State D Alternate Assessment Alignment Report

Links for Academic Learning

Report to the State Department of Education

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This report details findings from an investigation of the alignment of State D's alternate assessments based on alternate achievement standards in Reading and Mathematics to grade level content standards. The criteria used in this alignment study are being evaluated as part of the UNC Charlotte partnership in the *National Alternate Assessment Center* (NAAC). This report is organized by the eight criteria developed by a collaboration of content experts, special educators, and measurement experts at UNC Charlotte (Browder, Wakeman, Flowers, Rickleman, Pugalee, & Karvonen, 2006). While some of the alignment criteria are similar to other alignment methods (e.g., Webb, Surveys of Enacted Curriculum, and Achieve), additional criteria (criteria 5-8) were designed specifically as value indicators for students with significant cognitive disabilities (see Table 1).

A total of 225 reading and 231 math portfolios were evaluated in this alignment study. A stratified random sampling method (stratified on grade level) was used to select the portfolios. Portfolios from grades 3 to 8 and 10 were included in this study.

Alignment Results by Criterion

Criterion 1: *The content is academic and includes the major domains/strands of the content area as reflected in state and national standards (e.g., reading, math, science).*

> Outcome: Almost all of the reading and math Mastery Objectives (MOs) were rated academic, 99% (*n=2220*) and 94% (*n=2179*) respectively. Most of the reading MOs were aligned to the national standard of reading (85%) while some of the MOs were aligned to viewing/visual (10%) and listening (5%). Math MOs were aligned to all five components of the National Council of Teachers of Mathematics.

Criterion 2: *The content is referenced to the student's assigned grade level (based on chronological age).*

> Outcome: In reading, approximately 82% (*n=1817*) of the MOs reviewed were referenced to a grade level standard. Some of the MOs that were designed by the examiners teams (e.g., teachers; *n=44*, 2.0%) were not referenced to a grade level standard. Three hundred and fifty four MOs (15.7%) were referenced to off-grade standards (K-2) which were referenced to the standards of phonics and phonemic awareness. Some of the MOs (*n=21*, .9%) were not found in the database provided. In math, almost all of the MOs (97%, *n=2121*) were referenced to a grade level standard. A problematic area appears when the examiners team designs the MO and do not reference to the grade level.

Criteria 3: *The focus of achievement maintains fidelity with the content of the original grade level standards (content centrality) and when possible, the specified performance.*

> Outcome: Almost all of the reading MOs (99%) were rated as far or near for content centrality. The few MOs rated having no content centrality were due to mismatch to the appropriate standard. For reading performance centrality, most MOs were rated partial or full (92%). In math, most of the MOs were rated as far in content centrality (92%) and

partial in performance centrality (92%). Approximately 5% of the math MOs were rated non-scoreable due to a lack of information or detail. Only the MOs that were rated as academic and were referenced to grade level content standards were evaluated for content and performance centrality. Additionally, most of the student products and artifacts in reading (90%) and math (92%) were rated as being linked to the MO. Some the student products and artifacts (8%) could not be rated due to lack of information or detail.

Criterion 4: *The content differs from grade level in range, balance, and DOK, but matches high expectations set for students with significant cognitive disabilities.*

> Outcome: For reading, all the reading standards had multiple MOs that were linked to the standard, between 44 to 210 MOs per standard. All of the standards had at least six MOs, which satisfies Webb's categorical concurrence criteria. Most of the reading MOs were rated at the depth of knowledge level of memorize/recall (73%), but there were MOs rated at the highest level of depth of knowledge. As expected with alternate assessments, most MOs were below grade level standards depth of knowledge. The balance of representation suggested that the reading MOs were not evenly distributed across the standards. There was a greater emphasis on *General Reading Processes* than the other two categories, which was the intent of the state. The range-of-knowledge indicated that some grade level topics (nested under the standard) are under-represented (fluency, comprehension of literature, comprehension of information text) in some of the grades. Again, the state designed the alternate assessment based on alternate achievement standards to under-represent these objectives.
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> For math, MOs were aligned to all grade level standards except for 3rd and 10th grades, which had no items aligned to *Knowledge of Statistics* and *Data Analysis and Probability* respectively. MOs are distributed across all levels of depth of knowledge except the lowest level (i.e., attention). The performance and analysis/synthesis/evaluation levels had the largest percentage of MOs. This distribution of MOs across the levels of depth of knowledge is typically not found for most alternate assessments. The balance of representation results, which ranged from .36 to .61, indicate that the MOs were not evenly distributed across all of the standards. The range of knowledge results indicated that a few of the standards did not have MOs for at least 50% of the objectives.

Criterion 5: *There is some differentiation in achievement across grade levels or grade bands.*

> Outcome: Overall the reading has good differentiation across grade levels and could serve as a model for other states on how to achieve this criterion. Some improvement may be considered for General Reading Comprehension. In contrast, mathematics needs some improvement for most strands. While there is some limited differentiation, overall most items were redundant from lower to upper grades.

Criterion 6: *The expected achievement for students is for the students to show learning of grade referenced academic content.*

Outcome: In this system it can be inferred that the student performed a new response at a high level of accuracy and this score was in no way augmented with program factors. In contrast, the score may reflect a low level of actual learning when more intrusive prompting was used and no inference can be made with full physical guidance.

Criterion 7: *The potential barriers to demonstrating what students know and can do are minimized in the assessment.*

Outcome: Because flexibility is built into the tasks teachers select, this alternate assessment minimizes barriers for the broadest range of heterogeneity within the population. A review of 4883 MOs indicated that 92% of the MOs were accessible at an abstract level of symbolic communication while the remaining MOs were accessible to students at a concrete level of symbolic communication.

Criterion 8: *The instructional program promotes learning in the general curriculum.*

Outcome: The Handbook is well developed and covers the grade level domains that are included in alternate assessment. It is recommended that that additional information on how to fade prompts and promote independent student responding be included in the handbook. Also, some additional information on the use of assistive technology may also be useful.

Some counties within the state have exemplary professional development materials that could serve as a national model. In contrast, other counties seem to have minimal resources. Sharing resources across counties may be beneficial.

A review of the administration handbook and professional development materials indicated that program quality indicators (e.g., instruction with typical peers, making choices, provisions of assistive technology) were addressed in the materials. The handbook, however, did not mention the opportunity for instruction in general education classroom for students with significant cognitive disabilities.

Overall Analysis of Alignment

Overall the alternate assessment demonstrated good access to the general curriculum. Almost all of the MOs were academic and demonstrated a far or near content centrality link to the grade level content standards. For reading, the MOs were reduced in depth of knowledge from the grade level depth of knowledge and the MOs did not have the same content coverage that was found in the grade level standards. For math, the MOs had very similar depth of knowledge levels that are found in the grade level content standards, which is unusual for alternate assessments. The math MOs content coverage did not have the same emphasis that is found in the grade level content standards. There is clear differentiation across the reading grade levels but the number of repeating math MOs across the grade levels should be reviewed.

Flexibility is built into the examiners team selection of MOs, which minimizes barriers for students with significant cognitive disabilities. MOs at all levels of symbolic communication were found allowing access for all students regardless of their symbolic communication levels. The alternate assessment was well developed and covered the grade level standards. The quality of the professional development materials varied across the different counties but some counties had outstanding resources that might be shared statewide.

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ALTERNATE ASSESSMENT ALIGNMENT
REPORT TO THE STATE D STATE DEPARTMENT OF EDUCATION

This alignment study was conducted on the basis of information obtained on the 2007 State D Alternate Assessment. Portfolios were randomly selected from all 3rd to 10th participants. The criteria in this alignment study are being evaluated as part of the UNC Charlotte partnership in the *National Alternate Assessment Center* (NAAC). This report is organized by the eight criteria developed by a collaboration of content experts, special educators, and measurement experts at UNC Charlotte (Browder, Wakeman, Flowers, Rickleman, Pugalee, & Karvonen, 2006). While some of the alignment criteria are similar to other alignment methods (e.g., Webb, Surveys of Enacted Curriculum, and Achieve), additional criteria (criteria 5-8) were designed specifically as value indicators for students with significant cognitive disabilities (see Table 1).

All reviewers were instructed on the purpose of alternate assessments and reviewed all the testing materials and academic content standards provided by the state of State D. The Reading and Mathematics content reviewers rated the alignment of Mastery Objectives (i.e., AA tasks developed by the state) to grade level content standards as a team until there was consensus. After both the content experts reached consensus, they rated subsequent items independently. Independent ratings of some common Mastery Objectives (MOs) were used to evaluate inter-rater agreement. Only MOs that were included in the portfolios were rated and not the entire bank of MOs. Special education experts rated the student work or artifacts, professional development materials, and the age appropriateness and symbolic levels of the standards and MOs.

DESCRIPTION OF STATE D STANDARDS AND ALTERNATE ASSESSMENT

State D's alternate assessment based on alternate achievement standards assesses student mastery of reading and math objectives from the State D Content Standards. Student test examiner teams, which consist of teachers, related service providers, instructional assistants, and others, construct a portfolio of evidence that demonstrates that the student attained the target Mastery Objectives that were written to align with the selected reading and mathematics content standard objectives. While there are pools of Mastery Objectives for each grade level, examiner teams are allowed to design unique Mastery Objectives for students.

Early in the school year the examiner team uses the alternate assessment results from the prior year (or conducts a pre-assessment) to determine the student's current reading and mathematics skill. The student's upcoming instructional and assessment program is based on the results of this review. The team selects the reading and math content standard objectives that the student is expected to attain with at least 80% accuracy. The academic objectives should include objectives that the student has not achieved. The team then collaborates to develop one Mastery Objective (or assessment task) for each selected objective.

Evidence of student mastery can be obtained at any time during the test window (i.e., beginning of September to mid-March). The portfolio is a collection of student work and other artifacts that demonstrate mastery.

Test examiners select at least one indicator and two objectives from each of the content standards (i.e., the highest levels of content definition with each subject area). Indicators are attached to standards and are defined by discrete behaviors. Objectives are expected performance measures of indicators. One artifact is submitted for each objective selected. Each student who participates in the alternate assessment is assessed on 10 Reading and 10 Mathematics Mastery Objectives.

EXPERT REVIEWERS

The alignment team consisted of two English Language Arts (ELA) experts, two Mathematics experts, five experts in the education of students with significant cognitive disabilities, and two measurement experts. Content experts had a range of experience in their content area of 9 to 31 years and special education experts had a range of 7-30 years. The level of education ranged from a bachelor's degree (1 content expert) to a doctoral degree or individuals participating in a PhD program (1 content expert, 5 special education experts, 2 measurement experts). All experts had participated in conducting professional development related to their content area. Four experts had a licensure in curriculum and instruction. Five experts taught higher education classes. Finally, six of the experts had been item writers for their state's general and special education assessments.

At the beginning of each alignment activity, the team worked together to come to a consensus on the alignment of educational components. When experts disagreed, decision rules were made to ensure consistency. Then the reviewers independently rated a subset of MOs and standards and agreement between raters was examined. When the raters agreed 90%, each rater was given specific tasks. Reliability was checked periodically throughout the tasks to ensure consistent ratings.

CRITERIA FOR ALIGNING ALTERNATE ASSESSMENTS TO GRADE LEVEL ACADEMIC CONTENT

Non-regulatory guidance has specified that alternate assessments "should be clearly related to grade-level content, although it may be restricted in scope or complexity or take the form of introductory or prerequisite skills" (U.S. Department of Education, 2005, p.26). As stated in this regulation, there should be a clear *link* to the content standards for the grade in which the student is enrolled. While this gives states flexibility to determining the scope and breadth of content of alternate assessments, it does not exempt states from designing assessments that measure an academic domain with interpretable results and accurately reflecting what the student knows and can do within that academic domain. For this reason, the authors believe that the investigation of alignment between academic content, academic performance, alternate assessments, and instructional practices and resources should be as strenuous as those used for the assessment of students in the general population. In contrast, it is also expected there would be some differences in the depth, breadth or complexity of content addressed when the achievement target is an alternative to grade level achievement. Because of the unique characteristics and needs of students with significant cognitive disabilities (e.g., testing formats and instructional practices), additional alignment criteria also need to be considered for alternate assessments.

In our conceptual framework, we propose eight criteria for linking to grade-level academic content standards (see Table 1). To be linked to grade level standards, the target for achievement must be academic content (e.g., reading, math, science) that is referenced to the student's assigned grade based on chronological age. Functional activities and materials may be used to promote understanding, but the target skills for student achievement are academically-focused. Some prioritization of the content will occur in setting this expectation, but it should reflect the major domains of the curricular area (e.g., strands of math) and have fidelity with this content and how it is typically taught in general education. The alternate expectation for achievement may focus on prerequisite skills or some partial attainment of the grade level, but students should still have the opportunity to meet high expectations, to demonstrate a range of cognitive demand, to achieve within their level of symbolic communication, and to show growth across grade levels or grade bands.

Table 1: Criteria for Instruction and Assessment that Links to Grade Level Content

1. The content is academic and includes the major domains/strands of the content area as reflected in state and national standards (e.g., reading, math, science).

2. The content is referenced to the student's assigned grade level (based on chronological age).

3. The focus of achievement maintains fidelity with the content of the original grade level standards (content centrality) and when possible, the specified performance.

4. The content differs from grade level in range, balance, and DOK, but matches high expectations set for students with significant cognitive disabilities.

5. There is some differentiation in content across grade levels or grade bands.

6. The expected achievement for students is for the students to show learning of grade referenced academic content.

7. The potential barriers to demonstrating what students know and can do are minimized in the assessment.

8. The instructional program promotes learning in the general curriculum.

The following sections report the results of the pilot alignment method organized around the eight criteria, as applied to State D's alternate assessment system.

ALIGNMENT RESULTS

A total of 225 Reading and 231 Mathematics portfolios were evaluated. The number of portfolios by grade level included in the alignment study is reported in Table 2. Results are reported at the system level (aggregated across grade level) and for each grade level.

Table 2: Number of Portfolios Included in Alignment Study

Grade	Reading	Math
3rd	24	25
4th	28	28
5th	36	36
6th	18	18
7th	34	33
8th	52	54
10th	33	35

Only the MOs selected by examiner teams were rated, not the entire bank of MOs. Each MO was rated each time it appeared in a portfolio, which resulted in some MOs being rated multiple times. Most of the MOs in this study were designed by the state but some of the MOs were designed by the examiner teams.

Interrater Reliability and Accuracy of Data Entry

Interrater reliability was examined by having all ratings coded independently by two experts. The agreement for content experts were: (a) 89% exact agreement for reading with 5% portfolios independently coded, (b) 95% exact agreement for math with 8% of the portfolios, and (c) 89% exact agreement for science with 4% of the portfolios. The grade level standards were also coded with overall reliability at 98% for Reading and 94% for Math. Approximately 20% of the data were double entered and examined for data entry errors. There was a 97% accuracy rate obtained.

Criterion 1: The content is academic and includes the major domains/strands of the content areas as reflected in national standards as defined by the National Council of Teachers of English (NCTE) and National Council of Teachers of Mathematics (NCTM).

Criterion 1 requires content experts to determine if the MOs are academic. MOs that are not academic are not included in any further analyses. <u>In order to be rated nonacademic</u>, content experts must agree (either by identical, independent ratings or by consensus after different ratings) that the MO was indeed nonacademic. To make these decisions, reviewers are asked whether the item/standard/descriptor can be logically defined by a national standard for that content area. National standards are defined according to the national content organizations (National Council of Teachers of English and National Council of Teachers of Math). If the standard or assessment item can be labeled according to a strand/component within the national standards, the reviewer codes it as academic.

Some skills may be *foundational skills* or those skills which are an assumed competence across all grade levels specific to an academic context such as turning the pages of a book. While these skills are not academic skills (i.e., cannot be defined by a national strand), they may be appropriate for some students with significant cognitive disabilities. Special educators review the items/standards/descriptors that were rated by content experts as nonacademic to identify those components that may be foundational skills.

Furthermore, nonacademic MOs are coded for symbolic level of communication. A student at the awareness/presymbolic level communicates through gestures and objects (e.g., holding up a cup when thirsty). In the concrete symbolic level, the student uses some symbols to communicate (e.g., provides teacher with a picture of a cup when thirsty). At the abstract symbolic level, the student communicates with multiple symbols (e.g., concrete and abstract picture symbols) or words (e.g. provides teacher with written word "cup" when thirsty).

Reading Results

A total of 2250 Reading Mastery Objectives (MOs) across 225 Reading portfolios were rated by content experts. Some of the MOs were rated multiple times. The number of unique MOs rated was 680. The MOs and the number of times each MO was included in the portfolios are reported in Appendix A. The most frequently occurring non-academic MOs were designed by examiner teams ($n=115$) and not the MOs designed by the state.

Almost all of the reading MOs ($n=2220$, 98.7%) were rated academic. A total of 26 MOs reviewed (1.2%) were rated nonacademic and 4 (.2%) MOs did not provide enough specific information to be rated. After deleting duplication MOs found across portfolios, a total of 11 unique MOs were rated nonacademic. MOs rated nonacademic or non-scoreable are reported in Table 3. Of the MOs rated nonacademic, 22 (85%) were rated as foundational and 26 (100%) were rated pre-symbolic.

Table 3: Non-Academic and Non-Scoreable Reading Mastery Objectives

MO #		Foundational	Symbolic Level
Non-Academic			
4038/4374*	Given a grade level book, student will hold the book in the proper manner and turn the pages one at a time.	(see note)	Presymbolic
4039/4447	Given a grade level book, student will orient it for reading.	Foundational	Presymbolic
4041/4397/4416/4433/4450/4464	Given a grade level book and the direction "Show me the title of the book", student will identify the title.	Foundational	Presymbolic
4042	Given a grade level text, student will track text from left to right.	Foundational	Presymbolic
Teacher Design MO			

Note. * There are two skills in the same item. Holding the book is non-foundational but turning the page is foundational.

The six interrelated national ELA standards used in this alignment procedure are (1) Reading, (2) Writing, (3) Speaking, (4) Listening, (5) Viewing, and Visually Representing, and (6) Research. Most of the MOs were aligned to reading (84.9%), followed by viewing/visual (9.7%), and listening (4.9%).

Table 4: Alignment of Reading Mastery Objectives to NCTE Standards

Components	Primary		Secondary	
	N	*%*	*N*	*%*
Reading	1883	84.9	72	22.0
Writing	5	.2	13	4.0
Speaking	5	.2	40	12.2
Listening	109	4.9	16	4.9
Viewing/Visual	215	9.7	186	56.9
Research	2	.1	0	0

Mathematics Results

A total of 2308 Mathematics Mastery Objectives (MOs) across 231 Mathematics portfolios were rated by content experts. As with the Reading, some of the MOs were rated multiple times (i.e., rated each time found in a portfolio). The MOs and the number of times each MO was included in the portfolios are reported in Appendix B.

Almost all of the Mastery Objectives (MOs) (*n*=2179, 94.4%) were rated academic. A total of 129 MOs (5.6%) were rated nonacademic. After deleting duplication MOs found across

portfolios, a total of 36 specific MOs were consistently rated nonacademic. A list of nonacademic MOs is reported in Table 5. Of the teacher selected MOs rated nonacademic, none were identified as foundational. The number of non-academic MOs at each symbolic level was 26 (20.5%) at the presymbolic, 61 (48.0%) at concrete symbolic, and 40 (31.5%) at the abstract symbolic. Two of the nonacademic MOs were inadvertently excluded from coding for symbolic level.

Table 5: Mathematics MOs Rated Non-Academic

MO #		Foundational	Symbolic Level
2119/2326/2502/2683/2851/4072/4227	Given liquids/objects with different temperatures, student will identify the item which is hotter and which is colder.	Non-Foundational	Presymbolic/concrete
2126/2330/2510/2686/2865/4063/4223	Given pictures/ a list of events, Student will use the pictures/list to identify morning, afternoon, and night/before and after	Non-Foundational	Abstract
2130/2326/2505/2673/2859/4056/4228	Given a chart labeled with January and July and objects/pictures associated with cold and warm weather, student will identify cold weather and warm weather pictures/objects.	Non-Foundational	Presymbolic/concrete
2309/2669/2847/4039	Given the location of objects (on, above, next to, etc.), student will locate object.	Non-Foundational	Presymbolic/concrete
2310/2668/2846/4040	Given the location of objects (on, above, next to, etc.), student will place object in indicated position.	Non-Foundational	Presymbolic/concrete
2667/2845/4038/4054	Given the location of objects (on, above, next to, etc.), student will identify the position of the object.	Non-Foundational	Abstract
4042	Given the location of objects (on, above, next to, etc.), student will demonstrate a slide, flip, and turn.	Non-Foundational	Abstract

The five components of Mathematics are (1) Numbers and Operations, (2) Algebra, (3) Geometry, (4) Measurement, and (5) Data Analysis and Probability. The alignment of the Mathematics MOs to the NCTM standards can be found in Table 6. The MOs appeared fairly evenly distributed across all the components of Mathematics.

Table 6: Alignment of Math Measurement Guidelines and AA Items to NCTM National Standards

Components	Primary		Secondary	
	N	*%*	*N*	*%*
Numbers and Operations	497	22.90	4	80.00
Algebra	420	19.35	1	20.00
Geometry	436	20.09		
Measurement	358	16.50		

Data/Probability	458	21.11
Math Process (across standards)	1	0.05

Summary and Recommendations

Almost all of the reading and mathematics MOs were rated academic. As expected, the reading MOs were aligned to the NCTE strand of reading. Mathematics MOs were distributed across all the components of mathematics. It is interesting to note that teachers in the sample selected academic MOs 99% of the time in reading (Appendix A) and 95% of the time in math (Appendix B).

The first criterion focused on the broad question of "Are the Mastery Objectives academic?" In this second step, the focus is on the alignment with the state's own standards to ask the question, "Has the state referenced the MOs to grade level content standards?" Criterion 2 examines the **intended** alignment of the Mastery Objectives to grade level standards. Criterion 3 will evaluate the degree of the MOs alignment to grade level content standards.

Reading Results

Approximately 82% (*n*=1817) of the MOs reviewed were referenced to a grade level standard. Some of the MOs that were designed by the assessment teams (*n*=44, 2.0%) were not referenced to a grade level standard. Three hundred and fifty four MOs (15.7%) were referenced to off-grade standards (i.e., K-2), which measured phonics and phonemic awareness. Some of the MOs (*n*=21, .9%) were not found in the database provided. The following table displays the intended alignment of the MOs to the grade level standards. For grades 3rd through 8th, the three reading standards and no other standards are intended to be assessed.

Table 7: Number and Percentage of Mastery Objectives Referenced to Content Standards

ELA Standard	3rd N	3rd %	4th N	4th %	5th N	5th %	6th N	6th %	7th N	7th %	8th N	8th %
Below Grade Level	48	20.0	43	15.4	62	17.2	20	11.1	41	12.1	87	16.7
1. General Reading Processes	80	33.3	120	42.9	147	40.8	95	52.8	152	44.7	210	40.4
2. Comprehension of Informational Text	49	20.4	52	18.6	72	20.0	10	5.6	73	21.5	103	19.8
3. Comprehension of Literary Text	48	20.0	44	15.7	75	20.8	52	28.9	69	20.3	103	19.8
4. Writing	0	0	0	0	0	0	0	0	0	0	0	0
5. Controlling Language	0	0	0	0	0	0	0	0	0	0	0	0
6. Listening	0	0	0	0	0	0	0	0	0	0	0	0
7. Speaking	0	0	0	0	0	0	0	0	0	0	0	0
Not Referenced	10	4.2	5	1.8	4	1.1	3	1.7	5	1.5	17	3.3
MOs Not Found	5	2.1	16	5.7	0	0	0	0	0	0	0	0

| | 10th | |
ELA Standard	N	%
Below Grade Level	53	16.1
Reading, Reviewing and Responding to Texts	277	83.9
Evaluating the Content, Organization, and Language Use of Texts	0	0.0

Math Results

In math, almost all of the MOs (97%, *n=2121*) were referenced to a grade level standard. Some of the MOs (*n=34, 1.5%*) were not referenced to a grade level standard. These non-referenced MOs had been designed by the examiners team. Some of the MOs (*n=26, 1.1%*) were not found in the database provided. The following table displays the intended alignment of the MOs to the grade level standards.

Table 8: Number and Percentage of Mastery Objectives Referenced to Content Standards

Math Standard	3rd		4th		5th		6th		7th		8th	
	N	%	N	%	N	%	N	%	N	%	N	%
Previous Grade							1	0.6				
Knowledge of Algebra, Patterns, and Functions	50	20.2	57	20.4	71	19.2	36	20.0	64	18.8	106	19.6
Knowledge of Geometry	50	20.2	56	20.0	69	18.6	37	20.6	52	15.3	107	19.3
Knowledge of Measurement	97	39.1	54	19.3	74	20.0	38	21.1	66	19.4	104	19.3
Knowledge of Statistics	0	0.0	56	20.0	74	20.0	35	19.4	64	18.8	105	19.4
Knowledge of Probability	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Knowledge of Number Relationships	50	20.2	54	19.3	76	20.5	33	18.3	65	19.1	105	19.4
Processes of Mathematics	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Grade Level Link Not Able to Find	1	.4	3	1.1	1	.3	0	0.0	16	4.7	13	2.4
MO Not Found in Database	0	0.0	0	0.0	5	1.4	0	0.0	13	3.8	0	0.0

Math Standard	10th	
	N	*%*
Previous Grade	3	0.9
Functions and Algebra	244	69.7
Geometry, Measurement, & Reading	98	28.0
MO Not Found in Database	8	2.3

Summary

Most of the MOs were referenced to content standards. In reading, while most of the MOs were aligned to reading grade level standards, approximately 16% (*n=354*) were aligned to off-grade standards. A problematic area is when the examiners team designs the MO instead of selecting from the pool of MOs. Many of the examiners team designed MOs were not referenced to grade level standards.

> **Criterion 3:** The focus of achievement maintains fidelity with the content of the original grade level standards (content centrality) and when possible, the specified performance

Content experts rate content centrality on a three-point scale measuring the degree of alignment (none, far, near) between the grade level content standards and the MOs. Performance centrality concerns the level of expected performance of the standards. Ratings are made on a 3-point scale (none, some, all) based on the degree of match between the MOs and the grade level content standard. For example, an alternate content standard of "identify" would have some of the same performance as "analyze and identify." Content experts reviewed the MOs rated none for content centrality and determine whether the ratings were due to an overstretched skill, a mismatch to the standard, or a backfitting skill. Items that are rated as nonacademic are excluded from this analysis.

Reading

The results of the rating of content centrality for reading MOs are reported in Table 9. Most of the reading MOs were rated as far (26%, $n=166$) or near (68%, $n=1487$) for content centrality. For those items that were rated none on content centrality, the reason for the lack of content centrality was a simple mismatched to the appropriate grade level standard ($n=157$, 98.7%). Four MOs were inadvertently not rated by the experts. A list of the MOs rated none in content centrality is reported in Appendix C. For performance centrality, most MOs were rated partial or full (92%).

Table 9: Reading Content Centrality and Performance Centrality

	Content Centrality			Performance Centrality	
	N	*%*		*N*	*%*
None	166	7.5	None	164	7.4
Far	567	25.5	Partial	1199	53.9
Near	1487	66.9	Full	857	38.5
Non-Scoreable	4	.2	Non-Scoreable	4	.2

Mathematics

The following table displays the summary of mathematics content centrality and performance centrality. Most of the math MOs were rated as far in content centrality (91.5%) and partial in performance centrality (91.8%). For the MOs that were rated "none" in content centrality, 90% just had a mismatch in the standard ($n=57$) and five MOs were overstretching. Approximately 5% of the MOs did not provide enough detail to evaluate the content and performance centrality. A list of the MOs rated as having no content centrality is located in Appendix D.

Table 10: Mathematics Content Centrality and Performance Centrality

	Content Centrality			Performance Centrality	
	N	*%*		*N*	*%*
None	67	3.1	None	63	2.9
Far	1993	91.5	Partial	1997	91.8
Near	1	.0	Full	1	.0
Non-Scoreable	118	5.4	Non-Scoreable	115	5.3

Student Products and Artifacts

Special educators reviewed the student products and artifacts included in the portfolios to assess the link of the artifact to the MO. Because multiple student products were provided for a single MO, the raters indicted if *all*, *some*, or *none* of the products were aligned.

Reading Results

Special educators reviewed 2449 reading student work products and artifacts provided in the portfolio to evaluate the link to the MOs. Only .5% (*n*=13) of the student products reviewed were rated as not linked to MOs. Most of the products and artifacts were rated *all* linked to the MO (*n*=2136, 87.2%) with a small number (*n*=69, 2.8%) rated as *some* of the evidence links. About 10% (*n*=231) of the student products did not provide enough information to be evaluated (e.g., datasheets may have included information not specific enough to rate or may not have been able to view digital data).

Math Results

Special educators reviewed 2434 math student work products and artifacts included in the portfolio to evaluate the link to the MOs. Very few student work products were rated as having no link to the MO (*n*=6, .2%), with most of the student work products rated as having a link (*n*=2164, 88.9%). There were some student work products that were rated as having some of the evidence linked (*n*=74, 3%) and approximately 8% (*n*=190) of the student work products did not have enough detail to rate (e.g., datasheets may have included information not specific enough to rate or may not have been able to view digital data).

Summary

Almost all of the reading MOs (99%) were rated as far or near for content centrality. The few MOs rated having no content centrality were due to mismatch to the appropriate standard. For reading performance centrality, most MOs were rated partial or full (92%). In math, most of the MOs were rated as far in content centrality (91.5%) and partial in performance centrality (91.8%). Approximately 5% of the math MOs were rated non-scoreable due to a lack of information or detail. Additionally, most of the student products and artifacts in reading (90%) and math (92%) were rated as being linked to the MO.

Criterion 4: The content differs from grade level in range, balance, and DOK, but matches high expectations set for students with significant cognitive disabilities

Alignment indices for criterion 4 are based on Webb's alignment method (Webb, 1997). The following analyses include only MOs that were rated academic and had a content centrality rating of near or far. Four alignment indices are calculated: (a) categorical concurrence, (b) depth of knowledge, (c) range-of-knowledge, and (d) balance of representation. Below is a short description.

Categorical concurrence is the consistency of categories of content in the standards and assessments. The criterion of categorical concurrence between standards and assessment is met if the same or consistent categories of content appear in both the assessment and the standards. For example, if a content standard (or stand) is *measurement* in mathematics, the evaluative decision is "Does the assessment have items that target *measurement*?" It is possible for an assessment item to align to more than one content standard. For example, if an assessment item requires students to calculate surface area, which is aligned to the content standard of *measurement*, to successfully answer the question the student needs to be able to multiply numbers, which is aligned to the content standard of *operations*. In this case the item is aligned to both content standards.

Depth of knowledge (DOK*)* examines the consistency between the cognitive demands of the standards and cognitive demands of assessments (Webb, 1997). Important aspects of learning go beyond academic topics and include students' organization of knowledge, problem representations, use of strategies, and self-monitoring skills (Glaser, Linn, & Bohrnstedt, 1997). Completely aligned standards and assessments requires an assessment system designed to measure in some way the full range of cognitive complexity within each specified content standard. Rated on a 6-point scale (see Appendix A), DOK[1] provides a measure of performance complexity required to perform the skill listed in the standard or item. DOK ratings are guided by a list of verbs (e.g., identify, state) that reflect the response that would be required of the student. Experts consider the verb in conjunction with the content when determining DOK.

Range-of-knowledge correspondence criterion examines the alignment of assessment items to the multiple objectives within the content standards. Range-of-knowledge correspondence is used to judge whether 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 assessment items. The range-of-knowledge numeric value is the percentage of content standards with at least 50% of the objectives having one or more hits. For example, if there are five objectives (e.g., length, area, volume, telling time, and mass) included in the content standard of measurement, a minimum expectation is at least one assessment item is related to at least three of the objectives. According to Webb (1997), 40-50% of the objectives for a standard could be considered weakly met.

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[1] There are many scales for determining DOK levels. The one provided in this manual is just one of many rating scales available.

The *balance of representation* criterion is used to indicate the extent to which items are evenly distributed across the content standards and the objectives under the content standards. In our measurement content standard with five objectives, we would expect items would be evenly distributed across the five objectives. In practice educational agencies may place greater emphasis on specific objectives and content standards. In this case the assumption of an even distribution would be replaced with the expected proportion, or emphasis, as specified by the educational agency. The formula used to compute the balance of representation index is the following

$$Balance = 1 - (\sum_{i=1}^{o} \mid \frac{1}{O} - \frac{I_k}{H} \mid)/2,$$

where O is the total number of objectives hit (i.e., item has been judged to be aligned) for the content standard, I_k is the number of items hit corresponding to objective k, and H is the total number of items hit for the content standard. The balance index can range from 0 (indicating unbalanced representation) to 1.0 (indicating balance representation) with values from .6 to .7 considered a weak acceptable balance and values .7 or greater considered acceptable.

Reading Results

A list of the grade level content standards and the number of reading MOs aligned to each standard is presented in Appendix E.

Categorical Concurrence

The AA-AAS was designed to assess the reading standards (three of the seven ELA standards). The number of Reading MOs aligned to grade level content standards is reported in Table 11. All of the categories had at least six MOs, which satisfies Webb's criteria. It should be noted that students do not take all MOs but are only administered 10 MOs. While the alternate assessment allows access to all standards, teachers are instructed to select six MOs in the *General Reading Processes* and only two MOs in *Comprehension of Informational Text* and two MOs in *Comprehension of Literary Text*.

Table 11: Reading MOs Aligned to Grade Level Content Standards

	3rd		4th		5th		6th		7th		8th	
	N	*%*	*N*	*%*	*N*	*%*	*N*	*%*	*N*	*%*	*N*	*%*
General Reading Processes	80	45.2	120	55.6	147	50	95	60.5	152	51.7	210	50.5
Comprehension of Informational Text	49	27.7	52	24.1	72	24.5	10	6.4	73	24.8	103	24.8
Comprehension of Literary Text	48	27.1	44	20.4	75	25.5	52	33.1	69	23.5	103	24.8

Note. All 10th grade MOs are General Reading Processes

Depth of Knowledge

The level of depth of knowledge required to respond to reading MOs and the grade level content standards are reported in Table 11. Most of the MOs were rated at the memorize/recall level (73%), but there were MOs at the higher depth of knowledge levels. The grade level standards were rated mostly at the higher depth of knowledge levels (i.e., comprehension, application, and analysis).

Table 12: Reading MO Depth of Knowledge

	MOs		Grade Level	
	N	*%*	*N*	*%*
Attention	0	0	7	.5
Memorize/Recall	1617	72.8	19	1.5
Performance	93	4.2	70	5.4
Comprehension	348	15.7	159	12.2
Application	78	3.5	10	43.7
Analysis/Synthesis/Evaluation	84	3.8	35.7	36.8

Figure one illustrates the percentage of MOs and grade level standards at the depth of knowledge levels.

Figure 1: Percentage of Reading MOs and Content Standards at Depth of Knowledge Levels
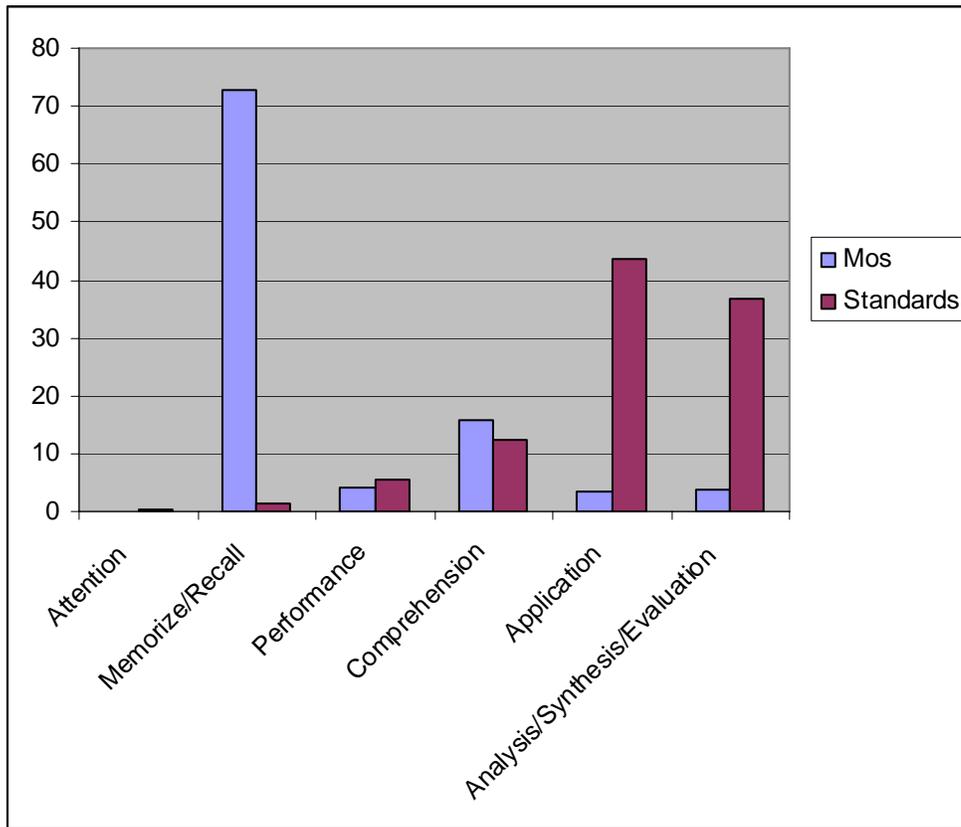
The following table displays the level of depth of knowledge required to respond to reading MOs and grade-level standards by grade.

Table 13: Reading MO Depth of Knowledge by Grade

	MOs		Grade Level	
	N	*%*	*N*	*%*
3rd				
Attention			2	.9
Memorize/Recall	181	75.7	3	1.3
Performance	7	2.9	19	8.3
Comprehension	40	16.7	41	17.8
Application	5	2.1	21.6	49.1
Analysis/Synthesis/Evaluation	6	2.5	95.4	22.6
4th				
Attention			1	.4
Memorize/Recall	195	69.9	3	1.3
Performance	9	3.2	13	5.5

Comprehension	52	18.6	38	16.0
Application	13	4.7	115	48.5
Analysis/Synthesis/Evaluation	10	3.6	53	22.4
			223	94.1
5th				
Attention			1	.5
Memorize/Recall	252	71.8	3	1.4
Performance	14	4.0	14	6.5
Comprehension	56	16.0	30	14.0
Application	14	4.0	106	49.5
Analysis/Synthesis/Evaluation	15	4.3	60	28.0
6th				
Attention			3	1.4
Memorize/Recall	130	73.4	3	1.4
Performance	5	2.8	9	4.2
Comprehension	32	18.1	31	14.5
Application	3	1.7	92	43.0
Analysis/Synthesis/Evaluation	7	4.0	76	35.5
7th				
Attention				
Memorize/Recall	248	73.2	3	1.6
Performance	13	3.8	7	3.6
Comprehension	54	15.9	11	5.7
Application	9	2.7	67	34.7
Analysis/Synthesis/Evaluation	15	4.4	105	54.4
8th				
Attention				
Memorize/Recall	378	73.1	4	2.1
Performance	28	5.4	8	4.1
Comprehension	77	14.9	8	4.1
Application	14	2.7	64	32.8
Analysis/Synthesis/Evaluation	19	3.7	111	56.9
10th				
Attention				
Memorize/Recall	233	73.0		
Performance	17	5.3		
Comprehension	37	11.6		
Application	20	6.3	12	35.3
Analysis/Synthesis/Evaluation	12	3.8	22	64.7

The following table reports the number of MOs below, at, or above the grade level content standards. As expected with alternate assessments, most of the MOs are below grade levels standards.

Table 14: Percentage of MOs Below, At, or Above Grade Level Content Standards DOK Level

Grade	Below	At	Above
All	93.5	.3	6.2
3rd	94.9	0	5.1
4th	91.2	.5	8.3
5th	92.8	.7	6.5
6th	93.6	0	6.4
7th	92.2	.7	7.1
8th	94.0	.2	5.8
10th	95.5	0	4.5

Balance of Representation. The balance of the MOs across the grade level content standards was examined. The balance indices across the grades are reported in Table 15. Webb indicates that values above .70 are acceptable. The MOs in the randomly selected portfolios emphasized the standard *General Reading Process* over the other two standards, *Comprehension of Informational Text* and *Comprehension of Literary Text*. The emphasis in *General Reading Process* was the intent of the state.

Table 15: Balance of Representation

Grade	Reading
3rd	.50
4th	.42
5th	.54
6th	.46
7th	.52
8th	.55
10th	.38

Range of Knowledge. The range of knowledge refers to the breadth or span of knowledge required by the MOs matched to grade level content standards. Grades 5, 7, and 10 had 100% range of knowledge indicating that at least 50% of the objectives had at least one MO. Grades 3, 4, and 8 each had one standard that did not have at least 50% of the objectives with an MO. Appendix E reports the distribution of MOs at the objective level.

Table 16: Range of Knowledge for Reading across All Grades

Grade	Reading	Under-Represented Objectives
3rd	83	Fluency
4th	83	Comprehension of Literacy Text

5th	100	
6th	83	Comprehension of Informational Text
7th	100	
8th	83	Fluency
10th	100	

Math Results

A list of the grade level content standards and the number of math MOs aligned to each standard is presented in Appendix F.

Categorical Concurrence. The number of Mathematics MOs aligned to grade level content standards is reported in Table 17. All math standards had at least six MOs for each standard except 3rd and 10th grades, which had no MOs aligned to *Knowledge of Statistics* and *Data Analysis and Probability* respectively. The lack of MOs aligned to these math standards was intended by the state.

Table 17: Mathematics MOs Aligned to Grade Level Content Standards

	3rd		4th		5th		6th		7th		8th	
	N	%	N	%	N	%	N	%	N	%	N	%
Knowledge of Algebra, Patterns, and Functions	50	20.2	57	20.6	71	19.5	36	20.1	64	20.6	106	20.1
Knowledge of Geometry	50	20.2	56	20.2	69	19.0	37	20.7	52	16.7	107	20.3
Knowledge of Measurement	97	39.3	54	19.5	74	20.3	38	21.2	66	21.2	104	19.7
Knowledge of Statistics	0	0	56	20.2	74	20.3	35	19.6	64	20.6	105	19.9
Knowledge of Number Relationships &Computation /Arithmetic	50	20.2	54	19.5	76	20.9	33	18.4	65	20.9	105	19.9

	10th	
	N	%
Functions and Algebra	244	71.3
Geometry, Measurement, And Reasoning	98	28.7
Data Analysis And Probability	0	0.0

Depth of knowledge. The following table displays the level of depth of knowledge required to respond to reading MOs and grade level objectives. MOs are distributed across all levels of depth of knowledge except the lowest level (i.e., attention). The performance and analysis/synthesis/evaluation levels have the largest percentage of MOs. These results are typically not seen for alternate assessments based on alternate achievement standards. Typically there are many more items at the lower depth of knowledge levels.

Table 18: Mathematics MO Depth of Knowledge

	MOs		Grade Level	
	N	*%*	*N*	*%*
Attention	0	0	0	0
Memorize/Recall	119	5.5	17	2.3
Performance	864	39.7	55	7.6
Comprehension	42	1.9	105	14.4
Application	325	14.9	227	31.2
Analysis/Synthesis/Evaluation	827	38.9	32	44.4

Figure 2 illustrates the percentage of MOs and grade level content standards at each depth of knowledge level.

Figure 2: Percentage of Math MOs and Grade Level Standards at Depth of Knowledge Levels
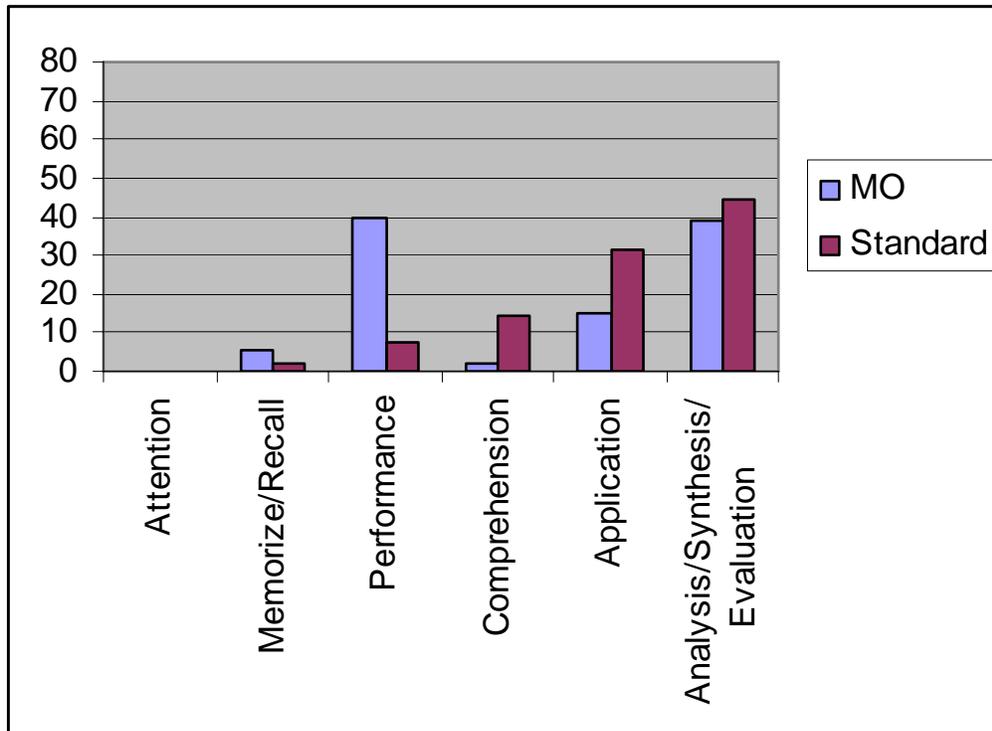
The following table displays the depth of knowledge level reported to respond to reading MOs and grade-level objectives by grade. For all grades items are distributed across all depth of knowledge levels except for the lowest level.

Table 19: Mathematics MO Depth of Knowledge by Grade

	MOs		Grade Level	
	N	*%*	*N*	*%*
3rd				
Attention	–	–	–	–
Memorize/Recall	15	6.4	4	3.4
Performance	100	42.9	18	15.1
Comprehension	4	1.7	13	10.9
Application	25	10.7	33	27.7
Analysis/Synthesis/Evaluation	89	38.2	51	42.9
4th				
Attention	–	–	–	–
Memorize/Recall	14	5.3	8	6.7
Performance	114	43.5	8	6.7
Comprehension	3	1.1	19	16.0
Application	37	14.1	36	30.3
Analysis/Synthesis/Evaluation	94	35.9	48	40.3
5th				
Attention	–	–	–	–
Memorize/Recall	27	7.8	1	.8
Performance	131	38.0	11	9.2
Comprehension	7	2.0	16	13.3
Application	52	15.1	42	35.0
Analysis/Synthesis/Evaluation	128	37.1	50	41.7
6th				
Attention	–	–	–	–
Memorize/Recall	7	4.0	–	–
Performance	72	41.1	9	7.8
Comprehension	6	3.4	24	20.9
Application	26	14.9	31	27.0
Analysis/Synthesis/Evaluation	64	36.6	51	44.3
7th				
Attention	–	–	–	–
Memorize/Recall	12	3.8	3	2.6
Performance	142	44.5	4	3.5
Comprehension	6	1.9	21	18.4
Application	40	12.5	39	34.2
Analysis/Synthesis/Evaluation	119	37.3	47	41.2

8th

Attention	–	–	–	–
Memorize/Recall	23	4.4	1	.9
Performance	190	36.5	4	3.6
Comprehension	8	1.5	12	10.9
Application	101	19.4	37	33.6
Analysis/Synthesis/Evaluation	198	38.0	56	50.9

10th

Attention	–	–	–	–
Memorize/Recall	21	6.5	–	–
Performance	115	35.6	–	–
Comprehension	8	2.5	1	3.3
Application	44	13.6	9	30.0
Analysis/Synthesis/Evaluation	135	41.8	20	66.7

The following table reports the percentage of MOs below, at, or above the grade level content standard's depth of knowledge level. While most of the MOs are below the standards depth of knowledge, in almost every grade approximately 50% of the items are at or above the content standards depth of knowledge level.

Table 20: Percentage of MOs Below, At, or Above Grade Level Content Standards DOK Level

Grade	Below	At	Above
All	53.5	17.9	28.7
3rd	47.4	20.1	32.5
4th	58.0	11.2	30.8
5th	58.6	2.0	39.4
6th	50.0	20.7	29.3
7th	57.2	13.7	29.1
8th	49.9	30.8	19.3
10th	52.5	21.7	25.8

Balance of Representation. The balance of representation indices across the grades are reported in Table 21. Webb indicates that values above .70 are acceptable. The results suggest that the MOs are not evenly distributed across the standards. An examination of the number of MOs across the grade level standards will provide information about the standards that have the greatest and least emphasis.

Table 21: Math Balance of Representation Indices

Grade	Mathematics
3rd	.37
4th	.36
5th	.41
6th	.36

7th	.42
8th	.44
10th	.61

Range-of-Knowledge. The range-of-knowledge values for math across all grades are reported in the table below. Third grade MOs were not aligned to at least 50% of the objectives in three of the nine standards.

Table 22: Range of Knowledge for Math across All Grades

Grade	Mathematics	Under-Represented
3rd	57%	Knowledge of statistics; Knowledge of probability; Processes of mathematics
4th	78%	Knowledge of probability; Processes of mathematics
5th	78%	Knowledge of probability; Processes of mathematics
6th	78%	Knowledge of probability; Processes of mathematics
7th	78%	Knowledge of probability; Processes of mathematics
8th	78%	Knowledge of probability; Processes of mathematics
10th	100%	

Summary

For reading, all the reading standards had multiple MOs that were aligned, between 44 to 210 MOs per standard. All of the standards had at least six MOs, which satisfies Webb's categorical concurrence criteria. Most of the reading MOs were rated at the depth of knowledge level of memorize/recall (73%), but there were MOs rated at the highest levels of depth of knowledge. As expected for alternate assessments, most MOs were below grade level standards depth of knowledge. The balance of representation suggested that the reading MOs were not evenly distributed across the standards, which was the intent of the state. There was a greater emphasis on *General Reading Processes* than the other two categories. The range-of-knowledge indices suggested that most the grade level topics (83% to 100%) had at least 50% of the indicators (nested within the topic) with at least one aligned MO. A few of the grade level topics were under-represented (fluency, comprehension of literature, comprehension of information text) in some of the grades.

For math, MOs were aligned to all grade level standards except for 3rd and 10th grades, which had no items aligned to *Knowledge of Statistics* and *Data Analysis and Probability* respectively. MOs are distributed across all levels of depth of knowledge except the lowest level (i.e., attention). The performance and analysis/synthesis/evaluation levels had the largest percentage of MOs. The balance of representation results, which ranged from .36 to .61, indicate that the MOs were not evenly distributed across all of the standards, which was the intent of the state. The range of knowledge results indicated that a few of the standards did not have MOs for 50% of the objectives.

Criterion 5: There is some differentiation in content across grade levels.

One way to examine the change in content across the grade levels demonstrated in the alternate assessment items is to use Webb's (2005) definitions for change across content. Those definitions are:

(a) *broader*—higher-grade standards or items reflect broader application of target skill or knowledge;

(b) *deeper*—higher-grade standards or items reflect deeper mastery of the target skill or knowledge;

(c) *prerequisite*--lower-grade standards or items reflects a different by prerequisite skill for mastery of the higher grade standard;

(d) *new*—the higher-grade has a new skill or knowledge unrelated to skills or knowledge covered at prior grades; and

(e) *identical*—higher-grade standards or items appear identical to one of the lower-grade standards.

Content experts were trained using these definitions and examples to review the AA items. Each strand within each content area was then rated using the definitions and a rating system (not evident-0%, limited- 25%, partial-50%, and clear- 75%) with experts noting information of particular interest and examples. Grade 10 was excluded from this analysis because of the significant change in grade level links (the content for this grade was linked to below grade level standards and would therefore be difficult to assess for any progression beyond grade 8).

A description of the reading differentiation across grade levels is reported in Table 23. The content experts reported that all strands of reading demonstrated some change (broader, deeper, new) across grade levels expect for *General Reading Comprehension*. Many of the MOs aligned to this strand repeated across grade levels.

A description of the math differentiation across grade levels is reported in Table 24. The content experts reported that there were some limited new, broader, and deeper MOs for all math strands across all grade levels. It is recommended that the state examine the number of repeating MOs across the strands of (a) patterns and function, (b) expression, equations, and inequalities, (c) plan and solid geometric figures, and (d) measurement.

Table 23: Reading Differentiation across Grade Levels

Strand	Differention-Broader, deeper, new or used prerequisites at lower grades	Lack of Differentiation-identical items occur	Examples of redundant items for undifferentiated strands	Overall
Phonemic Awareness	Would not be expected			Differentiation not expected
Phonics	Clearly deeper items; partial on use of prerequisite skills in lower grades; and some limited use of new skills in upper grades	Clear redundancy		Adequate; although some redundancy builds expectations across grade levels in other ways
Vocabulary	Clear on all criteria for differentiation	When occurs is linked to new content		Very strong differentiation
Fluency	Links to new grade level content	Redundancy but with links to grade level content		Adequate by linking to new grade level content
General Reading Comprehension	Very limited	Clear redundancy-most items are identical across grades		Needs improvement
Comprehension of Literacy Text	Clear for broader & deeper items; partial for new skills in upper grades & prerequisites in lower grades.	Only partial redundancy		Strong differentiation
Comprehension of Informational Text	Limited for new & prerequisite skills; partial for deeper; little/no broader skills	While clear redundancy, link to grade level text creates differentiation.		Adequate

Table 24: Math Differentiation across Grades

Strand	Differention-Broader, deeper, new or used prerequisites at lower grades	Lack of Differentiation- identical items occur	Examples of redundant items for undifferentiated strands	Overall
Patterns & Function	Limited*	Clear redundancy	Skip counting Given rules to add/ subtract	Needs Improvement
Expression, Equations, and Inequalities	Limited*	Clear redundancy	Number sentence with a missing no. using pictures/manipulatives and +/-, identify the missing number (grades 3-8).	Needs Improvement
Plane and Solid Geometric Figures	Limited*	Clear redundancy	Given geometric figures, identify sides and corners (grades 3-8), and given solid geometric figures, identify the names of figures (grades 3-5). Representation of geometric figures typically only had one skill which was identical across the grades (given the name or model of a geometric figure, sketch the figure).	Needs Improvement
Numeric and Graphic Representations	Limited*	Only partial redundancy		Adequate due to some differentiation and little redundancy
Measurement	Limited*	Clear redundancy	Given a calendar, identify the days of the week/months of the year, and given objects/lines, identify which is bigger or smaller.	Needs Improvement
Data Analysis	Limited*	Clear redundancy but		Adequate with

| | written to use grade level content within graphs or plots. | some differentiation and uses grade level content. |

***All of these strands has some limited new, broader, or deeper items. The use of prerequisites at lower grades would also be an option, but was not found.

Summary

Overall the reading has good differentiation across grade levels and could serve as a model for other states on how to achieve this criterion. Some improvement may be considered for General Reading Comprehension. In contrast, mathematics needs some improvement for most strands. While there is some limited differentiation, overall most items were redundant from lower to upper grades. In conversations with state officials, they reported that the redundancy in math was intentionally created.

Recommendations:

1. Consider making some adjustment in General Reading Comprehension, but overall reading is well differentiated.
2. Add items in math strands that are new, broader, deeper, or build on prerequisites from earlier grades.

Criterion 6: The expected achievement for students is for the students to show learning of grade referenced academic content.

Overall, strong inferences could be made about student learning based on expectations for accuracy and new learning to occur. Nearly all teachers chose 80-100% accuracy as their standard for mastery. Given that many data sheets only had 5 responses, 80% accuracy reflected the student getting all but one response correct. Besides this high expectation for accuracy found, this system also requires a baseline assessment. When baseline information is missing the objective is deleted from the computation for proficiency. In nearly all portfolios, the student did not have the skills at baseline. By the posttest, many objectives were at mastery strong evidence of new learning. Also contributing to being able to make a high degree of inference about student learning was the overall accuracy required for proficiency which was 60%. Finally, a high degree of inference about student learning is supported by basing the score on student performance alone versus program variables. As stated, although alignment is scored, students do NOT receive any "extra credit" for well done portfolios. Instead, poorly aligned items or inadequate data are dropped from the computation of proficiency.

While the overall inference that can be made about student learning were strong, consideration should be given to how this inference is weakened when more extensive prompting is used. On the positive side, the system promotes the use of the system of least prompts which is an evidence-based practice. In contrast, unlike the research on this prompting method, the system does not promote fading prompts. There is no incentive in the system for teachers to target student independence. Performing the skills with a gesture, verbal directive, model, or physical guidance can all be considered mastery. Also, the mastery criteria can allow up to 10 prompts. For example, performing the skill with 10 models could be the target for mastery. One positive feature is the "burden of proof" required before teachers use physical prompts. That is, they must document for 10 days the effort to use less intrusive prompts. There also is encouragement to use minimal physical assistance and to retain active student responding (e.g., guiding hand to a

scanner switch). In contrast in the portfolios that used physical prompting in the mastery objective, the reviewers could not determine what active response the student was making. It seemed feasible that a fully passive student (e.g., even asleep) could have received a correct score.

Other alternatives that can strengthen student inference include giving credit for more complex skills generalization across people and settings or conceptual generalization. There was some suggestion in the evidence that these criteria are considered (e.g., teachers are using different materials and activities at times within the evidence suggesting conceptual generalization). However, there was not enough evidence to rate these criteria. It should be noted that not all systems choose these methods to show student learning (optional criteria).

Summary

Overall, this system has been developed to allow for strong inferences about student learning of academic content based on levels of accuracy, the use of a baseline assessment, and the focus on student achievement. From the portfolios, the teachers seem to teach to mastery and expect high accuracy. In contrast, the inferences that can be made about student learning are less clear as teacher prompting becomes more extensive. We recommend providing more teacher training in methods to fade prompts and providing an incentive for teachers to target independent student performance for mastery.

Criterion 7: The potential barriers to demonstrating what students know and can do are minimized in the assessment.

Special education experts reviewed the alternate assessment and the accompanying administration manual to examine the extent to which a wide range of students to complete tasks within the assessment within the level of independence and accuracy expected by the state. Experts used four definitions to describe how students were able access the assessment items:

No provision: This type of student would not be able to demonstrate knowledge/skill on the assessment; needed supports are nonexistent or insufficient to help this type of student demonstrate learning.

Flexibility built into tasks: This type of student would be able to demonstrate knowledge/skill because of flexibility in administration. Flexibility is built into the items (e.g., teacher choice/design in portfolio, scaffolding in scripted performance events).

Accommodations: This type of student would be able to demonstrate knowledge/skill because of allowable accommodations. Accommodations are not built into items/tasks, but are described in the test administration materials and may be applied to this type of student. Accommodations do not change the construct being measured.

Modifications: This type of student would be able to demonstrate knowledge/skill because of modifications in assessment materials, administration procedures, etc. Modifications are not built into items/tasks, but are described in the test administration materials and may be applied to this type of student. Modifications do change the construct being measured.

Because flexibility is built into the tasks teachers select, this alternate assessment minimizing barriers for the broadest range of heterogeneity within the population. A review of 4883 MOs indicated that 91.5% of the MOs were accessible at an abstract level of symbolic communication while the remaining MOs were accessible to students at a concrete level of symbolic communication.

Criterion 8: The instructional program promotes learning in the general curriculum.

To evaluate criterion 8, special education experts reviewed the professional development materials, alternate assessment handbooks, and administration manuals. Because each local educational agency develops their own professional development material, a sample of 12 counties materials were collected and evaluated. A list of the counties is reported Table 25.

Table 25: Counties for State D's Professional Development Materials

County A	Howard County	Less than 50K
County B	Harford County	Less than 50K
County C	Cecil County	Less than 50K
County D	Calvert County	Less than 50K
County E	St. Mary's County	Less than 50K
County F	State D School for the Blind	Less than 50K
County G*	Baltimore County	More than 50K
County H	Montgomery County	More than 50K
County I	Anne Arundel County	More than 50K
County J	Baltimore City	More than 50K
County K*	Prince George's County	More than 50K
County L	Worchester County	Less than 50K

* Indicates highest rated counties with information submitted as professional development

The Handbook. Domains of learning and content standards for each content area were found. There is also a well developed mastery objective bank available for teachers to select alternate assessment items. The manual also assists teachers with a vertical articulation for math across grades PK-3, assessment suggestions for products, and IEP development guidance. Although the Handbook does not fully cover all the domains of ELA, but it does reflect the same emphasis as the alternate assessment (i.e., reading). The content provided is linked to a grade level or band. There is information regarding the link or alignment of the mastery objective to a grade level standard. The handbook provides several examples of student work and prompt hierarchy procedures. While overall this is a strong alternate assessment handbook, information was not found on how to fade prompts or increase student independence in the performance of skills. Also, while assistive technology is discussed, it is not clear how barriers for students with sensory or motor impairments are eliminated. This would help to increase standardization of accommodations across the administration of the assessment.

Professional Development Materials. As the different counties across State D submitted different levels of information (i.e., some counties submitted only agendas from workshops or a list of workshops offered and some counties submitted the materials used in workshops), a summary of findings across counties is provided. Seven counties represented systems with less than 50,000 overall students. The remaining five counties represented systems with more than 50,000 overall students.

Five of the smaller counties sent minimal information that did not illuminate the content of the professional development held within the system. Of the remaining two counties, the content of the workshops were clearly linked to the domains of reading and math (e.g., one county's submission contained a workshop on data analysis and statistics which included strategies on how to teach students to collect their own data). Evidence of the instructional program promoting learning in the general curriculum was found for teaching with typical peers, assistive technology, typical classroom resources, the use of literacy across content areas, and the teaching of academic skills in a functional context.

Of the larger counties, two provided minimal information. Of the three remaining counties, experts identified strong professional development opportunities for teachers. Grade level content standards were fully embedded across materials including a modified pacing guide for elementary and middle school special education teachers for ELA and science. These materials provided clear content links to standards for teachers including information on standards based instruction, classroom activities, and assessment suggestions. One county provided teachers with a guideline for teaching standards with at least one activity that would teach each of the corresponding standards. A second county provided a curriculum frameworks guide to modified lessons that were written in great detail. Two of these counties provided examples of how to teach the grade level standards to students at all of the symbolic levels. Information about how to differentiate performance for students, however, was limited across all counties. Expectations to access grade level content were clear. For example, while one county addressed the common threads or priorities within the content areas for the students who participate in the alternate assessment, another county provided teachers with a stepwise process to access the grade level content standards and curriculum. All three of the larger counties provided specific examples for teachers of activities and materials linked to typical grade level content and materials (e.g., the use of a grade appropriate text, the inclusion of grade appropriate math content for middle school students such as slope). Examples of how to generalize learning across the content areas (e.g., the use of literacy skills in reading and science) and generalize the concept themselves were evident (e.g., finding the main character in three different stories). Experts found evidence related to the instruction program quality regarding teaching in inclusive contexts, self-determination opportunities for students, the use of assistive technology, the use of typical classroom resources, the use of literacy across content areas, and the embedding of academic skills in a functional context. Overall, the experts were particularly impressed with two of the larger counties (Baltimore County and Prince George's County) that provided teachers with resource materials/lessons that were aligned to state standards and provided teachers with ideas and activities for teaching the content.

Summary and Recommendations

1. The Handbook is well developed, but needs additional information on how to fade prompts and promote independent student responding. Some additional information on the use of assistive technology may also be useful.

2. Some counties within the state have exemplary professional development materials that could serve as a national model. In contrast, other counties seem to have minimal resources. Sharing resources across counties would benefit these counties.

Program Quality Indicators

Special education experts reviewed the alternate assessment administration manual, all professional development submitted, and the mastery objectives for evidence of overall program quality indicators. The administration manual provided student opportunities for all program quality indicators expect for instruction in general education classrooms. The table below summarizes the findings.

Table 26: Program Quality Indicators

Does the alternate assessment and professional development promote:	
1. opportunities for instruction in general education classrooms for students with significant cognitive disabilities?	No- Experts could not find evidence of promoting inclusive opportunities in general education classes.
2. opportunities for instruction with typical peers for students with significant cognitive disabilities?	Yes- In the professional development materials from at least two counties, there was evidence that this practice was occurring.
3. opportunities for students with significant cognitive disabilities to make choices, problem solve, self-advocate, self-evaluate?	Yes- In the professional development materials from several counties, there was evidence that this practice was occurring.
4. the provision of assistive technology for students who need it?	Yes- This indicator was evident in the AA manual and in the professional development submitted from several counties.
5. the access and use of typical classroom resources within instruction (e.g., science kits, grade level books, textbooks)?	Yes- Experts were able to find evidence for this in all three resources reviewed.

6. literacy being promoted across the content areas for students with significant cognitive disabilities (e.g., the pairing of text with picture symbols and objects)?	Yes- Again, experts were able to find evidence of this indicator in all three resources reviewed.
7. the meaningful linking of academic skills in functional contexts?	Yes- Experts noted that while the AA manual and MO are very academic in nature, there is evidence that teachers are encouraged to embed skills in functional contexts. There was also evidence in at least one county's professional development about how to do this.

Overall Summary to the Eight Criteria

Overall the demonstrated good access to the general curriculum. Almost all of the MOs were academic and demonstrated a far or near content centrality link to the grade level content standards. For reading, the MOs were reduced in depth of knowledge from the grade level depth of knowledge and the MOs did not have the same content coverage that was found in the grade level standards. For math, the MOs had very similar depth of knowledge levels that are found in the grade level content standards, which is unusual for alternate assessments. The math MOs content coverage did not have the same emphasis that is found in the grade level content standards. There is clear differentiation across the reading grade levels but the number of repeating math MOs across the grade levels should be reviewed.

Flexibility is built into the examiners team selection of MOs, which minimizes barriers for students with significant cognitive disabilities. MOs at all levels of symbolic communication were found allowing access for all students regardless of their symbolic communication levels. The alternate assessment was well developed and covered the grade level standards. The quality of the professional development materials varied across the different counties but some counties had outstanding resources that might be shared statewide.

References

Browder, D. M., Wakeman, S. Y., Flowers, C., Rickelman, R., Pugalee. D., & Karvonen, M.
(2007). Creating access to the general curriculum with links to grade level content for
students with significant cognitive disabilities: An explication of the concept. *Journal of
Special Education*, *41*, 2-16.

Glaser, R., R. Linn, and G. Bohrnstedt 1997 *Assessment in Transition: Monitoring the Nation's
Educational Progress*. Stanford, CA: National Academy of Education.

U. S. Department of Education. (2005). *Alternate achievement standards for students with the
most significant cognitive disabilities*. Washington, DC: Author. Retrieved August 12,
2005, from http://www.ed.gov/policy/elsec/guid/altguidance.doc

Webb, N. L. (1997). *Criteria for alignment of expectation and assessments in mathematics and
science education*. (NISE Research Monograph No. 6). Madison: University of
Wisconsin-Madison, National Institute for Science Education. Washington, DC:
Councilof Chief State School Officers.

Webb, N. L. (2005, November). *Alignment, depth of knowledge, and change*. Paper presented at
the annual meeting of the Florida Educational Research Association, Miami, FL.

Appendix A

Reading Mastery Objectives and Frequency of Use

MO #	N	MO #	N	MO #	N
Teacher selected	115	1115	5	1179	1
Not found in the bank	31	1116	1	1181	3
9998	19	1118	13	1184	3
1025	1	1119	1	1185	1
1026	1	1120	1	1186	4
1028	2	1121	1	1187	2
1029	3	1122	7	1188	1
1030	1	1123	3	1193	2
1031	5	1125	3	1203	1
1035	1	1127	2	1205	5
1041	1	1130	1	1206	1
1047	3	1131	5	1208	4
1049	5	1134	4	1209	2
1058	4	1135	6	1210	2
1060	1	1136	4	1211	2
1064	4	1142	5	1214	1
1066	1	1143	9	1215	2
1068	1	1147	2	1223	1
1085	8	1148	3	1225	1
1086	5	1149	2	1227	1
1087	7	1150	3	1232	1
1088	1	1152	1	1233	1
1091	1	1154	1	1234	1
1092	1	1156	2	1235	1
1093	2	1159	1	1237	4
1094	2	1163	1	1238	2
1098	9	1165	7	1239	1
1099	7	1167	4	1247	1
1100	1	1169	2	1249	1
1101	1	1170	5	1254	1
1102	1	1171	3	1256	1
1107	3	1172	1	1261	5
1108	1	1173	4	1262	3
1112	2	1176	2	1263	3
1113	2	1178	1	1265	2

(continues on next page)

Reading Mastery Objectives and Frequency of Use (cont.)

MO #	N	MO #	N	MO #	N
1266	1	1379	1	1453	1
1267	3	1380	2	1456	2
1271	9	1381	3	1458	9
1272	10	1383	2	1459	11
1273	3	1384	3	1460	1
1274	3	1386	2	1461	6
1278	3	1396	2	1463	4
1279	2	1402	1	1464	4
1283	1	1405	1	1466	1
1284	10	1406	1	1467	12
1287	8	1407	1	1470	2
1288	1	1409	3	1471	3
1289	10	1411	1	1472	1
1290	2	1412	1	1473	3
1292	6	1413	1	1475	5
1293	4	1415	4	1476	2
1294	1	1418	1	1477	5
1296	9	1419	2	1478	4
1300	8	1420	2	1479	1
1301	1	1425	3	1480	4
1302	3	1432	1	1482	7
1303	1	1433	3	1483	10
1337	5	1434	1	1484	1
1340	8	1435	4	1487	2
1341	6	1436	5	1490	1
1342	4	1437	3	1491	3
1345	1	1438	13	1492	1
1346	5	1439	1	1493	1
1347	7	1440	1	1494	3
1349	3	1441	11	1495	6
1351	2	1442	2	1498	2
1352	2	1445	3	1500	1
1354	1	1446	10	1501	3
1376	4	1447	3	1502	4
1378	4	1449	7	1503	1

Reading Mastery Objectives and Frequency of Use (cont.)

MO #	N	MO #	N	MO #	N
1507	1	1605	1	1662	1
1508	15	1607	2	1664	1
1509	4	1608	2	1665	4
1511	6	1609	3	1666	1
1512	1	1611	1	1668	1
1513	1	1612	1	1669	1
1514	2	1613	9	1670	1
1515	4	1614	2	1671	1
1517	3	1615	2	1674	3
1518	1	1617	1	1675	4
1519	2	1622	2	1686	3
1520	1	1624	1	1687	7
1521	2	1625	12	1689	1
1526	1	1626	1	1690	1
1528	12	1635	4	1692	2
1529	1	1636	1	1693	1
1530	2	1637	1	1694	1
1531	5	1638	4	1695	1
1532	2	1639	4	1697	1
1535	1	1640	1	1698	2
1536	1	1641	1	1699	2
1542	1	1642	2	1703	1
1544	1	1645	9	1709	2
1545	1	1646	3	1710	2
1547	1	1647	4	1711	6
1550	1	1649	1	1724	1
1553	1	1651	2	1725	2
1574	1	1652	3	1726	2
1575	1	1653	2	1728	2
1576	1	1655	4	1729	2
1579	3	1656	2	1731	2
1591	1	1657	2	1732	1
1601	1	1658	5	1733	1
1602	1	1659	3	1734	4
1603	1	1660	1	1737	1

Reading Mastery Objectives and Frequency of Use (cont.)

MO #	N	MO #	N	MO #	N
1747	1	1827	4	1892	1
1755	1	1828	2	1894	2
1757	1	1830	3	1895	2
1760	2	1831	4	1909	2
1762	2	1832	4	1910	3
1763	1	1833	2	1911	5
1764	1	1837	8	1913	1
1765	1	1838	6	1915	1
1770	1	1840	2	1916	1
1773	1	1841	2	1919	4
1778	1	1842	1	1920	3
1784	4	1844	2	1922	2
1786	1	1846	3	1923	1
1787	11	1847	2	1924	1
1788	2	1848	1	1926	2
1791	2	1849	14	1928	2
1798	1	1850	2	1931	3
1799	6	1851	1	1933	3
1800	1	1852	3	1938	1
1801	5	1853	4	1939	1
1804	13	1856	2	1942	2
1806	1	1857	4	1944	4
1809	1	1859	2	1945	1
1811	1	1860	6	1947	5
1814	6	1861	4	1948	1
1815	2	1864	2	1949	2
1816	7	1868	14	1950	2
1818	5	1870	2	1951	6
1819	1	1871	2	1952	16
1821	2	1876	1	1953	7
1822	2	1879	2	1954	13
1823	7	1886	3	1955	3
1824	4	1888	2	1956	2
1825	1	1889	3	1958	2
1826	2	1891	1	1959	11

Reading Mastery Objectives and Frequency of Use (cont.)

MO #	N	MO #	N	MO #	N
1960	5	2003	1	3960	8
1961	2	2004	6	3963	1
1962	2	2005	9	3967	2
1964	21	2006	1	3968	1
1965	1	2007	1	3969	1
1966	1	2009	1	3972	1
1969	17	2010	5	3973	1
1970	2	2011	1	3974	2
1971	4	2012	3	3975	3
1972	4	2014	1	3977	1
1973	1	2015	19	3978	1
1974	5	2016	4	3980	1
1976	5	2017	1	3983	4
1977	16	2018	4	3984	3
1978	1	2019	10	3991	4
1979	1	2020	1	3994	1
1980	11	2021	4	3999	1
1981	4	2022	1	4001	4
1982	2	2023	4	4004	1
1983	8	2024	4	4014	2
1984	2	2025	3	4015	1
1985	2	2026	1	4016	1
1986	3	2027	5	4018	1
1987	2	2028	1	4019	2
1988	2	2030	4	4020	1
1989	12	2033	2	4021	9
1990	1	2034	1	4022	4
1992	4	2035	6	4023	3
1994	12	2037	16	4024	2
1995	3	2038	1	4027	1
1997	2	2042	1	4028	2
1999	7	2047	1	4030	1
2000	2	3956	1	4031	1
2001	1	3958	2	4032	3
2002	1	3959	1	4033	3

Reading Mastery Objectives and Frequency of Use (cont.)

MO #	N	MO #	N	MO #	N
1960	5	2003	1	3960	8
1961	2	2004	6	3963	1
1962	2	2005	9	3967	2
1964	21	2006	1	3968	1
1965	1	2007	1	3969	1
1966	1	2009	1	3972	1
1969	17	2010	5	3973	1
1970	2	2011	1	3974	2
1971	4	2012	3	3975	3
1972	4	2014	1	3977	1
1973	1	2015	19	3978	1
1974	5	2016	4	3980	1
1976	5	2017	1	3983	4
1977	16	2018	4	3984	3
1978	1	2019	10	3991	4
1979	1	2020	1	3994	1
1980	11	2021	4	3999	1
1981	4	2022	1	4001	4
1982	2	2023	4	4004	1
1983	8	2024	4	4014	2
1984	2	2025	3	4015	1
1985	2	2026	1	4016	1
1986	3	2027	5	4018	1
1987	2	2028	1	4019	2
1988	2	2030	4	4020	1
1989	12	2033	2	4021	9
1990	1	2034	1	4022	4
1992	4	2035	6	4023	3
1994	12	2037	16	4024	2
1995	3	2038	1	4027	1
1997	2	2042	1	4028	2
1999	7	2047	1	4030	1
2000	2	3956	1	4031	1
2001	1	3958	2	4032	3
2002	1	3959	1	4033	3

Reading Mastery Objectives and Frequency of Use (cont.)

MO #	N	MO #	N	MO #	N
4034	6	4083	6	4136	1
4036	2	4084	2	4137	6
4037	1	4086	1	4138	2
4038	1	4087	1	4140	2
4039	2	4088	3	4141	7
4041	7	4089	2	4142	1
4042	1	4091	7	4143	5
4043	2	4092	1	4144	1
4044	3	4093	5	4344	3
4045	2	4094	3	4345	3
4046	1	4095	4	4346	5
4048	2	4096	3	4347	3
4049	1	4097	1	4348	13
4050	1	4102	1	4349	1
4051	3	4104	2	4350	2
4052	2	4105	1	4351	1
4053	2	4107	3	4352	3
4054	3	4110	1	4354	2
4055	11	4111	3	4355	1
4056	7	4113	5	4356	1
4057	7	4114	1	4358	3
4058	1	4115	1	4359	2
4059	1	4116	6	4360	3
4060	5	4118	1	4362	3
4061	1	4119	1	4364	2
4062	1	4123	2	4365	5
4064	1	4124	7	4367	18
4068	6	4125	10	4368	5
4069	6	4127	1	4369	7
4070	6	4128	2	4370	14
4073	4	4131	5	4374	1
4074	3	4132	2	4377	1
4076	2	4133	1	4381	3
4079	5	4134	3	4383	2
4082	4	4135	1	4387	3

Reading Mastery Objectives and Frequency of Use (cont.)

MO #	N	MO #	N	MO #	N
4388	12	4478	3		
4389	3	4479	2		
4390	1	4481	2		
4395	1	4482	6		
4397	3	4487	4		
4399	1	4491	5		
4400	3	4496	8		
4401	1	4497	2		
4402	1	4501	1		
4408	1	4503	1		
4410	2	4505	1		
4416	1	4506	2		
4418	1	4518	2		
4419	1	4524	3		
4420	2	4526	5		
4421	2	4529	2		
4423	1	4534	1		
4424	1	4535	1		
4425	1	Total	2250		
4427	1				
4433	1				
4436	2				
4437	1				
4439	1				
4444	1				
4447	1				
4450	5				
4452	1				
4453	3				
4454	1				
4455	1				
4458	3				
4459	3				
4464	2				
4474	1				

Appendix B

Mathematics Mastery Objectives and Frequency of Use

MO #	N	MO #	N	MO #	N
Teacher selected	94	2108	2	2178	3
Not found in the bank	26	2119	1	2184	1
Not found on contractor MO list	20	2120	3	2186	3
1557	1	2121	3	2187	3
1687	1	2122	3	2188	1
1689	1	2123	1	2190	7
2050	1	2124	1	2193	1
2052	2	2125	8	2195	7
2054	4	2126	3	2197	2
2055	4	2127	1	2206	1
2056	2	2128	2	2207	2
2058	2	2130	10	2209	1
2059	15	2132	1	2210	1
2060	4	2135	3	2211	1
2061	2	2137	1	2213	12
2064	1	2139	1	2214	5
2066	2	2140	1	2215	2
2067	1	2141	3	2216	3
2070	4	2146	6	2217	2
2071	3	2150	6	2218	4
2076	4	2151	2	2219	9
2077	1	2152	11	2220	3
2078	2	2153	15	2221	2
2079	5	2154	1	2222	2
2080	3	2155	2	2224	1
2084	3	2157	2	2225	2
2086	3	2163	1	2233	2
2089	2	2165	2	2235	3
2091	1	2166	1	2236	6
2100	6	2168	1	2237	4
2101	3	2169	1	2238	3
2104	1	2170	1	2239	4
2105	3	2171	1	2240	5
2106	5	2173	2	2241	3
2107	3	2174	2	2242	2

Mathematics Mastery Objectives and Frequency of Use (cont)

MO #	N	MO #	N	MO #	N
2243	8	2310	1	2353	2
2244	2	2313	2	2354	3
2245	4	2314	2	2355	1
2247	1	2316	2	2356	1
2248	2	2317	1	2358	8
2250	3	2318	2	2359	7
2252	4	2319	3	2360	2
2253	7	2320	6	2361	2
2254	2	2321	5	2362	2
2256	1	2322	3	2364	1
2257	5	2323	9	2365	3
2258	1	2325	2	2366	1
2269	4	2326	6	2372	2
2270	3	2327	14	2374	1
2271	2	2328	1	2377	1
2272	1	2329	1	2378	1
2275	1	2330	3	2379	1
2278	1	2331	4	2380	2
2283	2	2332	1	2383	1
2284	2	2333	2	2384	1
2285	1	2334	2	2385	2
2289	3	2335	4	2387	3
2290	1	2337	9	2389	3
2291	1	2338	1	2391	3
2295	5	2340	5	2393	4
2296	1	2342	9	2397	1
2297	5	2343	1	2399	1
2299	1	2344	2	2403	1
2300	2	2345	19	2405	4
2302	8	2346	2	2406	3
2303	6	2347	7	2407	3
2304	2	2348	6	2408	4
2305	5	2350	1	2409	1
2306	3	2351	1	2412	2
2309	2	2352	3	2413	3

Mathematics Mastery Objectives and Frequency of Use (cont)

MO #	N	MO #	N	MO #	N
2415	2	2496	5	2554	1
2416	5	2497	2	2556	3
2417	3	2499	1	2557	1
2418	2	2500	1	2560	1
2419	6	2501	1	2562	2
2420	3	2502	1	2564	1
2421	1	2503	1	2566	2
2426	4	2504	1	2567	1
2427	1	2505	3	2569	1
2428	1	2506	2	2572	1
2434	1	2508	2	2574	1
2439	1	2509	2	2583	2
2444	3	2510	1	2586	1
2445	3	2511	3	2587	6
2446	1	2512	2	2589	6
2447	2	2513	2	2590	4
2448	4	2514	2	2592	4
2451	3	2515	1	2593	9
2460	1	2517	6	2594	1
2461	1	2518	4	2595	6
2464	1	2519	1	2596	3
2465	1	2520	1	2597	1
2468	2	2521	3	2599	1
2470	3	2523	6	2600	2
2471	1	2524	4	2602	7
2472	1	2525	1	2603	6
2480	2	2526	2	2604	1
2481	3	2528	1	2608	1
2482	1	2529	1	2609	1
2483	1	2535	1	2611	1
2484	2	2538	2	2615	1
2487	1	2548	4	2620	1
2493	1	2549	1	2633	2
2494	3	2550	2	2636	5
2495	4	2551	2	2642	1

Mathematics Mastery Objectives and Frequency of Use (cont)

MO #	N	MO #	N	MO #	N
2643	1	2691	1	2750	1
2646	4	2692	1	2751	1
2647	5	2693	13	2754	2
2655	1	2694	3	2755	3
2656	1	2696	3	2760	1
2657	1	2698	2	2762	5
2658	3	2699	2	2763	3
2659	8	2700	1	2764	6
2660	3	2701	5	2765	2
2661	2	2702	9	2768	9
2662	4	2703	4	2769	3
2663	1	2704	2	2770	3
2664	2	2705	1	2771	2
2667	1	2706	14	2773	6
2668	1	2707	4	2774	12
2669	1	2710	4	2775	1
2670	2	2715	4	2776	9
2672	3	2716	7	2777	9
2673	12	2717	1	2778	4
2675	1	2720	2	2779	2
2676	1	2721	2	2780	3
2677	2	2723	3	2781	5
2678	4	2724	1	2782	5
2679	1	2732	2	2783	5
2680	7	2734	1	2784	5
2681	2	2736	2	2785	1
2682	2	2737	3	2788	1
2683	1	2739	1	2789	1
2684	1	2740	1	2790	5
2685	7	2743	1	2792	1
2686	2	2744	1	2797	1
2687	7	2745	2	2799	6
2688	4	2747	1	2800	2
2689	4	2748	1	2802	1
2690	1	2749	1	2806	1

Mathematics Mastery Objectives and Frequency of Use (cont)

MO #	N	MO #	N	MO #	N
2807	3	2858	2	2897	4
2808	2	2859	6	2898	3
2809	1	2860	6	2899	2
2811	7	2861	3	2901	6
2812	6	2862	3	2902	7
2816	2	2863	2	2903	1
2817	1	2864	8	2904	5
2819	6	2865	4	2906	1
2820	1	2866	8	2908	1
2821	2	2867	3	2909	1
2822	1	2868	2	2911	1
2823	2	2869	9	2912	2
2825	2	2870	4	2916	2
2826	4	2871	7	2918	1
2827	3	2872	12	2920	1
2829	1	2873	27	2922	1
2832	1	2874	1	2924	4
2833	1	2875	13	2925	2
2834	8	2876	1	2926	4
2835	4	2877	2	2929	2
2836	7	2878	14	2932	1
2837	4	2879	4	2935	1
2838	12	2880	8	2937	6
2839	4	2881	2	2938	1
2840	5	2882	6	2943	1
2841	1	2883	4	2944	8
2842	3	2884	5	2945	3
2845	1	2885	1	2946	10
2846	3	2887	13	2947	3
2847	2	2888	1	2948	5
2848	3	2892	2	3917	1
2851	3	2893	1	3920	4
2855	8	2894	2	3922	1
2856	4	2895	1	3924	1
2857	7	2896	3	3926	2

Mathematics Mastery Objectives and Frequency of Use (cont)

MO #	N	MO #	N	MO #	N
3928	1	3994	1	4047	9
3931	2	3997	8	4048	5
3935	2	3998	1	4049	2
3936	1	3999	4	4051	1
3937	1	4000	1	4052	2
3939	2	4001	5	4054	3
3942	1	4003	5	4055	3
3943	2	4004	2	4056	10
3945	1	4005	1	4057	1
3948	1	4006	2	4058	2
3951	2	4010	2	4059	4
3959	1	4012	2	4060	3
3960	1	4014	1	4061	3
3962	1	4015	3	4062	5
3964	10	4016	6	4063	1
3965	5	4017	1	4064	7
3966	8	4018	1	4065	3
3967	2	4020	4	4066	4
3968	4	4025	1	4067	3
3969	4	4026	1	4068	1
3970	9	4027	3	4069	1
3971	6	4029	2	4070	7
3972	6	4030	1	4071	2
3973	1	4033	1	4072	5
3974	1	4034	1	4073	2
3975	2	4035	2	4074	1
3976	3	4037	1	4075	2
3977	1	4038	1	4076	1
3978	2	4039	3	4077	11
3983	1	4040	3	4078	2
3984	2	4041	1	4079	8
3986	2	4042	1	4080	5
3989	1	4044	1	4081	5
3990	1	4045	2	4082	1
3991	2	4046	1	4083	8

Mathematics Mastery Objectives and Frequency of Use (cont)

MO #	N	MO #	N	MO #	N
4084	3	4244	2	4312	5
4085	10	4245	1	4316	1
4086	8	4248	1	4319	1
4087	1	4253	5	4321	2
4088	3	4254	1	4322	8
4089	3	4255	3	4323	1
4090	1	4256	1	4324	2
4202	1	4257	5	4325	1
4204	4	4258	2	4326	2
4206	13	4259	3	4327	1
4207	14	4262	1	4329	2
4209	4	4264	1	4332	4
4210	10	4266	3	4333	2
4211	1	4267	2	4334	2
4212	3	4268	1	4340	1
4213	2	4269	1	Total	2308
4214	2	4270	4		
4215	5	4271	4		
4216	1	4272	3		
4217	3	4273	3		
4218	8	4275	1		
4219	2	4276	1		
4220	2	4277	1		
4222	6	4287	2		
4223	4	4292	2		
4224	1	4294	3		
4226	1	4295	1		
4227	7	4301	2		
4228	6	4302	1		
4230	3	4303	1		
4232	1	4305	1		
4233	1	4306	1		
4240	2	4308	1		
4241	1	4309	2		
4243	1	4310	1		

Appendix C
Reading MOs Rated No Content Centrality

MO #	MO #	MO #
1120	3991	4131
1181	3994	4133
1193	3999	4134
1337	4001	4140
1354	4014	4141
1509	4016	4142
1535	4018	4143
1670	4048	Examiner
1689	4049	
1815	4050	
1821	4051	
1822	4053	
1853	4054	
1864	4055	
1871	4056	
1978	4057	
1992	4058	
2010	4059	
3956	4060	
3958	4061	
3959	4062	
3960	4064	
3963	4068	
3967	4069	
3968	4070	
3969	4073	
3972	4074	
3973	4076	
3974	4079	
3975	4093	
3975	4094	
3977	4114	
3978	4124	
3983	4125	
3984	4127	

Appendix D
Mathematics MOs Rated No Content Centrality

MO #
2253
2359
2495
2664
2687
2783
2916
2922
3917
3920
3926
3931
3935
3937
3939
3943
3945
3948
3964
3971
3972
3973
3974
3975
3976
3978
3983
3984
3986
3991
4001
4003
4322
MO not found
Examiner

Some of the MOs are not included in the following list. There were 44 MOs with no grade level reference, 355 MOs referenced to below grade level, and 20 MOs that could not be found in the state provided database.

3rd Grade

Standard	Topic	Indicator	Number of MOs
General Reading Processes			
	Phonics: Students will apply their knowledge of letter/sound relationships and word structure to decode unfamiliar words		
		Use a variety of phonetic skills to read unfamiliar words	
		Decode words in grade-level texts	2
	Fluency: Students will read orally with accuracy and expression at a rate that sounds like speech		
		Read orally from familiar text at an appropriate rate	
		Read grade-level text accurately	3
		Read grade level text with expression	
	Vocabulary: Students will use a variety of strategies and opportunities to understand word meaning and to increase vocabulary		
		Develop and apply vocabulary through exposure to a variety of texts	
		Develop a conceptual understanding of new words	28
		Understand, acquire, and use new vocabulary	9
	Comprehension: Students will use a variety of strategies to understand what they read (construct meaning)		
		Develop comprehension skills through exposure to a variety of texts	
		Use strategies to prepare for reading (before reading)	20
		Use strategies to make meaning from text (during reading)	3
		Use strategies to demonstrate understanding of the text (after reading)	15
Comprehension of Informational Text			
	Students will read, comprehend, interpret, analyze, and evaluate informational texts		

		Develop comrehension skills by reading a variety of self-selected and assigned informational texts	20
		Identify and use text features to facilitate understanding of informational texts	14
		Develop knowledge of organizational structure of informational text to understand what is read	5
		Determine important ideas and messages in informational texts	10
		Identify and explain the author's use of language	
		Read critically to evaluate informational text	
Comprehension of Literary Text			
	Students will read, comprehend, interpret, analyze, and evaluate literary texts		
		Develop comprehension skills by reading a variety of self-selected and assigned literary texts	
		Use text features to facilitate understanding of literary texts	8
		Use elements of narrative texts to facilitate understanding	22
		Use elements of poetry to facilitate understanding	1
		Use elements of drama to facilitate understanding	4
		Determine important ideas and messages in literary texts	11
		Identify and describe the author's use of language	2
		Read critically to evaluate literary texts	.

4th Grade

General Reading Processes			.
	Phonics: Students will apply their knowledge of letter/sound relationships and word structure to decode unfamiliar words		.
		Use a variety of phonetic skills to read unfamiliar words	2
	Fluency		.
		Read orally at an appropriate rate	.
		Read grade-level text with both high accuracy and appropriate pacing, intonation, and expression	1
	Vocabulary		.
		Develop and apply vocabulary through exposure to a variety of texts	.
		Develop a conceptual understanding of new words	42
		Understand, acquire, and use new vocabulary	17
	Comprehension: Students will use a variety of strategies to understand what they read (construct meaning)		.

		Develop comprehension skills through exposure to a variety of texts	.
		Use strategies to prepare for reading (before reading)	21
		Use strategies to make meaning from text (during reading)	11
		Use strategies to demonstrate understanding of the text (after reading)	21
Comprehension of Informational Text			.
	Students will read, comprehend, interpret, analyze, and evaluate informational texts		.
		Develop comprehension skills by reading a variety of self-selected and assigned print and electronic informational texts	1
		Identify and use text features to facilitate understanding of informational texts	20
		Develop knowledge of organizational structure of informational text to understand what is read	.
		Determine important ideas and messages in informational texts	13
		Identify and explain the author's use of language	.
		Read critically to evaluate informational text	.
Comprehension of Literary Text			.
	Students will read, comprehend, interpret, analyze, and evaluate literary texts		.
		Develop comprehension skills by reading a variety of self-selected and assigned literary texts	.
		Use text features to facilitate understanding of literary texts	13
		Use elements of narrative texts to facilitate understanding	26
		Use elements of poetry to facilitate understanding	5
		Use elements of drama to facilitate understanding	.
		Determine important ideas and messages in literary texts	.
		Identify and describe the author's use of language	.
		Read critically to evaluate literary texts	.

5th Grade

General Reading Processes			.
	Fluency: Students will read orally with accuracy and expression at a rate that sounds like speech		.
		Read orally at an appropriate rate	.
		Read grade-level text with both high accuracy and appropriate pacing, intonation, and expression	6
	Vocabulary: Students will use a variety of strategies		.

	and opportunities to understand word meaning and to increase vocabulary		
		Develop and apply vocabulary through exposure to a variety of texts	.
		Develop and apply a conceptual undertanding of new words	47
		Understand, acquire, and use new vocabulary	30
	General Reading Comprehension		.
		Develop and apply comprehension skills through exposure to a variety of texts, including traditional print and electronic texts	.
		Use strategies to prepare for reading (before reading)	22
		Use strategies to make meaning from text (during reading)	14
		Use strategies to demonstrate understand of the text (after reading)	26
Comprehension of Informational Text			.
	Students will read, comprehend, interpret, analyze, and evaluate informational texts		.
		Develop and apply comprehension skills by reading a variety of self-selected and assigned print and electronic informational texts	21
		Identify and use text features to facilitate understanding of informational texts	23
		Develop and apply knowledge of organizational structure of informational text to understand what is read	5
		Determine and analyze important ideas and messages in informational texts	22
		Identify and explain the author's use of language	1
		Read critically to evaluate informational text	.
Comprehension of Literary Text			.
	Students will read, comprehend, interpret, analyze, and evaluate literary texts		.
		Develop and apply comprehension skills by reading a variety of self-selected and assigned literary texts	.
		Analyze text features to facilitate understanding of literary texts	20
		Analyze elements of narrative texts to facilitate understanding of interpretation	24
		Analyze elements of poetry to facilitate understanding and interpretation	2
		Analyze elements of drama to facilitate understanding	1
		Determine important ideas and messages in literary texts	23

		Identify and describe the author's use of language	3
		Read critically to evaluate literary texts	1
6th Grade			
General Reading Processes			.
	Fluency: Students will read orally with accuracy and expression at a rate that sounds like speech		.
		Read orally at an appropriate rate	.
		Read grade-level text with both high accuracy and appropriate pacing, intonation, and expression	1
	Vocabulary: Students will use a variety of strategies and opportunities to understand word meaning and to increase vocabulary		.
		Develop and apply vocabulary through exposure to a variety of texts	.
		Apply a conceptual understanding of new words	23
		Understand, acquire, and use new vocabulary	17
	General Reading Comprehension		.
		Develop and apply comprehension skills through exposure to a variety of texts, including traditional print and electronic texts	.
		Use strategies to prepare for reading (before reading)	9
		Use strategies to make meaning from text (during reading)	8
		Use strategies to demonstrate understanding of the text (after reading)	33
Comprehension of Informational Text			.
	Students will read, comprehend, interpret, analyze, and evaluate informational texts		.
		Develop and apply comprehension skills by reading a variety of self-selected and assigned print and electronic informational texts	.
		Identify and use text features to facilitate understanding of informational texts	.
		Develop and apply knowledge of organizational structure of informational text to facilitate understanding	2
		Determine and analyze important ideas and messages in informational texts	8
		Analyze purposeful use of language	.
		Read critically to evaluate informational text	.
Comprehension of Literary Text			.
	Students will read, comprehend, interpret, analyze, and evaluate literary texts		.

	Develop and apply comprehension skills by reading and analyzing a variety of self-selected and assigned literary texts	5
	Analyze text features to facilitate understanding of literary texts	23
	Analyze elements of narrative texts to facilitate understanding of interpretation	12
	Analyze elements of poetry to facilitate understanding and interpretation	.
	Analyze elements of drama to facilitate understanding	1
	Determine important ideas and messages in literary texts	10
	Analyze the author's purposeful use of language	1
	Read critically to evaluate literary texts	.

7th Grade

General Reading Processes		.
	Fluency: Students will read orally with accuracy and expression at a rate that sounds like speech	.
	Read orally at an appropriate rate	1
	Read grade-level text with both high accuracy and appropriate pacing, intonation, and expression	4
	Vocabulary: Students will use a variety of strategies and opportunities to understand word meaning and to increase vocabulary	.
	Develop and apply vocabulary through exposure to a variety of texts	.
	Apply a conceptual understanding of new words	47
	Understand, acquire, and use new vocabulary	30
	General Reading Comprehension	.
	Apply comprehension skills through exposure to a variety of texts, including traditional print and electronic texts	.
	Use strategies to prepare for reading (before reading)	19
	Use strategies to make meaning from text (during reading)	10
	Use strategies to demonstrate understanding of the text (after reading)	19
Comprehension of Informational Text		.
	Students will read, comprehend, interpret, analyze, and evaluate informational texts	.
	Apply comprehension skills by selecting, reading, and interpreting a variety of print and electronic informational texts	37
	Analyze text features to facilitate understanding of	.

		informational texts	
		Apply knowledge of organizational patterns of informational text to facilitate understanding	6
		Analyze important ideas and messages in informational texts	24
		Analyze purposeful use of language	3
		Read critically to evaluate informational text	1
Comprehension of Literary Text			.
	Students will read, comprehend, interpret, analyze, and evaluate literary texts		.
		Apply comprehension skills by reading and analyzing a variety of self-selected and assigned literary texts	.
		Analyze text features to facilitate understanding of literary texts	17
		Analyze elements of narrative texts to facilitate understanding of interpretation	22
		Analyze elements of poetry to facilitate understanding and interpretation	4
		Analyze elements of drama to facilitate understanding and interpretation	3
		Analyze important ideas and messages in informational texts	18
		Analyze the author's purposeful use of language	3
		Read critically to evaluate literary texts	.

8th Grade

General Reading Processes			.
	Fluency: Students will read orally with accuracy and expression at a rate that sounds like speech		.
		Read orally at an appropriate rate	.
		Read-grade level text with both accuracy and appropriate pacing, intonation, and expression	.
	Vocabulary		.
		Develop and apply vocabulary through exposure to a variety of texts	.
		Apply and refine a conceptual understanding of new words	61
		Understand, acquire, and use new vocabulary	52
	General Reading Comprehension		.
		Apply and refine comprehension skills through exposure to a variety of texts, including traditional print and electronic texts	.
		Use strategies to prepare for reading (before reading)	29
		Use strategies to make meaning from text (during	25

reading)

Comprehension of Informational Text		Use strategies to demonstrate understanding of the text (after reading)	42
			.
	Students will read, comprehend, interpret, analyze, and evaluate informational texts		.
		Apply and refine comprehension skills through exposure to a variety of texts, including traditional print and electronic texts	27
		Analyze text features to facilitate and extend understanding of informational texts	35
		Apply knowledge of organizational patterns of informational text to facilitate understanding and analysis	10
		Analyze important ideas and messages in informational texts	26
		Analyze purposeful use of language	3
		Read critically to evaluate informational text	1
Comprehension of Literary Text			.
	Studens will read, comprehend, interpret, analyze, and evaluate literary texts		.
		Refine comprehension skills by reading and analyzing a variety of self-selected and assigned literary texts	1
		Analyze and evaluate text features to facilitate and extend understanding of literary texts	23
		Analyze and evaluate elements of narrative texts to facilitate understanding and interpretation	38
		Analyze and evaluate elements of poetry to facilitate understand and interpretation	6
		Analyze and evaluate elements of drama to facilitate understanding and interpretation	6
		Analyze and interpret important ideas and messages in literary texts	25
		Analyze and evaluate the author's purposeful use of language	4
		Read critically to evaluate literary texts	.
10th Grade			
English			.
	Reading, Reviewing and Responding to Texts		.
		The student will use effective strategies before, during, and after reading, viewing, and listening to self-selected and assigned materials.	228
		The student will construct, examine, and extend meaning of traditional and contemporary works recognized as having significant literary merit.	40

	The student will evaluate textual changes in a work and explain how these changes alter tone, clarify meaning, address a particular audience, or fulfill a purpose.	.
Evaluating the Content, Organization, and Language Use of Texts		.
	The student will describe the effect that a given text, heard or read, has on a listener or reader.	6
	The student will assess the effectiveness of choice of details, organizational pattern, word choice, syntax, use of figurative language, and rhetorical devices.	3

Math Grade Level Content Standards and Number of Mastery Objectives that Aligned

Some of the MOs are not included in the following list. There were 14 MOs with no grade level reference, 1 MOs referenced to below grade level, and 26 MOs that could not be found in the state provided database.

3rd Grade

Standard	Topic	Indicator	Number of MOs
Knowledge of Algebra, Patterns, and Functions			
	Patterns and Functions		
		Identify, describe, extend, and create numeric patterns and functions	38
		identify, describe, extend, and create non-numeric patterns or repeating patterns	
	Expressions, Equations, and Inequalities		
		Write and identify expressions	
		Identify, write, solve, and apply equations, and inequalities	4
	Numeric and Graphic Representations of Relationships		
		Locate points on a number line	9
Knowledge of Geometry			
	Plane Geometric Figures		
		Analyze the properties of plane geometric figures	24
		Analyze geometric relationships	
	Solid Geometric Figures		
		Analyze the properties of solid geometric figures	17
	Representation of Geometric Figures		
		Prepresent plane geometric figures	5
	Congruence		
		Analyze congruent figures	5
	Transformations		
		Analyze a transformation	

Knowledge of Measurement		Analyze geometric figures and pictures	
	Measurement Units		
		Read customary and metric measurement units	39
	Measurement Tools		
		Measure in customary and metric units	11
	Applications in Measurement		
		Apply measurement concepts Calculate equivalent measurements	
	Data Analysis		
		Analyze data	47
Knowledge of Statistics			
	Data Displays		
		Collect, organize, and display data	
Knowledge of Probability			
	Sample Space		
		Identify possible outcomes	
	Theoretical Probability		
		Identify the probability of an event	
Knowledge of Number Relationships and Computation/Arithmetic			
	Knowledge of Number and Place Value		
		Apply knowledge of whole numbers and place value	16
		Apply knowledge of fractions	1
		Apply knowledge of Money	26
	Number Theory		
		Apply number relationships	4
	Number Computation		
		Analyze number relations and compute	3
		Estimation	
Processes of Mathematics			
	Problem Solving		
		Apply a variety of concepts, processes, and skills to solve	

		problems	
	Reasoning		
		Justify ideas or solutions with mathematical concepts or proofs	
	Communication		
		Present mathematical ideas using words, symbols, visual displays, or technology	
	Connections		
		Relate or apply mathematics within the discipline, to other disciplines, and to life	
4th Grade			
Knowledge of Algebra, Patterns, and Functions			
	Patterns and Functions		
		Identify, describe, extend, and create numeric patterns and functions	50
	Expressions, Equations, and Inequalities		
		Write and identify expressions Identify, write, solve, and apply equations and inequalities	
	Numeric and Graphic Representations of Relationships		
		Locate points on a number line and in a coordinate grid	3
Knowledge of Geometry			
	Plane Geometric Figures		
		Analyze the properties of plane geometric figures	29
	Solid geometric figures		
		Analyze the properties of solid geometric figures	12
		Analyze the relationship between plane geometric figures and surfaces of solid geometric figures	
	Representation of Geometric Figures		
		Represent plane geometric figures	4
	Congruence		
		Analyze geometric figures	6
	Transformation		
		Analyze a transformation	3

Knowledge of Measurement

    Measurement Units

        Read customary and metric measurement units   49

        Calculate equivalent measurements

    Measurement Tools

        Measure in customary and metric units   1

        Compare right angles to a corner

    Applications in Measurement

        Apply measurement concepts   2

Knowledge of Statistics

    Data Displays

        Collect, organize, and display data

    Data Analysis

        Analyze data   52

        Describe a set of data   2

Knowledge of Probability

    Theoretical Probability

        Determine the probability of one simple event comprised of equally likely outcomes

Knowledge of Number Relationships and Computation/Arithmetic

    Knowledge of Number and Place Value

        Apply knowledge of whole numbers and place value   22

        Apply knowledge of fractions and decimals   2

        Apply knowledge of money   19

    Number Theory

        Apply number relationships

    Number Computation

        Analyze number relations and compute   9

        Estimation

Processes of Mathematics

    Problem Solving

        Apply a variety of concepts, processes, and skills to solve

		problems	
	Reasoning		
		Justify ideas or solutions with mathematical concepts or proofs	
	Communication		
		Present mathematical ideas using words, symbols, visual displays, or technology	
	Connections		
		Relate or apply mathematics within the discipline, to other disciplines, and to life	
5th Grade			
Knowledge of Algebra, Patterns, and Functions			
	Patterns and Functions		
		Identify, describe, extend, and create numeric patterns and functions	45
	Expressions, Equations, and Inequalities		
		Write and identify expressions Identify, write, solve, and apply equations and inequalities	19
	Numeric and Graphic Representations of Relationships		
		Locate points on a number ine and in a coordinate grid	9
Knowledge of Geometry			
	Plane Geometric Figures		
		Analyze the properties of plane geometric figures	23
		Analyze geometric relationships	
	Solid Geometric Figures		
		Analyze the properties of solid geometric figures	23
		Analyze the relationship between plane geometric figures and faces of solid geometric figures	
	Representation of Geometric Figures		
		Represent plane geometric figures	6
	Congruence and Similarity		
		Analyze similar figures	12
	Transformation		

		Analyze a transformation	7
Knowledge of Measurement			
	Measurement Units		
		Read customary and metric measurement units	61
	Measurement Tools		
		Measure in customary and metric units	6
		Measure Angles	1
	Applications in Measurement		
		Estimate and apply measurement formulas	8
		Calculate equivalent measurements	
Knowledge of Statistics			
	Data Displays		
		Collect, organize, and display data	
	Data Analysis		
		Analyze Data	73
		Describe a set of data	3
Knowledge of Probability			
	Sample Space		
		Identify possible outcomes	
	Theoretical Probability		
		Determine if the probability of one simple event comprised of equally likely outcomes	
Knowledge of Number Relationships and Computation/Arithmetic			
	Knowledge of Number and Place Value		
		Apply knowledge of fractions, decimals, and place value	59
	Number Theory		
		Apply number relationships	
	Number Computation		
		Analyze number relations and compute	19
		Estimation	
Processes of Mathematics			
	Problem Solving		

	Reasoning	Apply a variety of concepts, processes, and skills to solve problems	
	Communication	Justify ideas or solutions with mathematical concepts or proofs	
	Connections	Present mathematical ideas using words, symbols, visual displays, or technology	
		Relate or apply mathematics within the discipline, to other disciplines, and to life	
6th Grade			
Knowledge of Algebra, Patterns, and Functions			
	Patterns and Functions		
	Expressions, Equations, and Inequalities	Identify, describe, extend, and create numeric patterns and functions	27
		Write and evaluate expressions Identify, write, solve, and apply equations and inequalities	7
	Numeric and Graphic Representation of Relationships		
		Locate points ona number line and in a coordinate plane	2
		Analyze linear relationships	
Knowledge of Geometry			
	Plane Geometric Figures		
		Analyze the properties of plane geometric figures	27
	Representation of Geometric Figures	Analyze geometric relationships	
		Represent plane geometric figures	2
	Congruence and Similarity		
		Analyze congruent figures	5
	Transformations		
		Analyze a transformation on a coordinate plane	3
Knowledge of Measurement			

	Measurement Tools		
		Measure in customary and metric units	1
		Measure angles in polygons	5
	Applications in Measurement		
		Estimate and apply measurement formulas	32
Knowledge of Statistics			
	Data Displays		
		Organize and display data	
	Data Analysis		
		Analyze Data	33
		Describe a set of data	2
Knowledge of Probability			
	Theoretical Probability		
		Determine the probability of one simple eent comprised of equally likely outcomes	
	Experimental Probability		
		Analyze the results of a probability experiment	
Knowledge of Number Relationships and Computation/Arithmetic			
	Knowledge of Number and Place Value		
		Apply knowledge of rational numbers and place value	28
	Number Theory		
		Apply number relationships	5
	Number Computation		
		Analyze number relations and compute	
		Estimation Analyze ratios, proportions, or percents	
Processes of Mathematics			
	Problem Solving		
		Apply a variety of concepts, processes, and skills to solve problems	
	Reasoning		
		Justify ideas or solutions with mathematical concepts or proofs	

	Communication		
		Present mathematical ideas using words, symbols, visual displays, or technology	
	Connections		
		Relate or apply mathematics within the discipline, to other disciplines, and to life	
7th Grade			
Knowledge of Algebra, Patterns, and Functions			
	Patterns and Functions		
		Identify, describe, extend, and create linear patterns and functions	39
	Expressions, Equations, and Inequalities		
		Write and evaluate expressions Identify, write, solve, and apply equations and inequalities	18
	Numeric and Graphic Representations of Relationships		
		Locate points on a number line and in a coordinate plane	5
		Analyze linear relationships	1
Knowledge of Geometry			
	Plane Geometric Figures		
		Analyze the properties of plane geometric figures	19
		Analyze geometric relationships	6
	Representation of Geometric Figures		
		Represent plane geometric figures	8
	Congruence and Similarity		
		Apply the properties of congruent polygons	10
	Transformations		
		Analyze a transformation on a coordinate plane	8
Knowledge of Measurement			
	Applications in Measurement		
		Estimate and apply measurement formulas	61
		Analyze measurement relationships	5
Knowledge of Statistics			

	Data Displays		
		Organize and display data	
	Data Analysis		
		Analyze data	59
		Describe a set of data	5
Knowledge of Probability			
	Sample Space		
		Identify a sample space	
	Theoretical Probability		
		Determine the probability of an event comprised of no more than 2 independent events	
	Experimental Probability		
		Analyze the results of a survey or simulation	
Knowledge of Number Relationships and Computation/Arithmetic			
	Knowledge of Place Value		
		Apply knowledge of rational numbers and place value	46
	Number Computation		
		Analyze number relations and compute	20
		Estimation Analyze ratios, proportions, or percents	
Processes of Mathematics			
	Problem Solving		
		Apply a variety of concepts, processes, and skills to solve problems	
	Reasoning		
		Justify ideas or solutions with mathematical concepts or proofs	
	Communication		
		Present mathematical ideas using words, symbols, visual displays, or technology	
	Connections		
		Relate or apply mathematics within the discipline, to other disciplines, and to life	
8th Grade			

Knowledge of Algebra, Patterns, and Functions

	Patterns and Functions		
		Identify, describe, extend, and create patterns, functions, and sequences	56
	Expressions, Equations, and Inequalities		
		Write, simplify, and evaluate expressions	
		Identify, write, solve, and apply equations and inequalities	33
	Numeric and Graphic Representations of Relationships		
		Locate points on a number line and in a coordinate plane	17
		Analyze linear relationships	

Knowledge of Geometry

	Properties of Plane Geometric Figures		
		Analyze the properties of plane geometric figures	49
		Analyze geometric relationships	23
	Representation of Geometric Figures		
		Represent plane geometric figures	12
	Congruence and Similarity		
		Apply the properties of similar polygons	10
	Transformations		
		Analyze a transformation on a coordinate plane	13

Knowledge of Measurement

	Applications in Measurement		
		Estimate and apply measurement formulas	85
		Analyze measurement relationships	19

Knowledge of Statistics

	Data Displays		
		Organize and display data	
	Data Analysis		
		Analyze Data	105

Knowledge of Probability

	Sample Space		
		Identify a sample space	
	Theoretical Probability		
		Determine the probability of an event comprised of no more than 2 independent events	
		Determine the probability of a second event that is dependent on a first event of equally likely outcomes	
	Experimental Probability		
		Analyze the results of a survey or simulation	
Knowledge of Number Relationships and Computation/Arithmetic			
	Knowledge of Number and Place Value		
		Apply knowledge of rational numbers and place value	66
	Number Computation		
		Analyze number relations and compute	38
		Estimation Analyze ratios, proportions, or percents	
Processes of Mathematics			
	Problem Solving		
		Apply a variety of concepts, processes, and skills to solve problems	
	Reasoning		
		Justify ideas or solutions with mathematical concepts or proofs	
	Communication		
		Present mathematical ideas using words, symbols, visual displays, or technology	
	Connections		
		Relate or apply mathematics within the discipline, to other disciplines, and to life	
10th Grade			
Mathematics			
	Functions and Algebra		
		The student will analyze a wide	99

	variety of patterns and functional relationships using the language of mathematics and appropriate technology	
	The student will model and interpret real-world situations using the language of mathematics and appropriate technology	34
Geometry, Measurement, And Reasoning		
	The student will represent and analyze two- and three-dimensional figures using tools and technology when appropriate	69
	The student will apply geometric properties and relationships to solve problems using tools and technology when appropriate	9
	The student will apply concepts of measurement using tools and technology when appropriate	62
Data Analysis And Probability		
	The student will collect, organize, analyze, and present data	69
	The student will apply the basic concepts of statistics and probability to predict possible outcomes of real-world situations	