Alignment by Design

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Focus Questions

- Does strong alignment guarantee good assessment?
- What are some strategies to apply the learnings from alignment studies in the refinement of state standards, and to the development of grade-level expectations?
- What are some potential strategies and considerations when using alignment study tools in front-end development when…
  - Building new assessments?
  - Augmenting CRTs or NRTs?
  - Building assessment systems?

Alignment by Design
Part I: Thoughtful Alignment

Alignment studies can be very helpful.

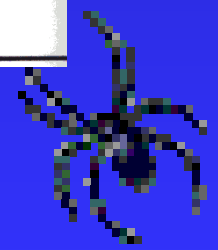
Be thoughtful.

Does alignment guarantee good assessment?

		Alignment: Standards and Assessments	
		Yes	No
Good Assessment	No		
	Yes		

Case A: The Spider

		Alignment: Standards and Assessments	
		Yes	No
Good Assessment	No		
	Yes		



Process Standards

Standard 2.5: Students produce solutions to mathematical problems requiring decisions about approach and presentation.

Standard 1.17: Students interpret and communicate using mathematical, scientific, and technological notation and representation.

Field of Knowledge Standards

Standard 7.7: Students use geometry and measurement concepts

• 7.7.ccc. Use relationships between figures that involve congruence, similarity, projections, and transformations;

Standard 7.8: Students use function and algebra concepts

7.8.ccc. Define and use variables, parameters, constants, and unknowns in work with both functions and equations

Standard 5.30: Students use a variety of visual arts media (animation, CAD, video) to show an understanding of the different properties each possesses.

Case A: The Spider

		Alignment: Standards and Assessments	
		Yes	No
Good Assessment	No		
	Yes		

Case B: Curriculum Aligned to Form of Assessment

		Alignment: Standards and Assessments	
		Yes	No
Good Assessment	No	●	
	Yes		

Example - Curriculum

Multiple choice only item type in assessment.

Curriculum aligned to form.

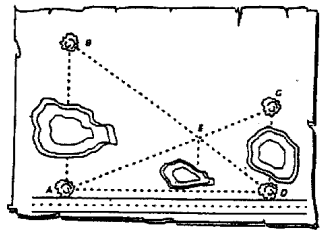
Case C: Standard as Target

Items in system ONLY at implied cognitive level.

State A - Geometry HS
Standard: Students apply geometric concepts, properties, and relationships in a problem solving situation.

		Alignment: Standards and Assessments	
		Yes	No
Good Assessment	No	●	
	Yes		

You are on a trip to one of the Pythagorean Islands. In the cellar of your cabin you have found an old map that claims to hold the secret location of a buried treasure. The map shows four trees at location A, B, C and D. The trees at A and D are right along a road that runs from west to east through the island. The tree at B is directly north of the tree at A, and the tree at C is directly north of the tree at D.



The map's directions say to trace a direct path from the tree at B to the tree at D, and to do the same for the trees at A and C. The treasure is buried halfway between the intersection of these paths and the road. Call the point of intersection E.

Unfortunately over time some of the document has deteriorated and only the following distances were readable:

A to C 260 paces
B to D 300 paces
A to D 240 paces

Write instructions that would lead anyone directly to the treasure.

Contributed to Wyoming Activities Based Consortium by EXEMPLARS

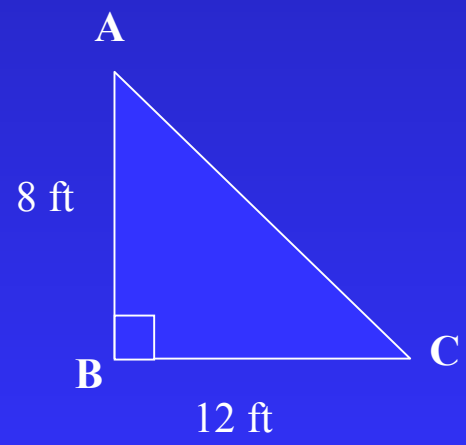
Case D: Weak alignment to cognitive level implied in standards

Geometry HS Standard: Students apply geometric concepts, properties, and relationships in a problem solving situation.

Items written below the cognitive demand implied in standard.

Implied cognitive demand – problem solving.

What is the length of $\overline{AC}$?



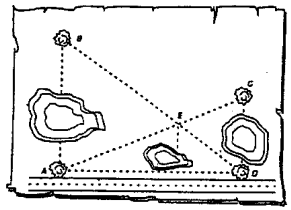
		Alignment: Standards and Assessments	
		Yes	No
Good Assessment	No		●
	Yes		

Case E: Standard as a Ceiling

Items in system written along a range of cognitive levels from routine to implied cognitive level in standard.

Geometry HS Standard: Students apply geometric concepts, properties, and relationships in a problem solving situation.

You are on a trip to one of the Pythagorean Islands. In the cellar of your cabin you have found an old map that claims to hold the secret location of a buried treasure. The map shows four trees at location A, B, C and D. The trees at A and D are right along a road that runs from west to east through the island. The tree at B is th of the tree at A, and the tree at C is directly north of .



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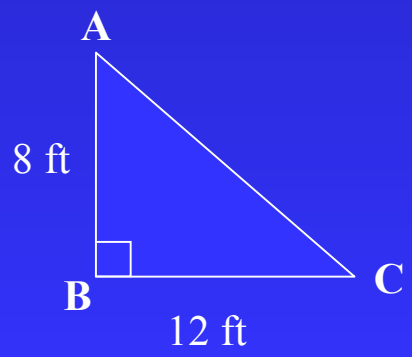
Range of items

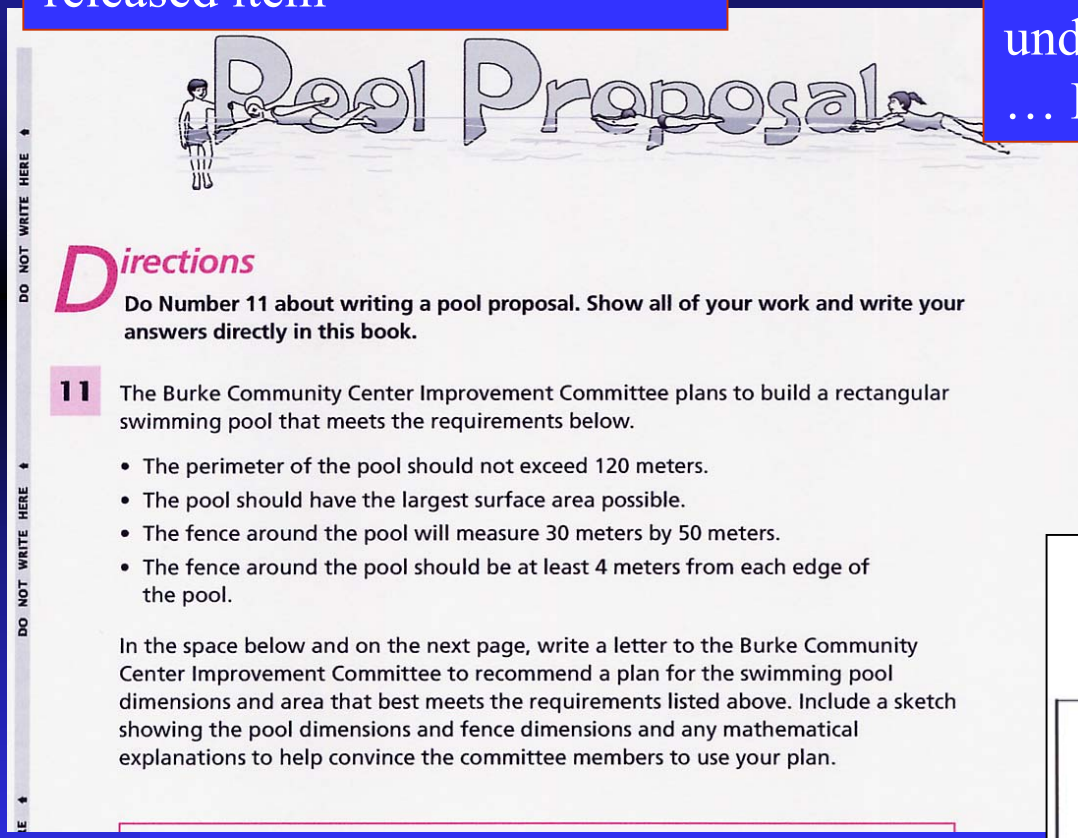
	Alignment: Standards and Assessments		
		Yes	No
Good Assessment	No		
	Yes		●

What is the length of $\overline{AC}$?



Case F: Interaction of content with process standards

Missouri 10th grade 2002 released item



Pool Proposal

DO NOT WRITE HERE

DO NOT WRITE HERE

Directions

Do Number 11 about writing a pool proposal. Show all of your work and write your answers directly in this book.

11 The Burke Community Center Improvement Committee plans to build a rectangular swimming pool that meets the requirements below.

- The perimeter of the pool should not exceed 120 meters.
- The pool should have the largest surface area possible.
- The fence around the pool will measure 30 meters by 50 meters.
- The fence around the pool should be at least 4 meters from each edge of the pool.

In the space below and on the next page, write a letter to the Burke Community Center Improvement Committee to recommend a plan for the swimming pool dimensions and area that best meets the requirements listed above. Include a sketch showing the pool dimensions and fence dimensions and any mathematical explanations to help convince the committee members to use your plan.

Missouri Geometry HS Standard: Students apply an understanding of perimeter, area … MO Goals 2.5; 3.3; 4.1

MO Goal 2.5: Produce works in… practical arts.

MO Goal 3.3: Develop and produce works in… solving problems.

MO Goal 4.1: Explain reasoning and identify information to support decisions.

		Alignment: Standards and Assessments	
		Yes	No
Good Assessment	No		
	Yes	●	

Case G: Strong alignment of assessment items to standards. Discrimination analysis used in construction of assessment to…

G1: …identify a range of complexity

		Alignment: Standards and Assessments	
		Yes	No
Good Assessment	No		
	Yes	●	

G2: …obtain norms

		Alignment: Standards and Assessments	
		Yes	No
Good Assessment	No	●	
	Yes		

Case H: Strong alignment of assessment items to standards. Weak alignment to NAEP Framework.

		Alignment: Standards and Assessments	
		Yes	No
Good Assessment	No	●	
	Yes	●	

Case Summary

		Alignment: Standards and Assessments	
		Yes	No
Good Assessment	No	B, C, G2, H	D
	Yes	F, G1, H	A, E

In your work, have you found other unusual cases that should be thought through?

Alignment by Design
Part II – Strengthening Standards

In a standards-based system,
be sure your standards provide
a firm foundation.

Potential Strategies for Standards Refinement

- Identification and elimination of overlaps or redundancies
- Prioritization - By importance? By meaning of "All" students?
- Differentiation of standards that are instructional strategies from those that are learning goals
- Differentiation of standards for large scale assessment from those more appropriately assessed at the school and classroom levels
- Determination of the balance between curriculum time vs. depth of learning; (Mile wide – inch deep)
- Grain size analysis
- Identification of relationships between content and process
- Consideration of the conversion to grade-specific standards from grade-span standards

State A: High School Science Standards

At high school level:

- 13 standards
- 51 benchmarks

→

3 standards

12 benchmarks

Strategies:

- Eliminated overlaps and redundancies;
- Identified relationships between content and process standards;
- Reviewed for "all" students.

Grain Size

Example Standard and Benchmarks

Students will understand that cells are the basic unit of life. Students will be able to…

1) Compare and contrast human organ systems with those of other species.
2) Prepare and examine a microscope slide of single cell and multi-celled organisms.
3) Describe the structure and function of major organs of the human body.
4) Identify causes and effects of diseases, explain their transmission, and identify prevention strategies.
5) Describe how body systems work together.

State B: Prioritizing by importance

Balance of Representation

Science					
Earth and Space Science 25%		**Life Science 40 %**		**Physical Science 35%**	
Standard	**BOR**	**Standard**	**BOR**	**Standard**	**BOR**
1	45%	1	25%	1	25%
2	10%	2	45%	2	30%
3	45%	3	25%	3	20%
		4	5%	4	25%

Are there other strategies that we have not identified?

Alignment by Design
Part III: Developing Assessments

Bring the power of good alignment analyses to bear throughout the assessment development cycle.

Webb Alignment Criteria (1997)

- Categorical Concurrence
- Balance of Representation
- Depth of Knowledge
- Range of Knowledge
- Balance

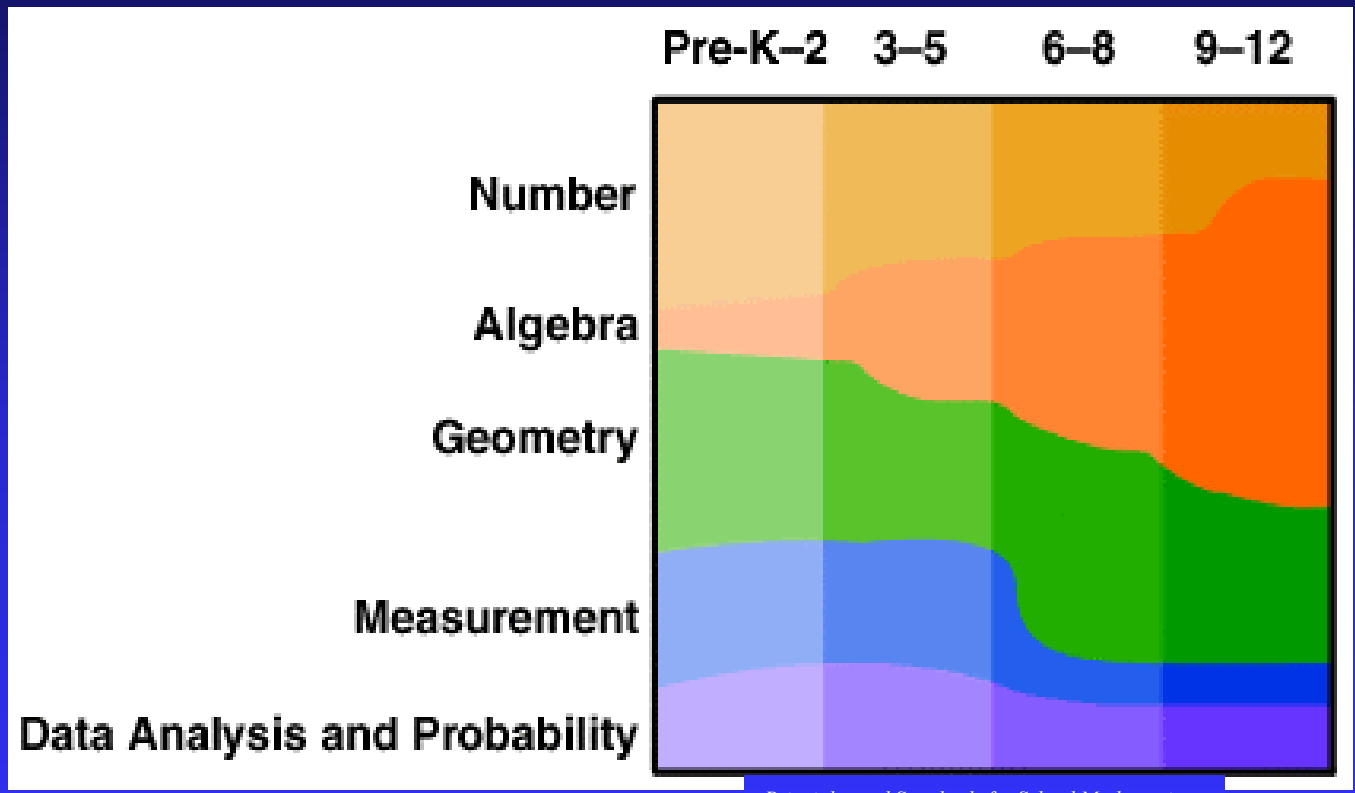
Categorical Concurrence

- Categorical Concurrence is the degree to which the same or consistent categories of content appear in both expectations and assessments. Agreement is defined by "a one-to-one correspondence" between topics in expectations and the topics by which the results are reported.

Balance of Representation

- **Balance of Representation**: Balance of Representation is defined as the degree to which the distribution of the items on an assessment matches the "agreed upon" emphasis. (Points/items should be distributed in proportion to the Balance of Representation).

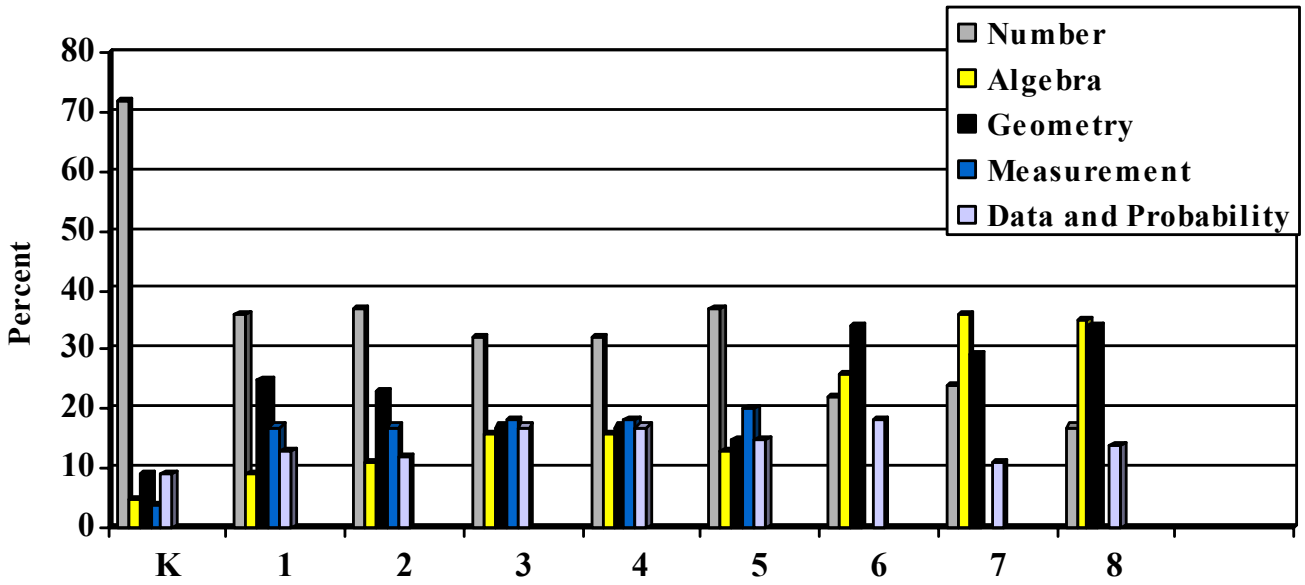
Balance of Representation Target Map (Example)



Principles and Standards for School Mathematics, NCTM, April 2000.

Reported by content strands

Balance of Rep - An Example



Depth of Knowledge

Depth of Knowledge: At least 50% of items at level two or above.

Level 1: Recall, information – procedural/routine – well practiced

Level 2: Use of information, conceptual knowledge, procedures, two or more steps. Includes engagement of some mental processes beyond habitual response

Level 3: Strategic thinking – requires reasoning, planning, using evidence, has some complexity, may have more than one possible answer, and involves a higher level of thinking than Levels 1 or 2

Level 4: Extended thinking – requires all of Level 3 over an extended period of time

Challenges: Depth of Knowledge

- Defining a level of specificity that is useful to developers and understandable to the field
- Implementing targets in development

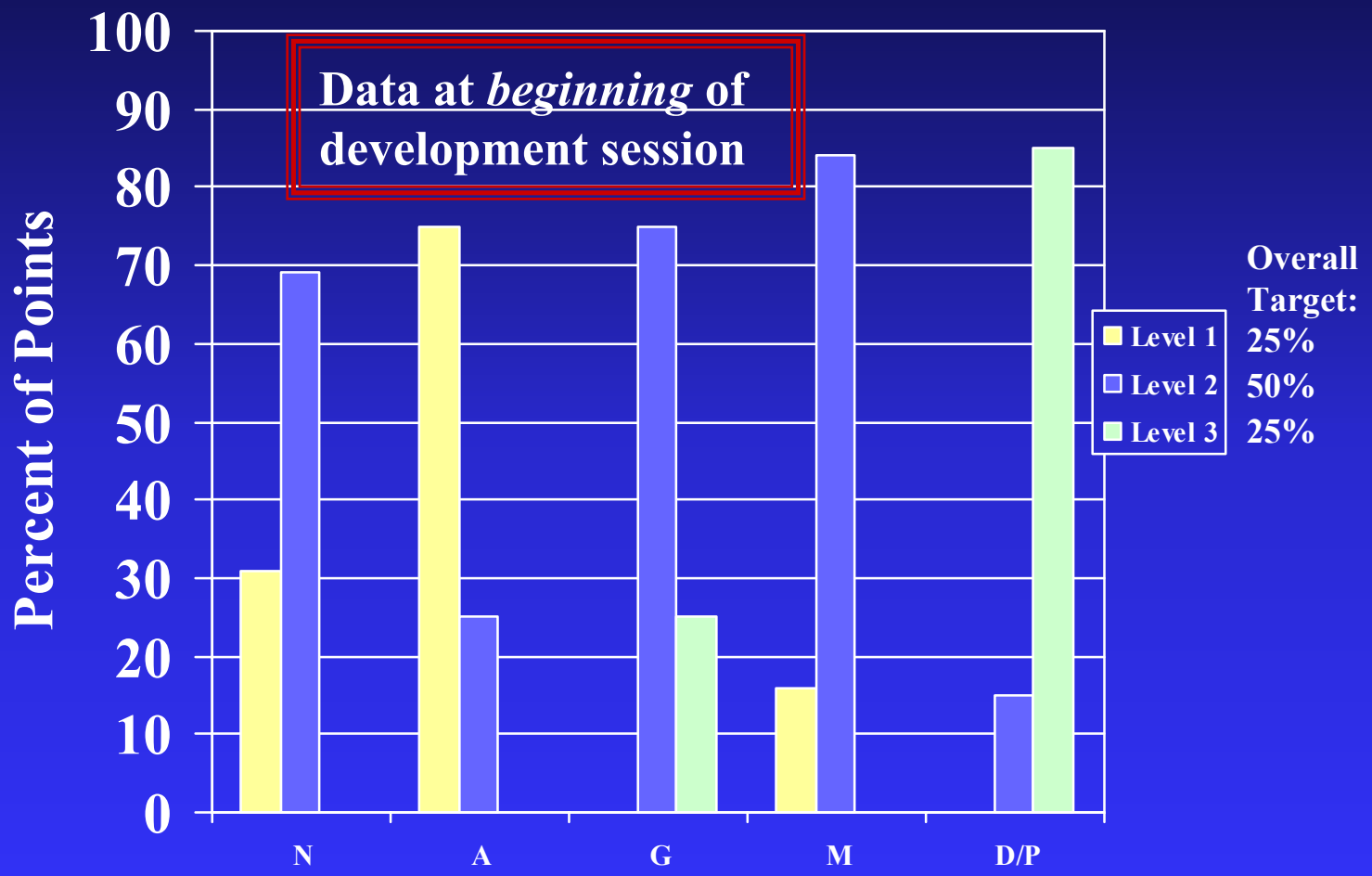
An Example: NAEP 2004 Draft Mathematics Framework

Low Complexity

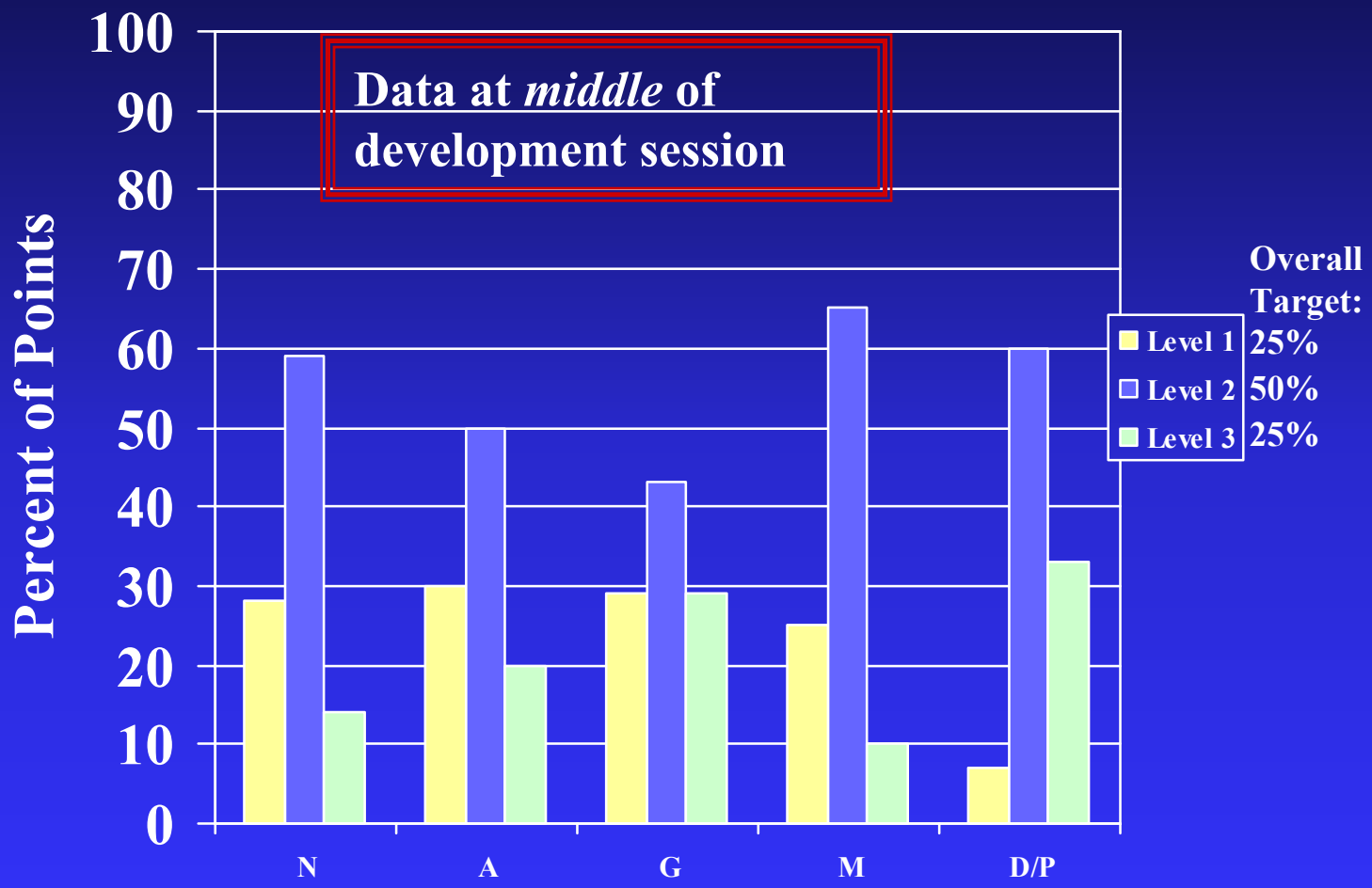
This category relies heavily on the recall and recognition of previously learned concepts and principles. Items typically specify what the student is to do, which is often to carry out some procedure that can be performed mechanically. It is not left to the student to come up with an original method or solution. Keywords to be found in routine items include *identify, compute, recall, recognize, find, evaluate, use,* and *measure.* The following are some, but not all, of the demands that items in the low-complexity category might make:

- Recall or recognize a fact, term, or property
- Recognize an example of a concept
- Compute a sum, difference, product, or quotient
- Recognize an equivalent representation
- Perform a specified procedure
- Evaluate an expression in an equation or formula for a given variable
- Solve a one-step word problem
- Draw or measure simple geometric figures
- Retrieve information from a graph, table, or figure

Depth of Knowledge by Content Strand Beginning of Work Session



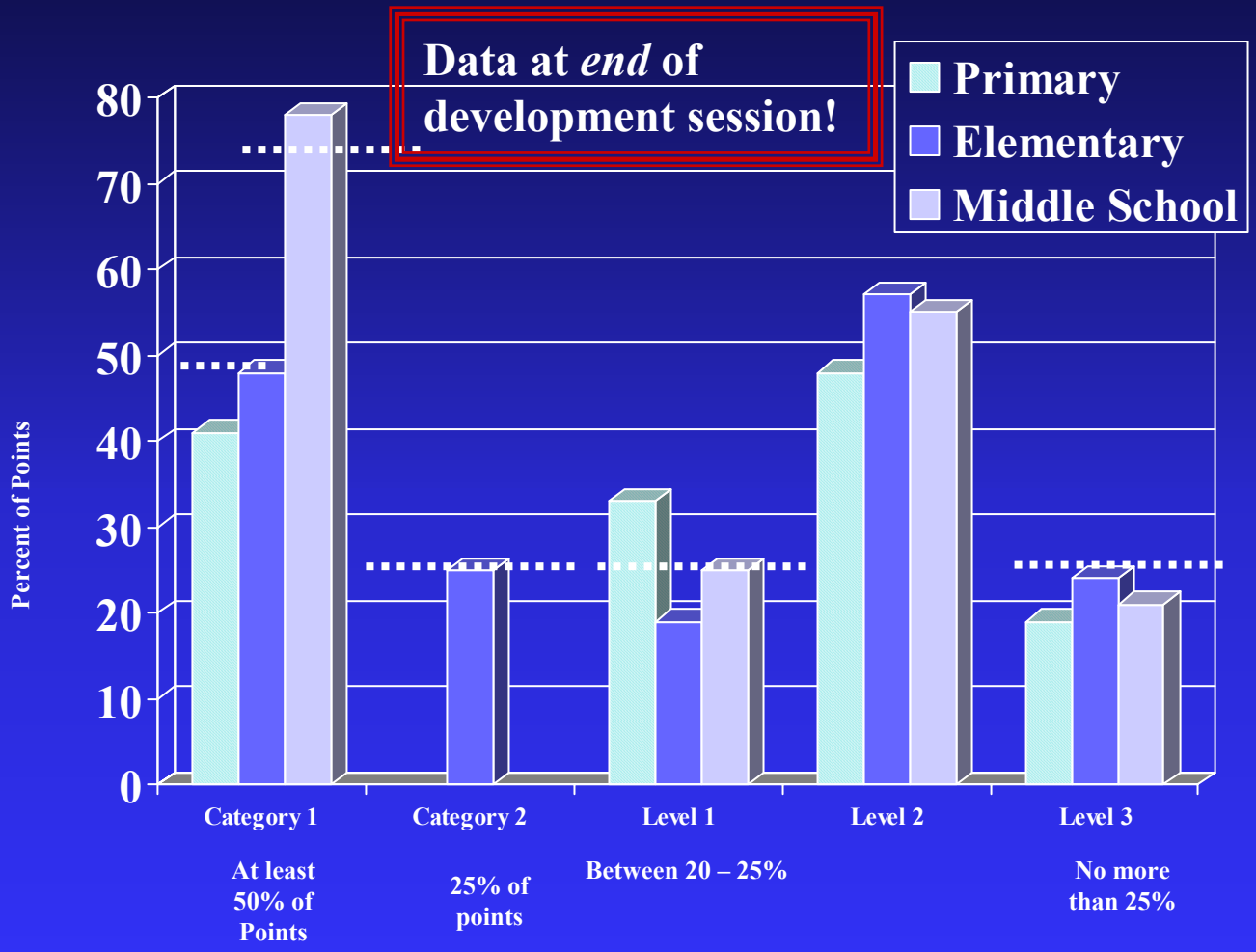
Depth of Knowledge by Content Strand Middle of Work Session



Depth of Knowledge by Grade Grouping

(and Category 1 and 2 by grade grouping)

End of Work Session



Range of Knowledge

Range of Knowledge: Items correspond to at least 50% of the objectives per standard

Balance

Balance: Degree of "evenness" in the distribution of items across the objectives. Target: - .7 or higher.

Balance Index Formula: $1 - (\Sigma \mid 1/O - I(k) / (H) \mid)/2$

Sum is over the total number of objectives hit for the standard.
O = Total number of objectives hit for the standard
I(k) = Number of items hit corresponding to objective (k)
H = Total number of items hit for the standard.

Front End Alignment Issues: Augmenting NRTs

- If you are using an augmented NRT to get norm information, how will you ensure accurate norm information after augmentation?
- If you are using an off-the-shelf NRT because it is less expensive, how can you maintain security of the NRT? How can you refresh your forms to guard against score inflation?
- What will you do about equating?
- How much augmentation is enough?

Front End Alignment Issues: Building Assessment Systems

Role of …

- Large scale assessment
- Curriculum-embedded assessments (e.g., Portfolios) over time
- Locally selected/developed assessments
- Local selection from a pool
- Student choice
- Other

Issues to consider: What is good enough?

- How much deviance from alignment targets is too much?
- How much effect will it have? How do we know?
  - Curricular effects
  - Assessment and accountability validity and reliability effects

Some specific situations of interest – Application of alignment studies to:

- Differences between assessment items, collections of items, systems; assessment vs. accountability vs. reporting
- Graduation requirements (validity in end-of-course vs. end-of-year-survey vs. best-work-body-of-evidence)
- Use with assessments where there is some choice" of evidence, e.g., local assessment systems
- Other elements of the educational system including instruction and curriculum

Summary

- Alignment studies can be very helpful. Be thoughtful.
- Make sure your standards are solid.
- Consider assessment alignment by design.
- Apply alignment to systems.

Questions

- Are there other alignment issues that we haven't covered or anticipated that you are facing or are of importance to the field?
- What advice would you give your peers about how to use alignment analyses as states, districts, and schools do grade level expectations, revise standards, and build assessment systems?