Analyze

Data Use Professional Development Series
Rhode Island Department of Education
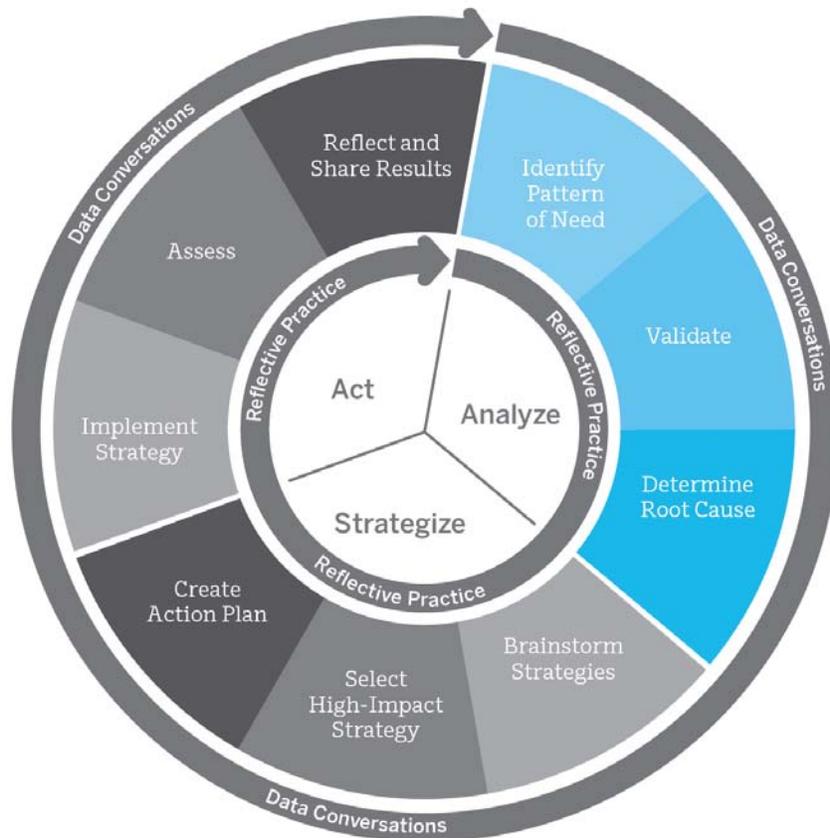
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Identify Pattern of Need

Identifying Patterns of Need in a classroom on an ongoing basis allows you to adjust your instruction to meet the needs of all learners. Working collaboratively to identify Patterns of Need with colleagues in your grade-level team or department helps identify students' similar challenges and strengths as well as possible ways to share students and interventions.

Vocabulary

Pattern of Need: Common results in the data for a group of students specific enough to target instruction where it is needed. The need may be skill-based or content-based. It does not necessarily indicate weakness; a pattern of strength in a particular area may call for enrichment or extension.

Overview

Looking for Patterns of Need for clusters of students is an efficient and effective method to identify the needs of multiple students. Traditionally, teachers track patterns and trends for individual students; however, identifying Patterns of Need for clusters or groups of students provides an opportunity to ask big questions and examine ones' own teaching practice. Identifying Patterns of Need in a data set is the first step in the Taking Action with Data Cycle of Inquiry.

This module provides opportunities to practice identifying Patterns of Need, enabling educators to make effective classroom-level instructional decisions. This module guides you through (1) identifying Patterns of Need in disaggregated data, (2) validating the patterns, (3) brainstorming strategies, and (4) developing a hypothesis. Note: This module includes two sample data sets; the last two exercises require educators to use their own data sets.

Objectives

Upon completion of the Identifying Patterns of Need module, educators will be able to:

- Define Pattern of Need
- Articulate the process for identifying a Pattern of Need
- Identify a Pattern of Need in data
- Complete the initial steps within the Cycle of Inquiry
- Articulate the reasons to focus on Patterns of Need for student clusters, as opposed to individuals

Opening Discussion: Identifying Patterns of Need

Discuss the following with educators before starting the first exercise:

1. Think about your grade book approaching the middle of a term/year.

   a. What data does your grade book contain?

   b. What patterns emerge in your grade book data?

2. Describe a time when you found a Pattern of Need in data. How did you adjust your instruction to address the need?

> **Listen for…**
>
> **During the Opening Discussion, remember these general guidelines to determine how to proceed based on what you hear.**
>
> Begin with Exercise 2.1 if educators have not addressed a well-formed need:
>
> - "All my students failed a unit test that I gave, so I gave them another test."
> - "I group my students into low, medium, and high groups."
>
> Consider jumping to Exercise 2.2 if educators have addressed a well-formed need:
>
> - "I noticed a few of my students struggled with a particular skill. I knew they needed to master it to understand our next unit, so I gave those students 15 minutes of extra practice a day for one week, then reassessed."

Exercise 2.1: Identify Pattern of Need in a Single-Source Data Set

Purpose:

Educators will use a color-based protocol to identify a Pattern of Need in a single-source data set.

Objectives:

Upon completion of this exercise, educators will be able to:

- Make patterns in a data set visible.

- Identify a pattern in a single-source data set.

Materials Needed (for each educator):

- Copies of *Data Set 1* (multiple copies)

- Two differently colored highlighters

- *Exercise 2.1 Reflections* handout

Time:

Approximately 15 minutes

> **Notes to Facilitator:**
>
> 1. When identifying a pattern in data, you may focus on either patterns of strength or challenge. You can conduct this exercise multiple times, and instruct educators to highlight different patterns in the data.
>
> 2. This exercise highlights the lowest and second-lowest scores; but educators can just as easily highlight the highest and lowest, highest and second highest, or another useful metric. The discussion at the exercise's conclusion includes this point.

Instructions

Visualize the Data:

1. Provide each educator a copy of *Data Set 1.*

2. Before examining the chart's data, instruct educators to look at the column headings and the key at the bottom. Ask for comment on what educators see. Responses may include:

   - *It's an item analysis of an assessment.*
   - *Three standards were assessed.*
   - *The highest score possible for each item is 4.*
   - *The lowest score possible is 1.*

3. Provide each educator with two differently colored highlighters to help identify possible patterns in the data.

4. Instruct educators to highlight the lowest possible score with one particular color, and highlight the second lowest possible score with the other color.

Examine Patterns:

1. Ask educators to take a "birds-eye view" and notice what stands out.

2. Ask educators to identify the type of patterns they see.
   Additional probes:

   a. Looking down the columns for each item, did students perform well or poorly on particular items?
      Responses may include:

      - *Most students did poorly on question 4.*
      - *Many students did poorly on question 6.*

   b. Looking across the rows, did clusters of students perform well or poorly?
      Responses may include:

      - *Six students scored 1 or 2 for all questions.*

- *A cluster of students scored 3 or 4 on all questions, except for questions 4 and 6.*

3. Ask educators if they notice details in the patterns that suggest why students scored poorly or well on particular questions.

   Responses may include:
   - *There were three questions about Standard 1, but students only scored poorly on one question of the three.*
   - *Six students scored 1 or 2 for all questions.*
   - *Standard 3 has only one question and few students scored at a proficient level.*

4. Ask educators, "After identifying these details in the pattern, what further questions might you ask?"

   Responses may include:
   - *Do questions 4 and 6 require deeper knowledge than the other two questions about this concept?*
   - *Is question 4 constructed poorly?*
   - *Does Standard 3's only question tell us enough to determine if it is constructed poorly?*
   - *Was Standard 3 taught differently from the other standards?*

5. Point out this exercise highlighted the two lowest scores. Ask, "What if we highlighted the two highest scores? How would that change our focus?"

   Responses may include:
   - *Focus may shift to what students learned rather than what they didn't learn.*
   - *Focus may shift to effective instruction.*

6. Ask educators to suggest other patterns to highlight.

   Responses may include:
   - *Highest and lowest score.*
   - *Level of knowledge of question.*

Reflection:

1. When the discussion concludes, ask each educator to complete the *Exercise 2.1 Reflections* handout.

2. Record the results of the *Exercise 2.1 Reflections* handouts in the *Data Use Professional Development Series Log.*

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Data Set 1

Item Analysis

Standard Number		Standard 1			Standard 2		Standard 3	Overall Score
Question/Item #		1	5	4	3	2	6	
Susan	Burmeister	4	4	2	4	4	2	3.33
Jill	Butler	2	2	1	2	2	1	1.67
Jeffery	Cantrell	4	4	2	4	4	2	3.50
Antonio	Dehart	3	3	1	3	3	2	2.50
John	Doe	3	3	1	2	3	2	2.33
Brandy	Dupree	4	4	3	3	4	3	3.50
Katrina	Farrow	4	3	2	3	3	3	3.00
Patreese	Fitzjohn	4	3	2	3	3	2	2.83
John	Fitzpatrick	2	2	1	1	2	1	1.50
Samuel	Fleck	4	4	2	3	3	2	3.00
Sheryl	Goshorn	4	4	3	3	3	3	3.33
Fred	Hartnett	2	2	1	1	2	2	1.67
Lucille	Islas	2	2	1	1	2	1	1.50
Jacob	Muldoon	4	4	2	3	4	2	3.17
Laura	Na	2	2	1	2	1	1	1.50
Billy	Pachall	4	3	2	3	3	2	3.00
Jacob	Pennell	4	4	3	4	4	3	3.67
Ryan	Pfister	2	1	1	1	2	1	1.33
Shelley	Pink	4	4	1	3	3	2	2.83
Mabel	Strain	3	2	1	2	3	1	1.83
Jonathan	Wayland	4	4	2	4	3	2	3.17
Tina	Wen	4	3	2	3	3	2	3.00
Pearl	Wilk	3	2	2	3	3	2	2.50
Ryan	Zucker	3	3	2	2	3	2	2.50
	AVG.:	3.29	3	1.71	2.63	2.92	1.92	2.58

Key: 1=Beginning   2=Developing   3=Proficient   4=Exemplary

Exercise 2.1: Reflections

Handout

Describe the process you will use to identify a Pattern of Need in student data you expect to collect in the next month.

Rate your ability to identify a Pattern of Need in student data.

Cannot do it	Can do it with significant support	Can do it with some support	Can do it independently
1	2	3	4

Information I still need or want to pursue further:

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Exercise 2.2: Patterns of Need

Purpose:

Educators will use a template and a data set to identify a Pattern of Need, clusters, characteristics.

Objectives:

Upon completion of this exercise, educators will be able to:

- Identify a Pattern of Need in a data set
- Identify cluster characteristics and corresponding evidence in the data set

Materials Needed (for each educator):

- *Data Set 2*
- *Identify Patterns of Need* Template
- Two differently colored highlighters (at least)
- *Exercise 2.2 Reflections* handout

Time:

Approximately 20 minutes

> **Note to Facilitator:**
> Early in this work, we expect educators to conduct rapid, simple Cycles of Inquiry that do not require validation with multiple sources of data.

Instructions:

1. Provide a copy of *Data Set 2* for each educator.

2. Ask educators to read the data set's description and comment on where this data came from.

   Response may include:

   - *It's a copy of each student's exit ticket.*
   - *From a second grade math teacher.*

- *Student answers to one math problem.*

3. Ask educators to use highlighters to make the *Patterns of Need* visual.

   Strategies may include:

   - *Coloring the same responses with the same color.*
   - *Highlighting correct responses only.*

4. Provide a copy of the *Identify Patterns of Need Template* for each educator and review the template's questions and vocabulary.

5. Ask educators to complete the template individually or in small groups. (See *Identify Patterns of Need* Response Guide for possible responses.)

6. Ask educators in small groups to share what they discovered with the whole group.

7. Ask educators to discuss, as a whole group, how reviewing formative assessments like exit tickets can impact how and what you teach.
   Discussion points may include:

   - *Re-teach a foundational skill students seem to lack.*
   - *Correct a misconception.*
   - *Move onto a higher-level concept or application of the concept.*
   - *Teach the concept in a different way (e.g., hands-on activity or small groups rather than lecture).*

8. Ask, "What are the implications for your instruction when viewing a single student's results versus a Pattern of Need for a group or class? Can you describe the differences?"
   Responses may include:

   - *More efficient to target groups of students.*
   - *Can serve as the basis for flexible grouping.*
   - *Can shift the focus to teaching practice or assessment rather than individual students.*

9. Explain to educators that next they will go through this exercise with their own data. Ask educators to think about the type of data they might bring for the next meeting and to share their ideas with a partner.

   Possible data include:
   - *Authentic; something directly from educators' classrooms*
   - *Low stakes*
   - *Recent data*
   - *Formative assessment*
   - *Single data source*

Reflection:

1. When the discussion concludes, ask each educator to complete the *Exercise 2.2 Reflections* handout.
2. Record the results of the *Exercise 2.2 Reflections* handouts in the *Data Use Professional Development Series Log*.

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Data Set 2

Second-grade students received an Exit Ticket after an initial lesson on two-digit addition with regrouping. The ticket had one question on it. The question and 24 students' answers are below.

Student 1	Student 2	Student 3	Student 4
47 +34 — 13	47 +34 — 71	47 +34 — 81	47 +34 — 82
Student 5	**Student 6**	**Student 7**	**Student 8**
47 +34 — 13	47 +34 — 71	47 +34 — 13	47 +34 — 71
Student 9	**Student 10**	**Student 11**	**Student 12**
47 +34 — 71	47 +34 — 71	47 +34 — 81	47 +34 — 71
Student 13	**Student 14**	**Student 15**	**Student 16**
47 +34 — 71	47 +34 — 81	47 +34 — 71	47 +34 — 81
Student 17	**Student 18**	**Student 19**	**Student 20**
47 +34 — 71	47 +34 — 71	47 +34 — 13	47 +34 — 81
Student 21	**Student 22**	**Student 23**	**Student 24**
47 +34 — 13	47 +34 — 13	47 +34 — 74	47 +34 — 81

Identifying Patterns of Need Template

1. High-Level View

   What do you notice first when you look at the data set?

2. Identify Clusters of Students

   What pattern(s) do you see?

3. Describe Clusters of Students

   What are each cluster's characteristics, drawn from what evidence from the data?

Cluster	Characteristics	Evidence
1		
2		
3		

4. Create Working Hypothesis

Pattern of Need:

Potential Actionable Cause:

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Identifying a Pattern of Need Template

Example

1. High-Level View

   What do you notice first when you look at the data set?

   Possible responses include:

   - *Certain answers are repeated.*

   - *Most of the answers are incorrect.*

2. Identify Clusters of Students

   What pattern(s) do you see?

   Possible responses include:

   - *Students who answered correctly with 81.*

   - *Students who answered incorrectly with 71.*

   - Students who answered incorrectly with 13.

3. Describe Clusters of Students

   What are each cluster's characteristics, drawn from what evidence from the data?

Cluster	Characteristics	Evidence
1	• *Students who correctly regroup*	• *6 students regrouped correctly and solved the problem*
2	• *Students who do not regroup*	• *10 students did not add the "regrouped" 10 from the ones column*
3	• *Students who made careless errors*	• *6 students subtracted rather than added*

Pattern of Need: <u>10 students did not regroup.</u>

Potential Actionable Cause: <u>Students did not understand regrouping.</u>

Exercise 2.2: Reflections

Handout

Describe a data set you will use to identify cluster characteristics and corresponding evidence.

Rate your ability to identify cluster characteristics and corresponding evidence.

Cannot do it	Can do it with significant support	Can do it with some support	Can do it independently
1	2	3	4

Information I still need or want to pursue further:

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Exercise 2.3: Identify Patterns of Need in Educator-Provided Data Set

Purpose:

Using their own data, educators will identify Patterns of Need. This exercise requires educators to apply their learning from Exercises 2.1 and 2.2.

Objectives:

Upon completion of this exercise, educators will be able to:

- Identify a Pattern of Need in their own data
- Form a working hypothesis about the cause of a Pattern of Need

Materials Needed (for each educator):

- Identify a *Pattern of Need in Your Own Data* Template
- An authentic data set. Recommend educators use data from a classroom-level formative assessment suitable for item analysis.
- Differently colored highlighters
- *Exercise 2.3 Reflections* handout

Time:

Approximately 30 minutes

Instructions:

1. Provide each educator with differently colored highlighters.
2. Ask educators to use highlighters to visualize the patterns in their data. Educators may need to collaborate on ways to make patterns visual.
3. Provide each educator with a copy of the *Identify a Pattern of Need in Your Own Data Template* to complete with their own data.
4. Ask some or all educators (if time permits) to share what they discovered.
5. Discuss the specific implications for educators' instruction based on what they learned from this exercise.

Reflection:

1. When the discussion concludes, ask each educator to complete the *Exercise 2.3 Reflections* handout.

2. Record the results of the *Exercise 2.3 Reflections* handout in the *Data Use Professional Development Series Log.*

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Identify a Pattern of Need in Your Own Data

Template

1. Before You Begin

    - When was the data collected?
    - Who collected the data?
    - What was the setting for the collection of this data?
    - Why was this data collected?
    - What pattern(s) do you expect to see?

2. High-Level View

    Looking at the data set, what do you notice first? What else do you notice?

3. Identify Clusters of Students

    What patterns do you see?

4. Describe Clusters of Students

What are each cluster's characteristics, drawn from what evidence from the data?

Cluster	Characteristics	Evidence
1		
2		
3		

5. Create Working Hypothesis

Pattern of Need:

Potential Actionable Cause:

Exercise 2.3: Reflections

Handout

Describe the Pattern of Need you found in your data and working hypothesis of the cause of the need.

Rate your ability to create a working hypothesis for a Pattern of Need.

Cannot do it	Can do it with significant support	Can do it with some support	Can do it independently
1	2	3	4

Information I still need or want to pursue further:

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Determine Root Cause

Introduction:

Identifying Root Causes of a Pattern of Need strengthens problem-solving in a Cycle of Inquiry. Determining Root Causes can identify general weaknesses (e.g., what causes problems with student achievement or which curricular units do not work) as well as what works and supports new initiatives.

If we do not determine and treat Root Causes, we risk squandering instructional time treating symptoms, which may vanish in the short term but will likely re-emerge in other forms.

In this step, we will refine your working hypothesis by digging deeper into what you identified as the cause of the Pattern of Need.

Overview:

This packet provides educators with a common language and tools to identify the Root Cause of a Pattern of Need. The exercises in this packet present two techniques that help educators determine Root Causes: The "5 Whys" and a Fishbone Diagram.

Objectives:

Upon completion of this module, educators will be able to:

- Distinguish between symptoms and Root Causes in areas of instructional need.
- Hypothesize the Root Cause(s) of a Pattern of Need before strategizing a solution.
- Articulate the purpose and value of exploring Root Causes.

Vocabulary:

Correlation: The relationship between two variables or factors. Correlation does not necessarily show a causal relationship.

Causation: One action that directly causes another action.

Root Cause: The cause of an event that, if eliminated, would substantially reduce or prevent the event.

Symptom: An indicator or evidence of an underlying cause.

Opening Discussion: Root Cause Analysis

Discuss the following before starting the first exercise:

1. Read the following scenario aloud:

   An article in the school newspaper reported students with bigger shoe sizes also had higher reading scores; this claim was based on extensive research into the school district's K-12 students. During the next faculty meeting, teachers report students arriving to class in bigger shoes, frequently tripping or actually walking out of them. Are students doing this to improve their reading scores on the upcoming high-stakes state test? The math teacher suggests a unit on the difference between correlation and causation.

2. Tell educators to think about why the math teacher proposed a lesson about correlation and causation.

3. Ask, "What strategies do you use to avoid confusing correlation with causation?"

4. Ask, "Have you ever found it difficult to make that distinction?"

Listen for…

Consider beginning with Exercise 2.4 and then moving onto Exercise 2.5 if you hear educators say:

- "I know there are different ways of looking at data, but I don't know what terms to use or how to validate what I'm seeing."
- "I think data can explain just about anything you want it to."
- "I *just* know how to find a cause."

Consider skipping Exercise 2.4 and beginning with Exercise 2.5 if you hear educators:

- Correctly define the terms *Causation*, *Root Cause*, *Correlation*, and *Symptom*
- Describe a strategy to identify possible causes

Exercise 2.4: Defining Causation, Correlation, and Symptom

Purpose:

By defining terms and providing examples of each, educators will learn vocabulary related to Root Cause analysis: Causation, Correlation, and Symptom.

Objectives:

Upon completion of this exercise, educators will be able to:

- Distinguish between Symptoms and Root Causes in areas of instructional need.

Materials Needed (for each educator):

- *Symptom, Cause, and Correlation* handout
- *Exercise 2.4 Reflections* handout

Time:

Approximately 10 minutes

Instructions:

1. Divide educators into three groups.

2. Provide a copy of the *Symptom, Cause, and Correlation* handout to each group.

3. Assign one of the scenarios to each group to discuss and answer questions.

4. When groups finish, ask each group to summarize their scenario and responses for the whole group.

Reflection:

1. When the discussion concludes, ask each educator to complete the *Exercise 2.4 Reflections* handout.

2. Record the results of *the Exercise 2.4 Reflections* handouts in the *Data Use Professional Development Series Log*.

Exercise 2.4: Symptom, Correlation and Causation Scenarios

Correlation: The relationship between two variables or factors. Correlation does not necessary show a causal relationship.

Causation: One action that directly causes another action.

Root Cause: The cause of an event that, if eliminated, would substantially reduce or prevent the event.

Symptom: An indicator or evidence of an underlying cause.

Scenario 1
A student in Ms. Simpson's room always asks to go to the restroom during independent-reading time. The student struggles to read and the teacher thinks if the student stays in the room and reads, her skills will improve. The teacher decides to refuse the student's request in order to improve her reading.
Scenario 2
Students at Stillwell Middle School leave the tables in such a mess at lunch that the custodial staff has complained to the principal Mr. Jones. Mr. Jones decides to institute a rotating duty for the entire staff that includes cleaning the tables after the students have finished eating.
Scenario 3
The past two times Ms. Parsons has put Charlie and Kylie in a group together they end up off topic and in a heated argument leaving the rest of the group to do all the work. Ms. Parsons decides that Charlie and Kylie can no longer work together in her class.

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Reflections on Scenarios:

1. What do you see as the common mistake that the educators are making in these three scenarios?

2. Can you think of other times that the symptom of a problem has been treated instead of the Root Cause?

3. Why might educators address symptoms instead of the Root Cause?

Symptom, Correlation and Causation Scenario

Response Guide

Question 1:

What do you see as the common mistake that the educators are making in these three scenarios?

Possible responses include:

- *In all cases, educators are jumping up the chain of inference too quickly.*
- *Educators are choosing the first, or easiest solution that comes to mind.*

Question 2:

Can you think of other times that the symptom of a problem has been treated instead of the Root Cause?

Possible responses include:

- *Answers will vary based on educator experience.*

Question 3:

Why might educators address symptoms instead of the Root Cause?

Possible responses include:

- *Short on time*
- *Working with what is available, or what is easiest*
- *Not collaborating or looking at data as closely as they should*

Exercise 2.4: Reflections

Handout

Describe the difference between Causation, Correlation, and Symptom.

Rate your ability to distinguish between Symptoms and Root Causes in areas of instructional need.

Cannot do it	Can do it with significant support	Can do it with some support	Can do it independently
1	2	3	4

Information I still need or want to pursue further:

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Exercise 2.5: The 5 Whys

Purpose:

Educators will develop a habit of mind to challenge their initial assumptions about the cause of a Pattern of Need by asking "Why?" in a short Cycle of Inquiry. Additionally, this serves as scaffolding to dig deeper into the Root Cause of higher-stakes decisions.

Objective:

Upon completion of this exercise, educators will be able to:

- Identify the Root Cause of a Pattern of Need through use of the "5 Whys" technique.

Materials Needed (for each educator):

- Pattern of Need identified from previous exercises
- *The 5 Whys* handout
- *Mr. Jones and the Why* handout
- Highlighters
- *Exercise 2.5 Reflections* handout

Time:

Approximately 15 minutes

Instructions:

1. Provide *Mr. Jones and the Why* handout to each educator and ask them to read it.
2. After reading, educators use the test at the bottom to determine if Mr. Jones identified a Root Cause of this pattern.
3. Introduce "The 5 Whys," a technique to dig more deeply into issues by asking "Why?" multiple times.
4. Ask educators to complete *The 5 Whys* handout individually or in pairs.
5. Ask educators to jot down a Pattern of Need they identified at the top of the handout.

6. Ask educators to write what caused the pattern next to the first "Why?" and work down until they believe they determined the Root Cause.

7. Invite educators to share their discoveries, if time permits.

Reflection:

1. When the discussion concludes, ask each educator to complete the *Exercise 2.5 Reflections* handout.

2. Record the results of the *Exercise 2.5 Reflections* handouts in the *Data Use Professional Development Series Log.*

Mr. Jones and the Why

Handout

After the first month of school, Mr. Jones noticed a Pattern of Need: in his last period class 50% of the students failed to complete the daily opener activities. Mr. Jones decided to investigate the problem by speaking with the students at the end of the period.

Pattern of Need:

50% of the students are not completing their daily opener activities.

5 Whys

1. Why?	Why are students not completing activities?
Answer:	They are late to class.
2. Why ?	Why are they late to class?
Answer:	They are getting their class materials from their lockers.
3. Why?	Why does it take so long to get materials from their lockers?
Answer:	The late students have Phys Ed prior to class and leave class late.
4. Why?	Why are students leaving Phys Ed late?
Answer:	The clock/bell system in the gym doesn't function correctly.
5. Why?	Why doesn't the clock/bell system function correctly?
Answer:	The protective cage has been removed exposing the clock to wayward dodgeballs.

Test for Root Cause:

Would addressing the last cause eliminate or substantially reduce this Pattern of Need?

Understand the Risks:

Implementing an Action Plan based on one of the first answers would probably not solve the need. If Mr. Jones didn't investigate, what could have happened? Could Mr. Jones ask "Why?" several more times?

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The 5 Whys

Pattern of Need:

_____ _____ _____

5 Whys:

1. Why?	
Answer:	
2. Why ?	
Answer:	
3. Why?	
Answer:	
4. Why?	
Answer:	
5. Why?	
Answer:	

Test for Root Cause:

Would addressing the last cause eliminate or substantially reduce this Pattern of Need?

Exercise 2.5: Reflections

Handout

Describe a Root Cause you found in a Pattern of Need.

Rate your ability to identify the Root Cause of a Pattern of Need through use of the "5 Whys" technique.

Cannot do it	Can do it with significant support	Can do it with some support	Can do it independently
1	2	3	4

Information I still need or want to pursue further:

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Exercise 2.6: Use a Fishbone Diagram to Identify Root Cause

Purpose:

Educators will use a Fishbone Diagram to identify potential Root Causes of school- or grade-level Pattern of Need.

Objectives:

Upon completion of this exercise, educators will be able to:

- Identify potential Root Causes of a Pattern of Need using a Fishbone Diagram.

Materials Needed (for each group):

- Facilitator provides each group with a piece of chart paper with the *Fishbone Diagram* drawn on it.
- Sticky Notes
- *Exercise 2.6 Reflections* handout

Time: Approximately 30 minutes

Option 1: Large Group Facilitation

1. Hand out the chart paper with the *Fishbone Diagram* to each group, and distribute sticky notes.

2. Each group decides on a Pattern of Need in their school, grade, content area or classroom and writes it in the Pattern of Need box on the Fishbone Diagram.

3. Ask educators to walk around the room and use their sticky notes to provide possible causes to other groups' Patterns of Need. This should be done as a silent activity, no discussion.

   - *Remind educators there are no wrong answers in brainstorming, and the group will "debone" the list later.*

   - *Mention different categories causes might come under such as curriculum, instruction, assessment, etc.*

4. Ask educators to begin to "debone" the list by placing similar sticky notes on top of each other.

5. Ask educators to go to the next level by removing causes outside the educators' control or areas educators cannot realistically impact. For example, educators should remove items that are too costly, or lay blame on others — e.g., students don't study, parents aren't supportive.

6. Ask educators to prioritize the remaining causes and choose 2 – 4 causes they would like to explore more deeply. They should write these causes in the boxes at the end of the fishbone ribs.

7. Ask educators as a group to apply the "5 Whys" technique to each chosen cause in order to dig deeper, placing the answers to their "why" questions on the lines under each cause.

8. Ask educators to check if they have identified a primary Root Cause and how they could verify it.

9. Facilitate a discussion on the results as well as the process of using the fishbone to find a Root Cause.

*Note: If your intention is to facilitate this process in a smaller group feel free to use the following directions in place of the large group facilitation notes.

Option 2: Small Group Facilitation)

Materials Needed (for each educator):
- Facilitator provides an identified school-, grade-, or content-level Pattern of Need and working hypothesis.
- Sticky notes
- Blank *Fishbone Diagram* handout
- *Exercise 2.6 Reflections* handout

Time:
Approximately 60 minutes

Instructions:

1. Describe a school, grade, or content-level Pattern of Need to educators.

2. Provide the *Fishbone Diagram* handout to educators.

3. Ask educators to summarize the Pattern of Need in the "head" section of their fishbone diagram.

4. Distribute sticky notes.

5. Pair or group educators to brainstorm the possible causes of this Pattern of Need; instruct them to write one cause per sticky note.
   Additional prompts may include:
   - *Remind educators there are no wrong answers in brainstorming, and the group will "debone" the list later.*
   - *Mention different categories causes might come under such as curriculum, instruction, assessment, etc.*

6. Invite educators to lay out sticky notes on a table or wall for all the groups to see.

7. Ask educators to begin to "debone" the list by placing similar sticky notes on top of each other.

8. Ask educators to go to the next level by removing causes outside the educators' control or areas educators cannot realistically impact. For example, educators should remove items that are too costly, or lay blame on others — e.g., students don't study, parents aren't supportive.

9. As a group, prioritize the remaining causes and write the four primary possible causes in the boxes at the end of the ribs that say "possible cause."

10. Divide educators into four groups and have each group select one of the four primary causes to dig more deeply by asking "Why?" multiple times. Write these on the lines under "possible cause."

11. Ask educators to share the results from their groups, after asking "Why?" multiple times. As a large group, discuss any relationships between the causes that might yield a primary Root Cause. Caution educators to avoid jumping to conclusions or generating solutions yet.

12. Ask educators to check if they have identified a primary Root Cause and how they could verify it.

Additional probe:

- *What data can we collect to validate the Root Cause?*

Reflection:

1. When the discussion concludes, ask each educator to complete the *Exercise 2.6 Reflections* handout.

2. Record the results of the *Exercise 2.6 Reflections* handouts in the *Data Use Professional Development Series Log.*

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Possible Cause

Possible Cause

Pattern of Need

Possible Cause

Possible Cause

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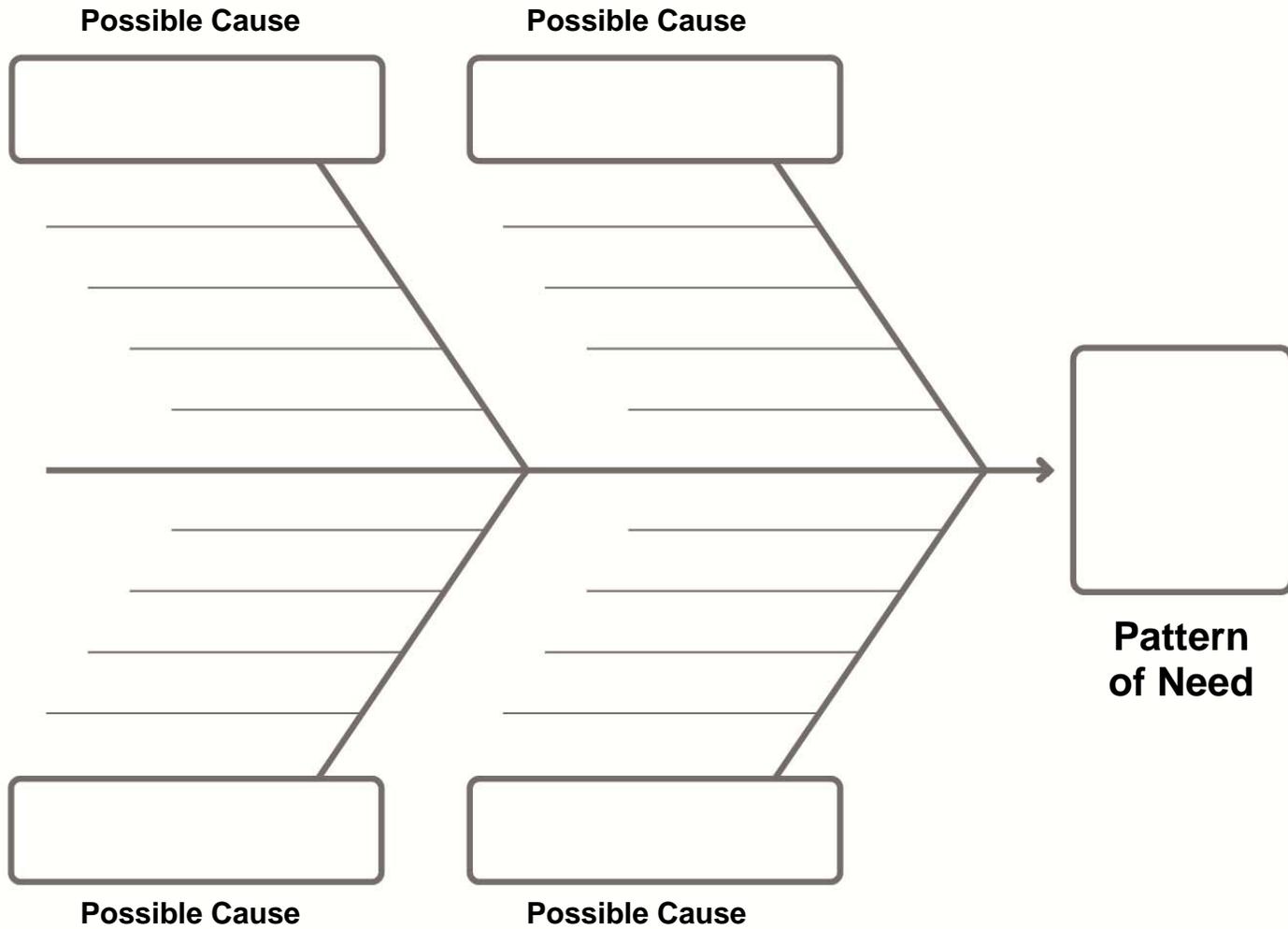
Exercise 2.6: Reflections

Handout

Describe the Root Cause you found in a Pattern of Need.

Rate your ability to identify the Root Cause of a Pattern of Need through the use of a fishbone diagram.

Cannot do it	Can do it with significant support	Can do it with some support	Can do it independently
1	2	3	4

Information I still need or want to pursue further:

Exercise 2.7: Refining Hypothesis of Root Cause of Pattern of Need

Purpose:

Educators will examine the cause of a Pattern of Need in their data and will dig deeper to determine the Root Cause and refine their hypothesis about the Pattern of Need.

Objectives:

Upon completion of this exercise, educators will be able to:

- Write a hypothesis that addresses the identified cause of a Pattern of Need.

Materials Needed (for each educator):

- Educators' working hypotheses from Exercise 2.3
- Blank *Fishbone Diagram* handout
- *Exercise 2.7 Reflections* handout

Time:

Approximately 30 minutes

Instructions:

1. Pair educators and ask them to consider a Pattern of Need they identified. Educators should brainstorm multiple possible causes and complete a fishbone diagram with the causes they feel contributed to the pattern most.

2. Direct educators to use the 5 Whys to further explore each cause.

3. Direct educators to examine the relationships between the possible causes written along the fishbone diagram's backbone. Does this isolate a Root Cause? Or, do the causes have a more independent nature?

4. Discuss the risk of trying to address all the possible causes at one time. What might they do to minimize that risk?

5. Explain the concept of isolating and focusing on the Root Cause to develop an Action Plan. Ask educators to use the follow strategy to identify the cause to address during this Cycle of Inquiry:

    a. Cross out the causes outside the educator's direct control.

    b. Cross out causes educators cannot address realistically with currently available resources.

    c. Circle one possible Root Cause to verify through the Cycle of Inquiry.

6. Instruct educators to include the Root Cause they identified in the *Revisiting Working Hypothesis* handout.

Reflection:

1. When the discussion concludes, ask each educator to complete the *Exercise 2.7 Reflections* handout.

2. Record the results of the *Exercise 2.7 Reflections* handouts in *the Data Use Professional Development Series Log*.

Revisiting Working Hypothesis

Handout

After analyzing Root Cause, revisit and refine your hypothesis.

Pattern of Need:

Potential Actionable Cause:

Exercise 2.7: Reflections

Handout

Describe your refined hypothesis of the Root Cause of a Pattern of Need.

Rate your ability to refine a hypothesis that addresses the identified cause of a Pattern of Need.

Cannot do it	Can do it with significant support	Can do it with some support	Can do it independently
1	2	3	4

Information I still need or want to pursue further:

Validation

Once we recognize we are making a higher stakes decision based on a Pattern of Need, we must conduct a longer Cycle of Inquiry. The long Cycle of Inquiry starts in the Analyze section and after identifying the Pattern of Need, moves to Validation and then Determining Root Cause. After completing the three steps in the Analyze section, we move on to Strategize and Act.

In order to validate a Pattern of Need, we need to bring in additional data sources to give us a fuller picture of that Pattern of Need. The process we use to validate a Pattern of Need is called Triangulation. When we triangulate, we are using additional data sources to test or confirm our original hypothesis or inference.

If our initial hypothesis is not supported, we continue to refine it by bringing in additional data sources. This continues until we have reached a reasonable, actionable hypothesis.

Overview:

This packet provides educators with a common language and tools to determine when it is appropriate to validate a Pattern of Need using multiple data sources. The exercises in this packet present several techniques for validating a Pattern of Need, including the use of data analysis questions to dig deeper and Triangulation.

Objectives:

Upon completion of this module, educators will be able to:

- Generate and apply data analysis questions.
- Extend thinking on Correlation and Causation.

- Decide when to apply validation techniques, including Triangulation, to validate a higher stakes Pattern of Need.

Vocabulary:

Validation: validating or confirming a Pattern of Need.

Triangulation: Triangulation is the process of using multiple data sources to address a particular question or problem and using evidence from each source to illuminate or temper evidence from the other sources. It also can be thought of as using each data source to test and confirm evidence from the other sources in order to arrive at well-justified conclusions about students' learning needs. (Hamilton et al., 2009, p. 14)

Exercise 2.8: Data Analysis Questions

Purpose

To determine what questions can be asked of all data sources and what questions are more appropriate for specific data sets.

Objectives

Upon completion of this exercise, educators will be able to:

- Construct a list of questions that are appropriate for use when analyzing any data source.
- Construct a list of questions that are appropriate for analysis of a specific data set.

Materials Needed (for each educator)

- Chart Paper
- Markers
- Classroom-level data set
- *Data Analysis Questions* handout
- *Exercise 2.8 Reflections*

Time

Approximately 20 minutes

> **Note to Facilitator**
>
> Turnkey Exercises 2.8 and 2.9 are designed for educators to create and ask questions of a *classroom-level data set*. As an extension exercise, educators may use different data sets (e.g., school- or district-level data, state data, or non-academic data such as attendance) to push their thinking on data analysis questioning techniques.

Instructions

1. For a large group, have educators form small groups, possibly by grade level. For a small group, educators can work independently. For each participating group or person, place one piece of chart paper on the wall and hand out a marker.

2. Have educators write the name of the data set they are using at the top of the chart paper.

3. On the chart paper, have educators answer the following question as a bulleted list: *What questions can you answer using this data set? Think of broad questions and those with a narrow focus.*

4. After listing as many questions as they can, have educators conduct a gallery walk of all the posters, placing sticky notes next to any of the written questions that can be asked of *all* data sources.

5. After reconvening in their groups, have educators review their lists, noting the questions with sticky notes. In the larger group, discuss whether those questions could truly be asked of *any* data source (for example, even attendance data). If not, remove the sticky note.

6. In the smaller groups or individually, have educators brainstorm any additional questions that can be asked of any data source and record them on the chart paper.

7. Have groups select four specific and four general questions from the chart paper and transfer them to the handout *Data Analysis Questions*. For each question listed, answer *"Why is this question important to ask?"* Please note to participants that these questions will be used in Exercise 2.9.

Exercise 2.8: Data Analysis Questions

Data Set_____

	What questions can you ask of this data set?	Why is this question important to ask?
1		
2		
3		
4		
	What questions can you ask of all data sources?	Why is this question important to ask?
5		
6		
7		
8		

Exercise 2.8: Reflections

Handout

Rate your ability to generate a list of questions related to a specific data set.

Rate your ability to generate questions relating to data sources.

Cannot do it	Can do it with significant support	Can do it with some support	Can do it independently
1	2	3	4

Information I still need or want to pursue further:

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Exercise 2.9: Applying Data Analysis Questions

Purpose

To identify a Pattern of Need and a Potential Actionable Cause through application of data analysis questions to a colleague's data set as a means of digging deeper into the data.

Objectives

Upon completion of this exercise, educators will be able to:

- Construct and revise data analysis questions.
- Apply questions to determine and refine a Potential Actionable Cause based on an identified Pattern of Need in a data set.

Materials Needed (for each educator)

- A classroom-level data set (from Exercise 2.8)
- *Data Analysis Questions* (from Exercise 2.8)
- Exercise 2.9 *Data Question Protocol*
- Exercise 2.9 *Data Conversation Reflection Sheet*
- *Exercise 2.9 Reflection* handout

> **Note to Facilitator**
>
> Educators will work with a colleague's data set. They will have some context for this data from working in the same school, but will not have all the details. They will use Data Analysis Questions to help identify a Pattern of Need and a Potential Actionable Cause. Then they will ask their colleague additional questions about the data set to further refine their Potential Actionable Cause.

Time

Approximately 20 minutes

Instructions

1. In pairs, have educators exchange their data sets with a colleague.

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2. Using the *Data Analysis Questions* from Exercise 2.8, each educator applies questions that can be asked of all data sources. Educators record those questions and answers on the *Data Questioning Protocol.*

3. Then educators generate and ask additional questions that are specific to the colleague's data set.

4. After applying those questions to the data set, educators identify a Pattern of Need and a Potential Actionable Cause in their colleague's data set on the *Data Questioning Protocol.*

5. Educators then generate a list of additional questions and suggested next steps for their colleague regarding this data set on the *Data Questioning Protocol.*

6. Once the *Data Questioning Protocol* is complete, educators should conduct a Data Conversation with their colleague, making sure to:

   a. Share additional questions and next steps

   b. Refine the Potential Actionable Cause based on the colleague's responses, if necessary

7. Pairs then switch roles, making sure to have a second Data Conversation on the remaining data set.

8. Upon completion of the second Data Conversation, have each educator independently reflect using the *Data Questioning Reflection Sheet.*

Exercise 2.9: Data Questioning Protocol

Instructions

Using a colleague's data set, record questions and answers to two kinds of data analysis questions: those that can be asked of all data sources, and those that are pertinent to a specific data set. After applying the questions to the colleague's data set and recording the results, identify a Pattern of Need and a Potential Actionable Cause.

Questions that can be asked of all Data Sources

Question	Answer
Question	Answer
Question	Answer
Question	Answer
Question	Answer

Questions that can be asked of my colleague's Data Set

Question	Answer
Question	Answer
Question	Answer
Question	Answer
Question	Answer

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Pattern of Need

Potential Actionable Cause

Additional questions for my colleague regarding this data set

Suggested next steps

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Exercise 2.9: Data Conversation Reflection Sheet

Instructions

Upon completion of the Data Conversations that took place between you and your colleague, answer the following reflection questions.

How did having a colleague analyze your data set alter your thinking? Did it reveal anything new?

Which questions helped you and your colleague dig deeper into the data sets?

How will this experience impact your data analysis practice in the future?

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Exercise 2.9: Reflections

Describe the process (or protocol) you will use to deepen your questioning technique going forward.

Rate your ability to use data questioning on less familiar data sets.

Cannot do it	Can do it with significant support	Can do it with some support	Can do it independently
1	2	3	4

Information I still need or want to pursue further:

Exercise 2.10: Extend thinking on Correlation and Causation

Purpose:

Educators will examine the relationships between graphical representations of data sets in terms of correlation and causation.

Objectives:

Upon completion of this exercise, educators will be able to:

- Articulate the difference between correlation and causation.
- Recognize the benefits and limitations of analyzing a relationship between two data sets.

Materials Needed (for each educator):

- Article synopses
- Sample Data Graphs with questions
- *Exercise 2.10 Reflections*

Time:

Approximately 30 minutes, including warm-up

> **Notes to Facilitator:**
>
> Before participating in this exercise, educators should have completed Exercise 2.4 Defining correlation, causation, and symptom.
>
> The warm-up for this exercise is a follow-up Exercise 2.4, more clearly defining correlation and causation. It can be skipped if the group is advanced.

Warm-up (Optional, see note on previous page).

Instructions:

Review the meanings of correlation and causation.

Correlation: The relationship between two variables or factors.

Causation: One action that directly causes another.

Read the *headline* to article synopsis 1 (*Sincere Smiling Promotes Longevity*) and to article synopsis 2 (*Facebook Use Leads to Worse Grades in College*). Note that each headline implies a causal relationship.

Have educators read the *article synopses* and describe the issues with implying a causal relationship. Ask, "*Is the relationship suggested in the headline supported by the facts of the synopsis? Why or why not? What questions are you left with? What else would you want to know? What other data sets might you examine?*"

Exercise

Instructions:

1. Tell educators that this next exercise will highlight the value of examining two data sets that may or may not show correlation.
2. Have educators examine Sample Scatter Plot Graph #1 and answer the questions. The following are possible responses.

Graph #1 Response Guide

What does this graph represent? What two sources are being compared?

- It is a scatter plot showing the relationship between student scores on weekly quizzes and scores on the unit assessment.
- X-Axis is the Unit Assessment scores; Y-Axis is Weekly Quiz results.
- Each diamond represents one student at the intersection of the two scores.

What do you notice?

- No clear pattern emerges.
- The majority of students scored better on the weekly quizzes than on the unit assessment.

If there was a strong correlation between student performance on the quizzes and the unit assessments, what would the graph look like?

- Diagonal line sloping upward from left to right; student scores on both assessments would be similar.

What is the next question that Mrs. Smith needs to ask?

- Why are the results of the two assessments not similar?
  A: There is weak correlation between these two variables.

Why might the scores show a weak correlation?

- There might be a lack of instruction-assessment alignment.
- There could be considerable differences in rigor.
- Students may not be retaining the information long-term.

For each of the possible causes, what next questions would you ask to inform your practice?

- Do the types of questions on the Weekly Quiz match the questions on the Unit Test?
- Are the questions on the Weekly Quiz as rigorous (or more) than the questions on the Unit Test?
- What retention strategies are students using to prepare for the Unit Test?
- What is the ratio of instruction to practice on any given day?

2. Have educators examine Graph #2 and respond to the questions. The following are possible responses.

Graph #2 Response Guide

What does this graph depict? What do the bubbles represent? What does the size of the bubble mean?

- It is a scatter plot showing how students scored on two different assessments of the same standard given by two different teachers.
- Each bubble represents a group of students.
- The larger bubbles represent larger numbers of students; smaller dots represent fewer students.

What do you notice?

- There is wide distribution of scores.
- There does not seem to be a relationship between scores earned on the two essays.

What is being correlated?

- *Student scores on two different assessments of the same standard given by two different teachers.*

How would you describe the correlation? Is there a causal relationship?

- There is wide distribution of scores.
- There does not seem to be a relationship between scores earned on the two essays.

What are the teachers' next steps in this process?

- Come to a mutual understanding of the standard and how to assess it.
- Attempt to standardize scoring processes.
- Sample a group of students: what were their impressions of the two essay questions?

How can you frame a Data Conversation around this information?

- Educators can <u>gather information</u> by finding the Root Cause of the grading discrepancy.
- An administrator or a colleague might <u>guide improvement </u> by looking at scoring practices in both classrooms.

Exercise 2.10 Article Synopses

Synopsis 1

Sincere Smiling Promotes Longevity

Date: 20 Feb 2010

Retrieved http://www.worldhealth.net/news/sincere-smiling-promotes-longevity/

- The researchers asked scientists (trained to analyze smiles) to review vintage photographs of 230 major league baseball players from the 1952 season.
- "Duchenne smilers", who engage muscles both near the corners of the mouth and around the eyes, are known as genuine smilers.
- Duchenne smilers tended to live the longest, followed by non-Duchenne smilers. In fact, 70% of Duchenne smilers lived to age 80, as compared to 50% of non-smilers who survived to that age.

Synopsis 2

Facebook Use Leads to Worse Grades in College

Jeremy Hsu

Date: 13 April 2009

Retrieved http://www.livescience.com/3495-facebook-users-worse-grades-college.html

- Facebook users had average GPAs 3.0 – 3.6
- Facebook users studied 1-5 hours/week
- Non Facebook users had average GPAs 3.5 – 4.0
- Non Facebook users studied 11-15 hours plus per week
- This raises questions as to how students spend their time outside of class.

Exercise 2.10 Sample Data Graphs

Sample Graph 1

Before a data meeting, Mrs. Smith averaged the scores of a recent unit test against the averages of weekly quizzes (from the same unit). Her graph is below.
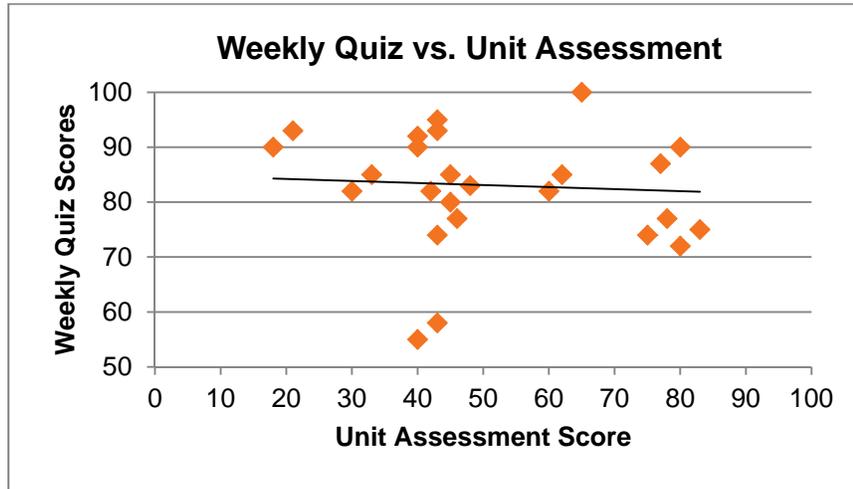
What does this graph represent? What two sources are being compared?

What do you notice?

If there was a strong correlation between student performance on the quizzes and the unit assessments, what would the graph look like?

What is the next question that Mrs. Smith needs to ask?

Why might the scores show a weak correlation?

For each of the possible causes, what next questions would you ask to inform your practice?

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Sample Graph 2

Mrs. Smith, a science teacher and Mr. Jones, a social studies teacher teach the same students. They graphed the students' scores from a recently administered CCSS-aliged assessment onto a scatter plot. The standard measured on the assessment was:

WHST.1. Write arguments to support claims in an analysis of substantive topics or texts using valid reasoning and relevant and sufficient evidence.

Each was essay was graded on a four-point rubric. Each bubble represents a cluster of students: smaller bubbles represent clusters with fewer students; larger bubbles represent clusters with more students. Mrs. Smith and Mr. Jones thought they would see results that were highly correlated.
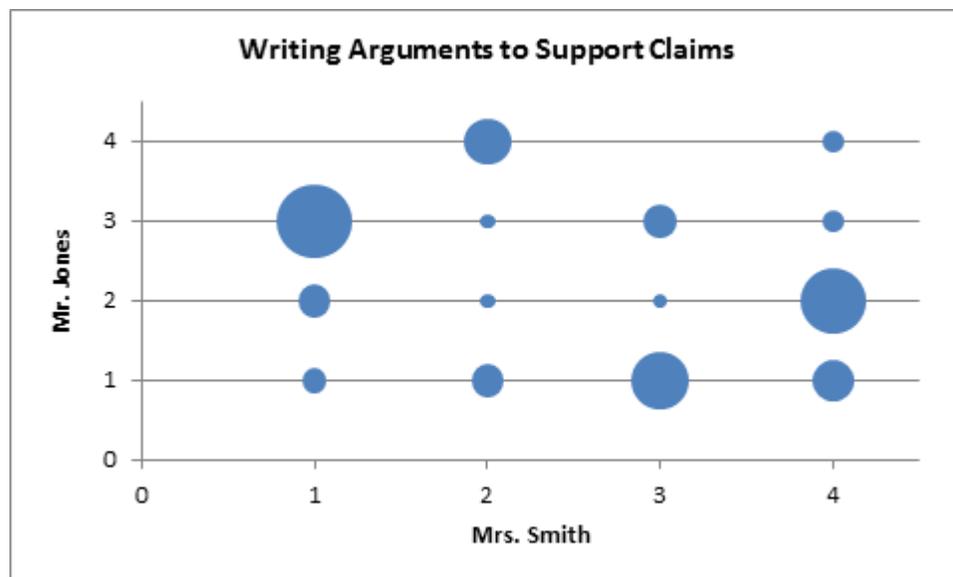
What does this graph depict? What do the bubbles represent? What does the size of the bubble mean?

What do you notice?

What is being correlated?

How would you describe the correlation? Is there a causal relationship?

What are the teachers' next steps in this process?

How can you frame a Data Conversation around this information?

Exercise 2.10: Reflections

Handout

Identify one advantage and one limitation of analyzing relationships between two data sets.

Rate your ability to distinguish between correlation and causation.

Cannot do it	Can do it with significant support	Can do it with some support	Can do it independently
1	2	3	4

Information I still need or want to pursue further:

Exercise 2.11: Triangulation: Validation Using Multiple Data Sources

Purpose:

Educators will refine a hypothesis by validating with additional data sources.

Objectives:

Upon completion of this exercise, educators will be able to:

- Use more than one data source to refine a hypothesis
- Define Triangulation as validation with multiple data sources
- Determine when validating with multiple data sources is appropriate

Materials Needed (for each educator):

- *Triangulation Scenarios Worksheet*
- *Template: Triangulating Data Sources*
- *Exercise 2.11 Reflections* handout

Time: Approximately 20 minutes

Instructions:

1. Review the definition of Triangulation with educators (see Note to Facilitator).

2. Have educators review the *Triangulation Scenarios Worksheet* and answer the following questions for each scenario:

   a. Would you validate? Yes or no?

   b. Why/Why not? Provide explanation.

> **Note to Facilitator:**
>
> "Triangulation" is the process of using multiple data sources to address a particular question or problem and using evidence from each source to illuminate or temper evidence from the other sources. It also can be thought of as using each data source to test and confirm evidence from the other sources in order to arrive at well-justified conclusions about students' learning needs. (Hamilton et al., 2009, p. 14)

- *Example:* Educators should validate with additional data sources when they make decisions that impact placement or have long-term implications, or they encounter unexpected results in the data and want to refute or confirm the findings.

- *Example*: Educators do not need to validate when making a low-stakes, quick decision.

c. What additional possible data sources could you use to validate your data source?

- Possible answers may include Interim Assessments, DIBELS, Common Assessments; NECAP results; district benchmarks.

3. Ask educators to share responses and to discuss examples from current practice when they would validate with multiple data sources.

4. Share the template for Triangulating Data so educators can use it when validating their own pattern of need. Discuss the template using the following questions:

a. How would this template help you refine your Potential Actionable Cause for a Pattern of Need?

b. How does this process relate to your Data Inventory?

Triangulation Scenarios Worksheet

Scenario	Validate? (Yes/No)	Why/Why not?	Possible data sources
A high school is developing recommendations for individual students to be nominated to take the Advanced Placement English course. To do so, they decide to recommend any student who made an A in English the previous year.			
A Grade 3 teacher developed a reading comprehension assessment and administered it to her students. She was surprised to find that only 40% demonstrated proficiency on the assessment.			
A social studies teacher spends 45 minutes reviewing the similarities and differences between the Articles of Confederation and the Constitution. For the exit ticket, he passes out slips of paper with the two statements,			

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one of which was true and the other, false. Students were asked to identify the factual statement. Ninety percent of the students correctly identified the true statement as fact.			
A group of Grade 5 teachers are deciding on the area of focus for next year's intervention block. In reviewing the NECAP scores from the last two years, they notice a Pattern of Need in Functions and Algebra, and they reach consensus to focus on this content strand in next year's intervention block.			
Grade 3 teachers use DIBELS data to create reading groups for a unit of study scheduled to last 8 weeks.			

Template: Triangulating Data Sources

This template may be used as a guide when engaging in the process of validating a Pattern of Need.

       a. How would this template help you refine your Potential Actionable Cause for a Pattern of Need?

       b. How does this process relate to your Data Inventory?

Original Data Set: Pattern of Need:	Possible Actionable Cause:	Questions:
Data Source #1: Pattern of Need:	Refined Possible Actionable Cause:	Questions:
Data Source #2: Pattern of Need:	Refined Possible Actionable Cause:	Questions:
Data Source #3: Pattern of Need:	Refined Possible Actionable Cause:	Questions:

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Exercise 2.11: Reflections

Handout

Describe how you could triangulate data sources to refine your hypothesis about a Pattern of Need that you recently identified.

Rate your ability to triangulate data sources.

Cannot do it	Can do it with significant support	Can do it with some support	Can do it independently
1	2	3	4

Information I still need or want to pursue further:

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