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ABSTRACT

The University of Oregon (UO) and Captain Robert Gray Elementary School formed a partnership where UO students used the elementary school as a case study for curriculum research. This document gives an overview of the 7-step process the students used to align the school's curriculum with Oregon's content and performance standards. The text opens with what curriculum aligners need to get started and provides information on the content standards timeline, the Oregon statewide assessment system, scoring guides, and the state-test schedule. The booklet then outlines the step-by-step process of curriculum alignment. These steps are: (1) "collect your school's Oregon statewide assessment data"; (2) "chart your school's assessment data by content-standard strand"; (3) analyze the data; (4) write a school-improvement goal and develop activities to carry out that goal based on analysis of the data; (5) develop content-standard strand booklets for each content-standard strand; (6) map content-standard strand by month; and (7) align textbook and other teacher resources using a month-by-month curriculum map. After teachers have completed the process, they can begin to compare their curriculum maps with those of other teachers. The activity should occur across grade levels and even across school levels. A statistics and probability chart and curriculum mapping form are included. (RJM)

A Seven-Step Process to Align Curriculum with Oregon State Content Standards

Nancy Golden
Marilyn Lane

DEPARTMENT OF EDUCATIONAL LEADERSHIP, TECHNOLOGY, AND ADMINISTRATION
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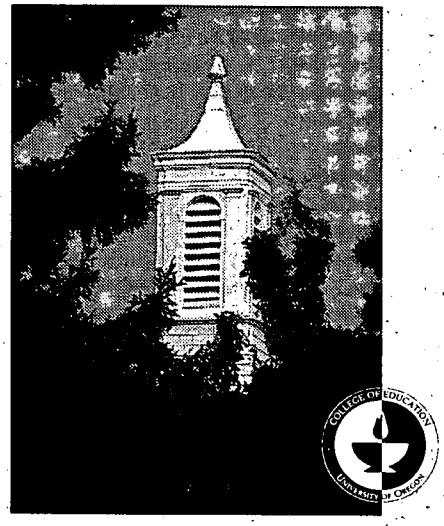

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Abstract

A key feature of the Oregon Educational Act for the Twenty-first Century is new, high state standards. These standards tell us what our students need to know and be able to do. In order to assure that our students reach these standards, we must teach to the standards. This requires aligning the curriculum to the standards. In this publication readers are given an easy seven-step process for this alignment.

In addition, readers will learn about a unique university and school district partnership in this publication. The students in the University of Oregon curriculum foundation course aligned the math curriculum for Captain Robert Gray Elementary School in Astoria, Oregon. This gave the university students a live case to use in their class and gave Gray Elementary the tremendous assistance of a skillfully aligned math curriculum. Partnerships such as this one are critical in the age of diminishing resources.

A Seven-Step Process to Align Curriculum with Oregon State Content Standards

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A Seven-Step Process to Align Curriculum with Oregon State Content Standards

A Seven-Step Process to Align Curriculum with Oregon State Content Standards

Section 1: A Tribute to School-University Partnerships

The University of Oregon and Captain Robert Gray Elementary School formed a partnership as UO students enrolled in a summer session curriculum foundations class used Gray Elementary School in Astoria, Oregon as a live case study. The class learned a seven-step process to align curriculum with Oregon's content and performance standards. The students used Gray Elementary School's 1997 Oregon statewide assessment data and the school's math textbooks to learn the process and align Gray's curriculum in two math domains. Upon examining the work completed over the summer at their first inservice, Gray Elementary School teachers delighted in having much of their curriculum alignment work completed for them, allowing Gray Elementary's teachers to spend more time on instructional planning.

In the age of diminishing resources for public schools, having knowledgeable college students help align curriculum with Oregon State content standards is a great service. The work the college students produced – analysis of statewide assessment data, skills booklets by grades, and textbooks aligned with curriculum standards by months – provided Gray Elementary teachers an articulated math curriculum in two of the math domains. Gray Elementary benefited from the students' assistance by having their test data analyzed and curriculum mapping completed for their math curriculum. The university students benefited by having a live case to study in this class. Gray Elementary will be used as an example throughout this publication to enhance understanding of the steven-step process to align curriculum of Oregon state content standards.

Section 2: Learning to Teach in Standards-Based System

Oregon is in the midst of a major shift toward a system of standards-based instruction. Since the passage of HB 2991 during the 1995 Legislative session, "the State Board of Education has adopted content standards, identifying what students should know and be able to do in six major academic areas. Benchmarks have been set within each of the content standards, specifying what subjects will be covered in the state tests at the end of grades three, five, eight, ten, and twelve" (*Teaching and Learning to Standards*, Oregon Department of Education, 1997). Schools across the state are beginning the process of examining curriculum to make sure they are teaching toward benchmarks that are tested on the Oregon statewide assessment.

This bulletin describes the steps a school can take to align curriculum with Oregon content and performance standards and determine if they are teaching what is being tested. The examples focus on Gray Elementary School's 1997 math assessment data and the University of Oregon students' alignment of Gray Elementary School's math textbooks with the state content and performance standards.

The stakes are high. For the first time in Oregon, students will have the opportunity to meet high academic standards to earn a Certificate of Initial Mastery at or near grade ten. Current Oregon statewide assessment results indicate that only 32 percent of students are meeting or exceeding the high performance standards for grade ten in math. Benchmark levels at grades three, five, and eight tell teachers how students are doing as they progress toward the Certificate of Initial Mastery (CIM). In 1998, 67 percent met or exceeded the standards at third grade in math. Sixty-one percent met or exceeded the standards at fifth grade in math, while 50 percent met or exceeded the standards at eighth grade in math.

As Oregon teachers and administrators, we must challenge students who meet the state performance standards to further their learning, as well as devise strategies to assist students who don't yet meet those standards.

WHAT YOU NEED TO HAVE BEFORE YOU GET STARTED

Become familiar with the content standards by reading through *Teaching and Learning to Standards*, Oregon Department of Education, 1997. Every school in the state has received at least one copy of this document. Additional copies are available from Barbara Slimak, Oregon Department of Education, (503) 378-3310 ext. 485 (or e-mail barbara.slimak@state.or.us). You also need to have your Oregon statewide assessment data presented by content strands for analysis.

Content Standards Timeline

	1997-98	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06
Content Standards in Place	Standards adopted 9/96 in place	Revised standards in place	Content standards will be reviewed and revised on two-year cycle.						
State Testing in Place *Grades 3,5,8,10*	English Math Science	English Math Science Social Science	State testing in English, mathematics, science, and social sciences; district testing in the arts and second languages.						
State Performance Standards in Place	English Math Science	English Math Science Social Science	State performance standards will be reviewed and revised on a two-year cycle. Districts will set performance standards in the arts and second languages.						
CIM Awarded		English Math	English Math Science	English Math Science Social Science	English Math Science Social Science The Arts	English Math Science Social Science The Arts Second Language	CIM Fully Implemented		
CAM Awarded				English Math Career-Related Learning	CAM models developed in selected schools. English Math Career-Related Learning Science	English Math Career-Related Learning Science Social Science	English Math Career-Related Learning Science Social Science The Arts	CAM in all schools. English Math Science Social Science The Arts Second Language Career-Related Learning	CAM Fully Implemented
PASS Proficiency Expected for College Admission					English Math	English Math Science	English Math Science Social Science	English Math Science Social Science The Arts	English Math Science Social Science The Arts Second Language
PREP Required for Selected Community College Programs			English Math Science Social Science						

WHAT YOU NEED TO KNOW BEFORE YOU GET STARTED

Content Standards

Content standards identify what students should know and be able to do in six major academic areas: English, math, science, social studies, the arts, and second language. Statewide assessments are being phased in based on the content standards timeline. (See phase-in schedule on page 7.)

OREGON STATEWIDE ASSESSMENT SYSTEM

Oregon's statewide assessment system has three components that are sometimes referred to as a three-legged stool: 1) classroom work samples collected at various times throughout the student's career, 2) on-demand mathematics problem-solving assessment, and 3) multiple choice tests given at grades three, five, eight, and ten. The current testing schedule is given in the chart below.

SCORING GUIDES

Scoring guides are used to help teachers assess student performance on open-ended assessments and classroom work samples. The same scoring guides are used by state scorers of the open-ended math assessment and writing. (See sample scoring guide on page 9.)

GETTING STARTED

This is a group process to help your staff understand historical influences contributing to a standards-based system.

The following activity can be done with your entire staff at an inservice meeting. This simple activity will help illustrate many of the historical influences that have contributed to the shift from a time-based public school system to a standards-based public school system.

1. Break into groups that graduated from high school in the same decade (fifties, sixties, seventies, eighties, nineties).
2. Give each group fifteen to twenty minutes to discuss the following and record information on chart paper:
   - *Significant historical events.* List the historical events that occurred during your K-12 experience (national/international).
   - *Key educational words.* List the educational words that describe how you remember your schooling years (i.e., new math, open classrooms, etc.).
   - *Attitude list.* List the words that describe your age group's attitude about the effectiveness of your K-12 schooling.
   - *Issues.* What are the issues, ideas, and/or events that people are most concerned about in your age group?
   - *Changes.* What changes do these issues promote?
   - *Today.* What words does your age group use to describe schools today?

STATE TEST SCHEDULE

SUBJECT	GRADES TESTED	APPROXIMATE TIME NEEDED FOR TESTING	DATES
Writing	5,8,10	three 50-minute sessions	Jan.19 - Feb. 12, 1999
Mathematics			
Problem-solving	5,8,10	one 45-minute session	Jan. 19 - Feb. 12, 1999
Multiple Choice	3,5,8,10	one 50-60 minute session*	Mar. 19 - Apr. 15, 1999
Reading/Literature *(multiple choice)*	3,5,8,10	two 50-minute sessions*	Mar. 29 - Apr. 16, 1999
Science *(multiple choice)*	5,8,10	two 40-minute sessions	Mar. 29 - Apr. 23, 1999
Social Sciences *(multiple choice)*	5,8,10	two 40-50 minute sessions	Mar. 29 - Apr. 23, 1999

*At grades 3 and 5, the testing sessions may be broken into several shorter sessions at the teacher's discretion

Students in grades 3, 5, 8, and 10 in the 1998-99 school year will take state tests according to the schedule above.

1998- 1999 Mathematics Problem Solving Official Scoring Guide 1998-1999

ACCURACY ___Precisely Correct ___Essentially Correct (no additional instruction appears necessary) ___Not Correct

	Conceptual Understanding *Showing an understanding of the mathematical concepts related to the task (the "what")*	Processes and Strategies *Choosing strategies that can work, and then carrying out the strategies chosen (the "how")*	Verification Field Test 1998-99* *In addition to solving the task, reviewing the work and defending the solution in relation to the task (the "defense")* **Although the scores in this dimension will not be used for decisions about students, they will inform the field test.*	Communication *Showing the reasoning (the "why") behind the process, using pictures, symbols, and/or vocabulary*
6				
5	A) The task is translated into thoroughly developed and/or complex mathematical concepts. B) The task is enhanced through connections and/or extensions to other mathematical ideas.	A) Pictures, models, diagrams, and/or symbols used to solve the task are thoroughly developed. B) Complex mathematical processes/ strategies are completed.	A) The verification is clearly identified and thoroughly developed. B) A different perspective, used as a defense of their solution, may enhance the "defense."	A) The reasoning behind the process of solving the task is clearly displayed throughout and enhanced through the use of graphics and/or examples allowing the reader to move easily from one thought to another.
4	C) The task is translated into adequate mathematical concepts using relevant information and/or data from the task.	C) Pictures, models, diagrams, and/or symbols are used to solve the task. D) Reasonable mathematical processes/ strategies are completed.	C) The verification is identified, completed, and supports their solution.	B) The reasoning behind the process of solving the task is clearly displayed.
3	D) An understanding of some of the major concepts is displayed. E) Fragments of the information and/or data presented in the task are used.	E) Pictures, models, diagrams, and/or symbols may be only partially useful or used to solve the task. F) Reasonable mathematical processes/ strategies are partially completed (or partially recorded)	D) The evidence of verification is partially completed (or partially recorded) or partially effective.	C) The reasoning behind the process is partially displayed with gaps that have to be inferred.
2	F) The translation of the task is underdeveloped or sketchy. G) Assumptions and/or data may be flawed.	G) Pictures, models, diagrams, and/or symbols used may partially detract from solving the task. H) Processes/strategies are underdeveoped.	E) The process of checking the work is underdeveloped (e.g., focusing only on their solution or its reasonableness).	D) The display of the reasoning behind the process is partially flawed. E) Communication explains the solution, but does not indicate a clear path to the solution.
1	H) The task is translated into inappropriate concepts or uses inappropriate information. I) The evidence of conceptual understanding is minimal.	I) Pictures, models, diagrams, and/or symbols conflict with their solution. J) Processes and strategies are ineffective or minimal.	F) The process of checking the work is ineffective (e.g., verification is minimal, verification strategy is inappropriate).	F) The display of the reasoning detracts from the work and may include irrelevant ideas.
NE	J) No evidence is provided.	K) Strategies are not recorded.	G) No evidence of a defense is provided.	G) The reasoning is not provided.

3. Ask each group to report, beginning with high school graduates of the earliest decade. From the charts generated during the group discussions, report on this activity. This activity was conducted in the summer school curriculum foundations class at the University of Oregon.

The university students in the curriculum foundations class grouped themselves according to the decade of their graduation from high school. The students reported on significant events, key words, attitudes, issues, and changes that occurred and how events in society affected schools. From the law and order and enforced respect of the early sixties to the political correctness of the nineties, events in society influenced schools and school curriculum. Anti war sentiment and desegregation led to inclusion practices, and the move away from the Dick and Jane basal readers translated into open classrooms in the seventies.

Economics of a strong middle class had an impact on curriculum in the sixties. The eighties and nineties found the middle class disappearing. The rich were becoming richer and the poor poorer as the nineties unfolded, leading to greater demands of accountability from the wealthy. The "laissez faire" attitude of the seventies also shifted into the accountability movement in the nineties. Neighborhood economies in the sixties melded into the global competition in the nineties, requiring higher standards and yielding international comparisons of student performance.

Other trends in the nineties influenced curriculum:

- The passage of IDEA, making inclusion of students with learning or behavior problems the standard.
- Along with the changes in the economy came increased numbers of single-parent families and a change in the amount of time adults have to spend with their children.
- Peer influence, as well as the influence of the popular media, increased, as did the number of children with few social skills and little family support.
- Teachers' abilities to focus on the academic curriculum lessened as the diversity of learners increased. At the same time, the accountability movement increased curricular expectations of schools.

Another major influence on school curricula between the sixties and the nineties has been the shift of control in funding from local to state and federal levels. This trend in Oregon is leading to standardized school budget reporting at the state level, allowing state legislators and officials to direct funds more carefully toward activities that seem to indicate greater achievement on state assessments.

Section 3: A Step-by-Step Process of Curriculum Alignment

In order to assist Oregon students in meeting state standards, we must assure that we are teaching to the standards. Curriculum alignment is a process that aligns what teachers teach with the state content standards. The following chart is of our seven-step process.

A Seven-Step Process to Align Curriculum with Oregon State Content Standards

Step 1:	Collect your school's Oregon statewide assessment data.
Step 2:	Chart your school's assessment data by content domains.
Step 3:	Analyze the data.
Step 4:	Write a school-improvement goal and develop activities to carry out that goal based on analysis of the data.
Step 5:	Design down from each content standards strand and chart the skills.
Step 6:	Map content standard strands by month.
Step 7:	Align textbook and other teaching resources using the month-by-month curriculum map created in step 6.

Step 1. Collect Your School's Oregon Statewide Assessment Data

Every year the Oregon Department of Education makes public each school district and individual school's performance data on the Oregon statewide assessment. These data are available at your school or district office. An example of how the data is displayed when it arrives from the state is shown on page 11. This data is analyzed by content standard strands. This example is of fifth-grade students in Gray Elementary School.

Step 2. Chart Your School's Assessment Data by Content Standard Strands

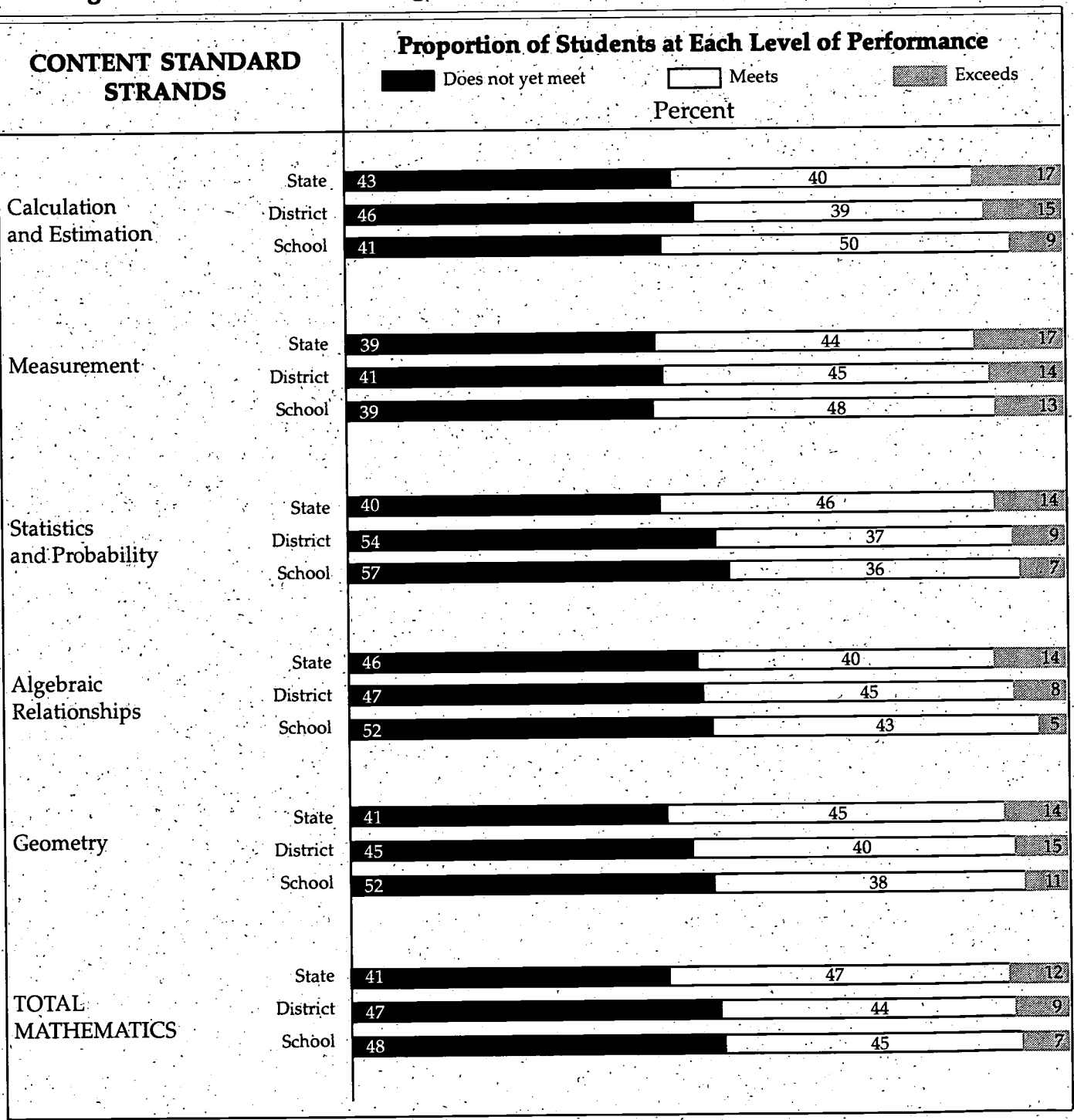
A school's statewide assessment data will be most easily understood if it is translated into charts by content standard strands. For example, the math content standard has five strands: calculation and estimation, measurement, statistics and probability, algebraic relationships, and geometry. Breaking your test data down by domains helps you identify specific curricular areas that need strengthening (see Figure 1). A similar graph would need to be produced for the third grade students.

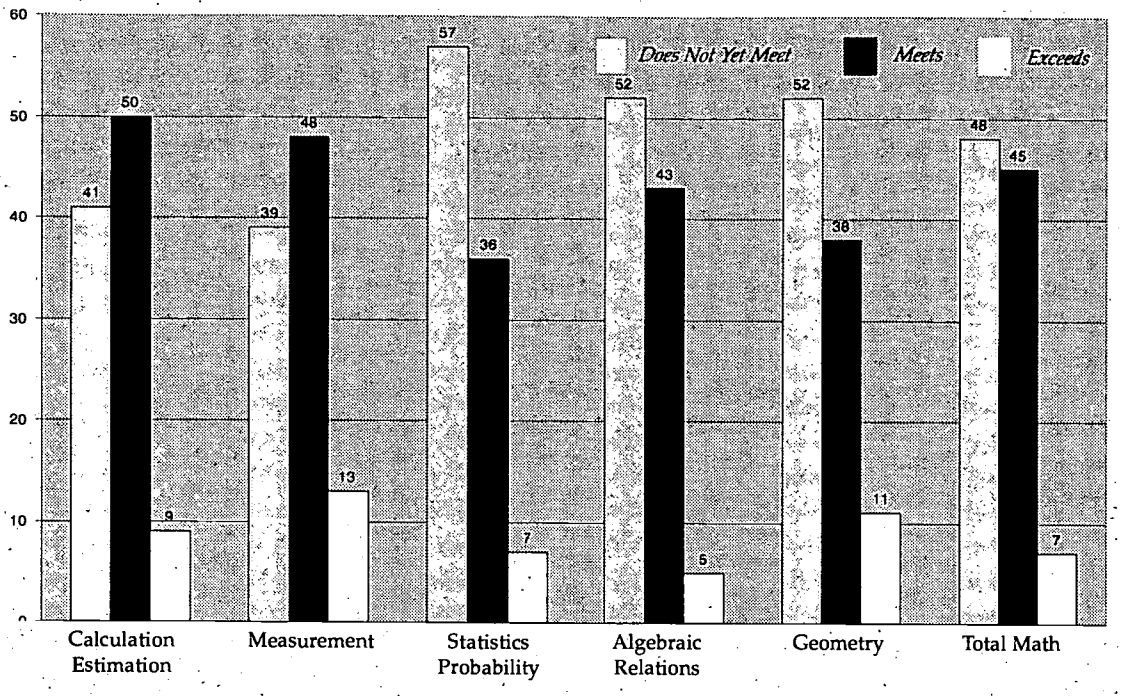
In addition to the chart that graphs the data by content standard strands (Figure 1), you may wish to produce a chart that compares your overall fifth-grade scores to those of the district and state. This would give you an opportunity to compare how you are doing relative to the district and state. The chart in Figure 2 is such a comparison for fifth-grade students at Gray Elementary School with the district and state. This data was also taken from page 11.

DISTRIBTUTION OF STUDENTS BY PERFORMANCE STANDARDS MATHEMATICS

School : Capt Robert Gray Elem
District : Astoria SD 1
CDS Code : 04-001-110
Grade : 5
No. of Students : Total 56
: Intact 50
Test Date : April 1997 Page : 1

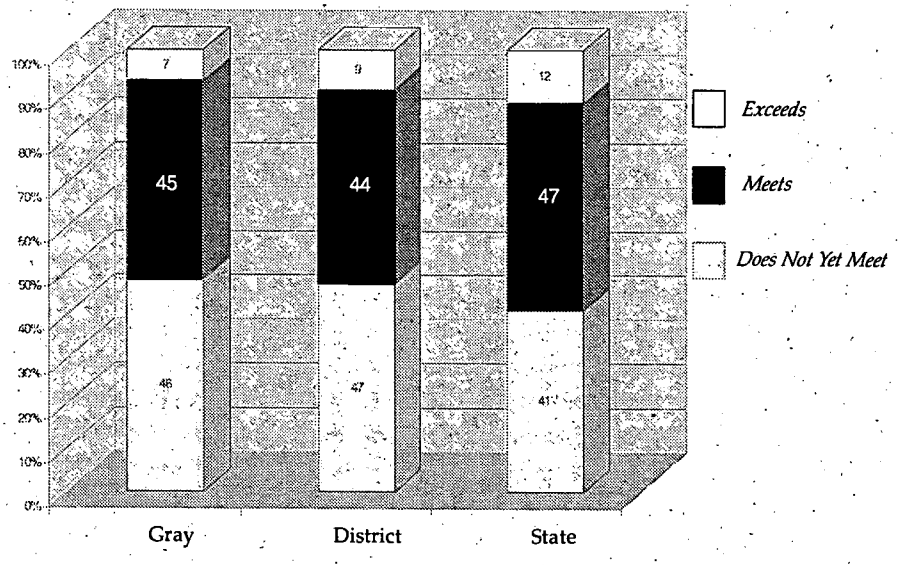
1997 Oregon Statewide Asssment Program





This graph represents the distribution of fifth-grade students at Gray Elementary in 1997 on the Oregon State Performance Standards in mathematics. Overall, 52 percent of the students met the total math performance standard. Measurement and calculation and estimations were the strongest areas of performance for these students. Sixty-one percent of these students met or exceeded the performance standard in measurement. Fifty-nine percent met or exceeded the performance standard in calculation and estimation. The lowest performance by students was in statistics and probability, where only 43 percent met or exceeded the performance standard.

FIGURE 1. FIFTH-GRADE MATH PERFORMANCE BY TEST DOMAINS – 1997



This graph represents the overall math scores of fifth-grade students for the 1997 school year. It shows that Gray Elementary had 48 percent of students who did not meet the standards compared to 47 percent for the district and 41 percent for the state. Gray Elementary had 45 percent who met the standards compared to 44 percent for the district and 47 percent for the state. Gray Elementary had 7 percent of the students that exceeded the standards compared to 9 percent for the district and 12 percent for the state.

FIGURE 2. GRAY ELEMENTARY SCHOOL FIFTH GRADE TOTAL MATH SCORES – 1997

STEP 3. ANALYZE THE DATA

Schools can analyze student performance in each content standard strand within each content area. At the bottom of each chart you need to write a narrative to explain your test data. These charts typically become a part of the school's profile and improvement plan and allow teachers to identify the curricular areas of strengths and weaknesses. This helps teachers focus on areas where the students need additional instruction. (See Figure 1.) For Gray Elementary, students strongest areas are measurement and calculation and estimation. Their weakest areas are statistics/probability, algebraic relationships, and geometry. Even though we have identified areas of strength, all areas need to improve because the goal is to have all students meet or exceed standards in all six domains.

STEP 4. WRITE A SCHOOL-IMPROVEMENT GOAL AND DEVELOP ACTIVITIES TO CARRY OUT THAT GOAL BASED ON ANALYSIS OF THE DATA

The form on page 14 is a framework for how to set a goal and provide activities, that will guide you in reaching the goal. A blank form is included in the appendix for your use when you write your school improvement goal. The information on page 14 is from Gray Elementary. We will explain how to complete the form using Gray Elementary's goal sheet as an example.

Goal: Each school-improvement goal is a part of your school improvement plan that is developed by each school's site council. The general rule is that a school-improvement plan has two to three goals. This is goal number one for Gray Elementary. The school determined that it was an appropriate goal as a result of the data analysis from Figures 1 and 2. The intact group includes students that have been at Gray Elementary for at least one year as reported by the students.

Profile Data That Supports the Implementation of the Goal: This data comes from the Oregon state assessment data that is sent to each school and district office. The information on page 11 is an example of this data. Data is included for grades three, five, and eight, which are the benchmark years, and for CIM, which is the tenth year. Once you have developed a graph of the data as in Figure 1, it is easy to interpret. In interpreting the data for Gray Elementary, it is clear that Gray has students that have not yet met the standard in all six of the math domains (see this section on goal sheet, page 14).

Activity: The activities are strategies that you are implementing that you believe will cause you to reach your goal. At Gray Elementary the strategy is curriculum mapping (see activity section on goal sheet).

Assigned to: Each activity must be assigned to a person(s) to assure that it will be completed. In the Gray Elementary example, activities are assigned to the math team.

Resources: Each activity will require resources like human resources, time, and materials. You must list the resources for each activity.

Timelines: The timeline section is divided into the project year and four quarters: fall, winter, spring, and summer. Some activities will take more than one year to complete, and the timeline provides a target for completion.

Evaluation: This section on the goal sheet records how a school will evaluate every activity. It is not the evaluation of the goal. State testing results the next year are the evaluation of the goal.

Person with Overall Responsibility for the Goal: This person is responsible for seeing that all activities on the goal sheet are completed and checks continualy with people assigned to each activity to assure progress. This person provides support for those working on each activity and reports progress at every site council meeting.

STEP 5. DESIGN FROM EACH CONTENT STANDARD STRAND AND CHART SKILLS

Using a process called "design down," a school looks at the content standards and benchmarks for each content standard strand. The school then specifies skills to be taught in each grade so that students can meet or exceed the performance standards. In the math area these domains are shown on the chart on pages 15-17 and include calculation and estimation, measurement, statistics and probability, aglebraic relationships, and geometry.

For example, at the third-grade benchmarks for calculation and estimation, the standards and benchmarks are shown on pages 15-17. These pages are taken directly from the documents we referred to earlier called "teaching and learning to standards." Once schools have identified the standard and benchmark, they ask which skills should be taught at the benchmark year and all the years that preceed it. At the third-grade benchmark, schools would ask what skills need to be taught at third grade, second grade, first grade and kindergarten.

The example below uses the third-grade benchmarks for calculation and estimation. All of the state standards for calculation and estimation are on pages 15-17.

1. Standard: Perform whole-number calculations using paper and pencil and calculators. What skills need to be taught:

- at third grade?
- at second grade?
- at first grade?
- in kindergarten?

GOAL 1: *By the 2000-2001 school year, the intact group of each fifth grade class at Gray Elementary School will increase their scores in all areas by 10 percent on the Oregon Statewide Math Assessment.*

PROFILE DATA THAT SUPPORTS IMPLEMENTATION OF THIS GOAL: *Grade five Gray Elementary students did not yet meet standards in the six domains by the following percentages: 41 percent in calculation and estimation, 39 percent in measurement, 57 percent in statistics/probability, 51 percent in algebraic relationships, and 52 percent in geometry.*

Activity	Assigned To	Resources	Timelines					Evaluation
			Project Yr	Quarter				
				F	W	SP	SU	
1. Design down from the current content standard in all five math content standard strands.	Math Team	*Teaching to Standards* (ODE) Time to complete task.	1998-99	X				Completed list of skills designed down from the content standards.
2. Map curriculum for all five content standard strands.	Math Team	Math Team Time to complete task.	1998-99		X			Completed curriculum map.
3. Align curriculum map with textbooks and other teaching resources.	Math Team	Math Team, Textbooks, Math Team	1998-99		X			Completed curriculum map aligned with state standards.

PERSON WITH OVERALL RESPONSBILITY FOR GOAL 1: *Site Council and Principal*

MATHEMATICS

CALCULATIONS AND ESTIMATIONS: Select and apply mathematical operations in a variety of contexts

COMMON CURRICULUM GOALS	CONTENT STANDARDS	GRADE 3 BENCHMARK	GRADE 5 BENCHMARK
COMPUTATION Read, write, and order real numbers. Demonstrate conceptual meanings for addition, subtraction, multiplication, and division. Select and use appropriate methods and tools for computing with numbers (e.g., mental calculation, paper and pencil, calculator, computer).	Compute with whole numbers, fractions, decimals, and integers using paper and pencil, calculators, and computers.	Perform whole number calculations using paper and pencil and calculators. *Students will:* • *order first through tenth in numeric form (i.e., 1st) or word form (i.e., first).* • *add three-digit whole numbers with regrouping.* • *subtract three-digit whole numbers with regrouping.* • *multiply single digit numbers.* • *identify simple fractions with numerators and single-digit common denominators from pictorial representations.*	Perform calculations on whole numbers, fractions, and decimals, using paper and pencil and calculators. *Students will:* • *identify correct operations for solving word problems.* • *pose equivalent questions for word problems.* • *identify the order of operations for multiple-step calculations including addition, subtraction, multiplication, and division.* • *interpret pictorial representations of percents.* *Students will demonstrate these skills by performing or explaining the following operations:* • *reading numbers from the millions place to the thousandths place.* • *adding and subtracting up to five-digit numbers with regrouping.* • *multiplying up to two-digit numbers.* • *dividing up to three-digit by one-digit numbers with remainders.* • *completing all fraction operations with common denominators (no improper fraction operations).* • *completing all decimal operations to hundredths; division operations terminate at thousandths.* • *identifying negative numbers (e.g., on temperature or number lines).* • *identifying common percentages (e.g., 25%, 50% 75%).*

Oregon Content Standards, May 1998

MATHEMATICS

CALCULATIONS AND ESTIMATIONS (continued)

COMMON CURRICULUM GOALS	CONTENT STANDARDS	GRADE 3 BENCHMARK	GRADE 5 BENCHMARK
ESTIMATION Use estimation to solve problems and check the accuracy of solutions.	Use estimation to solve problems and check the accuracy of solutions.	Estimate solutions to problems and determine if the solutions are accurate and reasonable. *Student will:* • *round one-, two-, or three-digit whole numbers to the nearest 10, 100, and 1,000 for addition and subtraction problems.* • *directly estimate real-world events to the nearest 10 and 100, e.g., grocery bill.* • *round one-, two-, and three-digit compatible whole numbers to the nearest 10 or 100 for multiplication and division applications.* • *determine cost to the nearest dollar for amounts under $100.*	Estimate solutions to problems and determine if the solutions are accurate and reasonable: *Students will:* • *round (with ranges from the nearest hundredth to the nearest ten-thousand) to estimate answers to calculations.* • *recognize which place will be the most helpful in estimating an answer.* • *multiply by powers of ten up to 1,000 to simplify calculations.* • *use front-end estimation to predict ranges for quotients.*

MATHEMATICS

CALCULATIONS AND ESTIMATIONS (continued)

COMMON CURRICULUM GOALS	CONTENT STANDARDS	GRADE 3 BENCHMARK	GRADE 5 BENCHMARK
NUMBER THEORY Apply number theory concepts to represent numbers in various ways and demonstrate relationships among numbers. Use ratios, proportions, and percents to solve problems. Construct and apply mathematical rules and algorithms to solve problems.	Apply number theories, mathematical rules, and algorithms to solve problems.	Use concepts of place value and grouping in whole number operations. *Students will apply:* • *place values from hundredths (using money) to thousands, inclusive.* • *addition and subtraction of three-digit numbers to assess regrouping skills.* • *the concept of odd and even numbers.*	Use concepts of primers, factors, and multiples in whole number, fraction, and decimal operations. *Students will:* • *use place values from thousandths through millions.* • *use factors and multiples to reduce fractions to lowest terms and identify fraction equivalents.* • *recognize primes less than 100.* • *recognize other number theory concepts, such as additive and multiplicative identities and inverses.*

Oregon Content Standards, May 1998

2. Standard: Estimate solutions to problems and determine if the solutions are accurate and reasonable. What skills need to be taught:

- at third grade?
- at second grade?
- at first grade?
- in kindergarten?

3. Standard: Use concepts of place value and grouping in whole number operations. What skills need to be taught:

- at third grade?
- at second grade?
- at first grade?
- in kindergarten?

What must students be taught to have the knowledge and skills to meet the benchmark for this curriculum strand?

After this process has been completed for each grade level, teachers can assemble skill domain booklets to help:

- assess what needs to be taught at each grade level, and
- communicate to parents what students are expected to know and do in each grade.

At third, fifth, eighth and CIM/tenth benchmarks, teachers not only need to determine what skills will be taught in the grades but also between benchmarks (e.g., grades four and five for benchmark five, or grades six and seven for benchmark eight, or nine for CIM/grade ten benchmark). They must also make certain those skills line up with what has been taught in each preceding benchmark (e.g., kindergarten through grade three for the grade five benchmark and kindergarten through grade five for the grade eight benchmark). This work allows alignment at both grade levels and school levels and helps teachers determine if gaps exist between grades.

It is important to know where to begin when you design down from the skill domains. The place to start is with the domain that has the highest percent of students who "do not meet" the standard. Figure 1 shows that Gray Elementary would begin with statistics and probability. Using the designing down process described above, start with the first content standard for probability, which is "determines the probability that an event will occur," and the grade five benchmark standard, which is "make predictions using experimental probability," and ask what skills need to be taught:

- at fifth grade?
- at fourth grade?

Exhibit 1, developed by the university students, illustrates the skills that need to be taught for the first content standard and benchmark for statistics and probability in grades four and five. It shows how teachers can display the skills they design down on a chart. The complete list of content standards for statistics and probability is on pages 20-22.

STEP 6. MAP SKILL DOMAINS BY MONTH

Once teachers have looked at the content standards and determined what skills need to be taught at each grade level, the skills should be mapped by month. What will be taught in September? October? November? A blank curriculum map is available for teacher use in the appendix on page 28.

STEP 7. ALIGN TEXTBOOK AND OTHER TEACHING RESOURCES USING THE MONTH-BY-MONTH CURRICULUM MAP CREATED IN STEP 6

Teachers must choose curriculum materials to help students reach the standards. If textbooks are used, do they present all the necesary skills to recall the standard? Do supplementary teaching materials teach to the standards, or can some lessons be omitted? For what skills must teaching resources stil be located?

These questions will be answered once teachers complete the process of aligning textbook and other teaching materials with the content standards using the month-by-month curriculum map. (See chart on pages 23-24.) A blank curriculum map/material form is available on pages 30-31 in the appendix.

Summary of Seven-Step Process to Align Curriculum with Oregon State Content Standards

- Step 1: Collect your school's Oregon statewide assessment data.
- Step 2: Chart your school's assessment data by content domains.
- Step 3: Analyze the data.
- Step 4: Write a school-improvement goal and develop activities to carry out that goal based on analysis of the data.
- Step 5: Design down from each content standard strand and chart the skills.
- Step 6: Map content standard strands by month.
- Step 7: Align textbook and other teaching resources using the month-by-month curriculum map created in Step 6.

After teachers have completed the seven-step process, they can begin to examine their curriculum maps with other teachers, looking for gaps or inconsistencies. This activity should occur across grade levels and even across school levels, creating an articulated curriculum, grades K-12, focused on helping students meet and exceed the high content standards designed by the state of Oregon.

The chart on page 25 takes all of the skills that need to be taught for statistics and probability and place them by months on the curriculum map. Teachers can make a separate map for all the skills for one content standard strand but eventually must combine them into one map that shows when they will teach all the fifth-grade benchmark skills. A blank curriculum map is provided in the appendix.

EXHIBIT 1. FOURTH- AND FIFTH-GRADE-LEVEL SKILLS: STATISTICS AND PROBABILITY

CONTENT STANDARD STRAND: ***Statistics and Probability — Collect, organize, display, interpret, and analyze facts, figures, and other data.***

CONTENT STANDARD: ***Determine the probability that an event will occur.***

GRADE 5 BENCHMARK: ***Make predictions using experimental probability. Express probabilities using fractions, ratios, and decimals.***

Grade 5 Skills	Students will express probabilities as fractions, ratios, and decimals. • divide whole numbers to get decimals • convert fractions to decimals • convert ratios to decimals *Benchmark Specification: Students will determine theoretical probabilities by calculating or counting the possible outcomes in a sample space. They will determine the number of these outcomes that fit the description of an event of interest and then express the probability as a fraction, decimal, or ratio.*
Grade 4 Skills	Students will make predictions using experimental probability. • add 1000s • recognize and write fractions • recognize decimals using money • use manipulatives like dice, coins, and spinners to determine probabilities *Benchmark Specification: Students will analyze exercises that include tossing one or more coins, rolling one or more dice, spinning a spinner of even or uneven divisions, drawing objects from a container with and without replacement. Students chart observed natural occurrences and interpret data from games or sports events.*

MATHEMATICS

STATISTICS AND PROBABILITY: Collect, organize, display, interpret, and analyze facts, figures, and other data.

COMMON CURRICULUM GOALS	CONTENT STANDARDS	GRADE 3 BENCHMARK	GRADE 5 BENCHMARK
PROBABILITY Generate, compare, and analyze data to draw inferences and make predictions, using experimental and theoretical probability. Solve problems using various strategies for making combinations and/or permutations.	Determine the probability that an event will occur.	Use concepts of probability such as likely, unlikely, and certain. *Student will determine probabilities using:* • *coins* • *dice* • *spinners with up to six sections that may be either evenly or unevenly divided.* • *objects hidden in containers — up to 100 objects* • *daily happenings such as a chance of rain.*	Make predictions using experimental probability. Express probabilities using fractions, ratios, and decimals. *Students will determine theoretical probabilities by calculating or counting the possible outcomes in a sample space, determine the number of these outcomes that fit the description of an event of interest, and then express the probability as a fraction, decimal, or ratio.* *Experiments performed or analyzed by the students will include:* • *Tossing one or more coins.* • *Rolling one or more dice.* • *Spinning a spinner of even or uneven divisions.* • *Drawing objects from a container with and without replacement.* • *Charting observednatural occurrences.* • *Interpreting data from games or sports events.*

MATHEMATICS

STATISTICS AND PROBABILITY (continued)

COMMON CURRICULUM GOALS	CONTENT STANDARDS	GRADE 3 BENCHMARK	GRADE 5 BENCHMARK
STATISTICS Display and use measures of central tendency and variability (e.g., mean, median, mode, range, quartiles). Analyze and evaluate statistical claims and arguments for erroneous conclusions and/or distortions. Formulate hypotheses, design and conduct experiments using appropriate technology, draw conclusions based on data, and communicate results.	Carry out and describe experiments using measures of central tendency and variability.	Carry out simple experiments and simulations and compare the predicted and actual outcomes. NOTE: *Classroom work samples only; not covered on the state multiple choice test.*	Formulate and carry out simple experiments and simulations. Collect and analyze data using measures of central tendency. *Students will:* • *Determine mean, median, and mode of ten or fewer numbers where the answer is no larger than 100.* • *find one missing data piece when the mean is known.*

Oregon Content Standards, May 1998

MATHEMATICS

STATISTICS AND PROBABILITY (continued)

COMMON CURRICULUM GOALS	CONTENT STANDARDS	GRADE 3 BENCHMARK	GRADE 5 BENCHMARK
INTERPRETATION OF DATA Read, construct, and interpret displays of data (e.g., charts, tables, graphs) using appropriate techniques and technologies. Analyze data to determine strength of relationships between sets, draw conclusions, and make predictions.	Create charts, tables, and graphs and use statistics to summarize data, draw inferences, and make predictions.	Collect, organize, display, and describe simple data using charts, tables, number lines, bar graphs, and line graphs. *Students will interpret data from charts or tables with five or fewer entries. Horizontal or vertical bar graphs with five or fewer bars and pictographs that represent ten or fewer data pieces will be used.* *Data will be limited to:* • *whole numbers through 200* • *whole dollar amounts up to $100*	Collect, organize, display, and analyze data using number lines, bar graphs, line graphs, circle graphs, stem and leaf plots, and histograms. *Students will read information directly from a display and compare two quantities from the same display.* *Data may be in the form of measurements of:* • *time* • *money* • *physical measurements — height, weight, length, distance, etc.* • *age* • *quantity* • *speed*

Curriculum Mapping/Material Form

Content Standard Strands: *Statistics and Probability — Collect, organize, display, interpret, and analyze facts, figures, and other data.*

Content Standard: *Determine the probability that an event will occur.*

Grade 5 Benchmark: *Make predictions using experimental probability. Express probabilities using fractions, ratios, and decimals.*

September	Materials	October	Materials	November	Materials	December	Materials	January	Materials
Add1000s	AW* p54	Number lines	AW p 30	Division of whole numbers with single divisors	AW pp 190-191				
Bar graphs Place value	OE1* p 3 AW p 346 OE1 pp 122-164 AW pp 23-44			Work sample	Work sample guidebook			Work sample	AW pp 190-191
Make tables	Teacher made								

AW = *Addison-Wesley*
OE = *Opening Eyes to Math*

Curriculum Mapping/Material Form

Content Standard Strands: *Collect, organize, display, interpret, and analyze facts, figures, and other data.*

Content Standard: *Determine the probability that an event will occur.*

Grade 5 Benchmark: *Make predictions using experimental probability. Express probabilities using fractions, ratios, and decimals.*

February	Materials	March	Materials	April	Materials	May	Materials	June	Materials
State assessment in math problem solving		Recognize and write fractions	OE3 p 59 AW p 220-227 *Lane Co. Problem Solving* pp 93-98	Recognizing decimals using money	OE1 p 72	Line graphs	AW p 328 OE 3 p 98		
		Use manipulatives like dice, coins, and spinners to get probabilities	OE1 p 21 OE3 p 220 OE2 p 71	State assessment		Work sample	Work sample guidebook		

AW = *Addison-Wesley*
OE = *Opening Eyes to Math*

Fourth- and Fifth-Grade Math — Statistics and Probability — Curriculum Map by Month — 1998-99

Content Standard Strands: *Statistics and Probability — Collect, organize, display, interpret, and analyze facts, figures, and other data.*

Content Standard: *Determine the probability that an event will occur.*

Grade 5 Benchmark: *Make predictions using experimental probability. Express probabilities using fractions, ratios, and decimals.*

September	October	November	December	January	February	March	April	May	June
Add 1000s		Division of whole numbers with single divisors				Recognize and write fractions	Recognize decimals using money	Line graphs	Line graphs
		Work sample		Work sample	State assessment	Use manipulatives like dice, coins, and spinners to determine probability	State assessment	Work sample	Work sample
Bar graphs	Number lines								
Place value									
Make Tables									
Review decimals (e.g., What is one hundredth?)		Division of whole numbers to get decimals	Add, subtract, multiply, and divide fractions	Histograms	Circle graphs Stem and leaf plots	Converting fractions and ratios to decimals.			
Make Tables									
		Mean, median, mode							
		Work sample		Work sample	State assessment		State assessment	Work sample	Work sample

Appendix

GOAL #____:

PROFILE DATA THAT SUPPORTS IMPLEMENTATION OF THIS GOAL:

Activity	Assigned To	Resources	Timelines					Evaluation
			Project Yr	Quarter				
				F	W	SP	SU	

PROFILE DATA THAT SUPPORTS IMPLEMENTATION OF THIS GOAL:

Curriculum Map by Month — 1998-99

Content Standard Strands:

Content Standard:

Grade 5 Benchmark:

September	October	November	December	January	February	March	April	May	June

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Curriculum Mapping/Material Form

Content Standard Strands:

Content Standard:

Grade 5 Benchmark:

September	Materials	October	Materials	November	Materials	December	Materials	January	Materials

Curriculum Mapping/Material Form

Content Standard Strands:

Content Standard:

Grade 5 Benchmark:

February	Materials	March	Materials	April	Materials	May	Materials	June	Materials

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