Simple Strategies for Using Data to Improve Learning

Jay McTighe

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www.ernweb.com

Essential Questions

• What types of data should we collect?
• How do we examine the data?
• How can data help us to improve learning?
Webinar Topics

- Types of educational data:
  - standardized tests
  - school/district assessments
  - classroom formative data
  - qualitative sources
- Protocols for examining data
- Using data for educational change

Three-Minute Pause

Meet in groups of 3 - 5 to...
- summarize key points.
- add your own thoughts.
- pose clarifying questions.
Think of educational data in terms of a “photo album,” not a “snapshot”

“Evaluation is a complex, multi-faceted process. Different tests provide different information, and no single test can give a complete picture of a student’s academic development.”

from CTB/McGraw-Hill Terra Nova Test Manual
**Types of Data**

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Analyzing External Test Data

- Determine what is assessed
- Disaggregate the data
- Look for patterns
- Summarize results
- Identify improvement actions
What is being assessed?

- What achievement targets are being measured?
- What format is used (S-R, BCR, etc.)
- What are the sources of the data?
- What are the units of measurement?
- What do the #s represent?
- Which students (including sub-groups) are included in these data?

Most difficult item on NY State 10th grade math test!

34 A straw is placed into a rectangular box that is 3 inches by 4 inches by 8 inches, as shown in the accompanying diagram. If the straw fits exactly into the box diagonally from the bottom left front corner to the top right back corner, how long is the straw, to the nearest tenth of an inch?

Fewer than 30% of all 10th graders answered this item correctly, even though the Pythagorean theorem is routinely taught.
Look for Patterns in Data

- What do the assessment results over time reveal about our school’s overall strengths?
- ... about areas of needed improvement?
- How close is our school to meeting established standards?
- How are different population groups in the school performing?

Summarize the Data

Prepare short, written data summaries to:
- describe current performance levels
- identify priority areas for school/district
- provide understandable “sound bites” about school performance
- help make achievement data meaningful for staff and stakeholders
Summary Statement (example)

Criterion-referenced:
State Reading Assessment (grade 3)

Norm-referenced:
Iowa Tests of Basic Skills (grade 2)

Summary statement:
The grade 2 reading median percentile score for the school on the Iowa Tests of Basic Skills has averaged between 65 and 70 for the past three years. In this period, students did well in word identification but were weak in inferring meaning and in identifying sequential relationships. On average, however, only 35% of the grade 3 students scored at the “proficient” level on the state reading assessment in the same three-year period. Lowest performance on the state test was in distinguishing cause from effect and in explaining the extent to which predictions were confirmed by the text and why. There was a small performance gap on both measures between African American and white students. Girls outperformed boys every year on both the criterion-referenced and norm-referenced assessments.

Effective Data Summaries

- involve the staff in summarizing
- synthesize results from multiple data sources
- address the benchmark or objective level
- describe disaggregated results
- indicate long-term trends
- suggest improvement actions
Summary Statement (example)

Norm-referenced:
Terra Nova - Mathematics (grade 4)

Summary statement:
For the past four years, between 75% and 80% of the school’s grade 4 students tested “on or above grade level” in mathematics on Terra Nova. On average, however, only 50% of the students who entered the school within the last 12 months tested at least “on grade level.” Areas of most concern over the years for all students have been in geometry and spatial sense; data analysis, statistics, and probability; and problem solving and mathematical reasoning. Students new to the school also typically had the most difficulty with computation and estimation.
Problem of Data Overload

<table>
<thead>
<tr>
<th>pie charts</th>
<th>bar graphs</th>
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<table>
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<th>line graphs</th>
<th>data reports</th>
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Improvement Strategy

Andy Greene, Middle School Principal:

“When I get the results from the state assessments, I give each individual teacher their scores as well as the scores of every teacher in the department — *without* any names!

(I want them to see how they “match up” against their colleagues, but in a safe environment.)

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Improvement Strategy

Then, I meet with the department and I ask them to analyze the questions that students missed, as well as the “topic” that the question dealt with. Next, we discuss what students will have to know, understand, and be able to do in order to be successful on that type of question. Finally, we discuss instructional strategies that would positively impact the problem area(s).”

Student Work as Data

“We don't have to wait for the once-a-year test score report to begin school improvement planning. We have the most authentic student performance data all around us – student work.”

– Jay McTighe, 2001
### Types of Data

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**Beware: Mistaking the measures for the goals!**

“Practicing for a standardized test is like practicing for your annual physical exam!”
Match the Assessment Evidence with the Learning Goals

Evidence of Understanding...

requires the student to:

- **Apply**
  to novel situation
  (*‘authentic’ context*)

- **Explain**
  support, justify
  theorize, defend
Authenticity Matters...

Therefore:

1. Understanding is revealed through contextualized performance.

2. Students apply knowledge in meaningful, “real-world” contexts to show that they really understand.

inauthentic vs. authentic
(examples)

<table>
<thead>
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<th>authentic</th>
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</thead>
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<tr>
<td>fill in the blank</td>
<td>purposeful writing</td>
</tr>
<tr>
<td>select an answer from a set of given choices</td>
<td>scientific investigation</td>
</tr>
<tr>
<td>answer the ?s at end of chapter</td>
<td>issues debate</td>
</tr>
<tr>
<td>solve contrived problems</td>
<td>primary research</td>
</tr>
<tr>
<td></td>
<td>interpret literature</td>
</tr>
<tr>
<td></td>
<td>solve “real-world” problems</td>
</tr>
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Important Distinction!

**Sideline drills**
Practicing and testing
- discrete skills
- de-contextualized

**Playing the Game**
Requires “putting it all together”
- authentic
  contextualized

example:

**State Tour**

The State Department of Tourism has asked your help in planning a four-day tour of *(your state)* for a group of foreign visitors. Plan the tour to help the visitors understand the state’s history, geography and its key economic assets.

You should prepare a written itinerary, including an explanation of *why* each site was included on the tour.
example:  
Public Advocacy

After investigating a current political issue, write a letter to a public policy maker regarding the official’s position on that issue. Assume that his public policy maker is opposed to your position. (Students will be provided documentation of public policy maker’s position and background information.)

Your letter should present your opinion and attempt to persuade the public policy maker to vote accordingly.

Source: Littleton High School, CO

example:
Making the Grade

Your math teacher will allow you to select the method – mean, median or mode – by which your quarterly grade will be calculated.

Review your grades for quizzes, tests, and homework to decide which measure of central tendency will be best for your situation. Write a note to your teacher explaining why you selected that method.
Examining Student Work

- common assessments or assignments linked to important content standards

### English Language Arts Writing Requirements
**Grades 6-12**

<table>
<thead>
<tr>
<th>Grade</th>
<th>Expository</th>
<th>Persuasive</th>
<th>Literary Analysis</th>
<th>Creative/Expressive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade 6</td>
<td>Research report</td>
<td>Position paper</td>
<td>Literary essay on setting and/or conflict</td>
<td>Myth</td>
</tr>
<tr>
<td>Grade 7</td>
<td>Autobiographical essay</td>
<td>Product/policy evaluation</td>
<td>Literary essay on character</td>
<td>Persona writing</td>
</tr>
<tr>
<td>Grade 8</td>
<td>Research report</td>
<td>Problem/solution essay</td>
<td>Literary essay on symbolism</td>
<td>Narrative (fiction or nonfiction)</td>
</tr>
<tr>
<td>Grade 9</td>
<td>Cause/effect essay</td>
<td>Editorial</td>
<td>Analysis of multiple literary elements essay</td>
<td>Poetry</td>
</tr>
<tr>
<td>Grade 10</td>
<td>Research report</td>
<td>Social issue essay</td>
<td>Critical lens essay</td>
<td>Historical persona</td>
</tr>
<tr>
<td>Grade 11</td>
<td>Definition essay</td>
<td>Argumentative essay</td>
<td>Comparative genre/literary analysis essay</td>
<td>Poetry</td>
</tr>
<tr>
<td>Grade 12</td>
<td>Research paper</td>
<td>Position paper</td>
<td>Response to literary criticism essay</td>
<td>Parody/satire</td>
</tr>
</tbody>
</table>

Note: Every 6-12 student will be required to complete two writing tasks for each genre. One writing task for each genre at each grade level will be consistent throughout the District as noted below.
Examining Student Work

- common assessments or assignments linked to important content standards
- agreed-upon evaluative criteria

requires:
- common assessments or assignments linked to important content standards
- agreed-upon evaluative criteria
### Persuasive Writing Rubric

<table>
<thead>
<tr>
<th>Skill Area</th>
<th>Response at this level</th>
<th>Response at this level</th>
<th>Response at this level</th>
<th>Response at this level</th>
<th>Response at this level</th>
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<tr>
<td><strong>Meaning</strong></td>
<td>Include an analysis of the topic, audience, and purpose for the writing task, and also include an explanation of the organization and structure of the argument or position</td>
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<td><strong>Development</strong></td>
<td>Support the position clearly and consistently with specific evidence and examples that clearly illustrate the points being made</td>
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<td></td>
<td>Time to meet in teams to:</td>
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<tr>
<td></td>
<td>1. Examine student work using a structured protocol</td>
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### Examining Student Work

- **common assessments or assignments linked to important content standards**
- **agreed-upon evaluative criteria**
- **time to meet in teams to:**
  1. examine student work using a structured protocol
Examining Student Work

- describe
- evaluate
- identify improvement actions
- interpret

Describing the Assessment

- What standards, outcomes, or benchmarks are being assessed?
- Specifically, what knowledge, skills and/or understanding are being assessed?
- What kinds of thinking are required (e.g., recall, interpretation, problem solving)?
Evaluating Student Work

• By what criteria are we evaluating student work?

• Are these the most important criteria?

• How good is “good enough” (i.e., the performance standard)?

Interpreting the Results

• What patterns of strengths and weaknesses are evident?

• Are these results consistent with other achievement data?

• What questions do these results raise?

• Are there any surprises? ... anomalies?

• Is there evidence of improvement or decline? If so, what caused the changes?
Examining Student Work

- common assessments or assignments linked to important content standards
- agreed-upon evaluative criteria
- time to meet in teams to:
  1. examine student work using a structured protocol
  2. select exemplars ("anchors")

Anchoring

Anchoring refers to the process of selecting examples of student responses to characterize each of the score points on a scale. These examples, known as anchors, provide tangible and specific illustrations of various levels of performance or degrees of proficiency based upon established criteria.
Anchors...

✓ help teachers to better understand and more consistently apply the evaluative criteria.

✓ provide teachers with models and examples for instructional use.

Anchors...

✓ offer students clear targets and examples of excellent work to motivate and guide their efforts.

✓ help students better understand and apply the criteria for self and peer evaluation.
Examining Student Work

- common assessments or assignments linked to important content standards
- agreed-upon evaluative criteria
- time to meet in teams to:
  1. examine student work using a structured protocol
  2. select exemplars ("anchors")
  3. plan improvement actions
Using Data to Improve Learning

Data-Driven Improvement Planning

Based on an analysis of achievement data and student work:

- What patterns of weakness are noted?
- What specific areas are most in need of improvement?

- Problem solving and mathematical reasoning are generally weak
- Students do not effectively explain their reasoning and their use of strategies
- Appropriate mathematical language is not always used

What specific improvement actions will we take?

- Increase our use of "non routine" problems that require mathematical reasoning.
- Explicitly teach (and regularly review) specific problem solving strategies.
- Develop a poster of problem solving strategies and post in each math classroom.
- Increase use of "think alouds" (by teacher & students) to model mathematical reasoning.
- Develop a "word wall" of key mathematical terms and use the terms regularly.
- Revise our problem solving rubric to emphasize explanation & use of mathematical language.

Symptom

When you visit your doctor, you have to describe your symptoms before you can find out what's wrong. Well, consider this like taking your car to a doctor. This information will help us diagnose your car's problem and get your car to feeling better.

Acid Buildup
Alternator Not Charging
Bent
Black Exhaust Smoke
Blue Exhaust Smoke
Brake Lights Always On
Brake Warning Lamp On
Burned Out
Charging Light On
Cigarette Lighter Inoperative
Clock Inoperative
Clogged
Contaminated Coolant
Coolant Is Low
Cracked
Crankcase Sludge
Dim Headlights
Dirty
Engine Oil Leaks
Engine Oil Pressure Low
Engine Overheats
Excessive Smoke
Excessive Tire Wear
Exhaust Smoke-Black
Exhaust Smoke-Blue
Exhaust Smoke-White
Fluid
Fluid Is Low
Fluid Leaking
Fuel Gauge Inaccurate
Fuel Leak
Headlights Dim
Headlights Won't Come On
Headlights Won't Dim Or Brighten
High Coolant Temperature
High Engine Oil Consumption
Ignition Light On
Interior Lights Won't Come On
Lopsided
Loss Of Brake Fluid
Loss Of Coolant
Loss Of Headlights
Loss Of Interior Lights
Loss Of Power Steering Fluid
Low Amps
Low Brake Pedal
Oil Is Low
Poor Fuel Economy
Poor Headlight Alignment
Premature Wear
Site Unevenly
Smoke
Steam
Steering
Stuck
Swollen Case Or Cover
Turn Signals Inoperative
Uneven Tire Wear
Wear
White Exhaust Smoke
Windshield Wipers Inoperative
Using Data to Improve Learning

**Diagnosis**

Here's what we think may be wrong with your car and what may be causing it. The list goes from the most likely problem to the least likely. Check out our Product and How To pages for more information about particular parts.

Keep in mind, this is a general diagnosis. Your car may not have the parts we list as potential problems. If you’re not sure if you car has a particular part, check your owner’s manual.

<table>
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<th>Priority</th>
<th>Action</th>
<th>Part Type</th>
<th>Cause</th>
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<tr>
<td>1</td>
<td>Inspect</td>
<td>HIGH PRESSURE SWITCH</td>
<td>Faulty, loose or poorly connected oil pressure switch.</td>
</tr>
<tr>
<td>2</td>
<td>Inspect</td>
<td>OIL (CRANKCASE) TYPE AND WEIGHT</td>
<td>Incorrect grade of motor oil</td>
</tr>
<tr>
<td>3</td>
<td>Inspect</td>
<td>OIL FILTER</td>
<td>Old or clogged oil filter.</td>
</tr>
<tr>
<td>4</td>
<td>Inspect</td>
<td>OIL PUMP</td>
<td>Oil pump cover bent or cracked</td>
</tr>
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**Troubleshooting Guide**

√ What are the common/predictable misconceptions, skill deficits, or performance weaknesses?

√ What specific approaches, strategies, and resources have proven successful in addressing these trouble spots?

√ How might we share the wisdom of experts with all teachers?
Troubleshooting Guide

- Think: Software help
- Specific to particular topics/skills
- Built on expertise from teachers, curriculum specialists, special population experts, and researchers
- Web-based – readily accessible & expandable

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  Local Surveys  
  Observations |
Summative Assessments...

✓ culminating – typically occur at the conclusion of instruction
✓ assess for degree of knowledge or skill proficiency
✓ evaluative in nature

Examples: unit test, final exam, performance task, culminating project, portfolio of work

Assessment OF Learning

“Evaluative feedback is often reported using letters, numbers, checks, or other symbols. Because evaluative feedback has been encoded into a summary comment (‘great job’) or a symbol (B, 72%, 3), students usually understand whether or not they need to improve but not how to improve.”

Anne Davies
Formative Assessments

- ongoing assessments
- provide feedback to teachers and students
- inform adjustments – the key to improvement

Examples: quiz, questioning, observation, draft work, “think aloud,” dress rehearsal, portfolio review

something to think about...

In a comprehensive meta-analysis of relevant research, Black and William concluded that the effective use of formative assessment yields gains in student achievement “among the largest ever reported for educational interventions.”
Highest Yield Assessments

Formative Assessment

Summative Assessment

Informal Formative Assessments

Hand Signals

- I understand and can explain ______.  
  (thumbs up)
- I do not yet understand ______.  
  (thumbs down)
- I am not sure about ______.  
  (wave hand)
Informal Formative Assessments

Hand Signals

- I understand and can explain the difference between analytic and holistic rubrics? (thumbs up)
  - I do not yet understand ““. (thumbs down)
  - I am not sure about ““. (wave hand)

Informal Formative Assessments

White Boards

- Student write responses on white boards.
  - T - F
  - A, B, C, D
  - Short answer
I.Q. Exit Cards

- **Side 1** - List an idea or insight you have about ________.

- **Side 2** - List a question you have about ________.

---

I.Q. Exit Cards

- **Side 1** - List an idea or insight you have about **rubrics**.

- **Side 2** - List a question you have about **rubrics**.
Informal Formative Assessments

3-2-1 Summary

3 – List three things you learned about _____.

2 – Give two examples of _____.

1 – Raise one question that you have about _____.

Informal Formative Assessments

3-2-1 Summary

3 – List three things you learned about *rubrics*.

2 – Give two examples of *criterion-based evaluation*.

1 – Raise one question that you have about *using rubrics*. 
**Exit Card Responses**

<table>
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<tr>
<th>What works:</th>
<th>when you give a “real” example after teaching a concept</th>
</tr>
</thead>
<tbody>
<tr>
<td>What doesn’t:</td>
<td>when you give us 2 different ways to solve the same problem - it’s confusing!</td>
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<th>What works:</th>
<th>when you gives an example on the board, make helpful drawings and tell us how you are thinking when solving the problem</th>
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<td>What doesn’t:</td>
<td>making me do math in my head because I need to draw pictures or write out a problem to solve it</td>
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**Web/Concept Map**

- Create a web or concept map to show how the parts or elements are related.
Three-Minute Pause

Meet in groups of 3 - 5 to...
✓ summarize key points.
✓ add your own thoughts.
✓ pose clarifying questions.

Informal Formative Assessments

Misconception Check

Present students with common misconceptions to see if they can:
1. Identify the error.
(Use true-false or multiple-choice items.)
2. Explain why it is wrong.
(Students respond orally or in writing.)
Mathematics

Misunderstanding

“An equals sign (=) means that you have to find the answer.”

History/ Social Studies

Misunderstanding

“If it’s written down (in a textbook, or a newspaper, etc.) it must be true.”
Chris wants to decide which of two spot removers is best. First, he tried Spot Remover A on a T-shirt that had fruit stains and chocolate stains. Next, he tried Spot Remover B on jeans that had grass stains and rust stains. Then he compared the results.

What did Chris do wrong that will make it hard for him to know which spot remover is best? Explain what would need to be changed to help him decide which spot remover is best?

Anticipating Concerns

“I have too many students to do this.”

“Yes, but…”

“But this takes too much time.”
Eric Mazur’s Physics Course

After fifteen minutes, Mazur poses a question that requires conceptual understanding and transfer (e.g., estimating the displacement of a toy boat in a bathtub).

- Students write their answers on a sheet and identify their levels of confidence in the answer.
- In pairs, attempt to convince others of their answers.
- Students then answer the question a second time and report their confidence levels again.
- The whole class is polled about their answers.

More assessment = better results

Mazur has collected data on the impact of his approach vs. traditional lecture for over a decade. He has found that students:

- performed better on standard physics course exams
- scored higher on measures of traditional problem solving
- scored much higher when conceptual understanding was assessed
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### Research into Local Assessment Practices*

Year 1 - Collected all assessments given during a seven week period from December - January, 2000-2001 (640 total assessments).

• A random sample (20% or 142) of these were analyzed.

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Analysis Process

% of assessment formats (e.g., selected-response, essay, performance tasks, etc.)

% of assessment at various cognitive levels (Bloom’s Taxonomy)

Number and quality of assessments requiring writing and/or problem solving

Number and quality of rubrics

Findings...

1. Testing the lower-levels of cognition (knowledge and comprehension levels on Bloom’s Taxonomy) predominated at all levels. (75.5%)

2. Traditional selected-response formats of multiple choice, true and false, matching, dominated all other types. (80%)
Findings continued...

3. Short answer writing (one or two sentences) was never scored using a rubric.

4. Essay formats were very rarely used (2%) and when used were rarely scored with a rubric. (5%)

5. Rubrics that were available were poorly crafted with checklist-formats sometimes (33%) being represented as rubrics.

Findings continued...

6. Mathematics assessments at all levels involved only comprehension types of problem solving (i.e., algorithmic “plug-in”), rather than authentic, real-world applications. Students were rarely called upon to write to justify or explain their process or the appropriateness of the answer to the problem posed.
Findings continued...

7. Performance assessments, where they existed, consisted mostly of products to be graded by a score sheet. Rubrics rarely existed for such assessments. (4%)

8. Essay writing at the elementary level was non-existent (in the samples). (0%)

Something to think about...

- If you were to replicate this study in your school or district, what would you expect to find?

- Are we assessing in ways that are easiest to grade, rather than matching assessment methods with our achievement targets?
Synthesis Session

individually...

Review your notes and handouts and identify one or two interesting or useful ideas that you gained from yesterday’s session.

with your group...

Briefly share one of your ideas and listen to others.