STEM Assessment: When the whole is greater than the sum of its parts!

Jodi J. Haney, PhD

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Professor Emeritus, BGSU
Owner & Operator, Xcite Learning
Follow Along?

bgsu.edu/nwosymposium

NWO SYMPOSIUM
Bowling Green State University / NWO / Programs / NWO Symposium

Northwest Ohio Symposium on Science, Technology, Engineering, and Mathematics Teaching

GNWO ANNUAL SYMPOSIUM ON SCIENCE, TECHNOLOGY, ENGINEERING, AND MATHEMATICS TEACHING

NOVEMBER 19, 2016

8:30 AM - 4 PM
Olscamp Hall
Bowling Green State University

Featuring the 2016 keynote speaker: Dr. Jodi Haney

Presentation Slides
Assess: to sit beside with the goal of IMPROVING... taking NEXT step.
FORMATIVE SUMMATIVE

WHEN THE CHEF TASTES THE SOUP
WHEN THE GUESTS TASTE THE SOUP
KEEP CALM
AND
SHOW WHAT
YOU KNOW
<table>
<thead>
<tr>
<th>False +</th>
<th>False -</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assessment shows MORE understanding that what is really there</td>
<td>Assessment shows LESS understanding that what is really there</td>
</tr>
</tbody>
</table>

Both problematic & endanger teaching and learning
Need a JUST RIGHT Classroom Assessment Plan

Allowing students to show ALL of what they know to avoid false positives and NEGATIVES.
Self Efficacy: Belief that I have the skill and ability to do this thing!

Growth Mindset: Carol Dweck
Intelligence is malleable and grows with effort & perseverance!
What are Some Classroom Strategies for + Self Efficacy * Growth Mindset (Persistence)?
Via a “What Wheel”

C - option .. use notes on test

Do Over Tests for 1/2 points back

Sign it: jhaney
jhaney3@mac.com
Graffiti Pie Chart: Your Classroom Assessments - NOW.
[9 week grading period]

- Tests & Quizzes - 50%
- Projects - 40%
- Homework - 10%
Going Retro (1994)

ODE Assessments: Classroom Assessment:

- Type 1 (Write/Say),
- Type 2 (Do/Perform), and
- Type 3 (Create/Produce) assessments

See Article “Assessing Student Success” by…me ; - )
Graffiti Pie Chart:
Tag Type I, II, III

- Type I
  - Tests & Quizzes - 50%

- Type II
  - Projects - 40%

- Type III
  - Homework - 10%
Science Grades: 9 Week Term

- Type I: 33%
- Type II: 33%
- Type III: 33%
We should MEASURE what matters....

Standardized AND Classroom tests measure but a thin slice!
<table>
<thead>
<tr>
<th>Type I  [write/say]</th>
<th>Type II [do/perform “right now”]</th>
<th>Type III [produce/create “over time”]</th>
</tr>
</thead>
<tbody>
<tr>
<td>• quizzes - 10%</td>
<td></td>
<td></td>
</tr>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

Total = ____%  [20 - 40%]

Total = ____%  [20 - 40%]

Total = ____%  [20 - 40%]

100% is all you get ;)
In Jodi’s World…

<table>
<thead>
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<th>Type II [do/perform]</th>
<th>Type III [produce/create]</th>
</tr>
</thead>
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<tr>
<td>• Quick quiz</td>
<td>• Performance indicator</td>
<td>• Green Fund Proposal</td>
</tr>
<tr>
<td>• Final exam</td>
<td>• Homework</td>
<td>• Digital Content Creation</td>
</tr>
<tr>
<td>• Concept maps</td>
<td>• Peer teaching</td>
<td>for public audience</td>
</tr>
<tr>
<td>• Discussion boards</td>
<td>• Presentations</td>
<td>• GLOBE Action Plan</td>
</tr>
<tr>
<td>• Interactive Notebooks</td>
<td>• Earth Day/service learning</td>
<td></td>
</tr>
<tr>
<td>• Keeley Assessment Probes</td>
<td>• festivities</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Science Investigations</td>
<td></td>
</tr>
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<td>Type II</td>
<td>Type III</td>
</tr>
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<td>----------------</td>
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<tr>
<td>[write/say]</td>
<td>[do/perform]</td>
<td>[produce/create]</td>
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- quiz - 10%
- Performance
- Habitats Project

Total = 30%
Total = 40%
Total = 30%
**Type II: Performance Indicator [10%]**

100% – **Leader in class.** Volunteers frequently for in-class activities, frequently asks thoughtful questions and answers questions with appropriate/thoughtful/logical responses. Demonstrates strong performance on both in-class and out of class assignments. Regularly demonstrates both passion and respect during course and/or online discussions. Adds significantly to a positive learning environment. Performance is highly consistent, accurate, and strong overall. **HIGHLY ENGAGED STUDENT/LEADER.** A maximum of 0 unexcused absences for this course.

85% - **Active Participant in class.** Regularly volunteers for in-class activities, asks thoughtful questions and answers questions with appropriate/thoughtful/logical responses. Demonstrates solid performance on both in-class and out of class assignments. Demonstrates respect. Performance is consistent, mostly accurate, and solid overall. **MOSTLY ENGAGED STUDENT.** A maximum of 2 unexcused absences for this course.

70% – **Regular Participant in class.** Sometimes asks thoughtful questions, sometimes answers questions with appropriate/thoughtful/logical responses. Demonstrates adequate performance on both in-class and out of class assignments. Performance is not always consistent or accurate, but adequate overall. **SOMEWHAET ENGAGED STUDENT.** A maximum of 4 unexcused absences for this course.

55%– **Sporadic Participant in class.** Rarely asks thoughtful questions or answers questions with appropriate/thoughtful/logical responses, etc. Performance is not consistent, often inaccurate and weak overall. **RARELY ENGAGED STUDENT.** A maximum of 6 unexcused absences for this course.

0% - **DISENGAGED STUDENT.** Did not meet the expectations above.

**Must meet all criteria in any category to receive the score for that category.**
Balanced Levels of Thinking for all types

BLOOM's Taxonomy Simplified… +

- Acquiring (facts, memory/recall)
- Processing (NEW questions/tasks requiring thinking/transfer of knowledge)
- Extending (synthesizing/analyzing multiple bits of NEW information)
ODE 2014 Cognitive Demands

Recalling / Identifying Accurate Science

• Students provide and identify accurate statements about previously learned, scientifically valid facts, concepts and relationships described by the Ohio Academic Content Standards, K-12 Science.

Communicating Understanding / Analyzing Science Information

• Students analyze scientific information and communicate scientifically, given rich investigative scenarios and valid scientific data and information.

Demonstrating Investigation Processes of Science

• Students use scientific inquiry skills, grounded in standards-based science content.

Applying Concepts / Making Relevant Connections with Science

• Students apply science in the context of individuals and society and scientifically analyze consequences and alternatives, given rich, real-world situations and technological problem-solving scenarios.
Type 1 Assessments to SHOW WHAT THEY KNOW
Examples of FACTs and Probes

- Whiteboarding – Batteries, Bulbs, & Wires probe
- Four Corners – Ice Cold Lemonade probe
- Card Sort – Is it Melting? probe
- Commit & Toss – Solids & Holes probe
- Human Scatterplot – Mirror on the Wall probe
- Sticky Bars – Giant Sequoia Tree probe
- P-E-O-E – Ice Cubes in a Bag probe
Is It Melting?

The strips of paper you have in front of you each list a situation that causes changes in materials.

Organize the strips into 2 categories:
Melting and Not Melting
Is It Melting?

The list below involves situations that cause changes in materials. The materials are italicized. Put an X next to the situations in which the italicized materials undergo melting.

___ A Putting a bowl of frozen *ice cream* in the sun.
___ B Sawing *wood* to make sawdust.
___ C Dissolving *salt* in water.
___ D Adding a *LifeSaver* candy to a glass of warm water.
___ E *Water* evaporating from a pan.
___ F Dissolving a *sugar cube* in a cup of hot tea.
___ G Pouring vinegar on *baking soda*.
___ H Sucking on a *lollipop* or other hard candy.
___ I Holding an *ice cube* in your hand.

Explain your thinking. Describe the “rule” or reasoning you used to decide if something melts.

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
Commit & Toss with Sticky Bars

Doing Science

Four students were having a discussion about how scientists do their work. This is what they said:

Antoine: “I think scientists just try out different things until something works.”

Tamara: “I think there is a definite set of steps all scientists follow called the scientific method.”

Marcos: “I think scientists use different methods depending on their question.”

Avery: “I think scientists use different methods but they all involve doing experiments.”

Which student do you most agree with? _______________________

Explain why you agree with that student and include why you disagree with the other students.
Google Form:

https://goo.gl/forms/1ViczzXG10Kmodbg2
STUDENTS SHOW WHAT THEY KNOW by Teachers UNCOVERING STUDENT IDEAS!
Type I, II, III? Why?
[Write/Say, Do/Perform/Create/Produce]

Level of Thinking A.P.E.?
[acquire facts/process ideas/extend & apply]

Cognitive Demand?
[recall/interpret/thinking-inquiry/apply]
A Word About Packaged Assessment Systems

- STAR, MAP, TeraNova, Study Island, etc.
- **Criterion Validity** typically fine (items measure what they say they do)
- **Predictive Validity** often weak (items predict success on future standardized assessments)
- **MOST IMPORTANTLY... If & HOW** the data is used to improve instruction! **THIS TAKES MORE TIME THAN MOST DISTRICTS PROVIDE** (another “planning” period for teachers)
You Don’t Fatten A Pig
By Weighing It

... FEED THE PIG!
# Breakfast in Bed: Holistic Rubric

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>All food is perfectly cooked, presentation surpasses expectations, and recipient is kept exceptionally comfortable throughout the meal.</td>
</tr>
<tr>
<td>3</td>
<td>Food is cooked correctly, the meal is presented in a clean and well-organized manner, and the recipient is kept comfortable throughout the meal.</td>
</tr>
<tr>
<td>2</td>
<td>Some food is cooked poorly, some aspects of presentation are sloppy or unclean, or the recipient is uncomfortable at times.</td>
</tr>
<tr>
<td>1</td>
<td>Most of the food is cooked poorly, the presentation is sloppy or unclean, and the recipient is uncomfortable most of the time.</td>
</tr>
</tbody>
</table>
# Breakfast in Bed: Analytic Rubric

<table>
<thead>
<tr>
<th></th>
<th>Beginning 1</th>
<th>Developing 2</th>
<th>Accomplished 3</th>
<th>Exemplary 4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Food</strong></td>
<td>Most food is colder or warmer than it should be, is under- or over-seasoned, or is under- or overcooked.</td>
<td>Some food is colder or warmer than it should be, is under- or over-seasoned, or is under- or overcooked.</td>
<td>All food is at the correct temperature, adequately seasoned, and cooked to the eater’s preference.</td>
<td>All food is perfectly cooked and seasoned to the eater’s preference. Additional condiments are offered.</td>
</tr>
<tr>
<td><strong>Presentation</strong></td>
<td>More than one item (tray, napkin, or silverware) are dirty or missing.</td>
<td>Tray, napkin or silverware may be dirty or missing.</td>
<td>Food is served on a clean tray, with napkin and silverware. Some decorative additions may be present.</td>
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<td><strong>Comfort</strong></td>
<td>Wake-up is abrupt, little to no help with seating, and the recipient is rushed and crowded during the meal.</td>
<td>Wake-up is somewhat abrupt, recipient may struggle with seat adjustment, or there may be some rushing or crowding during eating.</td>
<td>Recipient is woken gently, assisted in seat adjustment, and given reasonable time and space to eat.</td>
<td>Recipient is woken gently and lovingly, assisted until seating is just right, and given abundant time and space to eat.</td>
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**Ordinal Scale (8/12 or 67%) vs. Interval % scales (80%)**

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**Your Turn:** “Back of the Envelope” Math!
Big Ideas...

Good Classroom Assessment is a COMPLEX SYSTEM!

1. START with growth mindset strategies - PERSISTENCE
2. Design by aligning Curriculum, Instruction, Assessment (CIA) - Verb Agreement
3. CHECK it for BALANCE (Type I, II, III/Cognitive Demands/mindset opportunities)
4. Score Fairly (Rubrics: Use % vs. 4,3,2,1)
5. Influence district for time needed for Meaningful Use of the Data for individualized instruction
6. Reflect & MODIFY your assessment system regularly
Measuring What Matters
Workshop December 5 & 6, 2016
[Registration Ends November 28th]
8:30 am - 3:30 pm
XciteLearning.com
jhaney@xcitelearning.com

Questions?
Thank You for this Opportunity!