

Alignment Study in Language Arts, Mathematics, Science, and Social Studies of State Standards and Assessments for Four States

A Study of the State Collaborative on Assessment &
Student Standards (SCASS)

Technical Issues in Large-Scale Assessment (TILSA)

Norman L. Webb

Senior Research Scientist

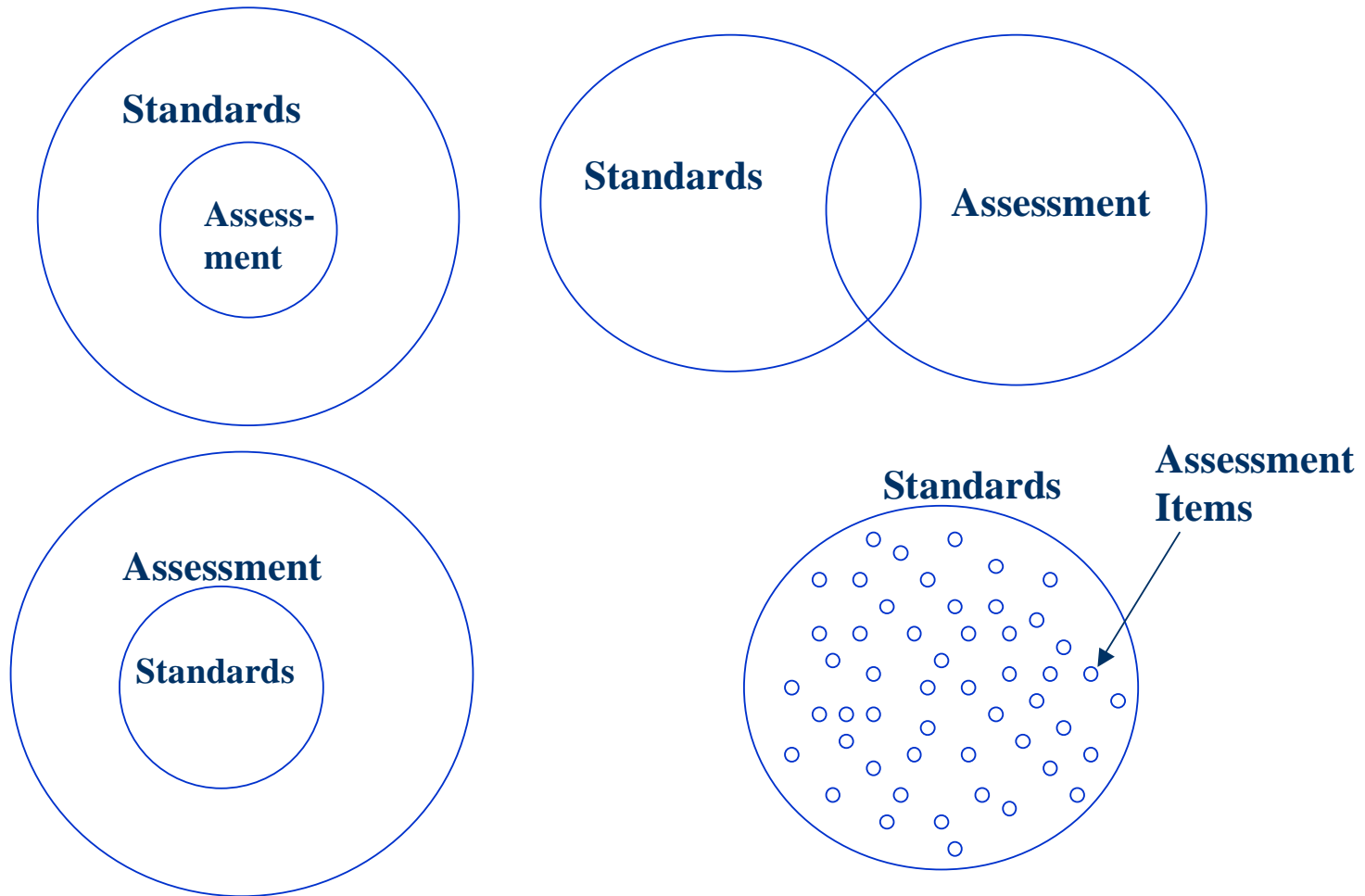
Wisconsin Center for Education Research

<http://facstaff.wcer.wisc.edu/normw>

ALIGNMENT

The degree to which expectations and assessments are in agreement and serve in conjunction with one another to guide the system toward students learning what is expected.

Degree of Alignment



Steps in Alignment Study

1. Identify criteria and acceptable levels
2. Identify expectations and assessments
3. Develop coding matrix
4. Train reviewers
5. Reviewers code assessment items
6. Spreadsheet data entry and analysis
7. Prepare tables
8. Report results

NISE Five General Criteria

1. Content Focus
2. Articulation Across Grades and Ages
3. Equity and Fairness
4. Pedagogical Implications
5. System Applicability

Specific Criteria

Content Focus

- A. Categorical Concurrence
- B. Depth-of-Knowledge Consistency
- C. Range-of-Knowledge Correspondence
- D. Structure-of-Knowledge Comparability
- E. Balance of Representation
- F. Dispositional Consonance

Acceptable Levels for Each Standard

| Criteria | Levels |
|--------------------------------------|---|
| Categorical Concurrence | 6 or more items per standard |
| Depth-of-Knowledge Consistency | At least 50% of items at or above knowledge level of related objectives |
| Range-of-Knowledge Correspondence | Items correspond to at least 50% of objectives per standard |
| Balance of Representation | Index value of at least .70 (no bi- or unimodal distributions) |

$$\begin{array}{r} 121 \\ 13 \\ 32 \\ + 34 \\ \hline \end{array}$$

- 1) 190
- 2) 200
- 3) 290
- 4) N

Level 1
Recall

A car odometer registered 41,256.9 miles when a highway sign warned of a detour 1,200 feet ahead. What will the odometer read when the car reaches the detour? (5,280 feet = 1 mile)

- (a) 42,456.9
- (b) 41,279.9
- (c) 41,261.3
- (d) 41,259.2
- (e) 41,257.1

Did you use the calculator on this question?

Yes

No

Level 2

This question refers to pieces N , P , and Q .

In Mr. Bell's classes, the students voted for their favorite shape for a symbol. Here are the results.

| | Class 1 | Class 2 | Class 3 |
|-----------|---------|---------|---------|
| Shape N | 9 | 14 | 11 |
| Shape P | 1 | 9 | 17 |
| Shape Q | 22 | 7 | 2 |

Using the information in the chart, Mr. Bell must select one of the shapes to be the symbol. Which one should he select and why?

The shape Mr. Bell should select: _____

Explain:

Level 3

Average Measure Intraclass Correlation of Depth-of-Knowledge Levels Ratings for Mathematics

| State/Grade | Number of Reviewers | Number of Items | Alpha | 95% CI Lower-Upper |
|--------------------|----------------------------|------------------------|--------------|---------------------------|
| A4 | 4 | 61 | .47 | .11-.68 |
| A7 | 4 | 61 | .93 | .89-.95 |
| A7 (Repl) | 4 | 63 | .77 | .66-.85 |
| A9 | 4 | 63 | .81 | .72-.88 |
| B5 | 4 | 49 | .79 | .67-.87 |
| B8 | 4 | 46 | .58 | .34-.75 |
| C4 | 4 | 48 | .88 | .81-.93 |
| C4 (Repl) | 4 | 52 | .89 | .84--.93 |
| C8 | 4 | 146 | .86 | .82-.89 |
| C11 | 4 | 56 | .91 | .86-.94 |
| Average | | | .79 | |

Reliability of Depth-of-Knowledge Levels Ratings for State E Language Arts, Mathematics, Science, and Social Studies

| Grade | Number of Reviewers | Number of Items | Alpha* | 95% CI Lower-Upper |
|-------------------------------|---------------------|-----------------|--------|-----------------------|
| State E Language Arts | | | | |
| 4 | 5 | 93 | .52 | .34-.67 |
| 7 | 3 | 92 | .70 | .56-.80 |
| 10 | 3 | 85 | .62 | .45-.74 |
| State E Mathematics | | | | |
| 4 | 4 | 61 | .47 | .12-.68 |
| 7A | 4 | 61 | .93 | .89-.95 |
| 7B | 4 | 63 | .77 | .66-.85 |
| 9 | 4 | 63 | .81 | .72-.88 |
| State E Science | | | | |
| Chem Ext | 5 | 60 | .81 | .73-.88 |
| Chem Int | 3 | 55 | .56 | .31-.73 |
| Bio Ext | 5 | 59 | .75 | .63-.84 |
| Bio Int | 3 | 55 | .40 | .06-.63 |
| State E Social Studies | | | | |
| 10 Ext | 5 | 52 | .84 | .76-.90 |
| 10 Int | 3 | 60 | .72 | .57-.82 |
| 11 Ext | 5 | 59 | .53 | .31-.70 |
| 11 Int | 3 | 60 | .66 | .48-.78 |

Agreement between Two Groups of Reviewers on
Categorical Concurrence Criterion--Mathematics

| State | Grade | Number of Standards | Exact Agreement on Standards | | Partial Agreement on Standards ¹ | | No Agreement on Standards | |
|---------|-------|---------------------------|------------------------------------|-----|---|----|---------------------------------|----|
| | | | N | % | N | % | N | % |
| State G | 4 | 7 | 5 | 71 | 1 | 14 | 1 | 14 |
| State E | 7 | 4 | 4 | 100 | | | | |
| Total | | 11 | 9 | 82 | 1 | 9 | 1 | 9 |

Note 1: Partial agreement is defined by the results of one group indicating a Weak Alignment and the other group indicating Alignment or No Alignment.

Agreement between Two Groups of Reviewers on
Depth-of-Knowledge Consistency Criterion--Mathematics

| State | Grade | Number of Standards | Exact Agreement on Standards | | Partial Agreement on Standards ¹ | | No Agreement on Standards | |
|---------|-------|---------------------|------------------------------|----|---|----|---------------------------|----|
| | | | N | % | N | % | N | % |
| State G | 4 | 5 ¹ | 2 | 40 | 2 | 40 | 1 | 20 |
| State E | 7 | 4 | 3 | 75 | | | 1 | 25 |
| Total | | 9 | 5 | 55 | 2 | 22 | 2 | 22 |

Note 1: Both groups coded an insufficient number of items for one standard and one group did the same for a second standard to rate this criterion.

Agreement between Two Groups of Reviewers on
Range-of-Knowledge Correspondence Criterion--
Mathematics

| State | Grade | Number of Standards | Exact Agreement on Standards | | Partial Agreement on Standards | | No Agreement on Standards | |
|---------|-------|---------------------|------------------------------|-----|--------------------------------|---|---------------------------|---|
| | | | N | % | N | % | N | % |
| State G | 4 | 5 ¹ | 5 | 100 | | | | |
| State E | 7 | 4 | 4 | 100 | | | | |
| Total | | 9 | 9 | 100 | | | | |

Note 1: Both groups coded an insufficient number of items for one standard and one group did the same for a second standard to rate this criterion.

Agreement between Two Groups of Reviewers on
Balance of Representation Criterion--
Mathematics

| State | Grade | Number of Standards | Exact Agreement on Standards | | Partial Agreement on Standards | | No Agreement on Standards | |
|---------|-------|---------------------|------------------------------|-----|--------------------------------|----|---------------------------|---|
| | | | N | % | N | % | N | % |
| State G | 4 | 5 ¹ | 3 | 60 | 2 | 40 | | |
| State E | 7 | 4 | 4 | 100 | | | | |
| Total | | 9 | 7 | 78 | 2 | 22 | | |

Note 1: Both groups coded an insufficient number of items for one standard and one group did the same for a second standard to rate this criterion.

Comparison of External Reviewers with Internal Reviewers
by State and Grade
Science

| State | Grade | Group | Number by DOK | | | | Total Obj | Mean | S.D. | Alpha |
|-------|-------|---------|---------------|----|----|---|--------------|------|------|-------|
| | | | 1 | 2 | 3 | 4 | | | | |
| E | Chem | Ext (5) | 40 | 31 | 14 | 2 | 87 | 1.75 | .81 | .81 |
| | | Int (3) | 44 | 37 | 5 | 1 | 87 | 1.57 | .66 | |
| E | Biol | Ext (5) | 27 | 36 | 14 | 4 | 81 | 1.94 | .84 | .71 |
| | | Int (3) | 32 | 39 | 9 | 1 | 81 | 1.74 | .70 | |
| F | 8 | Ext (5) | 23 | 27 | 4 | 0 | 54 | 1.65 | .62 | .59 |
| | | Int (3) | 16 | 29 | 8 | 1 | 54 | 1.89 | .72 | |

Comparison of External Reviewers with Internal Reviewers
by State and Grade
Social Studies

| State | Grade | Group | Number by DOK Level | | | | Total Obj | Mean | S.D. | Alpha |
|-------|-------|---------|---------------------|----|----|---|-----------|------|------|-------|
| | | | 1 | 2 | 3 | 4 | | | | |
| E | 10 | Ext (5) | 7 | 35 | 20 | 1 | 63 | 2.24 | .67 | .80 |
| | | Int (3) | 4 | 33 | 25 | 1 | 63 | 2.37 | .63 | |
| E | 11 | Ext (5) | 6 | 51 | 26 | 1 | 84 | 2.26 | .60 | .83 |
| | | Int (3) | 5 | 54 | 23 | 1 | 84 | 2.23 | .59 | |
| F | 8 | Ext (5) | 3 | 9 | 28 | | 40 | 2.63 | .63 | .75 |
| | | Int (2) | 4 | 16 | 20 | | 40 | 2.40 | .67 | |
| F | HS | Ext (5) | 5 | 22 | 22 | | 49 | 2.35 | .66 | .82 |
| | | Int (2) | 8 | 33 | 8 | | 49 | 2.00 | .58 | |

(Replication)
 Summary of Four Content Focus Criteria
 Grade 7 Mathematics
 (Number of Assessment Items—65 Multiple Choice Items)

| Standards | Alignment Criteria | | | |
|---|-------------------------|--------------------------------|--------------------|---------------------------|
| | Categorical Concurrence | Depth-of-Knowledge Consistency | Range-of-Knowledge | Balance of Representation |
| I. Number Sense | YES | YES | YES | YES |
| II. Algebra & Functions | YES | YES | YES | YES |
| III. Measurement & Geometry | YES | YES | YES | YES |
| IV. Statistics, Data Analysis & Probability | YES | YES (26% Under) | YES | YES |

(Original)
 Summary of Four Content Focus Criteria
 Grade 7 Mathematics
 (Number of Assessment Items—65 Multiple Choice Items)

| Standards | Alignment Criteria | | | |
|---|-------------------------|--------------------------------|--------------------|---------------------------|
| | Categorical Concurrence | Depth-of-Knowledge Consistency | Range-of-Knowledge | Balance of Representation |
| I. Number Sense | YES | YES | YES | YES |
| II. Algebra & Functions | YES | YES | YES | YES |
| III. Measurement & Geometry | YES | YES | YES | YES |
| IV. Statistics, Data Analysis & Probability | YES | NO (56% Under) | YES | YES |

Summary of Attainment of Acceptable Alignment Level on Four
Content Focus Criteria
Grade 4 Mathematics
(Number of Assessment Items—65 Multiple Choice Items)

| Standards | Alignment Criteria | | | |
|--|----------------------------|---------------------------------------|------------------------|------------------------------|
| | Categorical Concurrence | Depth-of- Knowledge Consistency | Range-of- Knowledge | Balance of Representation |
| I. Number Sense | YES | YES | YES | YES |
| II. Algebra & Functions | YES | YES | YES | WEAK |
| III. Measurement & Geometry | YES | YES | YES | YES |
| IV. Statistics, Data Analysis & Probability | NO | WEAK | WEAK | YES |

Balance of Representation Between Standards and Assessment
as Rated by Four Reviewers
Grade 4 Mathematics
(Number of Assessment Items—65 Multiple Choice Items)

| Standards | Balance Index (1 perfect-0 no Balance) | | | | Balance of Representation Acceptable |
|---|---|------|-------|------|--|
| | % Hits in Std/Ttl Hits | | Index | | |
| Title | Mean | S.D. | Mean | S.D. | |
| I. Number Sense | 41 | 1 | .81 | .01 | YES |
| II. Algebra & Functions | 31 | 1 | .67 | .05 | WEAK |
| III. Measurement & Geometry | 23 | 1 | .81 | .01 | YES |
| IV. Statistics, Data Analysis & Probability | 4 | 1 | .96 | .07 | YES |
| Total | 25 | 14 | .81 | .12 | |

Range-of-Knowledge Correspondence and Balance of Representation
 Between Standards and Assessment as Rated by Four Reviewers
 Grade 4 Mathematics
 (Number of Assessment Items—65 Multiple Choice Items)

| Standards | Range of Objectives | | | | Balance of Know. Acceptable |
|---|---------------------|------|------------|------|-----------------------------|
| | % Objs Hit | | % of Total | | |
| Title | Mean | S.D. | Mean | S.D. | |
| I. Number Sense | 13.5 | 1.80 | 76 | 9 | YES |
| II. Algebra & Functions | 5.25 | .43 | 72 | 2 | YES |
| III. Measurement & Geometry | 11.50 | .50 | 68 | 3 | YES |
| IV. Statistics, Data Analysis & Probability | 2.50 | .50 | 50 | 10 | WEAK |
| Total | 8.19 | 4.59 | 67 | 13 | |

Depth-of-Knowledge Consistency Between Standards and Assessment
as Rated by Four Reviewers
Grade 4 Mathematics
(Number of Assessment Items—65 Multiple Choice Items)

| Standards | Level of Item w.r.t. Standard | | | | | | Depth-of-Knowledge Consistency Acceptable |
|---|-------------------------------|------|------|------|---------|------|---|
| | % Under | | % At | | % Above | | |
| Title | Mean | S.D. | Mean | S.D. | Mean | S.D. | |
| I. Number Sense | 26 | 44 | 73 | 44 | 2 | 8 | YES |
| II. Algebra & Functions | 10 | 29 | 88 | 29 | 3 | 8 | YES |
| III. Measurement & Geometry | 4 | 20 | 95 | 21 | 1 | 7 | YES |
| IV. Statistics, Data Analysis & Probability | 50 | 50 | 50 | 50 | 0 | 0 | WEAK |
| Total | 18 | 38 | 81 | 38 | 1 | 7 | |

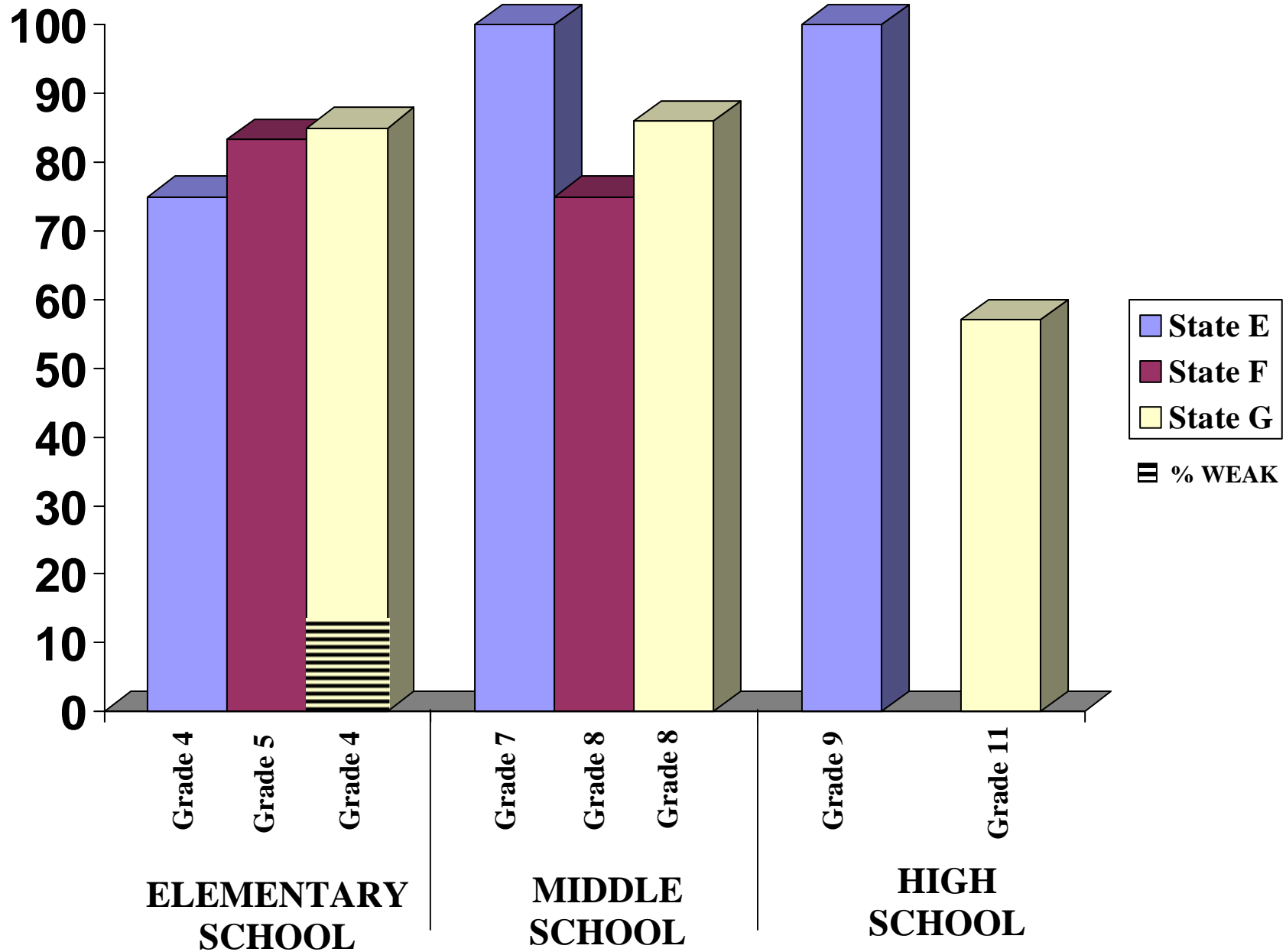
**Categorical Concurrence Between Standards and Assessment
as Rated by Four Reviewers
Grade 4 Mathematics
(Number of Assessment Items—65 Multiple Choice Items)**

| Standards | | | Level by Objective | | | Hits | | Categorical Concurr. Acceptable |
|--|---------|--------------------|--------------------|--------------------------|------------------------------|-------|------|---------------------------------------|
| Title | Goals # | Objs # | Level | # of objs by Level | % w/in std by Level | Mean | S.D. | |
| I. Number Sense | 4 | 17.75 ¹ | 1 2 | 11 7 | 61 39 | 26.75 | .43 | YES |
| II. Algebra & Functions | 2 | 7.25 | 1 2 | 5 2 | 71 29 | 20.50 | 1.12 | YES |
| III. Measurement & Geometry | 3 | 17 ² | 1 2 3 | 15 1 1 | 88 6 6 | 15.25 | .43 | YES |
| IV. Statistics, Data Analysis & Probability | 2 | 5 | 1 2 3 | 3 1 1 | 60 20 20 | 2.75 | .43 | NO |
| Total | 11 | 46.75 | 1 2 3 | 34 11 2 | 72 24 4 | 65.25 | .83 | |

¹Includes one generic objective because coded items did not correspond to existing objectives.

²Includes two generic objective because coded items did not correspond to existing objectives.

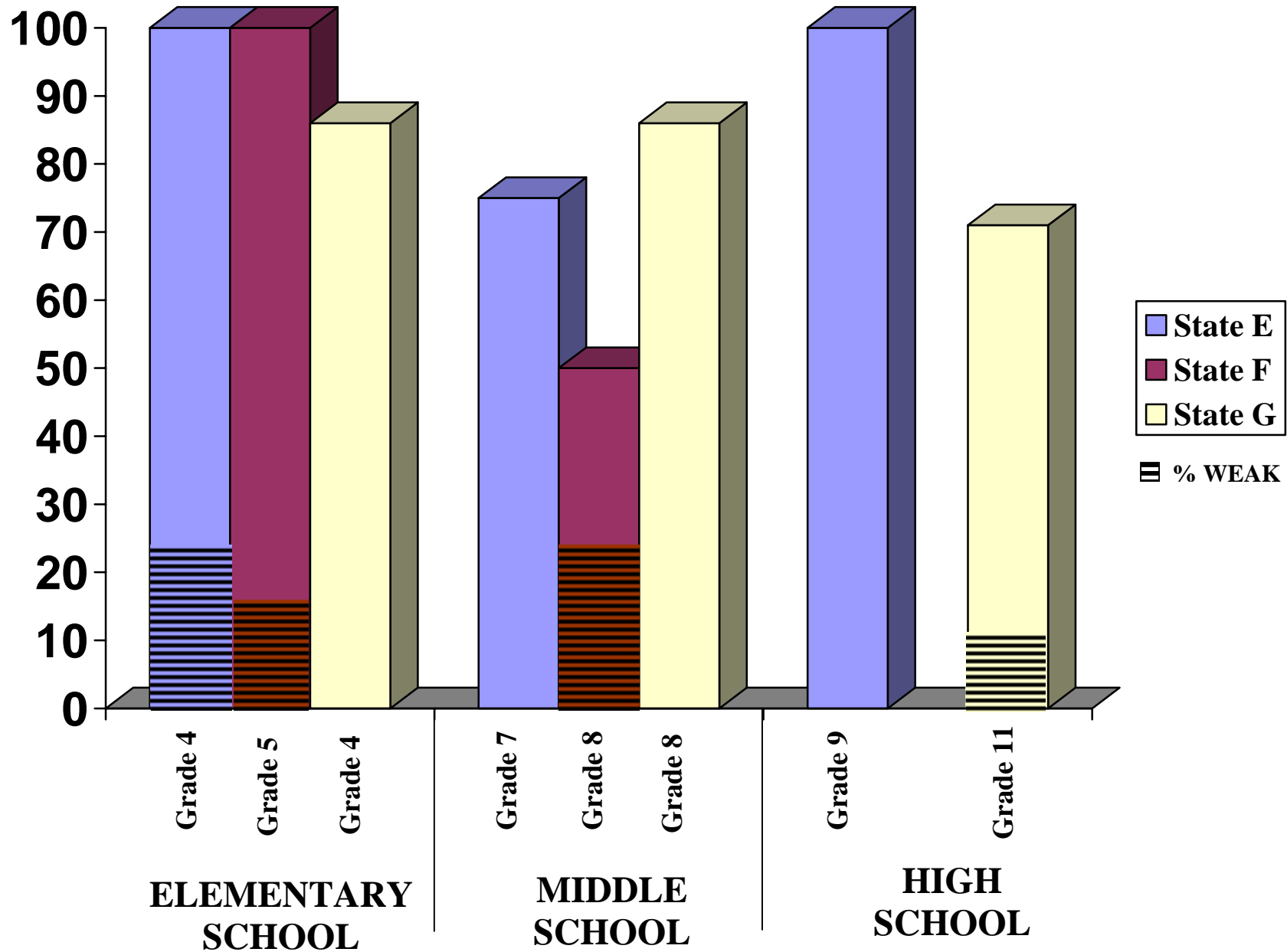
Percent of Standards with Acceptable Alignment Categorical Concurrence Mathematics



Percent of Standards with Acceptable Alignment

Depth-of-Knowledge

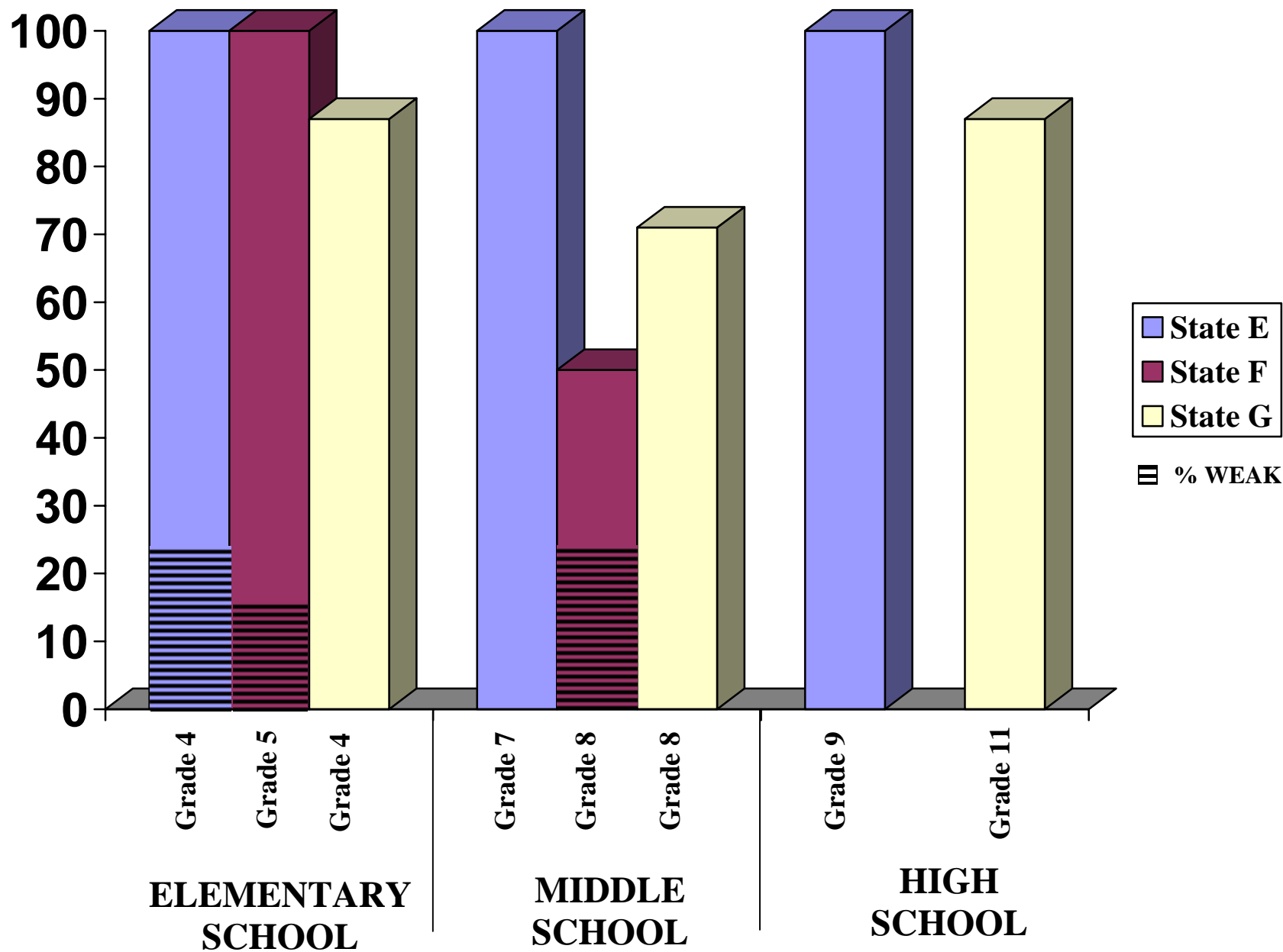
Mathematics



Percent of Standards with Acceptable Alignment

Range-of-Knowledge

Mathematics



Percent of Standards with Acceptable Alignment Balance-of-Representation Mathematics

