Meeting the NGSS “Alignment Challenge”

- Current alignment models may provide relevant and appropriate frameworks for understanding NGSS alignment but will require some modifications.

- Use of a language system such as DOK allows for consistent and efficient communication about the intended complexity of NGSS expectations and alignment of corresponding assessment tasks.
Alignment: A powerful tool for focusing instruction, curricula, and assessment

“Alignment is the degree to which expectations[, curriculum,] and assessments are in agreement and serve in conjunction with one another to guide the system toward students learning what is expected.” (Webb, 1997)
<table>
<thead>
<tr>
<th>Alignment Criteria (Webb, 1997)</th>
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<tbody>
<tr>
<td><strong>Categorical Concurrence</strong></td>
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<tr>
<td>same or consistent content in</td>
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<tr>
<td>standards and assessment</td>
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<tr>
<td><strong>DOK Consistency</strong></td>
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<tr>
<td>assessment elicits work that</td>
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<tr>
<td>is as cognitively demanding</td>
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<tr>
<td>as the expectations in the</td>
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<tr>
<td>standards</td>
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<tr>
<td><strong>Range of Knowledge</strong></td>
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<tr>
<td>comparable span of knowledge</td>
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<tr>
<td>required for assessment as</td>
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<tr>
<td>expressed in the standards</td>
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<tr>
<td><strong>Balance of Representation</strong></td>
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<tr>
<td>emphasis on assessment</td>
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Defining Categorical Concurrence in the Context of NGSS

- how 3-dimensionality is evaluated
- appropriateness of stimulus
- scientific accuracy
- (depends on targeted construct)
How might we map multivariate Categorical Concurrence?
“The NGSS PEs were designed to be very cognitively demanding, so student proficiency will require a higher level of rigor (for example, a higher Depth of Knowledge [DOK] or Bloom’s Taxonomy Level) than did most previous sets of state science standards.”

From NGSS Evidence Statements Front Matter (2015):
NGSS and Complexity

- “complex task design”
- “rich cognitive processes”
- “purposeful complexity”
It's pretty rigorous. My students struggle with this.

I don't think it's hard. Students really have to think about this one.
Depth of Knowledge (DOK) is a powerful language system for talking about content complexity.

DOK helps us differentiate between and among different levels of content complexity.
Content Complexity

- Novelty of material
- Processing of concepts and skills
- Use of context
- Sophistication of material
- Connection among parts
HS-1E. Develop response plans to emergency situations.

Does it mean....?

If fire then call fire department.
HS-1E. Develop response plans to emergency situations.

Does it mean…?
HS-PS-1-2 Construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties.

HS-LS-1-1 Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins, which carry out the essential functions of life through systems of specialized cells.

HS-LS-3-1 Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.
# Depth of Knowledge (Webb, 1997)

<table>
<thead>
<tr>
<th>Level 1: Recall and Reproduction</th>
<th>Level 2: Skills and Concepts</th>
<th>Level 3: Strategic thinking</th>
<th>Level 4: Extended thinking</th>
</tr>
</thead>
<tbody>
<tr>
<td>recall or reproduction of a fact, information, or procedure, etc.</td>
<td>interpret phenomena in terms of science concepts, connecting ideas, explaining relationships, etc.</td>
<td>requires demanding reasoning, use of evidence to develop and support a logical argument, abstract and non-routine problem-solving, etc.</td>
<td>authentic science investigation or project; involves extended time spent on complex problems</td>
</tr>
</tbody>
</table>
DOK 2!
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DOK 2!
DOK 2!
DOK 2!
PISA 2006: Three Categories of Science Items (OECD, 2007)

- identifying scientific issues
- explaining phenomena scientifically
- using scientific evidence

From: https://www.oecd.org/pisa/pisaproduc
Takeaways: DOK & NGSS

• “NGSS is where DOK 1 goes to die” – Peter McLaren (2016ish)

• An aligned assessment should NOT include DOK 1 items

• Differentiating between DOK 2 and DOK 3 expectations could help promote alignment.

• Use of a common language to differentiate between and among levels of complexity can help support alignment endeavors.
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WebbAlign

webbalign.org