Instructional Improvement Through Collaborative Data Inquiry

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Session Objectives: Participants Will Be Able To...

• Analyze item data to identify patterns of student performance on individual test items and distractors (errors)
• Facilitate Data-Driven Dialogue
• Apply an expanded repertoire of tools for analyzing and responding to data

Agenda

• Quick Poll
• Simulation: Data-Driven Dialogue with Item Data
• Reflection
Quick Poll

1. Rate your familiarity with item-level analysis of data. (BLUE)
   1 (not at all)  2 (a little)  3 (somewhat)  4 (very)

2. Rate your skill in facilitating team dialogue about data. (PINK)
   1 (not at all)  2 (a little)  3 (somewhat)  4 (very)

3. How invested are you in this session? (YELLOW)
   1 (not at all)  2 (a little)  3 (somewhat)  4 (very)

4. How much do you like chocolate? (GREEN)
   1 (not at all)  2 (a little)  3 (somewhat)  4 (very much)

Multiple Hats

• Learner
• Facilitator/coach
• Support system

Building the Bridge Between Data and Results

Data-Driven Dialogue

Use Multiple Sources of Data and Drill Down Deep

Item Analysis Definition

Analyzing student performance on individual test items, including the percentage answered correctly for each item, distractor patterns, and scores on open-response items.
Item Analysis for Number Sense and Operations

<table>
<thead>
<tr>
<th>Item #</th>
<th>Type</th>
<th>Strand</th>
<th>Standard</th>
<th>School A</th>
<th>School B</th>
<th>School C</th>
<th>School D</th>
<th>Blank</th>
<th>MC</th>
<th>Correct Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>MC</td>
<td>NS</td>
<td>8.N.1</td>
<td>41%</td>
<td>7</td>
<td>40</td>
<td>13</td>
<td>A</td>
<td>6</td>
<td>77%</td>
</tr>
<tr>
<td>11</td>
<td>MC</td>
<td>NS</td>
<td>8.N.3</td>
<td>60%</td>
<td>15</td>
<td>12</td>
<td>23</td>
<td>30</td>
<td>D</td>
<td>6%</td>
</tr>
<tr>
<td>17</td>
<td>MC</td>
<td>NS</td>
<td>8.N.5</td>
<td>5%</td>
<td>5</td>
<td>16</td>
<td>6</td>
<td>0</td>
<td>A</td>
<td>0%</td>
</tr>
<tr>
<td>22</td>
<td>MC</td>
<td>NS</td>
<td>8.N.1</td>
<td>45%</td>
<td>5</td>
<td>14</td>
<td>25</td>
<td>14</td>
<td>B</td>
<td>48%</td>
</tr>
<tr>
<td>26</td>
<td>MC</td>
<td>NS</td>
<td>8.N.2</td>
<td>65%</td>
<td>7</td>
<td>22</td>
<td>8</td>
<td>56</td>
<td>D</td>
<td>6%</td>
</tr>
</tbody>
</table>

What does this tell you? What can you learn/not learn from these data?

Item Analysis Inquiry

- What kinds of items are on the test?
- What specific skills and understandings are our students’ strengths? Which pose difficulties?
- What types of questions do our students perform best on? What types are they most challenged by?
- For which items are students frequently giving the same incorrect answer? Why might that be?
- Why are students missing points on extended-response items?

Group Roles

- Data Coach
  - Facilitate process
  - Include everyone
- Dialogue Monitor
  - Use No-Because sign
  - Monitor four-phase process
- Materials Manager
  - Use one prediction template
  - Wait on data
- Recorder
  - Record team members’ words
  - Abbreviate
  - Write large so all group members can see
- Timekeeper
Phase 1: Predict

I predict…
I assume…
I wonder…
I’m expecting to see…

ITEM DATA:
- What items do you think students will do well on?
- What will they have difficulty with?
- What makes you say so?

Phase 1: Predict

Review the test items and relevant standards
- What are your predictions about students’ performance on these items?
- Which items do you think they will do well on?
- Which will they have difficulty with?

Document your predictions on the handout
- Use ONE sheet for the whole group
- You do not need to agree on predictions
- Make statements rather than predict percentages

Sim School: Grade 6 Mathematics, Multiple-Choice Item Results, 2012 – Prediction Template

<table>
<thead>
<tr>
<th>Item</th>
<th>Type</th>
<th>Standard</th>
<th>Prediction</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>MC</td>
<td>6P.2: Symbols</td>
<td>Should do all right; simple algebraic expression</td>
</tr>
<tr>
<td>16</td>
<td>MC</td>
<td>6P.7: Change</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>MC</td>
<td>6P.8: Models</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>MC</td>
<td>6P.4: Models</td>
<td></td>
</tr>
<tr>
<td>32</td>
<td>MC</td>
<td>6P.8: Models</td>
<td></td>
</tr>
<tr>
<td>34</td>
<td>MC</td>
<td>6R.1: P, R, F</td>
<td></td>
</tr>
<tr>
<td>36</td>
<td>MC</td>
<td>6R.1: P, R, F</td>
<td></td>
</tr>
<tr>
<td>38</td>
<td>MC</td>
<td>6R.5: Models</td>
<td></td>
</tr>
</tbody>
</table>
Sim School: Grade 4 English Language Arts, Multiple-Choice Item Results, 2012 – Prediction Template

Common Core Standards for ELA: Informational Text (IT) and Language (L)

<table>
<thead>
<tr>
<th>Item</th>
<th>Type</th>
<th>CC Standard</th>
<th>Prediction</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>MC</td>
<td>IT: Key Ideas: 4</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>MC</td>
<td>IT: Key Ideas: 1</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>MC</td>
<td>IT: Key Ideas: 1</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>MC</td>
<td>IT: Key Ideas: 2</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>MC</td>
<td>IT: Craft/Structure: 4</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>MC</td>
<td>L: Vocabulary: 4</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>MC</td>
<td>L: Figurative: 5</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>OR</td>
<td>IT: Key Ideas: 1</td>
<td></td>
</tr>
</tbody>
</table>

Phase 2: Go Visual

- Stoplight highlighting

Stoplight Highlighting: Multiple-Choice Item Analysis Data

<table>
<thead>
<tr>
<th>Highlight Color</th>
<th>Meaning</th>
<th>% Correct (our cutoffs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green</td>
<td>Go! Meets expectations</td>
<td></td>
</tr>
<tr>
<td>Yellow</td>
<td>Caution! Below expectations</td>
<td></td>
</tr>
<tr>
<td>Pink</td>
<td>Urgent! In immediate need of improvement</td>
<td></td>
</tr>
</tbody>
</table>

1. Determine your criteria for stoplight highlighting percentage correct.
2. Stoplight highlight your table.

Adapted from NCREL, Data Retreat Facilitator Guide, 2001.
**Possible Criteria for Stoplight Highlighting**

- Team’s vision of an excellent school
- Cut points that will help distinguish urgent areas
- Local guidelines
- Comparison with comparable schools, if available

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**Item Analysis for Number Sense and Operations:**

*Stoplight Highlight Multiple-Choice: Percentage Correct*

<table>
<thead>
<tr>
<th>Item #</th>
<th>Type</th>
<th>Strand</th>
<th>School</th>
<th>School</th>
<th>Average Score — Open-Response</th>
<th>Percentage Correct — Multiple-Choice</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>Correct Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>MC</td>
<td>NS</td>
<td>B.N.1</td>
<td>64%</td>
<td>37%</td>
<td>41, 40, 12</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>MC</td>
<td>NS</td>
<td>B.N.1</td>
<td>25%</td>
<td>33%</td>
<td>15, 23, 50</td>
<td>D</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>ML</td>
<td>NS</td>
<td>B.N.1</td>
<td>64%</td>
<td>33%</td>
<td>64, 40, 7</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>ML</td>
<td>NS</td>
<td>B.N.1</td>
<td>25%</td>
<td>33%</td>
<td>41, 23, 12</td>
<td>B</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>MC</td>
<td>NS</td>
<td>B.N.2</td>
<td>65%</td>
<td>41%</td>
<td>5, 22, 68, 85</td>
<td>D</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>OR</td>
<td>NS</td>
<td>B.N.4</td>
<td>14%</td>
<td>17%</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Highlight Color**
- Green: Meets expectations
- Yellow: Caution! Below expectations
- Pink: Urgent! Immediate need of improvement

**% Correct (our cutoffs)**
- 70-100
- 60-69
- Below 60

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**Stoplight Highlighting: High-Frequency Distractors**

<table>
<thead>
<tr>
<th>Highlight Color</th>
<th>Meaning</th>
<th>% Correct (our cutoffs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pink</td>
<td>Urgent! Immediate need of improvement</td>
<td>20</td>
</tr>
</tbody>
</table>

1. Determine your criteria for stoplight highlighting distractors.
2. Highlight high-frequency INCORRECT selections.
Item Analysis for Number Sense and Operations: Stoplight Highlight Distractors

<table>
<thead>
<tr>
<th>Item #</th>
<th>Type</th>
<th>Strand</th>
<th>Standard</th>
<th>School 1</th>
<th>Comp. Schools</th>
<th>Blank</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>Correct Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>MC</td>
<td>N</td>
<td>8.NS.1</td>
<td>0%</td>
<td>43</td>
<td>12</td>
<td>2</td>
<td>4</td>
<td>1</td>
<td>2</td>
<td>A</td>
</tr>
<tr>
<td>2</td>
<td>MC</td>
<td>N</td>
<td>8.NS.1</td>
<td>3%</td>
<td>15</td>
<td>22</td>
<td>4</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>D</td>
</tr>
<tr>
<td>3</td>
<td>MC</td>
<td>N</td>
<td>8.NS.1</td>
<td>3%</td>
<td>104</td>
<td>9</td>
<td>9</td>
<td>2</td>
<td>0</td>
<td>4</td>
<td>A</td>
</tr>
<tr>
<td>4</td>
<td>MC</td>
<td>N</td>
<td>8.NS.1</td>
<td>58%</td>
<td>17</td>
<td>40</td>
<td>2</td>
<td>5</td>
<td>0</td>
<td>3</td>
<td>B</td>
</tr>
<tr>
<td>5</td>
<td>MC</td>
<td>N</td>
<td>8.NS.1</td>
<td>7%</td>
<td>0</td>
<td>6</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>A</td>
</tr>
</tbody>
</table>

Highlight Color: Pink — Urgent! In immediate need of improvement (our cutoffs)


Phase 3: Observe

*I am struck by…
I observe…
I notice…*


BECAUSE

Observation Reminders

- Made by the five senses.
- Contain no explanations.
- “Just the facts.”

Sample Observations on Multiple-Choice Item-Level Data

- For the three items designated to assess learning outcome 4, students did not perform better than 39% correct.
- Five out of seven items are in the red or urgent zone.
- On test item number 12, 32% of students responded to the incorrect answer B.
- All test items assessing students’ understanding of algebraic equations are highlighted in red.

Phase 4: Infer/Question

A possible explanation…
That may be because…
A question I have now…
Phase 4: Infer/Question

- What would students need to know/do to be successful at this task?
- What might students have been thinking to make the errors they did?
- How can we find out which of our hypotheses is right?
- What questions do we have?
- What additional data might we need?

NOTE: You may also inquire into student success: Why might so many of our students have done well on a particular item?

Sample Inferences from Multiple-Choice Item-Level Data

- Students seem confused about the motion of objects. 28% chose B; they were thinking that a moving object stops when its force is "used up."
- It seems like the students who chose answer D simply added the two different denominators. They seem confused about how to add fractions. We could use more data about their thinking.
- I think we need more strategies for teaching students to draw inferences from text.

Phase 4: Infer/Question

Choose two frequently missed items to study, including item 34.

Do the item first and then consider:

- What would students need to know/do to be successful at this task?
- What might students have been thinking to make the errors they did?
- How can we find out which of our hypotheses is right?
- What questions do we have?
- What additional data might we need?
Why Did So Many Students Miss Item 34?

34. A comet passed by Earth in the year 1835. It passes by Earth every 60 years. Based on this information, in which of the following years can the comet be expected to pass by Earth? Show your work.

A. 2035 – 21%
B. 2060 – 16%
C. 2075 – 44% (correct)
D. 2080 – 12%

Verify Causes

Hypothesize Possible Cause
Collect Additional Data, e.g.,
+ student interviews
+ observations
+ additional work
+ research
Generate Solutions
DATA CONFIRMS
DATA REFUTES

ReTEACH in Response to Data

- Teach in a different way.
- Engage learners in a different way.
- Align reteaching to the essence of the error or confusion.
- Challenge students with more complex tasks.
- Help students who aren’t there yet through tutoring before, during, or after class, more opportunities for practice, and all of the above.
ReTEACHing Practice

- Brainstorm several ideas for reTEACHing a particular concept or skill identified as a problem for students through item analysis.
- Narrow down to one or two strategies that everyone on the team agrees to try.

Looking for Love in All the Right Places

**Possible Causes**

- Curriculum
- Instruction
- Assessment
- Equity
- Critical Supports
- Teacher Preparation
- Other

Looking for Causes of Student-Learning Problems

- **Curriculum** – Did we teach it? In enough depth? Placed in the right sequence? Frequently enough?
- **Instruction** – Did we use a variety of research-based instructional approaches? Are we sharing successful practices? Did we reteach using a different approach to individuals or groups who didn’t yet get it? Did we align our instruction to the essence of students’ errors or confusion?
- **Assessment** – Did we use ongoing formative assessment to explore student thinking and build on it in our instruction? Communicate to students how to improve? Help them self-assess?
- **Equity** – Did we examine attitudes or practices that might contribute to achievement/relationship/teaching gaps?
- **Individual Assistance** – Did we identify students who need additional help and provide them with it?
- **Teaching**? – Do our teachers have what they need in order to be successful with our students?
Item Analysis Cautions

• Is the test item valid, i.e., does it measure what it is supposed to measure?
• Is the content accurate?
• Do the items elicit varying levels of student understanding from factual recall to conceptual understanding?
• Is the test itself fair and unbiased?
• Are there sufficient items from which to draw conclusions?

Reflection

• What discoveries are you making about the data (learner)?
• What discoveries are you making about the process (facilitator)?
• How can you help to foster productive item analysis with your colleagues (support system)?

Principles for Effective Data Use

• Pay attention to the process.
• Separate data from inference.
• Multiple perspectives yield the richest analysis.