

Loess Hills AEA 13

Alignment Study of the NWEA
Achievement Level Tests –
Grades 4 & 8

**AEA 13 Mathematics
Cooperative Curriculum
Project**

August, 2003

Review Team

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Document is available on the AEA 13 Assessment Resources Web Page (as a pdf or Word document):

<http://www.aea13.org/assessment>

Other documents associated with the Iowa Technical Adequacy Project may be obtained from the ITAP website:

<http://projects.education.uiowa.edu/itap/>

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Executive Summary of Process and Findings

Process

The AEA 13 team met for a number of days in August, 2003, to intensively review NWEA Achievement Level Tests (mathematics) associated with grades 4 and 8. Generally, the process suggested by the Iowa Technical Adequacy Project (ITAP) was utilized to compare the test content to the AEA 13 Mathematics Cooperative Curriculum Project (C2P). Some slight modifications were made to the process, and these are noted within this document. For further information on the ITAP alignment process, refer to documents on the ITAP website (<http://projects.education.uiowa.edu/itap/>). The process is outlined in detail in Dr. David Frisbie's 2003 paper, "Checking the Alignment of an Assessment Tool and a Set of Content Standards." At the time this document was released, the paper and other supporting materials were available on the web site noted above. It is also linked with the AEA 13 Assessment Resources Page (<http://www.aea13.org/assessment>). This paper was modified from a paper previously written by Dr. Frisbie and made available as an "Occasional Paper" through the University of Iowa/Iowa Testing Program.

For each of the two grades, this document includes several charts and summary documents. For each grade, the order of documents is:

- 1) **AEA 13 Mathematics Cooperative Curriculum Project.**
- 2) **Summary of Alignment Evidence (median form for each set of booklets evaluated).**
- 3) **Alignment Checking Matrix** – The matrix shows content matches per item and cognitive complexity for items and benchmarks.
- 4) **Chart Showing Analysis of "Depth of Knowledge"** – This chart outlines the extent to which high or low level items match with high or low level benchmarks in terms of cognitive complexity.
- 5) **Summary of Decisions Chart** – This chart concisely summarizes the extent to which each test meets criteria for:
 - **Comprehensiveness** – How well is the standard covered? The criteria of at least five items matched to a standard was used to determine appropriate comprehensiveness.
 - **Range of Knowledge** – The evenness (balance) with which the items matching a content standard are distributed across the set of indicators for that content standard. For example, there may be a substantial number of items aligned to a standard, but if all or most of those items match to just one indicator, the assessment is not balanced.

A criteria of having at least one item matched to 75% of the indicators under a standard was used to determine appropriate range of knowledge.

- **Depth of Knowledge (Cognitive Complexity)** – How well does the level of cognitive complexity required by benchmarks conform to the demands of the items that match the benchmarks in content? For example, an indicator may have a number of items matched by content, but perhaps, the benchmark represents a "high level" cognitive demand, while the items focus more on "low level" cognitive demands. A global judgment process was used to estimate whether there is at least a "moderate" degree of match in cognitive complexity between the assessment content and benchmarks. For each grade, a chart has been produced that summarizes the cognitive complexity analysis.

How Should A District Use This Document?

How should this alignment study be used?

This document is being made available to all districts. For some districts that have adopted the AEA 13 Mathematics Cooperative Curriculum Project, the study results will be applicable for your district, and you may choose to use the AEA 13 study as part of the documentation you will be submitting to the Iowa Department of Education in October, 2003. *However, remember that the alignment results in this document only apply to your district to the extent that your benchmarks are similar to AEA 13 benchmarks.* Also keep in mind that while the ITAP process is established as an appropriate way to document curriculum and assessment alignment, the process can be subjective, and there are always judgmental decisions made by the alignment team. A district may or may not agree with all of the decisions made by this AEA 13 alignment team. Also, be sure not to generalize the findings of this study with your own district standards and benchmarks. For example, below in the executive summary, areas of strong and weak coverage are discussed. Do not automatically assume that this will be true for your district, as your mathematics standards may differ from the AEA 13 curriculum.

The primary intent was for this document to be reviewed by a district as a model, to show how the necessary components of the ITAP process might be compiled to summarize the extent to which one instrument addresses standards in terms of comprehensiveness, range of knowledge, and depth of knowledge (cognitive complexity).

Finally, when referring to this document or when using your own analysis of alignment, it is critical to consider issues of alignment between *curriculum, assessment, and instruction*. Even when curriculum documents match well with an assessment, **an alignment study is not very beneficial unless a district has checked that the curriculum document actually describes what is being taught in a system.**

Executive Summary

Grade 4 Alignment with NWEA Achievement Level Tests

- All three criteria of comprehensiveness, range of knowledge, and depth of knowledge (cognitive complexity) are met for: Number and Operation; Data Analysis and Probability; Algebra; Geometry.
- **Measurement**, while aligning to eight items and meeting criteria for comprehensiveness, does not meet criteria for range of knowledge since all eight items align with one of two (50%) benchmarks. There were zero matches for the benchmark "Uses appropriate tools and technology for measurement." Keep in mind that as noted in the summary of alignment evidence for grade 4, the elementary series level test 5 was used for summarizing since it was the median booklet examined. In each of the other two booklets examined (levels 4 and 6), there were one and two item matches respectively. While this is the case, it appears clear that measurement, or at least the noted benchmark, is a weaker area of coverage and so "no" was indicated for the range of knowledge category on the summary of decisions chart. *A district should keep in mind, however, that if synthesizing NWEA tests with ITBS at grade 4, criteria should be met. The above noted benchmark had 5 matches in the AEA 13 alignment study for grade 4 ITBS.*
- It was noted that the NWEA forms **clearly had the most matches associated with Number and Operations**, particularly with the benchmark associated with computation of whole numbers. While there were several matches with the fractions benchmark, this area was slightly weaker in coverage in the area of Number and Operations.
- In the AEA 13 study of grade 4 ITBS, **the standard of geometry** did not meet comprehensiveness or range of knowledge criteria. It appears that NWEA forms have noticeably more items that align with C2P geometry benchmarks. Thus, synthesizing ITBS and NWEA at grade 4 might be a possible solution for demonstrating coverage of the C2P standards.

Grade 8 Alignment with NWEA Achievement Level Tests

- All three criteria of comprehensiveness, range of knowledge, and depth of knowledge (cognitive complexity) are met for: Number and Operation; Data Analysis and Probability; Measurement; Algebra; Geometry. **Thus, NWEA tests appear to show very good coverage of the C2P standards at grade 8.**
- It was noted that the NWEA forms **clearly had the most matches associated with Number and Operations**, and its associated benchmark that involves computation with whole numbers, rational numbers, and integers.

- In the AEA 13 study of grade 8 ITBS, **the standard of geometry** did not meet comprehensiveness criteria (as there were only four item matches. It appears that NWEA forms have noticeably more items that align with C2P geometry benchmarks. Thus, synthesizing ITBS and NWEA at grade 8 might be a possible solution for demonstrating coverage of the C2P standards.

NWEA is an adaptive test with students in the same grade taking different levels. How were levels selected for the alignment study?

Each level test in the Loess Hills AEA 13 test series was built by a group of teachers from various districts representing AEA 13. Items were selected, with the help of an NWEA facilitator, to represent each of five goal areas that align with C2P (Number and Operation; Patterns, Functions and Algebra; Geometry and Spatial Sense; Measurement; Data Analysis, Statistics and Probability) in a balanced manner. Items were chosen within a 20-point RIT span for each level as noted in the chart below. Each item in the NWEA database is calibrated to a RIT score so that test forms can be built with increasing difficulty, following an achievement continuum:

<i>Test Form</i>	<i>RIT Range</i>
Level 1	150-170
Level 2	160-180
Level 3	170-190
Level 4	180-200
Level 5	190-210
Level 6	200-220
Level 7	210-230
Level 8	220 and above

For each test level, note that there is a RIT range overlap. In many cases, there is as much as a 50% overlap of items in each level (for example, the second half of the items, a level may be the same as the first half of the items in the next highest level). Note that for mathematics, there are two series of level tests (elementary and middle grades series), yet each set of eight level tests was built to correspond to the above chart (while content/items were different).

If we want to align a mathematics level test to fourth grade benchmarks, which form do we choose?

The NWEA format is adaptive, and so there is no booklet specifically assigned to grade four. However, we can consider the national median RIT score for fourth grade or another grade that we want to consider. The median scores can be found on the latest "Monitoring Growth in Student Achievement" handout from NWEA (available online – <http://www.nwea.org/Support/MonitoringGrowthSept2002.pdf>). Below are the medians for mathematics:

Grade	Fall Median	Spring Median
2	178	189
3	191	201
4	201	209
5	209	217
6	216	222
7	222	228
8	228	235
9	231	244
10	235	251

To study the alignment of grade 4 reading (Spring), first consider that the chart above shows that the median RIT score for a fourth grader in the nation is 209. Referring to the previous chart, we can see that a "typical" or median fourth grader would be placed in either a level 5 or a level 6 booklet. The review team considered both levels and decided to use level 5 as the median booklet. If we then also consider one booklet below and one booklet above, we might decide to use the ITAP process to align our grade 4 benchmarks with booklet levels 4, 5, and 6 (elementary series). A case could be made that a large percentage of fourth graders would be exposed to the test content within one of these level tests. This was the process used by the review team for both grades 4 and 8. To study alignment with grade 8 curriculum, we used levels tests 6, 7, and 8 (from the middle grade series). We did find that the balance of items matching particular benchmarks was good across forms. Thus, when a reader looks at the balance of items on levels 4, 5, and 6 compared to fourth grade skills, it appears that students, while taking easier or more difficult levels, appear to receive items that represent similar benchmarks. We can also consider that fact that with Iowa Tests of Basic Skills, we also have "out of level testing," and so even though there is a grade 4 booklet, not all students are tested with it. Since the balance between forms appeared to be good, we completed the alignment summary forms for the median form examined.

What if we are a school using computerized NWEA assessment – Measures of Academic Progress (MAP)?

Conducting an alignment study with a computerized adaptive test presents some difficult issues. MAP users in AEA 13 have students taking varied forms, since each student is presented questions specifically adapted to their achievement level. Theoretically, each student taking a test, even if in the same grade, could have completely different questions. While the test design does offer items balanced across the AEA 13 reading goal areas (Number and Operation; Patterns, Functions and Algebra; Geometry and Spatial Sense; Measurement; Data Analysis, Statistics and Probability), each test would be unique, with items selected from a large pool of thousands of items from the NWEA database.

*At this time, we are suggesting that the alignment study of the AEA 13 paper-pencil tests present a **reasonable approximation** of alignment that one would find on the AEA 13 MAP version. The items from the paper-pencil version would represent a "sample" of the larger item pool that is*

available to students taking computerized MAP tests. There is an experimental alignment process for MAP (that has been tried by Johnston Community Schools and AEA 11), that involves producing sample MAP "scripts" so that teachers can conduct alignment studies with actual tests produced by the computer system. However, this process would be somewhat costly (would involve contracting with an NWEA facilitator) and would involve a large number of AEA and LEA staff. If a more precise alignment study is required, after districts receive feedback from the Department of Education, this type of a project could be considered.

Grade 4

Standards Benchmarks and Grade Level Indicators Loess Hills AEA 13 Cooperative Curriculum Project

	Number and Operation	Data Analysis and Probability	Measurement	Algebra	Geometry
Grade 4	<p>1) Understands fractions.</p> <ul style="list-style-type: none"> • Identify numerators and denominators. • Write a fraction to identify a portion of a set or object. • Write equivalent fractions for $\frac{1}{4}$, $\frac{1}{2}$, and 1. • Add and subtract fractions with like denominators. • Represent fractions with models. <p>2) Understands numbers, ways of representing numbers, relationships among numbers, and number systems.</p> <ul style="list-style-type: none"> • Read, write, compare, and order numbers to the hundred millions place. <p>3) Demonstrate ability to compute sums, differences, products, and quotients of whole numbers.</p> <ul style="list-style-type: none"> • Add and subtract whole numbers. • Multiply 3-digit by 2-digit numbers. • Divide 3-digit by 1-digit numbers with remainders. • Use estimation in problem solving. • Apply appropriate strategies for problem solving. 	<p>Demonstrates the ability to represent data in a variety of formats (including tables and graphs).</p> <ul style="list-style-type: none"> • Choose topic, collect (by surveys, observations, or experiments), and organize data using visual displays for analysis. • Apply probability to a given situation (ex. certain, equally likely, impossible). 	<p>1) Understands measurement using standard units in the customary and metric systems.</p> <ul style="list-style-type: none"> • Determine the amount of change to be received from a purchase not to exceed \$20.00. • Calculate area of squares and rectangles. • Calculate perimeter of polygons. • Write the vocabulary of the metric measurement system including abbreviations. • Identify correct unit of measurement for length, weight, capacity, and temperature. <p>2) Uses appropriate tools and technology for measurement.</p> <ul style="list-style-type: none"> • Read scales (e.g.: thermometer, calendar, odometer, ruler). • Determine appropriate tool to measure a given object. 	<p>Understands and analyzes mathematical situations using algebraic symbols.</p> <ul style="list-style-type: none"> • Repeat and extend patterns. • Solve number sentences involving addition and subtraction with one variable. 	<p>1) Understands characteristics of one, two, and three-dimensional shapes.</p> <ul style="list-style-type: none"> • Classify polygons by number of sides (i.e., triangles, rectangles etc.). • Classify angles (i.e., right, obtuse, acute). • Identify three-dimensional shapes (i.e., prism, cone, pyramid, cube, cylinder, sphere). <p>2) Understands characteristics of lines.</p> <ul style="list-style-type: none"> • Identify lines, rays, and line segments. • Classify lines as parallel, perpendicular, or intersecting.

Grade 4

Alignment Evidence Summary:

NWEA Achievement Level Tests
and
AEA 13 Mathematics Cooperative
Curriculum Project

District Name:	Loess Hills AEA 13	Reviewer's Names:	R. Russell, H. Paul, S. Huffman
Review Date:	August, 2003		

Alignment Evidence Summary:

Grade 4 NWEA Achievement Level Tests and AEA 13 Mathematics Cooperative Curriculum Project

General Instructions: This template is to be completed for each instrument being checked for “alignment.” The information provided here should be a consolidation of the findings of the team that did the alignment checking. Provide the following information for the specific instrument being reviewed. Then, complete each of the six numbered parts of this template.

Title:	NWEA Achievement Levels Tests – AEA 13 Custom Developed Paper Pencil Assessments	Grade Level Reviewed:	Spring Forms – Levels 4, 5, 6 – Elementary Series
Author/Publisher:	NWEA/Loess Hills AEA 13	Content Area Reviewed:	Mathematics
Publication Date:	2000	Purposes/Uses by District:	Public Reporting, Student Progress/History

Whenever the evidence reported in this template is in the form of a reference (or citation), complete citation information needs to be provided so that those who are evaluating the quality/sufficiency of this evidence can locate the referenced material. In the space below, list the references cited within this summary of alignment evidence for this instrument.

- **Achievement Level Tests – Spring forms – Elementary Series – Levels 4, 5, 6 (Custom Developed by AEA 13 Teachers – NWEA in cooperation with Loess Hills AEA 13).**
- **Loess Hills AEA 13 Mathematics Cooperative Curriculum Project.**
- **Iowa Technical Adequacy Project (ITAP) Materials and Resources (process adapted for cognitive complexity and alignment).**

Summary of Alignment Evidence

Alignment (How does the assessment align with the content standards?)

1. What process was used to check the alignment between the assessment items or tasks (including scoring criteria where relevant) and the LEA's content standards?
a. Describe the qualifications of the panel of people who participated in the alignment-checking process.
AEA staff – three assessment consultants.
b. Describe what was done to determine that the content standards and benchmarks (or grade-level indicators) are of sufficient quality for use in an alignment-checking process.
1) Describe (or reference) the process used to evaluate the quality of the set of content standards and benchmarks (or grade-level indicators).
The Cooperative Curriculum Project, during June, 2002, involved math educators from 26 districts in AEA 13. National standards documents such as NCTM were used as models for teachers who developed the curriculum document during a five-day session facilitated by AEA staff. The alignment checking group (see above) did not make changes to the documents.
2) List content standards and/or benchmarks (or grade-level indicators) that were excluded from the alignment-checking process.
None.
c. Describe (or reference) the process used to evaluate the extent to which the knowledge/skills of the collection of items/tasks matches the knowledge/skills in the content standards and benchmarks (or grade-level indicators).
1) Describe (or reference) the classification system used to categorize the extent to which an item/task matches the content represented by the benchmarks (or grade-level indicators).
Step 6 of the ITAP process was used with some modification. We used the ITAP rating system for "complete," "partial," and "no fit." The category of "slight fit" was not used.
2) Describe the process followed (i.e., independent review vs. consensus) to check the alignment of content.
A group consensus format was used in the alignment checking process.
d. Describe (or reference) the process used to evaluate the extent to which the level of cognitive complexity of the collection of items/tasks matches the cognitive complexity of the content standard and benchmarks.
1) Describe (or reference) the classification system used to categorize benchmarks (or grade-level indicators) and assessment items/tasks in terms of cognitive complexity.
For classifying our benchmarks, we modified Step 4 from the ITAP process, using only the definitions of "low" and "high." The "moderate" and "unclassifiable" categories were not used. The same process was used to classify NWEA items.
2) Describe the process followed to check alignment in terms of cognitive complexity.
ITAP Step 7 was used to review for depth of knowledge/cognitive complexity. A summary table is attached for the alignment study of grade 4 skills and the level 5 level test. Three level tests – Levels 4, 5, 6 Elementary Series – were evaluated for alignment and found to be generally consistent and balanced. <i>Level 5, as the median booklet, is used to create the cognitive complexity summary and summary of decisions.</i>

2. Attach the completed table(s) used by each reviewer to record/summarize judgments from the alignment-checking process. How many tables are attached?
Three alignment-checking matrices (representing alignment of grade 4 skills and test level booklets 4, 5, 6 – Elementary Series), one depth of knowledge summary chart, one summary of decisions chart (summary charts are based on the median booklet – Level 5).
3. To what extent is this collection of items/tasks measuring something different than the knowledge/skills represented by the collection of content standards (extraneous content)?
a. Provide the total number of items/tasks that did not match at least one content standard.
No items were categorized as "no fit."
b. Specify, as a percentage, the portion of total points possible on the assessment that were <u>not</u> matched to at least one content standard.
Zero percent - all items matched at least partially to a benchmark.
4. To what extent are all the content standards in the subject area being assessed by this assessment tool (comprehensiveness)?
a. Describe the criteria used to determine “sufficiency” of content alignment for a content standard.
A minimum of five items must align to a content standard.
b. List the content standards that align sufficiently with this assessment, and specify the total number of points associated with each content standard.
Number and Operation – 20; Data Analysis and Probability – 9; Measurement – 8; Algebra – 12; Geometry – 12.
c. List the content standards that do <u>not</u> align sufficiently with this assessment.
None.
5. To what extent are the benchmarks (or grade-level indicators) within each content standard given proper content emphasis (range of knowledge) by this collection of items/tasks?
a. Describe the criteria used to determine “sufficiency” of range of knowledge for a content standard.
75% of the benchmarks within a content standard must have at least one item match.
b. List the content standards for which the range of knowledge is sufficient.
Number and Operation; Data Analysis and Probability; Algebra; Geometry.
c. List the content standards for which the range of knowledge is too narrow.
Measurement – On Level 5 (median booklets), there were matches to only 1 of 2 (50%) of the benchmarks. Note: other levels did meet criteria (see alignment checking matrices for Levels 4 and 6).
d. List each of the significant benchmarks that is not assessed.
Uses appropriate tools and technology for measurement.

6. Is the level of cognitive complexity with which each content standard is assessed (depth of knowledge) by the collection of items/tasks appropriate?
a. Describe the criteria used to determine whether benchmarks and items/tasks match well enough.
Criteria in Step 7 of the ITAP process was used – global judgment of matching.
b. List the content standards for which most benchmarks and items/tasks match well enough.
Number and Operation; Data Analysis and Probability; Measurement; Algebra; Geometry.
c. List the content standards for which most benchmarks and items/tasks do <u>not</u> match well enough.
None.

Alignment-Checking Matrix – Grade 4 Math Spring Level Test 4

ITEM NUMBER	Item Cognitive Complexity	Number and Operations			Data Analysis and Probability	Measurement		Algebra	Geometry		NO FIT
		Understands fractions.	Understands numbers, ways of representing numbers, relationships among numbers, and number systems.	Demonstrate ability to compute sums, differences, products, and quotients of whole numbers.	Demonstrates the ability to represent data in a variety of formats (including tables and graphs).	Understands measurement using standard units in the customary and metric systems.	Uses appropriate tools and technology for measurement.	Understands and analyzes mathematical situations using algebraic symbols.	Understands characteristics of two and three-dimensional shapes.	Understands characteristics of lines.	
Flag		1	2	3	4	5	6	7	8	9	
CC		L	L	L	H	L	H	H	H	L	
Level 4											
1	L					C					
2	L		C								
3	H				C						
4	L							C			
5	L				C						
6	L					C					
7	L									C	
8	H			P		P					
9	L						C				
10	H				C						
11	L		C								
12	L								C		
13	L							C			
14	H								P		
15	H							C			
16	H			P		P					
17	L			C							
18	L				P						
19	L			P	P						
20	L								P		
21	H							C			
22	L				C						
23	L								C		
24	H							C			
25	H							C			
26	H					C					
27	L									C	

Classification Codes:

Cognitive Complexity:
Item Content:

L = low
 C = complete

H = high
 P = partial

ITEM NUMBER	Item Cognitive Complexity	Number and Operations			Data Analysis and Probability	Measurement		Algebra	Geometry		NO FIT
		Understands fractions.	Understands numbers, ways of representing numbers, relationships among numbers, and number systems.	Demonstrate ability to compute sums, differences, products, and quotients of whole numbers.	Demonstrates the ability to represent data in a variety of formats (including tables and graphs).	Understands measurement using standard units in the customary and metric systems.	Uses appropriate tools and technology for measurement.	Understands and analyzes mathematical situations using algebraic symbols.	Understands characteristics of two and three-dimensional shapes.	Understands characteristics of lines.	
28	L								C		
29	H							C			
30	H								C		
31	H			C							
32	L			P	P						
33	H				P			P			
34	H			P				P			
35	H					P			P		
36	H				C						
37	L								P		
38	L	C									
39	L			C							
40	L			C							
41	L		C								
42	L			C							
43	L		P								
44	L			C							
45	L			C							
46	L		C								
47	H				C						
48	H				C						
49	L					C					
50	H							C			
Sum		1	5	12	11	7	1	10	8	2	0

Alignment-Checking Matrix – Grade 4 Math Spring Level Test 5

ITEM NUMBER	Item Cognitive Complexity	Number and Operations			Data Analysis and Probability	Measurement		Algebra	Geometry		NO FIT
		Understands fractions.	Understands numbers, ways of representing numbers, relationships among numbers, and number systems.	Demonstrate ability to compute sums, differences, products, and quotients of whole numbers.	Demonstrates the ability to represent data in a variety of formats (including tables and graphs).	Understands measurement using standard units in the customary and metric systems.	Uses appropriate tools and technology for measurement.	Understands and analyzes mathematical situations using algebraic symbols.	Understands characteristics of two and three-dimensional shapes.	Understands characteristics of lines.	
Flag		1	2	3	4	5	6	7	8	9	
CC		L	L	L	H	L	H	H	H	L	
Level 5											
1	L								P		
2	H							C			
3	L			P	P						
4	L				C						
5	L								C		
6	H							C			
7	L									C	
8	H							C			
9	H					C					
10	L								C		
11	H							C			
12	H							C			
13	L		C								
14	H			C							
15	L			P	P						
16	H				P			P			
17	H			P				P			
18	H					P			P		
19	L	C									
20	L								P		
21	L									C	
22	H					C					
23	L					P				P	
24	L					C					
25	H							C			
26	L								C		
27	L			P	P						

Classification Codes:

Cognitive Complexity: L = low H = high
Item Content: C = complete P = partial

ITEM NUMBER	Item Cognitive Complexity	Number and Operations			Data Analysis and Probability	Measurement		Algebra	Geometry		NO FIT
		Understands fractions.	Understands numbers, ways of representing numbers, relationships among numbers, and number systems.	Demonstrate ability to compute sums, differences, products, and quotients of whole numbers.	Demonstrates the ability to represent data in a variety of formats (including tables and graphs).	Understands measurement using standard units in the customary and metric systems.	Uses appropriate tools and technology for measurement.	Understands and analyzes mathematical situations using algebraic symbols.	Understands characteristics of two and three-dimensional shapes.	Understands characteristics of lines.	
28	L									C	
29	L					C					
30	L		C								
31	H		P					P			
32	H	P							P		
33	H			C							
34	L					C					
35	H			C							
36	H							P	P		
37	H							C			
38	L				C						
39	L			C							
40	L		C								
41	L					C					
42	H				C						
43	H				C						
44	H							C			
45	H				C						
46	L		P	P							
47	H			C							
48	L			C							
49	L	C									
50	L		C								
Sum		3	6	11	9	8	0	12	8	4	0

Alignment-Checking Matrix – Grade 4 Math Spring Level Test 6

ITEM NUMBER	Item Cognitive Complexity	Number and Operations			Data Analysis and Probability	Measurement		Algebra	Geometry		NO FIT
		Understands fractions.	Understands numbers, ways of representing numbers, relationships among numbers, and number systems.	Demonstrate ability to compute sums, differences, products, and quotients of whole numbers.	Demonstrates the ability to represent data in a variety of formats (including tables and graphs).	Understands measurement using standard units in the customary and metric systems.	Uses appropriate tools and technology for measurement.	Understands and analyzes mathematical situations using algebraic symbols.	Understands characteristics of two and three-dimensional shapes.	Understands characteristics of lines.	
Flag		1	2	3	4	5	6	7	8	9	
CC		L	L	L	H	L	H	H	H	L	
Level 6											
1	L					C					
2	L									C	
3	H					C					
4	L					P				P	
5	L		C								
6	L			P	P						
7	L								C		
8	H							C			
9	L									C	
10	L					C					
11	H			P		P					
12	L		C								
13	H	P							P		
14	L					C					
15	H		P					P			
16	H				C						
17	H			C							
18	H							P	P		
19	H			C							
20	H							C			
21	L				C						
22	L			C							
23	H			C							
24	H					P	P				
25	L								C		
26	L				C						
27	H			P							

Classification Codes:

Cognitive Complexity: L = low H = high
Item Content: C = complete P = partial

ITEM NUMBER	Item Cognitive Complexity	Number and Operations			Data Analysis and Probability	Measurement		Algebra	Geometry		NO FIT
		Understands fractions.	Understands numbers, ways of representing numbers, relationships among numbers, and number systems.	Demonstrate ability to compute sums, differences, products, and quotients of whole numbers.	Demonstrates the ability to represent data in a variety of formats (including tables and graphs).	Understands measurement using standard units in the customary and metric systems.	Uses appropriate tools and technology for measurement.	Understands and analyzes mathematical situations using algebraic symbols.	Understands characteristics of two and three-dimensional shapes.	Understands characteristics of lines.	
28	H							C			
29	H								C		
30	L								P		
31	H			P		P					
32	L			C							
33	H							C			
34	H									C	
35	H				C						
36	H			P			P				
37	L				P						
38	L							C			
39	H							C			
40	H	P			P						
41	L		P	P							
42	H			C							
43	L			C							
44	L	C									
45	L		C								
46	L		C								
47	L							C			
48	L		C								
49	L		P								
50	L					C					
Sum		3	8	13	7	9	2	9	6	4	0

Grade 4 NWEA – Depth of Knowledge (Cognitive Complexity) Analysis with C2P Benchmarks*

**Levels 4, 5, and 6 (elementary grade series) were reviewed for alignment. Since forms were comparable in alignment, the summary is based on comparison with NWEA Level 5 booklet (median booklet)*

Standard	Benchmarks	Complexity of Benchmark	Complexity of Items	Global Judgment	Summary Judgment
Number and Operation	Understands fractions...	Low	1 high, 2 low	Moderate	Moderate
	Understands numbers...	Low	1 high, 5 low	Strong	
	Computes sums, differences...	Low	5 high, 6 low	Moderate	
Data Analysis and Probability	Ability to represent data...	High	4 high, 5 low	Moderate	Moderate
Measurement	Understands measurement...	Low	3 high, 5 low	Moderate	Moderate
	Uses tools... measurement...	High	0 high, 0 low	Weak	
Algebra	Algebraic symbols...	High	11 high, 1 low	Strong	Strong
Geometry	Two dimensional shapes....	High	3 high, 5 low	Moderate	Moderate
	Characteristics of lines...	High	0 high, 4 low	Weak	

Grade 4 NWEA Mathematics – Summary of Decisions

Content Standards	Comprehensiveness	Range of Knowledge	Cognitive Complexity
Number and Operation	Yes	Yes	Yes
Data Analysis and Probability	Yes	Yes	Yes
Measurement	Yes	No	Yes

Content Standards	Comprehensiveness	Range of Knowledge	Cognitive Complexity
Algebra	Yes	Yes	Yes
Geometry	Yes	Yes	Yes

Grade 8

Standards, Benchmarks and Grade Level Indicators Loess Hills AEA 13 Reading Consensus

	Number and Operation	Data Analysis and Probability	Measurement	Algebra	Geometry
Grade 8	<p>Demonstrates ability to compute using addition and multiplication properties and order of operations with whole numbers, rational numbers and integers.</p> <ul style="list-style-type: none"> • Compute using the four basic operations with rational numbers. • Simplify powers, exponents, and square roots. • Use order of operations to simplify expressions. • Find equivalent forms of decimals, fractions, and percents. 	<p>1) Use various tools to organize and interpret data.</p> <ul style="list-style-type: none"> • Create, read, and interpret various kinds of graphs (i.e., histograms, line graphs, stem and leaf plots, box-and-whisker plots). • Identify and use measures of central tendencies (mean, median, mode). <p>2) Demonstrate an understanding of probability.</p> <ul style="list-style-type: none"> • Find the probability of one or more events. 	<p>1) Understand conversions and relationships within systems.</p> <ul style="list-style-type: none"> • Convert units of length, capacity and mass in customary and metric systems. <p>2) Uses tools and techniques for determining area and volume.</p> <ul style="list-style-type: none"> • Find the area of various types of 2-dimensional figures. • Find the surface area and volume of prisms. • Find the volume of cylinders. 	<p>1) Demonstrates the ability to solve linear equations.</p> <ul style="list-style-type: none"> • Solve one-step equations using rational numbers. • Solve two-step equations with one variable term (i.e., $3x-2=34$). <p>2) Demonstrates the ability to translate common language into algebraic form.</p> <p>3) Writes simple algebraic expressions and equations from verbal phrases.</p>	<p>Understands and applies geometric properties in order to solve problems.</p> <ul style="list-style-type: none"> • Use proportions to solve problems involving similar figures. • Use the Pythagorean Theorem to find the lengths of sides of right triangles.

Grade 8

Alignment Evidence Summary:

NWEA Achievement Level Tests
and
AEA 13 Mathematics Cooperative
Curriculum Project

District Name:	Loess Hills AEA 13	Reviewer's Names:	R. Russell, H. Paul
Review Date:	August, 2003		

Alignment Evidence Summary:

Grade 8 NWEA Achievement Level Tests and AEA 13 Mathematics Cooperative Curriculum Project

General Instructions: This template is to be completed for each instrument being checked for “alignment.” The information provided here should be a consolidation of the findings of the team that did the alignment checking. Provide the following information for the specific instrument being reviewed. Then, complete each of the six numbered parts of this template.

Title:	NWEA Achievement Levels Tests – AEA 13 Custom Developed Paper Pencil Assessments	Grade Level Reviewed:	Spring Forms – Middle Grades Series – Levels 6, 7, and 8
Author/Publisher:	NWEA/Loess Hills AEA 13	Content Area Reviewed:	Math
Publication Date:	2000	Purposes/Uses by District:	Public Reporting, Student Progress/History

Whenever the evidence reported in this template is in the form of a reference (or citation), complete citation information needs to be provided so that those who are evaluating the quality/sufficiency of this evidence can locate the referenced material. In the space below, list the references cited within this summary of alignment evidence for this instrument.

- **Achievement Level Tests – Spring forms – Levels 6, 7, 8 – Middle Grades Series (Custom Developed by AEA 13 Teachers - NWEA in cooperation with Loess Hills AEA 13).**
- **Loess Hills AEA 13 Mathematics Cooperative Curriculum Project.**
- **Iowa Technical Adequacy Project (ITAP) Materials and Resources (process adapted for cognitive complexity and alignment).**

Summary of Alignment Evidence

Alignment (How does the assessment align with the content standards?)

1. What process was used to check the alignment between the assessment items or tasks (including scoring criteria where relevant) and the LEA's content standards?
a. Describe the qualifications of the panel of people who participated in the alignment-checking process.
AEA staff – two assessment consultants.
b. Describe what was done to determine that the content standards and benchmarks (or grade-level indicators) are of sufficient quality for use in an alignment-checking process.
1) Describe (or reference) the process used to evaluate the quality of the set of content standards and benchmarks (or grade-level indicators).
The Cooperative Curriculum Project during June, 2002, involved math educators from 26 districts in AEA 13. National standards documents such as NCTM were used as models for teachers who developed the curriculum document during a five-day session facilitated by AEA staff. The alignment checking group (see above) did not make changes to the documents.
2) List content standards and/or benchmarks (or grade-level indicators) that were excluded from the alignment-checking process.
None.
c. Describe (or reference) the process used to evaluate the extent to which the knowledge/skills of the collection of items/tasks matches the knowledge/skills in the content standards and benchmarks (or grade-level indicators).
1) Describe (or reference) the classification system used to categorize the extent to which an item/task matches the content represented by the benchmarks (or grade-level indicators).
Step 6 of the ITAP process was used with some modification. We used the ITAP rating system for "complete," "partial," and "no fit." The category of "slight fit" was not used.
2) Describe the process followed (i.e., independent review vs. consensus) to check the alignment of content.
A group consensus format was used in the alignment checking process.
d. Describe (or reference) the process used to evaluate the extent to which the level of cognitive complexity of the collection of items/tasks matches the cognitive complexity of the content standard and benchmarks.
1) Describe (or reference) the classification system used to categorize benchmarks (or grade-level indicators) and assessment items/tasks in terms of cognitive complexity.
For classifying our benchmarks, we modified Step 4 from the ITAP process, using only the definitions of "low" and "high." The "moderate" and "unclassifiable" categories were not used. The same process was used to classify NWEA items.
2) Describe the process followed to check alignment in terms of cognitive complexity.
ITAP Step 7 was used to review for depth of knowledge/cognitive complexity. A summary table is attached for the alignment study of grade 8 skills and the Level 7 middle grades test. Three level tests – Levels 6, 7, 8 – middle grades series – were evaluated for alignment and found to be consistent and balanced. <i>Level 7, as the median booklet, was used to create the cognitive complexity summary and summary of decisions.</i>

2. Attach the completed table(s) used by each reviewer to record/summarize judgments from the alignment-checking process. How many tables are attached?
Three alignment-checking matrices (representing alignment of grade 8 skills and test level booklets 6, 7, 8 – middle grades series), one depth of knowledge summary chart, one summary of decisions chart (summary charts are based on the median booklet – Level 7).
3. To what extent is this collection of items/tasks measuring something different than the knowledge/skills represented by the collection of content standards (extraneous content)?
a. Provide the total number of items/tasks that did not match at least one content standard.
One item.
b. Specify, as a percentage, the portion of total points possible on the assessment that were <u>not</u> matched to at least one content standard.
2% or 1 of the 50 items.
4. To what extent are all the content standards in the subject area being assessed by this assessment tool (comprehensiveness)?
a. Describe the criteria used to determine “sufficiency” of content alignment for a content standard.
A minimum of five items must align to a content standard.
b. List the content standards that align sufficiently with this assessment, and specify the total number of points associated with each content standard.
Number and Operation – 22; Data Analysis and Probability – 8; Measurement – 5; Algebra – 10; Geometry – 10.
c. List the content standards that do <u>not</u> align sufficiently with this assessment.
None.
5. To what extent are the benchmarks (or grade-level indicators) within each content standard given proper content emphasis (range of knowledge) by this collection of items/tasks?
a. Describe the criteria used to determine “sufficiency” of range of knowledge for a content standard.
75% of the benchmarks within a content standard must have at least one item match.
b. List the content standards for which the range of knowledge is sufficient.
Number and Operation; Data Analysis and Probability; Measurement; Algebra; Geometry.
c. List the content standards for which the range of knowledge is too narrow.
None.
d. List each of the significant benchmarks that is not assessed.
None

6. Is the level of cognitive complexity with which each content standard is assessed (depth of knowledge) by the collection of items/tasks appropriate?
a. Describe the criteria used to determine whether benchmarks and items/tasks match well enough.
Criteria in Step 7 of the ITAP process was used – global judgment of matching.
b. List the content standards for which most benchmarks and items/tasks match well enough.
Number and Operation; Data Analysis and Probability; Measurement; Algebra; Geometry.
c. List the content standards for which most benchmarks and items/tasks do <u>not</u> match well enough.
None.

Alignment-Checking Matrix – Grade 8 Math Spring Level Test 6

ITEM NUMBER	Item Cognitive Complexity	Number and Operations	Data Analysis and Probability		Measurement		Algebra			Geometry	NO FIT
		Demonstrates ability to compute using addition and multiplication properties and order of operations with whole numbers, rational numbers, and integers.	Use various tools to organize and interpret data.	Demonstrate an understanding of probability.	Understand conversions and relationships within systems.	Uses tools and techniques for determining area and volume.	Demonstrates the ability to solve linear equations.	Demonstrates the ability to translate common language into algebraic form.	Writes simple algebraic expressions and equations from verbal phrases.	Understands and applies geometric properties in order to solve problems.	
Flag		1	2	3	4	5	6	7	8	9	
CC		L	H	H	L	L	L	H	H	H	
Level 6											
1	L									P	
2	L				C						
3	L										X
4	H						P				
5	L									C	
6	H			C							
7	L									P	
8	L		C								
9	L				P						
10	H			C							
11	L										X
12	L					C					
13	L									P	
14	L										X
15	H	P						P			
16	L				P						
17	H									C	
18	L		C								
19	H			C							
20	L	C									
21	H		C								
22	L					P					
23	L				C						
24	L	P									
25	L	C									
26	H	P									
27	L									C	

Classification Codes:

Cognitive Complexity:
Item Content:

L = low
 C = complete

H = high
 P = partial

ITEM NUMBER	Item Cognitive Complexity	Number and Operations	Data Analysis and Probability		Measurement		Algebra			Geometry	NO FIT
		Demonstrates ability to compute using addition and multiplication properties and order of operations with whole numbers, rational numbers, and integers.	Use various tools to organize and interpret data.	Demonstrate an understanding of probability.	Understand conversions and relationships within systems.	Uses tools and techniques for determining area and volume.	Demonstrates the ability to solve linear equations.	Demonstrates the ability to translate common language into algebraic form.	Writes simple algebraic expressions and equations from verbal phrases.	Understands and applies geometric properties in order to solve problems.	
28	L	C									
29	L						C				
30	L						C				
31	L				P						
32	L									C	
33	H			C							
34	L									C	
35	H									C	
36	H		C								
37	L	C									
38	H					P				P	
39	L	C									
40	L	P									
41	H		C								
42	L	C									
43	L						C				
44	L	C									
45	L	C									
46	L	C									
47	L	C									
48	H		C								
49	L										X
50	L	C									
Sum		15	6	4	5	3	4	1	0	10	4

Alignment-Checking Matrix – Grade 8 Math Spring Level Test 7

ITEM NUMBER	Item Cognitive Complexity	Number and Operations	Data Analysis and Probability		Measurement		Algebra			Geometry	NO FIT
		Demonstrates ability to compute using addition and multiplication properties and order of operations with whole numbers, rational numbers, and integers.	Use various tools to organize and interpret data.	Demonstrate an understanding of probability.	Understand conversions and relationships within systems.	Uses tools and techniques for determining area and volume.	Demonstrates the ability to solve linear equations.	Demonstrates the ability to translate common language into algebraic form.	Writes simple algebraic expressions and equations from verbal phrases.	Understands and applies geometric properties in order to solve problems.	
Flag		1	2	3	4	5	6	7	8	9	
CC		L	H	H	L	L	L	H	H	H	
Level 7											
1	L	C									
2	L									P	
3	H	P	P								
4	L				C						
5	L					P					
6	L	P									
7	L									C	
8	L	P									
9	L	P									
10	H		C								
11	L									C	
12	L									C	
13	H	P						P	P		
14	L					C					
15	L						C				
16	L	C									
17	L									C	
18	L										X
19	H			C							
20	H		C								
21	H		C								
22	L	C									
23	H	P									
24	L						C				
25	H									C	
26	L									C	
27	H			C							

Classification Codes:

Cognitive Complexity:

L = low

H = high

Item Content:

C = complete

P = partial

ITEM NUMBER	Item Cognitive Complexity	Number and Operations	Data Analysis and Probability		Measurement		Algebra			Geometry	NO FIT
		Demonstrates ability to compute using addition and multiplication properties and order of operations with whole numbers, rational numbers, and integers.	Use various tools to organize and interpret data.	Demonstrate an understanding of probability.	Understand conversions and relationships within systems.	Uses tools and techniques for determining area and volume.	Demonstrates the ability to solve linear equations.	Demonstrates the ability to translate common language into algebraic form.	Writes simple algebraic expressions and equations from verbal phrases.	Understands and applies geometric properties in order to solve problems.	
28	H	C									
29	H	P						P	P		
30	L				C						
31	H		C								
32	H							P	P		
33	L	C									
34	L	P									
35	H									C	
36	L	P									
37	L	C									
38	H	C									
39	L						C				
40	L					P					
41	H		C								
42	H									C	
43	L	C									
44	L	C									
45	H						P				
46	L	C									
47	L	C									
48	L									C	
49	L	C									
50	L	C									
Sum		22	6	2	2	3	4	3	3	10	1

Alignment-Checking Matrix – Grade 8 Math Spring Level Test 8

ITEM NUMBER	Item Cognitive Complexity	Number and Operations	Data Analysis and Probability		Measurement		Algebra			Geometry	NOFIT
		Demonstrates ability to compute using addition and multiplication properties and order of operations with whole numbers, rational numbers, and integers.	Use various tools to organize and interpret data.	Demonstrate an understanding of probability.	Understand conversions and relationships within systems.	Uses tools and techniques for determining area and volume.	Demonstrates the ability to solve linear equations.	Demonstrates the ability to translate common language into algebraic form.	Writes simple algebraic expressions and equations from verbal phrases.	Understands and applies geometric properties in order to solve problems.	
Flag		1	2	3	4	5	6	7	8	9	
CC		L	H	H	L	L	L	H	H	H	
Level 8											
1	H		C								
2	L	C									
3	H		C								
4	H	P									
5	H									C	
6	L						C				
7	L									C	
8	H			C							
9	L									C	
10	H	C									
11	L									C	
12	H	P						P	P		
13	L				C						
14	H							P	P		
15	H		C								
16	L	P									
17	H									C	
18	H	P					P				
19	L	C									
20	H	C									
21	L					P				P	
22	L	C									
23	H	P								P	
24	H		C								
25	L									C	
26	H	C									
27	L				C						

Classification Codes:

Cognitive Complexity:

L = low

H = high

Item Content:

C = complete

P = partial

ITEM NUMBER	Item Cognitive Complexity	Number and Operations	Data Analysis and Probability		Measurement		Algebra			Geometry	NO FIT
		Demonstrates ability to compute using addition and multiplication properties and order of operations with whole numbers, rational numbers, and integers.	Use various tools to organize and interpret data.	Demonstrate an understanding of probability.	Understand conversions and relationships within systems.	Uses tools and techniques for determining area and volume.	Demonstrates the ability to solve linear equations.	Demonstrates the ability to translate common language into algebraic form.	Writes simple algebraic expressions and equations from verbal phrases.	Understands and applies geometric properties in order to solve problems.	
28	L	C									
29	H	P	P								
30	H						C				
31	H						P			P	
32	L				C						
33	H							P	P		
34	H	P	P								
35	H									C	
36	L	C									
37	L			C							
38	L									C	
39	L	P					P				
40	L				C						
41	L	C									
42	L	C									
43	H						P				
44	L	C									
45	L									C	
46	L	C									
47	L	C									
48	L	C									
49	L		C								
50	L	C									
Sum		23	7	2	4	1	6	3	3	12	0

Grade 8 NWEA Mathematics – Depth of Knowledge (Cognitive Complexity) Analysis with C2P Benchmarks*

**Levels 6, 7, and 8 (middle grade series) were reviewed for alignment. Since forms were comparable in alignment, the summary is based on comparison with NWEA Level 7 booklet (median booklet)*

Standard	Benchmarks	Complexity of Benchmark	Complexity of Items	Global Judgment	Summary Judgment
Number and Operation	Ability to compute...	Low	6 high, 16 low	Strong	Strong
Data Analysis and Probability	Uses tools...to organize and interpret data	High	6 high, 0 low	Strong	Strong
	...Understanding of probability...	High	2 high, 0 low	Strong	
Measurement	...Conversions and relationships	Low	0 high, 2 low	Strong	Strong
	Tools...area and volume	Low	0 high, 3 low	Strong	
Algebra	...Solve linear equations...	Low	1 high, 3 low	Strong	Strong
	...Translate language into algebraic form...	High	3 high, 0 low	Strong	
	...Writes simple algebraic expressions from verbal phrases...	High	3 high, 0 low	Strong	
Geometry	... Applies geometric properties to solve problems...	High	3 high, 7 low	Moderate	Moderate

Grade 8 NWEA Mathematics – Summary of Decisions

Content Standards	Comprehensiveness	Range of Knowledge	Cognitive Complexity
Number and Operation	Yes	Yes	Yes
Data Analysis and Probability	Yes	Yes	Yes

Content Standards	Comprehensiveness	Range of Knowledge	Cognitive Complexity
Measurement	Yes	Yes	Yes
Algebra	Yes	Yes	Yes
Geometry	Yes	Yes	Yes