

Appendices

**Appendix A Criteria for Alignment of Expectations and Assessments in
Mathematic and Science Education**

Appendix B Coding by Individual Reviewers and Summary

Appendix A

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1 – Content Focus. System components should focus consistently on developing students' knowledge of subject matter. Consistency will be present to the extent components' logic of action and the ends achieved share the following attributes:

- A. *Categorical Concurrence.* Agreement in content topics addressed.
- B. *Depth-of-Knowledge Consistency.* Agreement in level of cognitive complexity of information required.
- C. *Range-of-Knowledge Correspondence.* Agreement in the span of topics.
- D. *Structure-of-Knowledge Comparability.* Agreement in what it means to know concepts.
- E. *Balance of Representation.* Agreement in emphasis given to different content topics.
- F. *Dispositional Consonance.* Agreement in attention to students' attitudes and beliefs.

2 – Articulation Across Grades and Ages. Students' knowledge of subject matter grows over time. All system components must be rooted in a common view of how students develop, and how best to help them learn at different developmental stages. This common view is based on:

- A. *Cognitive Soundness Determined by Superior Research and Understanding.* All components build on principles for sound learning programs.
- B. *Cumulative Growth in Knowledge During Students' Schooling.* All components are based on a common rationale regarding progress in student learning.

3 – Equity and Fairness. When expectations are that all students can meet high standards, aligned instruction, assessments, and resources must give every student a reasonable opportunity to demonstrate attainment of what is expected. System components that are aligned will serve the full diversity in the education system through demanding equally high learning standards for all students while fairly providing means for students to achieve and demonstrate the expected level of learning. To be equitable and fair, time is required for patterns to form in order to decipher how system components are working in concert with each other. Judging a system on the criterion of equity and fairness will require analysis over a period of time.

4 – Pedagogical Implications. Classroom practice greatly influences what students learn. Other system components, including expectations and assessments, can and should have a strong impact on these practices, and should send clear and consistent messages to teachers about appropriate pedagogy. Critical elements to be considered in judging alignment related to pedagogy include:

- A. *Engagement of Students and Effective Classroom Practices.* Agreement among components in a range of learning activities and in what they are to attain.
- B. *Use of Technology, Materials, and Tools.* Agreement among components in how and to what ends applications of technology, materials, and tools are to be included.

5 – System Applicability. Although system components should seek to encourage high expectations for student performance, they also need to form the basis for a program that is realistic and manageable in the real world. The policy elements must be in a form that can be used by teachers and administrators in a day-to-day setting. Also, the public must feel that these elements are credible, and that they are aimed at getting students to learn the mathematics and science that are important and useful in society.

Appendix B

Coding by Individual Reviewers and Summary

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Coding Variables Used in Alignment Data Summaries

ST	Standard #
GO	Goal
OB	Objective
LVL	Cognitive Skill Level
PUN	Percent Under Cognitive Level
PAT	Percent At Cognitive Level
PAB	Percent Above Cognitive Level
# RNG	Number of Range (Number of Goals/Objectives in Standard)
RNG	Range (Number of Goals/Objectives Represented on Assessment)
PRNG	Percent Range = RNG/#RNG
# HITS	Number of Hits (Total # of Codings* for Assessment Items)
PHITS	Percent of Hits = Hits / # Hits
BALANCE INDEX	$1 - \left(\sum_{k=1}^O \left 1/(O) - I_{(k)}/(H) \right \right) / 2$
	Where 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
BAL X PRNG	Product of Balance Index and Percent Range

* A single assessment item may be coded in more than one standard, goal, or objective.