Alignment between the Minnesota Academic Standards in Mathematics and Science, and the WIDA Consortium's English Language Proficiency Standards: a report on research carried out by the University of Illinois on behalf of the WIDA Consortium

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ILLINOIS

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Preamble

This document and the research activities that support it were prepared by an external independent consultant and a researcher at the University of Illinois at Urbana-Champaign (UIUC).

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Members of the WIDA headquarters team at the Wisconsin Center for Educational Research (University of Wisconsin)[1] facilitated the logistics of the research and provided review and comment on this report.

Enquiries about this report should be directed to WIDA, on behalf of UIUC.[2]

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Executive Summary

This report presents the results of an alignment study conducted in Roseville, Minnesota on November 8 and 9, 2011. The alignment protocol is based on Cook's (2005, 2006, 2007) adaptation of Webb's (1997) alignment framework. For this study, Cook's framework was used to examine the relationship between the Model Performance Indicators (MPIs) contained in the WIDA English Language Proficiency (ELP) Standards, 2007 Edition and the Minnesota Academic Standards in Mathematics and Science.

What is alignment?

Federal guidance refers to two criteria to evaluate the relationship between English language proficiency standards and a state's academic content standards: linking and alignment (U.S. Department of Education, Office of English Language Acquisition, February 2003). Linking is required as a minimum criterion; alignment, the higher criterion, is encouraged by federal guidelines. In our conceptualization, alignment is the combination of both linking (match between standards) and correspondence, which is comprised of depth and breadth. Depth refers to similarity of cognitive complexity and breadth to similarity in dispersion (how linking is distributed among goals within a standard). Each aspect of the alignment has associated statistics: *Linking*, *Depth of Knowledge (DOK) Consistency* (depth), and *Coverage* (breadth). As conceived in this report, alignment is a higher criterion in that it not only examines whether there is a match between standards (linking), but also establishes whether there is strong cognitive correspondence between standards and whether a state's content goals within a content standard have corollary English proficiency expectations (correspondence).

Results

Linking

Results suggest adequate Linking across all grade clusters between the Model Performance Indicators (MPIs) in the WIDA Consortium's English Language Proficiency (ELP) Standards and the Minnesota Academic Standards in Mathematics and Science investigated in this study. We therefore conclude that the relationship between the WIDA ELP standards and the Minnesota Academic Standards in Mathematics and Science meets the requirements of the No Child Left Behind Act of 2001 (NCLB). Strong Linking was observed in most grades with moderate Linking observed in Mathematics grades 3, 4, 6, and high school Science (Life Science).

Correspondence

As stated above, federal guidance encourages states to meet a higher standard, i.e., alignment. Our analyses indicate that the Depth of Knowledge criterion is strongly met for Mathematics, and is moderately met for Science. In addition, coverage in Mathematics and Science is moderate. Overall, we conclude that while the alignment criteria as defined here are not entirely met, the Minnesota Academic Standards in Mathematics and Science align moderately with the MPIs within the WIDA ELPs.

Introduction

Background

This study was an evaluation of the alignment between the Minnesota Academic Standards in Mathematics and Science and the WIDA English Language Proficiency (ELP) Standards in the areas of Mathematics and Science. Webb's (1997) alignment methodology, which has traditionally been used to evaluate the alignment between academic content standards and academic content assessments, has recently been adapted to study the alignment between different sets of standards (e.g., English language proficiency and academic content). Cook (2005) explains that one-to-one correspondences are less expected when aligning two sets of standards than when examining the alignment between a set of standards and an assessment. Thus, the criteria for acceptable levels of key alignment statistics are different for standards-to-standards alignment than for test-to-standards alignment, in which the primary interest is to probe into the degree to which test items cover the content knowledge exemplified in a set of standards.

The text below is drawn from federal non-regulatory guidance as it relates to English language proficiency standards and the issue of alignment.

> **B-3. What is the relationship between English language proficiency standards, English language proficiency annual measurable achievement objectives, and English language proficiency assessments?**
>
> English language proficiency standards ***must, at a minimum, be linked*** [bolding not in original] to the State academic content and achievement standards. States ***are encouraged, but not required, to align*** [bolding not in original] English language proficiency standards with academic content and achievement standards. Annual measurable achievement objectives for English language proficiency serve as targets for achievement of the English language proficiency standards. English language proficiency assessments must be aligned with English language proficiency standards and provide a means of demonstrating progress towards meeting the English language proficiency annual measurable achievement objectives. (U.S. Department of Education, Office of English Language Acquisition, February 2003, pp. 9-10).

As specified in the italicized, bolded phrases in the text above, the federal government has expanded upon the notion of alignment, traditionally seen as a relationship between standards and tests, to include the relationship between a state's English language proficiency standards and its academic content standards.

Alignment Methods

The alignment of assessment systems to state standards (test-to-standards alignment) has gained prominence in recent years. NCLB also requires alignment of state assessments to state standards.

The notion of alignment is not new. In years past, however, alignment was conducted during a test's item review. Content experts reviewed assessment items and determined if items matched test specifications, test framework documents, or standards. The primary purpose in this type of alignment was to assure that a test item matched a specification, framework or standard. Researchers have argued that there is more to alignment than simple assurances achieved during test development (see La Marca, et al., 2001; Webb 1997, 2002; and Rothman, et al., 2002). In particular, alignment refers not only to matching items to standards but also to ascertaining the breadth and the cognitive depth of items relative to standards, which may or may not have been considered during test construction.

Alignment is and has been a mechanism for contributing evidence to a test's validity argument. Even if alignment was a key feature during test construction, subsequent alignment research serves as a means to validate the presumptions of test developers. The test developers can utilize such evidence as they argue that score-based inferences are valid for the intended purpose of the test, which is in accord with the modern paradigm of test validation (Messick,1989; Kane, 2006).

A variety of alignment strategies and methodologies exist (see CCSSO, 2002 & 2007). One of the most prominent methods used today is that created by Dr. Norman Webb of the Wisconsin Center for Educational Research, which is employed in this project. The Webb approach to alignment evaluates item match, cognitive complexity (or depth), and breadth of coverage. Each alignment component (match, depth, breadth) has associated statistics.

To evaluate match, the statistic Categorical Concurrence is used. Categorical Concurrence refers to the average number of items raters assign to specific standards or curricular goals. Raters select specific standards, goals or objectives that match to individual test items on rated tests. The numbers of coded items are averaged across all raters and reported as Categorical Concurrence. This statistic is a proxy for average numbers of items raters believe address a specific standard or objective. With this methodology, items can address more than one standard, and raters are allowed to code accordingly.

To evaluate depth, raters judge the Depth of Knowledge (DOK) of standards, goals and/or objectives and the DOK of test items. Depth of Knowledge can be defined in a variety of ways. Webb argues that:

> Standards vary on the complexity of what students are expected to know and do. Some standards simply expect students to reproduce a fact or complete a sequence of steps while others expect students to reason, extend their thinking, synthesize information from multiple sources, and produce significant work over time. Alignment on depth-of-knowledge is achieved when the assessment and standards agree on the cognitive level students are expected to demonstrate and are asked to perform.

Webb identifies four DOK levels:

- Level 1 Recall and Reproduction,
- Level 2 Skills and Concepts,

- Level 3 Strategic Thinking, and
- Level 4 Extended Thinking.

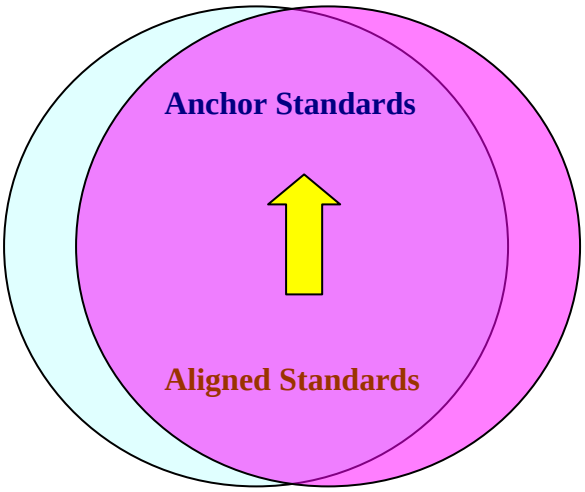
During the alignment process, test items and standards are assigned unique DOK levels, and these levels are compared to identify their correspondence. The final component analyzed in a Webb alignment is breadth. Two statistics are associated with breadth: Range and Balance. The Range criterion "is met if a comparable span of knowledge expected of students by a standard is the same as, or corresponds to, the span of knowledge that students need in order to correctly answer the assessment items/activities" (Webb, 2001). If test items are identified with most, if not all, relevant objectives in a standard, then it is said that there is good Range. In essence, Range examines whether all objectives within a goal or standard are adequately covered. The second statistic examining breadth is Balance. Balance refers to the "degree to which one objective is given emphasis on the assessment is comparable to the emphasis given to the other objectives within a standard" (Webb, 2001).

Standards-to-Standards Alignment Criteria

The Webb alignment system focuses on state tests and state academic content standards, usually in the areas of reading and mathematics. The federal linking or alignment guidance described in this report is different. Instead of examining test-to-standards (i.e., Webb's approach), federal requirements suggest conducting standards-to-standards investigations, be they linking or alignment. A variety of procedures have been developed to "align" curriculum in education (Anderson, 2002). A very prominent example is the Surveys of Enacted Curriculum (Porter and Smithson, 2001 and Blank, 2002). With this approach, researchers examine relationships between standards, instructional practices, and assessments. The power of this approach is to unveil how standards-based, assessment-evaluated systems are realized in the classroom. This approach is very comprehensive and informative. However, it does not provide a means to compare two particular sets of standards (although, undoubtedly, it could be altered to accomplish such a goal). Another approach to examine standard-to-standard relationships has been applied to sets of standards using a modified version of the Webb alignment procedure (Cook, 2005). With this method, Cook aligned a state's academic framework to a district's learning targets. The goal of this alignment was to communicate the association between the district's standards and the state's standards for assessment. The district's learning targets were developed to support the state's assessment framework, and as such good alignment was anticipated between these two sets of student expectations.

Close correspondence is not necessarily the expectation in a standards-to-standards alignment. This distinction is highlighted by the figures below.

Figure 1: Standards-to-Standards Alignment (1)



In Figure 1, the anchor standards are defined as expectations that one aligns to, e.g., state standards/ assessment frameworks, and aligned standards are expectations to be aligned, e.g., learning targets. For example, one might align one set of mathematics standards at 4th grade to another set of mathematics standards at 4th grade. A high degree of overlap (i.e., match, depth and breadth) would represent good alignment. However, Figure 1 portrays alignment between highly similar content domains—in this example 4th grade mathematics. Would this be the expected alignment between associated domains, say between elementary, mathematics academic language standards for grades 3 through 5 and 4th grade mathematics content standards? Probably not. Continuing this line of reasoning, alignment between language proficiency standards and academic content standards is best reflected in Figure 2. If Figure 1 were the target, why have different standards?

Figure 2: Standards-to-Standards Alignment (2)

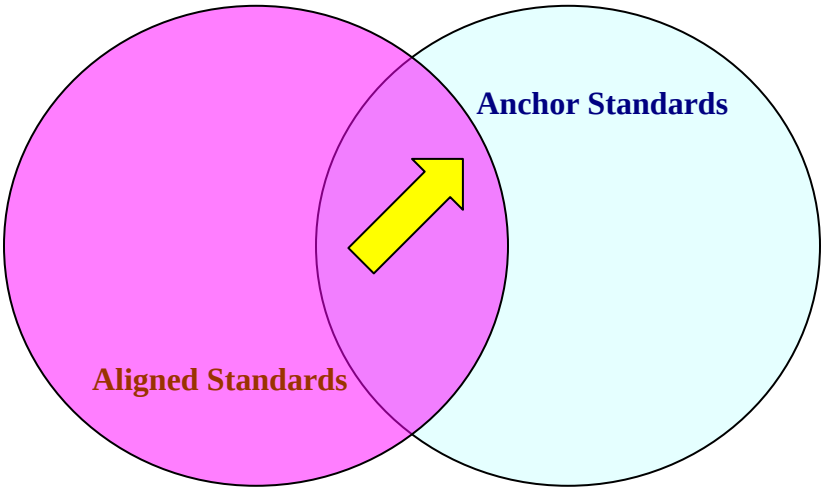


Figure 2 portrays association between two sets of standards—the association of related but not identical expectations. There are three logical possibilities for standards comparison research: (a)

one set of content standards with another set of content standards, (b) one set of English proficiency standards with another set of English proficiency standards, or (c) a set of content standards with English proficiency standards. Our research is of type (c). We examine content register relationships – or to put the matter more broadly – we examine the amount of expected English language load in a given set of content standards. The register used in subject areas like mathematics, science or language arts are subsets of the content domain. As a result, the criterion for alignment should differ for type (c) versus types (a) or (b) above.

As stated earlier, federal guidance identifies two notions related to academic content and language proficiency standards alignment: linking and alignment. We interpret the term *alignment* mentioned in federal guidance to be that reflected by Figure 2. That is, strong alignment between English language proficiency standards and academic content standards ***ARE NOT*** one-to-one correspondences. What then does alignment mean?

Linking

First, a state's English language proficiency standards must be, at a minimum, linked to its academic content standards. The operational assumption of this research is: **To be linked, we utilize a "presence versus non-presence" argument: at least one aligned goal/objective within a content standard in each assessed subject must be represented in the English language proficiency standards at each grade cluster.**

A presence vs. non-presence argument is used to interpret whether the Linking criterion is met for the NCLB requirement. If simple presence (rather than non-presence) of Linking was observed, then we argue that the NCLB requirement with respect to Linking is met. An example will help clarify this criterion. Table 1 displays elements of the National Council of Teachers of Mathematics (NCTM) standards. Let us assume that Table 1 reflects a state's mathematics standards at a particular grade. To be appropriately linked, linguistic elements (i.e., phonological, lexical, grammatical, sociolinguistic) associated with Number Operations, Algebra, Geometry, Measurement, and Data Analysis and Probability would need to be reflected in the English language proficiency standards for speaking, listening, reading or writing at the grade span associated with this standard. A language proficiency standard requiring students to orally describe groups of and/or sequences of objects, figures or numbers would be consistent with Number and Operations. Another standard might have students read a graph or figure representing numeric relationships. This standard could be linked to Algebra and possibly Data Analysis and Probability. Linking assures that register elements associated with the language of mathematics are included in language proficiency standards.

Table 1: NCTM Standards

Standards	Goals
Number and Operations	1. Understand numbers, ways of representing numbers, relationships among numbers, and number systems; 2. Understand meanings of operations and how they relate to one another; 3. Compute fluently and make reasonable estimates;
Algebra	1. Understand patterns, relations, and functions; 2. Represent and analyze mathematical situations and structures using algebraic symbols; 3. Use mathematical models to represent and understand quantitative relationships; 4. Analyze change in various contexts;

Standards	Goals
Geometry	1. Analyze characteristics and properties of two- and three-dimensional geometric shapes and develop mathematical arguments about geometric relationships; 2. Specify locations and describe spatial relationships using coordinate geometry and other representational systems; 3. Apply transformations and use symmetry to analyze mathematical situations; 4. Use visualization, spatial reasoning, and geometric modeling to solve problems;
Measurement	1. Understand measurable attributes of objects and the units, systems, and processes of measurement; 2. Apply appropriate techniques, tools, and formulas to determine measurements;
Data Analysis and Probability	1. Formulate questions that can be addressed with data and collect, organize, and display relevant data to answer them; 2. Select and use appropriate statistical methods to analyze data; 3. Develop and evaluate inferences and predictions that are based on data; 4. Understand and apply basic concepts of probability;

Correspondence

Federal guidance states that linking is a minimum criterion. Alignment is encouraged. This methodology conceptualizes **alignment as the combination of Linking and Correspondence and uses "alignment" as the over-arching term.** Table 2 shows this relationship. Linking describes the match between standards. Correspondence includes depth and breadth. There is inadequate guidance in the research literature about depth when comparing English language proficiency standards to content standards. We propose that 40% of linked English language proficiency standards should be at or above the Depth of Knowledge (DOK) level of the content standards to reflect strong cognitive Correspondence. This DOK criterion associates with Scarcella's (2003) cognitive dimension, including higher-order thinking, strategic competence, and metalinguistic awareness. Furthermore, we contend that a 40% DOK criterion establishes challenging but attainable expectations as it indicates that the English language load of the content standards does not exceed fifty percent of the content demands.

Table 2: Standard-to-Standard Alignment Criteria: English Language Proficiency to Academic Content Standards

Scope		Criterion	Alignment Statistics
Alignment	Linking	Match	At least one aligned content standard across skill domains, as agreed upon by a **majority** of raters
	Correspondence	Depth	At least a 40% DOK across skill domains
		Breadth	At least moderate coverage of goals (benchmarks) across domains where: **Limited** ≤ 1 goal aligned for each standard, **Moderate** > 1 goal aligned for each standard, **Strong** = a majority of goals aligned for each standard

The first aspect of Correspondence is depth, and the second is breadth. Again, there is limited guidance in the research literature. Our stance is represented by the above three Coverage criteria (Table 2). The Coverage criteria relate to the number of goals within a standard that are aligned. In the example shown in Table 1, we see there are 3 goals for Number and Operations, 4 goals for Algebra, 4 goals for geometry, 2 goals for Measurement, and 4 goals for Data Analysis and Probability. Moderate breadth would mean that more than one goal in the math standards is associated with the language proficiency standards. Strong breadth would mean a majority of a state's content goals within a content standard have corollary English language proficiency expectations. As with the DOK criterion, this is an aggressive but obtainable expectation.

For adequate alignment, we suggest that a state's English language proficiency standards should meet the Linking criterion, the DOK criterion, and have moderate or greater breadth of Coverage. Were language proficiency standards to have this degree of alignment, we believe greater attention would be given to academic English in the classroom and on language proficiency assessments. Given Gottlieb's (2006) conviction that academic English language proficiency is a precursor to academic achievement, such adequate alignment should promote students' progress in English, which could directly affect annual measurable achievement objective (AMAO) goals. This type of alignment would move states toward best practice in language instruction and assessment.

Standards Aligned in this Study

The following are brief descriptions of the two sets of standards aligned in this study:

Minnesota Academic Standards

The Minnesota Academic Standards in Mathematics and Science (http://education.state.mn.us/MDE/EdExc/StanCurri/K-12AcademicStandards/index.htm) articulate essential knowledge, skills, and concepts, and describe what students are expected to know. For Mathematics, the standards describe a connected body of mathematical knowledge students learn through the processes of problem solving, reasoning and proof, communication, connections, and representation. The standards are organized by grade levels from kindergarten through grade eight and by grade span for 9-12. They are grouped by strands: 1) Number and Operation; 2) Algebra; 3) Geometry and Measurement; 4) Data Analysis and Probability. For Science, the standards describe the structures and processes of the natural world. The standards are organized by grade spans K-5, 6-8 and 9-12; the benchmarks in grade cluster 3-5, 6-8 and Life Science for high school were used in this study. In this report, the standards are used as our reporting categories for the two content domains.

The Minnesota Academic Standards in Mathematics include the following five reporting categories:

- Number and Operation
- Algebra
- Geometry and Measurement
- Data Analysis

- Data Analysis and Probability

The Minnesota Academic Standards in Science include the following eight reporting categories:

Grades 5 and 8
- The Nature of Science and Engineering
- Physical Science
- Earth Science
- Life Science

High school (Life Science)
- Structure and Function in Living Systems
- Interdependence among Living Systems
- Evolution in Living Systems
- Human Interactions with Living Systems

WIDA Consortium's English Language Proficiency (ELP) Standards

The WIDA Consortium's English Language Proficiency Standards (WIDA, 2007) are comprised of the following five standards:

1. English language learners communicate in English for SOCIAL AND INSTRUCTIONAL purposes within the school setting.

2. English language learners communicate information, ideas, and concepts necessary for academic success in the content area of LANGUAGE ARTS.

3. English language learners communicate information, ideas, and concepts necessary for academic success in the content area of MATHEMATICS.

4. English language learners communicate information, ideas, and concepts necessary for academic success in the content area of SCIENCE.

5. English language learners communicate information, ideas, and concepts necessary for academic success in the content area of SOCIAL STUDIES.

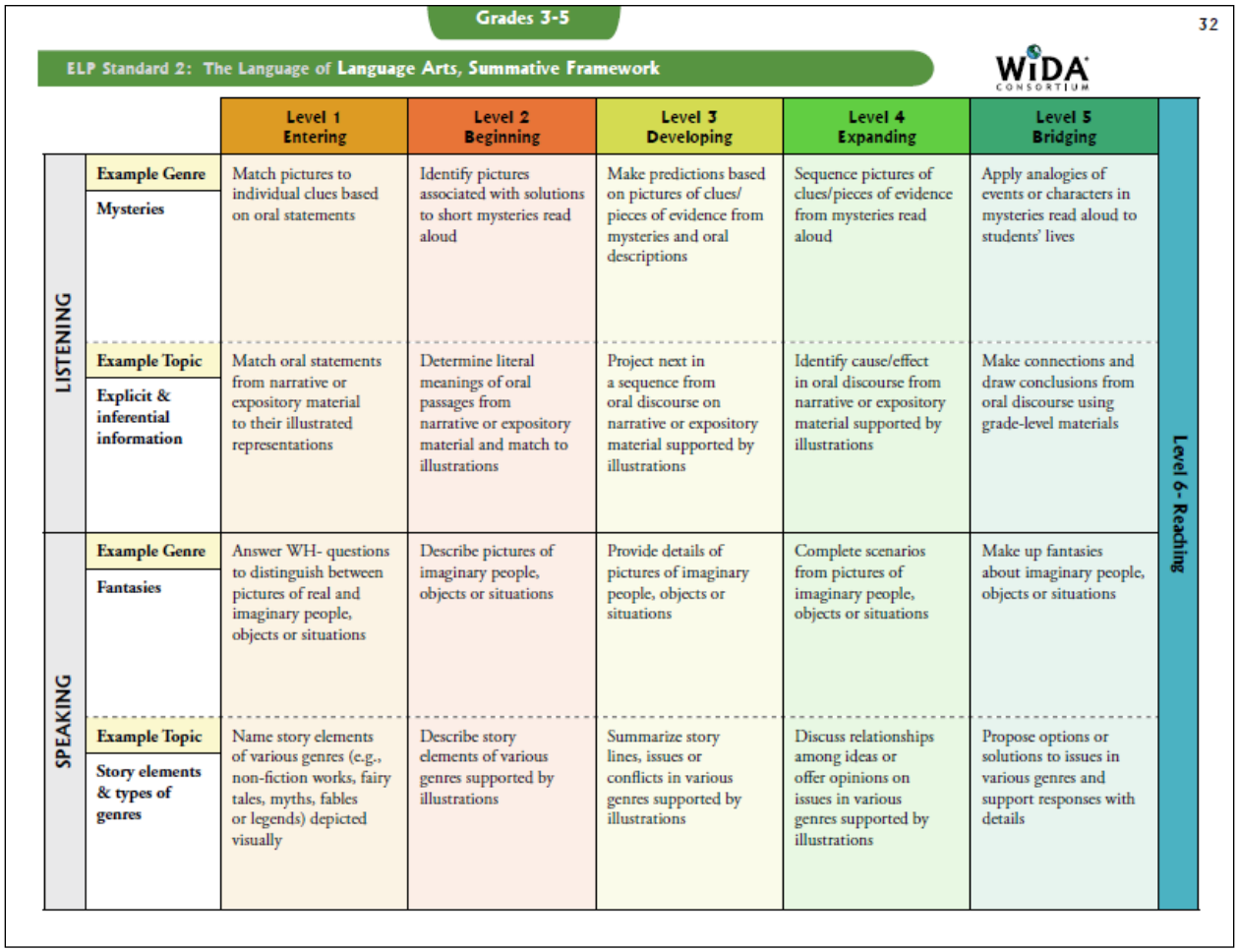
Each standard covers four language domains: listening, speaking, reading, and writing. The model performance indicators for each standard are organized into five grade-level clusters (PreK-K, 1-2, 3-5, 6-8, and 9-12) and two frameworks: formative assessment and summative assessment. Within each framework, grade cluster and language domain, there are model performance indicators for each language proficiency level. The model performance indicators are functional, measurable indices of the language domains (listening, speaking, reading, and writing) and are aimed at the targeted age/developmental levels of English language learners. As their label implies, model performance indicators are examples, which have been drawn from a myriad of English language proficiency and state academic content standards. There are three components of a model performance indicator: 1) language function (how the students use

language), 2) content stem (specific content examples), and 3) instructional support (such as working with a partner, visual aid, etc.).
A visual layout of the components of the standards is displayed in Figure 3. The English language proficiency levels head each column and the language domains begin each row. The remaining cells contain at least one model performance indicator, creating a strand or strands across proficiency levels within a language domain. (Figure 3 points to an example of a strand of performance indicators for Language Arts at grade 3-5.)

The five language proficiency levels covered in the WIDA Consortium ELP standards are

- Level 1 – Entering;
- Level 2 – Beginning;
- Level 3 – Developing;
- Level 4 – Expanding; and
- Level 5 – Bridging.

Figure 3: An Example of a Standard of Performance Indicators for Language Arts Grade 3-5



Grades 3-5

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ELP Standard 2: The Language of Language Arts, Summative Framework

WIDA CONSORTIUM

		Level 1 Entering	Level 2 Beginning	Level 3 Developing	Level 4 Expanding	Level 5 Bridging	Level 6- Reaching
LISTENING	Example Genre Mysteries	Match pictures to individual clues based on oral statements	Identify pictures associated with solutions to short mysteries read aloud	Make predictions based on pictures of clues/ pieces of evidence from mysteries and oral descriptions	Sequence pictures of clues/pieces of evidence from mysteries read aloud	Apply analogies of events or characters in mysteries read aloud to students' lives	
	Example Topic Explicit & inferential information	Match oral statements from narrative or expository material to their illustrated representations	Determine literal meanings of oral passages from narrative or expository material and match to illustrations	Project next in a sequence from oral discourse on narrative or expository material supported by illustrations	Identify cause/effect in oral discourse from narrative or expository material supported by illustrations	Make connections and draw conclusions from oral discourse using grade-level materials	
SPEAKING	Example Genre Fantasies	Answer WH- questions to distinguish between pictures of real and imaginary people, objects or situations	Describe pictures of imaginary people, objects or situations	Provide details of pictures of imaginary people, objects or situations	Complete scenarios from pictures of imaginary people, objects or situations	Make up fantasies about imaginary people, objects or situations	
	Example Topic Story elements & types of genres	Name story elements of various genres (e.g., non-fiction works, fairy tales, myths, fables or legends) depicted visually	Describe story elements of various genres supported by illustrations	Summarize story lines, issues or conflicts in various genres supported by illustrations	Discuss relationships among ideas or offer opinions on issues in various genres supported by illustrations	Propose options or solutions to issues in various genres and support responses with details	

Review Committee and Review Process

The alignment workshop was conducted at the Minnesota Department of Education located in Roseville, Minnesota on November 8 and 9, 2011. Twenty-two Minnesota teachers were recruited to represent various school districts in Minnesota and served as alignment committee members. The review committee is grouped into the following committees:

- Mathematics Grades K to 2;
- Mathematics Grades 3 to 5 and Science 5;
- Mathematics Grades 6 to 8 and 11;
- Science Grades 8 and 12 (Life Science);

The following are the names of the review committee and the grade clusters to which they belong:

Table 3: Alignment Study Review Committee

Grade Cluster	Name
Math K-2	Joe Alfano
Math K-2	Sara Swanlund
Math K-2	Nancy Schaaf
Math K-2	Andrea Erichsrud
Math K-2	Jennifer Bauer
Math 3-5 & Science 5	Amy Kennedy
Math 3-5 & Science 5	Michelle Vanden Plas
Math 3-5 & Science 5	Breanna Mueller
Math 3-5 & Science 5	Melanie Stodola
Math 3-5 & Science 5	Andrea Wilson
Math 3-5 & Science 5	Janet Thomson
Math 6-8 & 11	Leah Soderlund
Math 6-8 & 11	Emily Larsen
Math 6-8 & 11	Jonathan Gustafson
Math 6-8 & 11	Ariel Chang
Math 6-8 & 11	Ginna Grussing
Science 8 & Life Science	Liza Anderson Schmid
Science 8 & Life Science	Eric Vernon
Science 8 & Life Science	Amani Ahrens
Science 8 & Life Science	Elizabeth Bortke
Science 8 & Life Science	David Clark
Science 8 & Life Science	Jennifer Rose

To facilitate the alignment workshop, staff from the WIDA Consortium at the Wisconsin Center for Education Research (WCER) and a researcher from the University of Illinois at Urbana-Champaign (UIUC) facilitated the four groups of Minnesota committee members who reviewed the standards.

Prior to the alignment workshop, one member from each group of committee members was designated as a table leader. The role of table leaders was to facilitate part of the alignment process during which committee members reached consensus concerning their DOK assignments to the content and performance standards. The four table leaders met with the staff from the WIDA Consortium and the researcher from UIUC to participate in an alignment training one day before the workshop.

Intensive training was provided to all committee members, explaining Webb's alignment model and the three alignment criteria and the use of the web-based alignment tool. The general training included an overview of the alignment process and a brief description of the standards that would be reviewed. After the general session, the committee members broke into subject area groups to learn how to apply the DOK levels to standards in their respective grade levels. All committee members reviewed the definitions of the four levels of DOK and sample standards at each level during the training. Following the training, committee members split into the grade-level groups to continue the alignment process. The process involved four steps:

Step One – Committee members read and coded the Minnesota Academic Standards in Mathematics and Science and reached consensus on the appropriate DOK level for each benchmark. The consensus process was led by the designated table leader in each group.

Step Two – As training for the review process, each team of committee members independently coded a sample of model performance indicators drawn from the WIDA standards and then discussed the DOK levels and the Minnesota Academic Standards that they had assigned to each of the WIDA standards. Committee members were encouraged to assign only one Minnesota Academic objective to each WIDA MPI unless the WIDA MPI clearly covered more than one standard. In cases where a WIDA MPI did not adequately describe the knowledge and skills assessed, committee members could assign secondary and tertiary standards. Committee members were not required to reach agreement on the DOK assigned to a WIDA MPI. Instead, they discussed the rationale for the assignments to help each other reach a clearer understanding of DOK levels in the Mathematics and Science model performance indicators (MPIs) of the WIDA ELP Standards.

Step Three – Committee members independently coded the WIDA model performance indicators in Mathematics and Science for each grade level, identified a Minnesota Academic objective to which each MPI most closely matched, and noted any issues or sources of challenge related to aligning Minnesota Academic objectives to the WIDA standards.

Step Four – Committee members participated in a debriefing session for each grade level. They had been encouraged to complete a debriefing questionnaire for each study as they reviewed it and to use their notes in the discussion session. During this session, the committee members provided their impressions about the degree of alignment between the two sets of standards.

The same process was applied to each grade level. At the conclusion of the alignment workshop, committee members were asked to complete a debriefing questionnaire to provide feedback about the alignment review process.

Results

Mathematics Alignment Results

Based on the alignment criteria specified above, Table 4 below presents findings from the alignment between the Minnesota Academic Standards in Mathematics and the WIDA Consortium's ELP Standards (MPIs). The first set of columns presents alignment statistics and the second displays alignment findings based on the criteria set forth in the previous section. Three alignment statistics are introduced in alignment statistics. *Linked* indicates the total number of benchmarks linked to the WIDA MPIs, *DOK* indicates the percentage of linked WIDA MPIs having DOK levels *at* or *above* the DOK levels of the benchmarks, and *Coverage* indicates the number of benchmarks, within each content standard, that is linked to the WIDA MPIs. The Linking criterion for Mathematics was strongly met for grades K-2, 5, and 7-11, and moderately met for grades 3, 4 and 6.

Table 4: Summary of Alignment between the Minnesota Academic Standards in Mathematics and the WIDA ELP standards across Grades K-12

Standards	**(Standards-to-Standards)** Alignment Criteria					
	Alignment Statistics			Alignment Findings		
	Linked	Correspondence		Linked	Correspondence	
		DOK	**Coverage**		**DOK**	**Coverage**
Grade K (with 5 panelists)		**81%**			**(40%)**	
1: Number and Operations	4	100%	1 of 7	YES	YES	LIMITED
2: Algebra	6	67%	1 of 1	YES	YES	STRONG
3: Geometry and Measurement	13	77%	4 of 5	YES	YES	STRONG
Grade 1 (with 5 panelists)		**82%**			**(40%)**	
1: Number and Operations	14	80%	3 of 10	YES	YES	MODERATE
2: Algebra	3	88%	0 of 5	YES	YES	LIMITED
3: Geometry and Measurement	7	79%	2 of 5	YES	YES	MODERATE
Grade 2 (with 5 panelists)		**80%**			**(40%)**	
1: Number and Operations	12	93%	2 of 11	YES	YES	MODERATE
2: Algebra	2	77%	0 of 3	YES	YES	LIMITED
3: Geometry and Measurement	9	71%	2 of 6	YES	YES	MODERATE
Grade 3 (with 6 panelists)		**76%**			**(40%)**	
1: Number and Operations	17	85%	4 of 13	YES	YES	MODERATE
2: Algebra	3	56%	1 of 3	YES	YES	LIMITED
3: Geometry and Measurement	10	72%	2 of 9	YES	YES	MODERATE
4: Data Analysis	0	91%	0 of 1	NO	YES	LIMITED
Grade 4 (with 6 panelists)		**67%**			**(40%)**	
1: Number and Operations	13	66%	2 of 13	YES	YES	MODERATE
2: Algebra	1	67%	0 of 3	YES	YES	LIMITED
3: Geometry and Measurement	17	71%	5 of 10	YES	YES	STRONG
4: Data Analysis	0	65%	0 of 1	NO	YES	LIMITED
Grade 5 (with 6 panelists)		**61%**			**(40%)**	
1: Number and Operations	17	85%	4 of 13	YES	YES	MODERATE

Standards	**(Standards-to-Standards)** Alignment Criteria					
	Alignment Statistics			Alignment Findings		
	Linked	Correspondence		Linked	Correspondence	
		DOK	**Coverage**		**DOK**	**Coverage**
2: Algebra	8	48%	0 of 6	YES	YES	LIMITED
3: Geometry and Measurement	14	68%	2 of 6	YES	YES	MODERATE
4: Data Analysis	3	43%	1 of 2	YES	YES	STRONG
Grade 6 (with 5 panelists)		**72%**			**(40%)**	
1: Number and Operations	13	72%	2 of 16	YES	YES	MODERATE
2: Algebra	9	58%	1 of 5	YES	YES	LIMITED
3: Geometry and Measurement	3	58%	0 of 8	YES	YES	LIMITED
4: Data Analysis and Probability	0	100%	0 of 4	NO	YES	LIMITED
Grade 7 (with 5 panelists)		**61%**			**(40%)**	
1: Number and Operations	7	80%	1 of 11	YES	YES	LIMITED
2: Algebra	15	60%	2 of 11	YES	YES	MODERATE
3: Geometry and Measurement	5	61%	1 of 6	YES	YES	LIMITED
4: Data Analysis and Probability	5	44%	0 of 6	YES	YES	LIMITED
Grade 8 (with 5 panelists)		**67%**			**(40%)**	
1: Number and Operations	4	62%	1 of 5	YES	YES	LIMITED
2: Algebra	18	58%	3 of 21	YES	YES	MODERATE
3: Geometry and Measurement	2	79%	1 of 6	YES	YES	LIMITED
4: Data Analysis and Probability	1	67%	1 of 3	YES	YES	LIMITED
Grade 11 (with 5 panelists)		**52%**			**(40%)**	
1: Algebra	13	46%	4 of 4	YES	YES	STRONG
2: Geometry and Measurement	7	45%	3 of 4	YES	YES	STRONG
3: Data Analysis and Probability	5	65%	2 of 3	YES	YES	STRONG

Tables 5 through 8 summarize Mathematics alignment results by grade clusters. Again, to meet the Linking criterion at least 1 linked WIDA ELP standard should be identified for each Minnesota Mathematics Academic Standards reporting category across grades. To meet the Correspondence criterion, DOK should be ≥40% for each reporting category, and there should be moderate or strong Coverage across reporting categories. Adequate alignment would be represented by acceptable Linking and Correspondence.

Table 5: Summary of Alignment between the Minnesota Academic Standards in Mathematics and the WIDA ELP Standards across Grades K-2

Reporting category			Coverage	
	Linked	DOK	Moderate	Strong
1: Number and Operations	30	91%	2	0
2: Algebra	11	77%	0	1
3: Geometry and Measurement	29	76%	2	1

For the K-2 grade cluster:

- The Linking criterion was strongly met for all reporting categories;

- The DOK criterion was strongly met for all reporting categories;
- Coverage was either moderate or strong for all reporting categories.

Table 6: Summary of Alignment between the Minnesota Academic Standards in Mathematics and the WIDA ELP Standards across Grades 3-5

Reporting category			Coverage	
	Linked	DOK	Moderate	Strong
1: Number and Operations	47	79%	3	0
2: Algebra	12	57%	0	0
3: Geometry and Measurement	41	70%	2	1
4: Data Analysis	3	66%	0	1

For the 3-5 grade cluster:

- The Linking criterion was strongly met for all reporting categories;
- The DOK consistency was strong for all reporting categories;
- Coverage exhibited moderate or strong dispersion for three out of four reporting categories. Coverage for *Algebra* was limited.

Table 7: Summary of Alignment between the Minnesota Academic Standards in Mathematics and the WIDA ELP Standards across Grades 6-8

Reporting category			Coverage	
	Linked	DOK	Moderate	Strong
1: Number and Operations	24	71%	1	0
2: Algebra	42	59%	2	0
3: Geometry and Measurement	10	66%	0	0
4: Data Analysis and Probability	6	70%	0	0

For the 6-8 grade cluster:

- The Linking criterion was strongly met for all reporting categories;
- The DOK criterion was strongly met for all reporting categories;
- Coverage was moderate for two out of four reporting categories. Reporting categories, *Geometry and Measurement* and *Data Analysis and Probability* were limited.

Table 8: Summary of Alignment between the Minnesota Academic Standards in Mathematics and the WIDA ELP Standards across Grades 9-12

Reporting category			Coverage	
	Linked	DOK	Moderate	Strong
1: Algebra	13	46%	0	1
2: Geometry and Measurement	7	45%	0	1
3: Data Analysis and Probability	5	65%	0	1

For the 9-12 grade cluster:

- The Linking criterion was strongly met for all reporting categories;

- The DOK criterion was generally met for all reporting categories;
- Coverage was strong for all reporting categories.

Science Alignment Results

Table 9 presents the summary of the alignment for Science across Grades 5-12. Again, the first set of columns presents alignment statistics and the second displays alignment findings based on the criteria set forth in the previous section. Three alignment statistics are introduced in alignment statistics. *Linked* indicates the total number of benchmarks linked to the WIDA MPIs, *DOK* indicates the percentage of linked WIDA MPIs having DOK levels *at* or *above* the DOK levels of the benchmarks, and *Coverage* indicates the number of benchmarks, within each content standard, that is linked to the WIDA MPIs. Based on our analysis, the Linking criterion was strongly met for grades 5 and 8. For high school Science (Life Science), which represents the grade cluster 9-12, the Linking criterion was met for most reporting categories except for *Human Interactions with Living Systems*.

Table 9: Summary of Alignment between the Minnesota Academic Standards in Science and the WIDA ELP standards across Grades 3-12

Standards	**(Standards-to-Standards)** Alignment Criteria					
	Alignment Statistics			Alignment Findings		
	Linked	Correspondence		Linked	Correspondence	
		DOK	**Coverage**		**DOK**	**Coverage**
Grade 5 (with 6 panelists)		**62%**			**(40%)**	
1: The Nature of Science and Engineering	18	59%	3 of 10	YES	YES	MODERATE
2: Physical Science	6	77%	2 of 3	YES	YES	STRONG
3: Earth Science	13	60%	3 of 5	YES	YES	STRONG
4: Life Science	12	50%	4 of 4	YES	YES	STRONG
Grade 8 (with 6 panelists)		**58%**			**(40%)**	
1: The Nature of Science and Engineering	10	39%	4 of 8	YES	NO	STRONG
2: Physical Science	2	82%	1 of 7	YES	YES	LIMITED
3: Earth Science	7	54%	3 of 23	YES	YES	MODERATE
High School (Life Science) (with 6 panelists)		**39%**			**(40%)**	
1: Structure and Function of Living Systems	10	73%	2 of 8	YES	YES	MODERATE
2: Interdependence Among Living Systems	7	51%	3 of 4	YES	YES	STRONG
3: Evolution in Living Systems	4	30%	1 of 12	YES	NO	LIMITED
4: Human Interactions with Living Systems	0	0%	0 of 8	NO	NO	LIMITED

Tables 10 through 13 summarize the alignment results for Science by grade clusters. Again, to meet the Linking criterion at least one linked WIDA ELP standard should be identified for each Minnesota Science Academic Standards reporting category across grades. To meet the Correspondence criterion, DOK should be ≥40% for each reporting category, and there should be

moderate or strong Coverage. Adequate alignment would be represented by acceptable Linking and Correspondence.

Table 10: **Summary of Alignment between the Minnesota Academic Standards in Science and the WIDA ELP standards across Grades 3-5**

Reporting category			Coverage	
	Linked	DOK	Moderate	Strong
1: The Nature of Science and Engineering	18	59%	1	0
2: Physical Science	6	77%	0	1
3: Earth Science	13	60%	0	1
4: Life Science	12	50%	0	1

For the 3-5 grade cluster:

- The Linking criterion was met for all reporting categories;
- The DOK criterion was strongly met for all reporting categories;
- Coverage showed moderate or strong dispersion for all reporting categories.

Table 11: **Summary of Alignment between the Minnesota Academics Standards in Science and the WIDA ELP standards across Grades 6-8**

Reporting category			Coverage	
	Linked	DOK	Moderate	Strong
1: The Nature of Science and Engineering	10	39%	0	1
2: Physical Science	2	82%	0	0
3: Earth Science	7	54%	1	0

For the 6-8 grade cluster:

- The Linking criterion was met for all reporting categories;
- The DOK criterion was met for two out of three reporting categories. *The Nature of Science and Engineering* exhibited low DOK consistency;
- Coverage showed moderate or strong dispersion for two out of three reporting categories. Limited coverage was observed for *Physical Science*.

Table 12: Summary of Alignment between the Minnesota Academic Standards in Science and the WIDA ELP standards across Grades 9-12

Reporting category			Coverage	
	Linked	DOK	Moderate	Strong
1: Structure and Function of Living Systems	10	73%	1	0
2: Interdependence Among Living Systems	7	51%	0	1
3: Evolution in Living Systems	4	30%	0	0

4: Human Interactions with Living Systems	0	0%	0	0

For the 9-12 grade cluster:

- The Linking criterion was met for most reporting categories except for *Human Interactions with Living Systems*;
- The DOK criterion exhibited strong consistency for two out of four reporting categories. *Evolution in Living Systems* and *Human Interactions with Living Systems* showed low DOK consistency;
- Coverage showed moderate or strong dispersion for two out of four reporting categories. Limited coverage was observed for *Evolution in Living Systems* and *Human Interactions with Living Systems*.

Reliability among Committee Members

The following table shows the intraclass correlation coefficients[3] for each grade level, which indicate the degree of agreement for DOK levels among committee members in each group. Values larger than 0.7 indicate a good level of reliability among committee members; this criterion has been met for all groups in this alignment study. It should, however, be noted that these values are highly dependent on the number of committee members in each group. The DOK pairwise comparison values represent the average agreement for pairs of committee members in each group. As a previous alignment report argued[4], a result of 0.6 or higher reflects reasonable agreement, 0.7 or higher demonstrates good agreement, and a result of less than 0.5 to reflect poor agreement among committee members.

Table 13: Reliability among Committee Members

Grade(s)	Standards	Number of standards	Number of committee members	Intraclass correlation	DOK Pairwise Comparison
Mathematics					
K	WIDA	20	5	0.76	0.48
1	Mathematics		5	0.76	0.52
2	K-2		5	0.90	0.64
3	WIDA	20	6	0.89	0.58
4	Mathematics		6	0.88	0.62
5	3-5		6	0.82	0.56

[3] An intraclass correlation coefficient (ICC) serves as an index of the reliability of more than two raters rating the same set of items (Shrout, P.E., & Fleiss, J.L., 1979).

[4] Cook, H.G. and Wilmes, C. (October, 2007). Alignment Between the Kentucky Core Content for Assessment and the WIDA Consortium English Language Proficiency Standards. Madison, WI: University of Wisconsin, Wisconsin Center for Education Research.

Grade(s)	Standards	Number of standards	Number of committee members	Intraclass correlation	DOK Pairwise Comparison
6	WIDA Mathematics 6-8	20	5	0.76	0.41
7			5	0.86	0.56
8			5	0.85	0.53
11	WIDA Mathematics 9-12	20	5	0.79	0.58
Science					
5	WIDA Science 3-5	20	6	0.93	0.61
8	WIDA Science 6-8	20	6	0.87	0.49
Life Science	WIDA Science 9-12	20	6	0.95	0.65

Summary

Findings from this alignment study suggest that there is adequate Linking between the Model Performance Indicators (MPIs) in the WIDA Consortium's English Language Proficiency (ELP) Standards and the Minnesota Academic Standards in Mathematics and Science.

The majority of Academic Standards in Mathematics is linked to the WIDA MPIs. The exceptions to this are found in the strand *Data Analysis* in grades 3 and 4, and *Data Analysis and Probability* in grade 6. For Science, most standards exhibit strong Linking with the exception of the benchmark *Human Interaction with Living Systems* in high school (Life Science).

Federal guidance on the association between ELL and state content standards directs that, at a minimum, ELL Standards be *linked* to state academic content standards. In terms of alignment, the Committee members' ratings indicate that there is adequate alignment between the WIDA MPIs and the Minnesota Academic Standards in Mathematics and Science. Adequate alignment in Mathematics is based on findings of strong Linking, strong DOK consistency, and moderate coverage. Adequate alignment in Science is based on findings of strong Linking, moderate DOK consistency, and moderate coverage.

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Appendices

Appendix A: *General Comments by Committee members*

This section includes committee member responses to the general debriefing questions as well as any generalizations or comments by the group leaders or program administrators collected via the Web Alignment Tool (http://alignment.wida.us). The following table provides a summary of these comments:

Table 14: Committee members' Perceptions of Alignment between the Minnesota Academic Standards in Mathematics and Science and the WIDA Consortium's ELP Standards

Acceptable Alignment	Needs Slight Improvement	Needs Major Improvement
13%	70%	17%
Summary of Committee member Comments by Content Area		
MATHEMATICS	The WIDA MPIs covered most topics in the Minnesota Academic Standards in Mathematics. Some reporting categories such as *Number and Operations* in grade K, *Algebra*, and *Data Analysis* in grades 3-5 were not covered in the standards. The Minnesota Academic Standards were covered at the appropriate DOK levels across grades, however a higher level of DOK at level 4 was expected. The Minnesota Academic Standards were mostly written at an appropriate level of specificity.	
SCIENCE	Most topics were covered fairly well by the elements in the standards. The Minnesota Academic Standards in Science were covered at the appropriate DOK levels. The Minnesota Science standards were written at an appropriate level of specificity.	

Mathematics, Grade K

A. For each standard, did the items cover the most important topics you expected by the standard? If not, what topics were not assessed that should have been?

- The MPIs did not seem to address number sense very much. Language like more and less, before and after would be helpful to understand number sense in kindergarten.
- I did not find that the elements covered the topics of number and operation on a depth level I would like to see.
- Yes

- Our Minnesota standards missed time completely. WIDA standards seemed to focus on concrete patterns – i.e. physical movements, or physical representations of information in a picture - surprised to not find the number sense.

B. For each standard, did the items cover the most important performance (DOK levels) you expected by the standard? If not, what performance was not assessed?

- Yes, I think that the MPIs covered depth levels that was expected.
- Yes. The depth levels of the standards were mainly 1s and 2s and the depth levels of the elements were also 1s and 2s.
- Yes
- 19 & 20 I wondered about coding them as 3 or 4's but didn't feel they utilized complex reasoning.

C. Were the standards written at an appropriate level of specificity and directed towards expectations appropriate for the grade level?

- Yes the MPIs were specific and would be appropriate for kindergarten age children.
- Yes
- I believe that the Math standards should be more specific and include asking students to demonstrate or explain how they reach their conclusions beginning with Standard K.1.2.2. The Standards also need to be more specific about the Topic of Time. I like the topic of "Time" strand that WIDA has included in the Language of Math Summative Framework and would suggest that it be added to the MN Standards.
- Yes

D. What is your general opinion of the alignment between the standards and assessment:

ii. Acceptable Alignment -- 1
iii. Needs slight improvement -- 4

E. Comments

- I was unfamiliar with "transformation" or how to change the language to match other mathematical content. It was very confusing to align time tasks when there are no time standards in kindergarten.
- I think my results may have been more in-depth and insightful if I had transformations training prior to this study.
- My impression is that we are stripping away as much of the WIDA language so that we can make the elements fit the standards so that WIDA can say that it is aligned to the state standards. I think a worthwhile alignment would require us to look at the WIDA elements across all four language domains and determine whether or not the language domains are aligned with the standards and then focus on what we need to do to improve that.

Mathematics, Grade 1

A. For each standard, did the items cover the most important topics you expected by the standard? If not, what topics were not assessed that should have been?

- Yes. In comparison to the kindergarten standards the content and actions from the WIDA standards were identifiable in the MN State Standards.
- The MPIs covered much of the language required to describe or tell about real world math problems.
- The standards did not address the element of "distinguish between".
- The elements did cover each topic.

B. For each standard, did the items cover the most important performance (DOK levels) you expected by the standard? If not, what performance was not assessed?

- Yes
- Yes
- Yes

C. Were the standards written at an appropriate level of specificity and directed towards expectations appropriate for the grade level?

- Yes
- The standards were fairly specific. The expectations of estimation and comparing estimates would be challenging for many first grade students particularly ELL students.
- Yes
- Yes

D. What is your general opinion of the alignment between the standards and assessment:

ii. Acceptable Alignment -- 2
iii. Needs slight improvement -- 3

E. Comments

- I put slight improvement because some of the content found in Minnesota Standards is not being addressed directly in the WIDA standards.

Mathematics, Grade 2

A. For each standard, did the items cover the most important topics you expected by the standard? If not, what topics were not assessed that should have been?

- Yes
- The WIDA standards only covered partially the elements found in the Minnesota

Standards
- There did not seem to be many MPIs covering measurement.
- Yes

B. For each standard, did the items cover the most important performance (DOK levels) you expected by the standard? If not, what performance was not assessed?

- Yes
- The depth levels of 1 to 3 were well represented
- Yes
- DOK of matching words to pictures was not aligned with standards--though a necessary component, there wasn't any alignment as replacing with find still didn't meet content standard.
- Yes

C. Were the standards written at an appropriate level of specificity and directed towards expectations appropriate for the grade level?

- The standards are written at a directed towards expectations appropriate for the grade level, but I believe that they could be written with a bit more specificity.
- Yes
- Yes
- Yes

D. What is your general opinion of the alignment between the standards and assessment:

ii. Acceptable Alignment -- 2
iii. Needs slight improvement -- 3

Mathematics, Grade 3

A. For each standard, did the items cover the most important topics you expected by the standard? If not, what topics were not assessed that should have been?

- They covered most topics. However, I did not notice a correlation between addition and subtraction and the WIDA standards. I also did not see an alignment between measurement and the MPIs.
- Several standards were covered extensively, but I felt there were gaps in Algebra and Data Analysis.
- There were several standards that were covered multiple times, but there were also a few areas that were not covered well by the elements: algebra and data analysis.
- I did not notice any huge gaps.
- The Math Standards did not involve as many level 3 DOKs as I had thought they would. I am eager to see what is included in the 2012 MPIs. There were not as many language processes involved that were applicable to Math content as I had thought, neither.

- Many standards were not covered by the WIDA MPIs. This may reflect that the MN Standards were not written with Language functions in mind.

B. For each standard, did the items cover the most important performance (DOK levels) you expected by the standard? If not, what performance was not assessed?

- I did not notice much depth in the MPIs since a majority of the language function words related to match, identify, list, and compare/contrast. There were a few describe, explain, and apply functions that encourage higher order thinking and more depth of knowledge, but the majority of them were limited in rigor.
- I feel overall, there was a lack of requiring students to explain or justify their answers. That is a key part of this era of mathematics. Of course, this may be lacking in the Minnesota standards, as well.
- The number and operation standard was covered fairly well, however rounding and using multiple strategies to solve mathematical problems were not addressed. Fractions were covered fairly well. Algebra was not covered well, except in the area of creating a real-word situation to represent a number sentence. Geometry was covered well, however perimeter, measurement, time, temperature and money were not addressed. Data analysis could have used more emphasis.
- The depth level seemed slightly lower than I would have expected. I didn't see a lot of complex reasoning but perhaps that comes later with the developmental level of the student.
- Yes.

C. Were the standards written at an appropriate level of specificity and directed towards expectations appropriate for the grade level?

- There was noted lack of expectations for addition, subtraction, multiplication, and division as well as measurement and algebra.
- Some standards were difficult to understand. For example, the ones on descriptive statistics. This is not a standard that is tested in 3rd grade, or at least, it's not a focus.
- Some of the content standards are written in a student-friendly manner, however others contain some specific vocabulary that might be unclear to students, such as "attributes", "various contexts", "corresponding", "emphasis", "reasonableness", etc. The WIDA standards were, for the most part, not in student friendly terms either.
- Many were not clear as to the expectation - one step vs. two step process etc.
- There are some ambiguous areas that include "compare and order" as separate cognitive demands. However, in classrooms they can be inferred as a single act. It would be a nice clarification for standards to be more specific in the action expected in that respect.

D. What is your general opinion of the alignment between the standards and assessment:

iii. Needs slight improvement -- 4

iv. Needs major improvement -- 2

E. Comments

- Overall, I feel there are too many level 1 DOKs. There was a lot of matching and identifying. When we rated the DOKs of the standards, there were more level 2s. I think the WIDA standards need to reflect this.
- As long as transformations can be made to the WIDA standards' content stems, the alignment could be acceptable, however it is concerning that there were still areas of the content standards that were not addressed.
- Interesting process - It will be interesting to see what information can be gathered from this process.

Mathematics, Grade 4

A. For each standard, did the items cover the most important topics you expected by the standard? If not, what topics were not assessed that should have been?

- The elements covered the topics of geometry (angles, polygons, translations, reflections, and rotations), data tables, and comparing decimals and fractions. However, it did not cover many operations or number sentences.
- The 4th grade mathematics standards seem to be more closely aligned with the WIDA standards than the 3rd grade mathematics standards. I feel there could still be more elements of the algebra standard covered.
- I thought there would have been more synthesis between the standards. So, through the standards, there would be a 1-2-3 sort of building block implementation of the standards. So, first there would be a level 1 DOK, secondly a level 2, and sequence the level of difficulty until finally a level 3 for each topic area. This would give students the ability and expectation to apply their knowledge after learning and solidify learning in an authentic experience.
- Several of the content standards were covered extensively, while others were barely covered. For example, the content standards involving the tasks of "describing, classifying and drawing" and "comparing" were covered very extensively. The other content standards were covered less extensively.
- There seemed to be a lack of measurement standards.

B. For each standard, did the items cover the most important performance (DOK levels) you expected by the standard? If not, what performance was not assessed?

- The depth levels were more surface level. There were many identify, match, and list functions and not as many explanation or justification functions.
- Again, I felt the 4th grade standards covered more DOKs than the 3rd grade. There is nothing glaring that seems to be missing.
- I expected the Depth levels to be much deeper than they were. There was some discrepancy in our group that I think related to our experiences with what material is taught and demographics of our schools. It took discussion and interpretation of the uses of words in the standards to determine what the problems would entail that would

meet the standard.
- It seemed like the elements covered the depth levels at an acceptable level for each standard. However, there needs to be many more examples of language support and objectives incorporated in each content standard to ensure the accessibility of the content to EL students. Both the content standards and WIDA's MPIs included very vague language, which made matching them difficult.
- I noticed most required lower level performance.

C. Were the standards written at an appropriate level of specificity and directed towards expectations appropriate for the grade level?

- There is need for the standards to include more number operations and algebraic concepts than geometry and identification concepts.
- Some of the words are still rather vague. "Incorporate" and "apply", for example are not as meaningful to me when separated from the content stem and supports.
- Yes.
- The content standards' wording was often so vague that it became difficult to determine the depth levels and language expectations. Verbs such as "describe", "understand", "represent", "use" and "recognize" made it difficult to interpret exactly what the expectation was for the standard.
- The fact that our group had many discussions on most standards is evidence that they can be interpreted in many ways.

D. What is your general opinion of the alignment between the standards and assessment:

iii. Needs slight improvement -- 4
iv. Needs major improvement -- 1

E. Comments

- Both the content standards and WIDA MPIs need to have more specific language to clearly express the expectations for each standard.

Mathematics, Grade 5

A. For each standard, did the items cover the most important topics you expected by the standard? If not, what topics were not assessed that should have been?

- The WIDA elements are not present in a majority of the MN standards.
- Yes, I did feel the topics were covered adequately.
- It seems like there are language function words lacking to align with division, multiplication, addition, and subtraction. Formula problems in general are lacking from the language functions.
- Data analysis was the only topic that was not covered as thoroughly by the MPIs as I would have expected. Maybe some language stems with "explain" could have been helpful.

- Number and Operations seemed to be covered pretty thoroughly. Measurement seemed to be lacking.

B. For each standard, did the items cover the most important performance (DOK levels) you expected by the standard? If not, what performance was not assessed?

- Yes
- The majority of the MPI elements were 1s and 2s. There were no level 4 DOK standards.
- There were very few 3s in the MPIs.
- The 5th grade was getting to more in depth levels.

C. Were the standards written at an appropriate level of specificity and directed towards expectations appropriate for the grade level?

- I still find some of the words used such as "match", to be slightly confusing. It would be helpful to have a list of synonyms explaining the language functions in the standards in order to fully understand what they involve.
- It covered 3 dimensional shapes, but there need to be more standards directed towards numbers and operations, towards estimating, algebraic equations, and volume equations.
- The specificity of what entails "real world, apply, understand" and other words is not there. Identifying a connection to curriculum is connecting to a publisher's interpretation of the standard. The standards' expected outcomes could be more specific.
- Volume was not covered very thoroughly.
- The language can sometimes be confusing as to whether it is a high level or lower level of performance expected.

D. What is your general opinion of the alignment between the standards and assessment:

iii. Needs slight improvement -- 5
iv. Needs major improvement -- 1

E. Comments

- As a teacher of English Language Learners in a high-needs area, it is interesting to see what I view as Depth of Knowledge in my students that are well below grade level. The comparisons to the DOKs of the language activity is interesting because it adds a step to the level of understanding every time.
- In an effort to maintain rigor in both language and content areas, it would be important to incorporate higher complex thought, such as level 3s in depth of knowledge.

Mathematics, Grade 6

A. For each standard, did the items cover the most important topics you expected by the standard? If not, what topics were not assessed that should have been?

- The topics (meaning content) were surprisingly similar. It matched well with the 6th grade math standards. Still, the standards and the elements have different focuses. The standards fail to mention anything about algebraic or geometric terms and vocabulary, but the WIDA elements have a whole strand pertaining to terms. It would be possible to truly connect them only if the language function AND content stem were transformed, which is what I chose not to do in this study. The elements need to include more justification and citing evidence, which is an important part of the math standards.
- The important parts of content were not always covered by the stem function.
- It is very difficult to find a standard to match the elements. First, the content focuses on the skills of what the students need to know, but the elements do not. The elements ask students to work on language based skills that involve more than what we can choose from. For example, "order the steps" it is an important element that students need to know for the content. However, there is no standard that in the 6th grade math that expect students to order the steps. Maybe in a lower grade level, we will be able to find a match. Vocabulary is not mentioned in the standards.
- There were quite a few of the MN Academic standards that I didn't align with the WIDA standards. The biggest challenge was the Probability and Stats strand.
- The elements cover a lot. The standards are missing anything having to do with language. It is tough to know what is needed, depending on prior schooling.

B. For each standard, did the items cover the most important performance (DOK levels) you expected by the standard? If not, what performance was not assessed?

- We did not label even one standard a DOK 4. In that sense, the elements covered DOK levels 1-3 as the standards did, so my answer is yes.
- Yes
- There are not many 1s, 3s, or 4s, in the elements. I feel that it is important for students to be able to reason, develop, argue, and analyze their answers more. There should be more elements that focus on these areas. Teachers tend to create level 1 and 2 lessons. The level 3 and level 4 lessons require more time for them and they should allow time to create those lessons to meet the standards.
- This was very challenging. There was some components of problem solving that the WIDA levels 1 and 2 don't meet.
- It seems that there could be more 3 and 4 elements.

C. Were the standards written at an appropriate level of specificity and directed towards expectations appropriate for the grade level?

- The standards were mostly written at an appropriate level of specificity. In standards 6.4.1.2 uses "understand" without explaining how the student should demonstrate that

understanding. The elements, on the other hand, occasionally use language functions that are too specific and limiting.
- I thought that the content was not addressed as well as I thought it would be by the language function.
- The standards seem to be appropriate for the grade level and there are many vague words that allow teachers to bring their lesson to a higher or lower level. Such as understand, use, and estimate. There are many students that are not at the grade level. Teachers should know standards from different or lower grade level in order to help students to achieve their grade standards.
- Yes
- Yes and sometimes students have gaps in their learning.

D. What is your general opinion of the alignment between the standards and assessment:

iii. Needs slight improvement -- 5

E. Comments

- Generally, through transformation, these elements could be excellent matches for the standards if the standards would include math terms/vocabulary.

Mathematics, Grade 7

A. For each standard, did the items cover the most important topics you expected by the standard? If not, what topics were not assessed that should have been?

- The elements are missing the topic of justification or citing evidence. That was a big part of the 7th grade standards. The elements also seem to jump from lower level language functions to very high level and those intermediate students are left without scaffolds to reach the content. Also, the elements included a lot about students describing visual models but not creating them.
- The elements are general enough that they could support many of the standards (when transformed) I would like to see the elements require more justification and more cognitive demand. This grade level seemed easier to match than the 6th grade.
- It is very difficult to find a standard to match the elements. First, the content focuses on the skills of what the students need to know, but the elements do not. The elements ask students to work on language based skills that involve more than what we can choose from. For example, "summarize and predict" it is an important element that students need to know for the content. However, there is only one standard that in the 7th grade math that expect students to order the steps. Maybe in a lower grade level, we will be able to find a match. Vocabulary is not mentioned in the standards. Maybe in the lower grade level standards, vocabulary is included.
- No. There needed to be more standards that covered number sense and the relationships of numbers. Many of elements were written for students to identify the real life situation from the mathematics, while the standards are written to identify the math that describes the real life situation.

- There were only a few cases where the Standard was well covered. There are many standards where there weren't any elements.

B. For each standard, did the items cover the most important performance (DOK levels) you expected by the standard? If not, what performance was not assessed?

- There were no 4's and very few 3's. Many of the elements were not very cognitively demanding.
- It seemed that the elements covered ones and twos well and not as many threes and no fours.
- There are not many 3s, or 4s, in the elements. I feel that it is important for students to be able to reason, develop, argue, and analyze their answers more. There should be more elements that focus on these areas. Teachers tend to create level 1 and 2 activities. The level 3 and level 4 lessons require more time for them and teachers should be provided more time to create those lessons to meet the standards.
- As a content teaches with a focus on standardized testing, I see that many of the elements are not directed at students being able to answer questions in a multiple choice format.
- In the case of the 2-3 standards that were well covered, they seem to reach the DOK pretty well.

C. Were the standards written at an appropriate level of specificity and directed towards expectations appropriate for the grade level?

- Yes, but as usual, the content standards are missing a huge piece surrounding the language of 7th grade math. They do not require the student to elaborate or define much.
- Yes, and I transformed most of them to match them.
- The standards seem to be appropriate for the grade level and there are many vague words that allow teachers to bring their lesson to a higher or lower level. Such as understand, use, estimate, apply. There are many students who are not at the grade level. Teachers should be familiar with the standards from different or lower grade levels in order to help students to achieve their grade standards.
- Yes
- Yes

D. What is your general opinion of the alignment between the standards and assessment:

ii. Acceptable Alignment -- 1
iii. Needs slight improvement -- 3
iv. Needs major improvement -- 1

E. Comments

- It is difficult to match elements to standards at the secondary level because the state has removed the language of math from most of its standards. It is very present in the lower levels but without it explicitly stated, it is difficult to know which element will support a student to reach that content. It seems like a waste of great MPIs.
- For ELL students, they have to learn so much according to all of the grade standards. For a 7th grade newcomer student, this student will have to know more than just 7th grade standards. This student will need to learn PK to 7th grade standards content in order to close the knowledge gap among the traditional native speakers. WIDA standards could help content teachers to fill in students' gap, however, for EL teachers and EL students, resources and time need to be provided to complete this task and it is not easy.

Mathematics, Grade 8

A. For each standard, did the items cover the most important topics you expected by the standard? If not, what topics were not assessed that should have been?

- There were 4 Standards where there was very good coverage. There were some with no element alignment.
- It is very difficult to find a standard to match the elements. First, the content focuses on the skills of what the students need to know, but the elements do not. The elements ask students to work on language based skills that involve more than what we can choose from. For example, "order the steps" it is an important element that students need to know for the content. However, there is no standard that in the 8th grade math that expect students to order the steps. Maybe in a lower grade level, we will be able to find a match. Vocabulary is not mentioned in the standards. I feel lower grade level standards would have these elements included in the math standards.
- Yes
- mostly
- The elements did not do much for the standards that included "understand. They also focused on deriving information from models or visuals, not creating models or visual from information.

B. For each standard, did the items cover the most important performance (DOK levels) you expected by the standard? If not, what performance was not assessed?

- For the 2-4 that were well covered, the DOK was also good.
- There are very few 3s, or 4s levels, in the elements. I feel that it is important for students to be able to reason, develop, argue, evaluate and analyze their answers more. There should be more elements that focus on these areas. Teachers tend to create level 1 and 2 lessons. The level 3 and level 4 lessons require more time for teachers and they should be allowed time to create those lessons to meet the standards. Or there should be curriculums that match or scaffold the standards.
- The elements work in opposite order of the standards asking students to derive the real life situations from the mathematical model. The standards ask the students to derive the mathematical model from real life.
- The elements didn't seem to cover the upper levels of DOK.

- Yes, though they were the same elements as Grade 7, I considered grade 8 content when coding a few of them and gave them a 4. I did then have a range of 1-4.

C. Were the standards written at an appropriate level of specificity and directed towards expectations appropriate for the grade level?

- Yes
- The standards seem to be appropriate for the grade level and there are many vague words that allow teachers to bring their lessons to a higher or lower level. Such as understand, use, estimate, and represent. There are many students that are not at the grade level. Teachers should be familiar with the standards from different or lower grade levels in order to help students to achieve their grade standards.
- Yes
- Yes
- Yes, but they need to have at least one strand focus on the language/vocab/terms of the content area.

D. What is your general opinion of the alignment between the standards and assessment:

ii. Acceptable Alignment -- 1
iii. Needs slight improvement -- 3
iv. Needs major improvement -- 1

E. Comments

- Language component is very important for learning content. Based on the 8th grade math standards, the teachers should be aware that there are many students who did not complete the previous standards are in the 8th grade classes. Who can help these students to catch up to the standards? Do they have time to learn all they need to know before they can accomplish the 8th grade standards? Who is going to be responsible for these students?

Mathematics, Grade 12

A. For each standard, did the items cover the most important topics you expected by the standard? If not, what topics were not assessed that should have been?

- It is very difficult to find a standard to match the elements. First, the content focuses on the skills of what the students need to know, but the elements do not. The elements ask students to work on language based skills that involve more than what we can choose from. For example, "order the steps" it is an important element that students need to know for the content. However, there is no standard that in the 9-12th grade math that expect students to order the steps. Maybe in a lower grade level, we will be able to find a match. Vocabulary is not mentioned in the standards.
- No, there were no elements that mentioned data or probability
- There was only one standard that I didn't have an element for. There were some

weaker connections. The standards that had multiple elements had good coverage.
- Yes
- The elements do a much better job of covering the topics when they are more vague and not benchmarks.

B. For each standard, did the items cover the most important performance (DOK levels) you expected by the standard? If not, what performance was not assessed?

- There are not many 3s or 4s level DOK in the elements. I feel that it is important for students to be able to reason, develop, argue, and analyze their answers more. There should be more elements that focus on these areas. For 9-12th grade standards, many of them are at the higher DOK that students will need to spend more time on a unit. Or it will take more than one elements to complete one standard.
- Yes
- The DOK was good for those that had multiple elements attached.
- Yes - this was the best match yet.
- The DOK levels covered 1-3. I did not rate any a level 4.

C. Were the standards written at an appropriate level of specificity and directed towards expectations appropriate for the grade level?

- The standards seem to be appropriate for the grade level.
- Yes
- Yes
- Yes
- Yes, there are no set standards for Grade 9 so these were well-chosen.

D. What is your general opinion of the alignment between the standards and assessment:

ii. Acceptable Alignment -- 2
iii. Needs slight improvement -- 3

E. Comments

- For high school, students will need to pass a standard test to graduate. It is important for high school math teacher to review all the grade standards to help students to pass the test. If they don't learn all the standards in 6-8, it is very difficult for students to be successful in the high school math class.

Science, Grade 5

A. For each standard, did the items cover the most important topics you expected by the standard? If not, what topics were not assessed that should have been?

- Yes.

- The scientific method (practice of science) questions were not as thoroughly covered.
- I think the topics were covered fairly well by the elements.
- The WIDA elements seem to be much more connected to the state standards in science than they are in math.
- For the most part, it covered topics I predicted. However, there was less specificity in life sciences and living systems. There is a lot of assumption on the part of the standards that students will have completed the previous standards, and they do not include many lower-level DOKs for students with missing pieces.
- Yes

B. For each standard, did the items cover the most important performance (DOK levels) you expected by the standard? If not, what performance was not assessed?

- Yes. There was a wide variety of DOK levels, which was appropriate to the standards.
- I expected more explanatory or evaluative DOK levels.
- There was a variety of depth levels covered by the standards, although there were fewer 1s.
- Both the WIDA and state standards did not reach the depth level I would have anticipated.
- Yes

C. Were the standards written at an appropriate level of specificity and directed towards expectations appropriate for the grade level?

- The language functions correlated much more closely to these standards than the math standards. They seemed to mesh well and be clear.
- The WIDA seemed to more closely align with the science standards than it did with the math standards. However, there could be more examples for motion and simple machines, for scientific method and the practice of science, and for life science.
- No. The wording used in several content and WIDA standards was very ambiguous. Some examples of ambiguous language was 'understand', 'discuss', 'imagine', 'apply', 'evaluate', and 'incorporate'. Many of these words make it difficult to know what the student should do to meet the expectation. How should the student demonstrate mastery of 'imagining', for example?
- They are appropriate grade levels.
- The word ‘understand’ is confusing.

D. What is your general opinion of the alignment between the standards and assessment:

iii. Needs slight improvement -- 6

E. Comments

- Again, the WIDA standards seemed to much more closely align with the science standards than with the math standards. It seems that the verbs used to explain the language functions made more sense in a science context than those language function words used within the math context.
- The wording used in both the content and WIDA standards should be revisited to include more specify - what should the student do to demonstrate mastery?
- I thought the science standards aligned more easily and were easier to think through in terms of the language.

Science, Grade 8

A. For each standard, did the items cover the most important topics you expected by the standard? If not, what topics were not assessed that should have been?

- I think they covered the topics fairly well. I think there were too many questions related to energy. Some elements related matter and the universe covered.
- Somewhat, it seemed like the MPI's were randomly scattered through the content standards. I would have liked to see more MPI's addressing the universe and matter.
- Yes, I felt that the elements covered the most important topics expected. However, it was a little difficult since you are trying to align MN 8th grade Science standards while WIDA standards for grades 6-8.
- The elements did not cover all of the topics expected by the standard; the elements need to cover all areas of science - earth, life, physical.
- It would have been much easier to match if we had used all of the middle school science standards for MN instead of just 8th grade which only addresses Earth Science concepts
- No. If you want to include specific science content in the elements Life, Earth, and Physics (chemical and physics) and the standards we are mapping should correspond.

B. For each standard, did the items cover the most important performance (DOK levels) you expected by the standard? If not, what performance was not assessed?

- I think they did a good job of covering the performance. Maybe a few more #4.
- The majority of the DOK values that I entered were between 1-2 so the depth was not sufficient.
- Yes, I thought the elements covered the most important performance areas.
- The elements did not cover the most in-depth levels.
- For the most part they did.
- I didn't document level 2 or 3 of the DOK.

C. Were the standards written at an appropriate level of specificity and directed towards expectations appropriate for the grade level?

- Yes. But there needed to be more of the standards covered.
- Yes, definitely.
- In trying to make the MPIs broad so that they can cover many content standards, sometimes it almost seems like it's too broad. Therefore, it can be difficult to

determine how to connect the content standard to the ELP standard.
- Yes.
- Yes, but sometime the content got in the way of determining the DOK.
- It would be helpful to reference Webb's cognitive levels. You may be able to add more descriptors for the DOK

D. What is your general opinion of the alignment between the standards and assessment:

iii. Needs slight improvement -- 5
iv. Needs major improvement -- 1

E. Comments

- Very interesting to do this activity.

Science, Grade 12

A. For each standard, did the items cover the most important topics you expected by the standard? If not, what topics were not assessed that should have been?

- The elements needed to be far more specific to cover the majority of the standards.
- No, we only examined MN life science standards, but elements covered MN nature of science standards.
- There was a strand of questions related to tables and charts that were difficult to find a standard that related to it.
- No. It felt like there were several elements that were not in the Life Science standards. I think there should have been less on interpreting graphs and charts.
- No, there are huge gaps in the standards and elements covered.
- There are several resources provided by the National Science Teachers association that describe the "big ideas" in science. I think the topics should be connected to the 4 disciplines in science- nature of science and engineering, life, earth, and physical (chemistry and physics)

B. For each standard, did the items cover the most important performance (DOK levels) you expected by the standard? If not, what performance was not assessed?

- No, the elements did not go in-depth enough and/or did not even cover the most important performance pieces of the standards.
- No, the majority of depth levels were low.
- I don't think there were a lot of the highest depth levels.
- No, it felt like a lot of the elements covered very basic DOK levels (mostly 2s) and there should have been more at the higher DOK levels.
- Of the few MN Science Standards touched by the elements, very few get to a level 4 DOK. When reaching consensus on part 1, we had a lot of 2 and 3 DOK's but not very many 1 and 4. In part 2, I had a lot of 1 and 2 and not a lot of 3 and 4.
- There were 1-4 DOK levels represented in the elements. I think there should be more

representation from DOK's in the "2" and "3" areas and fewer elements in "1" and "4" categories related to the assessability

C. Were the standards written at an appropriate level of specificity and directed towards expectations appropriate for the grade level?

- Yes.
- Yes
- I don't think so. I think the standards were specific but almost limiting.
- Since the standards were written for all science standards in grades 9-12, there were many Life Science standards that weren't covered.
- No, the descriptors need to be more connected with the appropriate grade level (9, 10, 11, 12) MN Science Standard.
- If the elements could be more general such as the example "using data". This cuts across multiple disaplines of science.

D. What is your general opinion of the alignment between the standards and assessment:

iii. Needs slight improvement -- 1
iv. Needs major improvement -- 5

E. Comments

- Very interesting. I think that the science standards are not written in an applicable way to language learners. I think the use of terms like "use" and "distinguish" are not clear enough in their expectations.

Appendix B: *Example of Linked and Non-Linked Standards*

The following illustrates cases of linked and non-linked standards for mathematics at the 6-8 grades cluster.

Minnesota Academic Standards (Mathematics) Grade 7
7. Number and Operation **7.1.2 Calculate with positive and negative rational numbers, and rational numbers with whole number exponents, to solve real-world and mathematical problems.** 7.1.2.2 Use real-world contexts and the inverse relationship between addition and subtraction to explain why the procedures of arithmetic with negative rational numbers make sense.

WIDA Level 4, Mathematics Grade Cluster 6-8, Reading
"Order steps for computing perimeter, area, volume or circumference in real-world situations using sequential language"

State A's ELP Standard, Level 4, Grade Cluster 6-8, Reading
"Use math formulas to solve problems"

The above expectations are associated with mathematics; are at DOK level 4 and address the domain of reading. The WIDA standard focuses on ordering of real world mathematics procedures, with perimeter and area given as examples. This standard is closely associated (or linked) with the Minnesota Academic Standards, Mathematics 7.1.2.2 (Grade 7).

State A's (a pseudonym) ELP mathematics standard is addressing use, but it is vague and unfocused. What math formulas or strategies are to be addressed? And how are they used? The lack of clarity in this standard would make it difficult to link to any particular standard; hence, this ELP standard is NOT linked to the Minnesota Academic Standards, Mathematics 7.1.2.2. The goal in linking ELP standards to content expectations deals with both specificity and appropriate discourse function. The WIDA ELP example is specific and provides an appropriate discourse function: order. While State A's ELP example does provide an appropriate language function (use) it is too vague.