lab	
	One Computer	
	Graphing Calculator	
	Measurement-Based Data Collection	
Bridge to the Classroom		