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Opportunities to Learn in PROM/SE Classrooms: Teachers' Reported Coverage of Mathematics Content

Introduction

Opportunity to learn (OTL) is one of the most important factors influencing student achievement. Numerous research studies have indicated that students learn when they are provided an opportunity. In an era of accountability when schools and teachers are evaluated based on students' performance on high-stakes tests, there is concern expressed regarding the fairness of holding students accountable for skills and knowledge if they have not been provided an opportunity to learn (Porter, 1993). It is equally important that the opportunity to learn curriculum content is available to ***all*** students in ***all*** schools.

The content and process standards and grade level expectations (GLEs) that are articulated at the state and/or district levels provide students the ***potential*** opportunities to learn. However, based on these standards, teachers make final decisions regarding topic coverage, depth of topic coverage, and emphasis on specific mathematical ideas. Such decisions are likely to result in very different outcomes for students.

This report examines the pattern of reported mathematics content coverage in elementary grades classrooms in the PROM/SE districts. In these PROM/SE districts about 2625 teachers (about 525 teachers at each of the five grade levels) reported on their mathematics content coverage. Our results indicate that there is great variation across classrooms in the mathematics content coverage, suggesting the presence of enormous inequalities in opportunities to learn mathematics content.

What does research tell us about students' opportunity to learn in the classroom?

According to McDonnell (1995), the term "opportunity to learn" was first used in educational research in the early 1960s as part of the First International Mathematics Study and was subsequently refined in the Second International Mathematics Study, conducted between 1976 and 1982. The researchers involved in these studies realized that to interpret differences in student achievement across different national systems they needed to measure "whether or not…students have had an opportunity to study a particular topic or learn how to solve a particular type of problem presented by the test" (Husen as cited in Burstein, 1993, p. xxxiii). These data provided rich information about the status of mathematics curricula both from an international perspective and within the United States.

From the series of international studies it is clear that there are remarkable differences between the organization of the curriculum in high achieving nations and the curricular organization in the United States. The mathematics curriculum as it has been implemented in the United States has been described as consisting of a lot of repetition and review and very little coverage of topics in depth. Thus, individual mathematics topics are covered in a few class periods and the mathematical ideas are often quite fragmented (McKnight et al., 1987).

In the United States, the standards setting and student accountability movements have highlighted the importance of students attaining a certain level of mastery in core subject areas (Porter, 1993). With this emphasis on student performance there has been a growing concern about connecting student performance with student opportunity to learn. In the early 1980s this connection was established in *Debra P. v. Turlington, 1981*. The case was filed before Florida instituted a high school graduation test. The ruling indicated that before the state could use its' graduation test, it had to establish, in a manner acceptable to the court, that students had an opportunity to learn the content.

Many researchers point out that the study of students' opportunities to learn provides us great insights on variations in student achievement (Floden, 2002; McDonnell, 1995; Smith, 2002). Researchers have described opportunities to learn in a variety of ways: based on teachers' reported content coverage, time ***allocated*** for instruction or instructional time that is actually used to deliver instruction.

In the 1970s and 1980s many research studies focused on establishing a connection between the time teachers spent in class on content and student learning (Bloom, 1971; Carroll, 1989; Fisher & Berliner, 1985; Wiley & Harnischfeger, 1974). Increases in time on learning have also been found to facilitate a greater development of skills, knowledge and deep understanding of concepts (Clark & Linn, 2003; Smith, 2002). These and other later studies consistently show a positive relationship between time spent on content and student achievement (Huyvaert, 1998; Rangel & Berliner, 2007). Research also points to a very important finding: "[The] largest and most powerful relationships between instructional time and learning are found in schools and classrooms serving disadvantaged and low-performing students" (Smith, 2002; p.655).

Such inequity is also reported in Oakes's (1990) study on the variation in opportunities for learning mathematics and science across the nation. Oakes found evidence that "lends considerable support to the argument that low-income, minority, and inner-city students have fewer opportunities…They have considerably less access to science and mathematics knowledge at school, fewer material resources, less-engaging activities in their classrooms…Moreover, our findings are likely to be equally relevant for subject areas other than mathematics and science" (Oakes, 1990; pp. x-xi).

To better understand students' opportunity to learn from a prescribed curriculum, some researchers distinguish between the intended and implemented curriculum (Floden, 2002). The intended curriculum represents the state/district standards or grade level expectations. Teachers' classroom content coverage represents the implementation of those intentions. The implementation of intentions is reflected in teacher decisions regarding what topics to cover, in what order to cover the topics, how much time to devote to each topic, and what activities to use in support of student learning. Thus, content coverage represents one of the several instructional decisions a teacher makes as s/he implements the state/district's curricular intentions.

Measurement of the curriculum that teachers implement in the classroom is fraught with complexity. A comprehensive view of curriculum implementation may require us to not only determine what content teachers cover but also what they emphasize, what achievement standards they use, the effectiveness of their pedagogical strategies, and the syllabi, textbooks and other resource materials employed to support learning.

Researchers note that syllabi and textbooks "are only crude proxies" (Porter, 1993, p.28) of the implemented curriculum. Direct observation of classrooms over an extended period of time would provide a rich source of information about the implemented curriculum. However, such studies are very costly and time consuming so they are infrequently employed by researchers. Self-report measures such as daily teacher logs of instruction, interviews, and questionnaires have been frequently used to determine content coverage and related implementation data. Such self-reports have certain limitations, but validation studies have found an acceptable level of agreement among the self-reports of the implemented curriculum and direct observation (Porter, 1993).

Implementation of instructional decisions may also be influenced by teachers' content knowledge, beliefs, and prior experiences with teaching mathematics. Thus, the prescribed (intended) and the implemented curriculum may not be aligned in terms of the opportunities for learning that students experience in the classroom. Variation in curriculum implementation was noted by Tarr et. al (2006) who found that teachers regularly substituted curriculum materials regardless of whether they were using NSF-funded reform curricula or commercially prepared instructional materials. The variation in implementation of curricula becomes a serious concern, especially if the adaptations are not aligned to the developers' philosophy, goals or intentions (Davis & Lo, 2008).

Which Mathematics Topics are Taught at What Grades in TIMSS Countries?

In 1995, as part of the comprehensive TIMSS study, researchers conducted a cross-national analysis of the mathematics curriculum. The researchers reviewed textbooks and national standards of nearly fifty countries and coded the documents using a framework that was developed based on cross-national consensus regarding mathematics topic coverage in grades one through eight in the participating TIMSS countries.

Content standards of the six top achieving nations were used to develop a model of coherent content coverage in mathematics. Subsequent analysis of the model by research mathematicians indicated that the model was consistent with the logic intrinsic to the discipline of mathematics (Schmidt & Houang, 2007).

Table 1 depicts the common topics that two-thirds or more of the top achieving countries intend to cover in grades one through eight. The data suggest a coherence or logical progression in the coverage of topics from the simpler/basic to more advanced topics. We would view the progression as "a three-tier pattern of increasing mathematical complexity" (Schmidt & Houang, 2007, p. 68).

In grades one through five the focal topics representing the first tier are primarily related to arithmetic, which includes concepts and operations related to whole number, common and decimal fractions, estimation and rounding. In the seventh and eighth grades, there is intended coverage of third tier topics such as advanced number topics, algebra, functions and slope, and geometry topics including 3-dimensional geometry, congruence and similarity. Topics intended for coverage in grades five and six represent the second tier, a transitional phase with focus on arithmetic topics, including fractions and decimals along with an introduction to the topics of percentages, negative number, proportionality, coordinate geometry, and geometric transformations.

While the data presented in the table depicts the ***intended*** mathematics curriculum of high achieving TIMSS countries, it also provides an analytical framework for assessing the coherence of state and district level curricular intentions and also for assessing the pattern of topic coverage by PROM/SE teachers. In this report we look at the pattern of teacher topic coverage by grade level and compare it with the coherent pattern depicted in Table 1.

Which Mathematics Topics are Taught in What Grades in PROM/SE Classrooms?

Teachers in 55 PROM/SE districts completed the Teacher Content Goals Survey. There were 2,625 teachers who completed the survey, with about 525 teachers at each of five grade levels. In this survey they indicated the number of class periods over a year in which they taught each of the 29 topics in mathematics. The 29 topics in the survey were comparable to the topics used in the TIMSS (1995) study.

In this section we will examine the percentage of teachers across the elementary grades that taught each of the 29 topics at each of the five grade levels. Our aim in presenting this information is not to suggest that teaching all 29 topics at each of the five grade levels is the ideal or that it is desirable. However, each one of these topic/grade combinations represents a potential opportunity to learn for the students. In PROM/SE-related work we have underscored the importance of introducing some topics earlier to students.

Table 1. Mathematics Topics Intended at Each Grade by Top Achieving TIMSS Countries

Topic	Grade 1	2	3	4	5	6	7	8
Whole Number: Meaning	●	●	●	●	●			
Whole Number: Operations	●	●	●	●	●			
Measurement Units	●	●	●	●	●	●	●	
Common Fractions			●	●	●	●		
Equations & Formulas			●	●	●	●	●	●
Data Representation & Analysis			●	●	●	●		●
2-D Geometry: Basics			●	●	●	●	●	●
2-D Geometry: Polygons & Circles				●	●	●	●	●
Measurement: Perimeter, Area & Volume				●	●	●	●	●
Rounding & Significant Figures				●	●			
Estimating Computations				●	●	●		
Whole Numbers: Properties of Operations				●	●			
Estimating Quantity & Size				●	●			
Decimal Fractions				●	●	●		
Relation of Common & Decimal Fractions				●	●	●		
Properties of Common & Decimal Fractions					●	●		
Percentages					●	●		
Proportionality Concepts					●	●	●	●
Proportionality Problems					●	●	●	●
2-D Geometry: Coordinate Geometry					●	●	●	●
Geometry: Transformations						●	●	●
Negative Numbers, Integers, & Their Properties						●	●	
Number Theory							●	●
Exponents, Roots & Radicals							●	●
Exponents & Orders of Magnitude							●	●
Measurement: Estimation & Errors							●	
Constructions Using Straightedge & Compass							●	●
3-D Geometry							●	●
Geometry: Congruence & Similarity								●
Rational Numbers & Their Properties								●
Patterns, Relations & Functions								●
Proportionality: Slope & Trigonometry								●

Intended by more than half of the top-achieving countries ●

Table 2. Teacher Coverage of Mathematics Topics by Grade

	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5
	Valid N=460	**Valid N=556**	**Valid N=631**	**Valid N=550**	**Valid N=438**
Mathematics Content Categories	**% Covering Content**				
Whole Number Meaning	97.61	98.38	98.42	98.37	97.43
Whole Number Operations & Properties	91.30	93.71	96.35	96.37	93.46
Common Fractions	65.00	70.86	85.74	90.74	94.86
Decimal Fractions	10.87	21.58	64.18	81.49	90.42
Common & Decimal Fraction Relations	8.48	19.42	52.46	71.87	90.89
Percentages	12.61	20.32	48.02	68.78	88.55
Properties of Common & Decimal Fractions	17.61	26.44	48.97	62.98	73.60
Number Sets & Concepts	28.48	28.42	36.61	49.36	63.55
Other Number Topics	6.74	8.99	16.96	32.49	59.81
Number Theory	18.91	23.74	49.29	74.95	83.41
Estimation & Number Sense	86.96	94.24	95.88	96.37	96.50
Measurement Units	93.48	95.32	95.88	95.64	94.63
Perimeter, Area & Volume	43.04	77.70	87.16	91.65	92.29
Estimation & Measurement Error	41.30	53.78	62.12	70.42	72.90
Geometry Basics	63.04	75.90	88.91	94.92	92.29
Polygons & Circles	61.52	66.01	72.58	80.76	84.35
3-D Geometry	50.65	53.42	54.04	62.07	67.06
Geometric Transformations	72.39	78.60	80.19	87.11	82.71
Congruence and Similarity	48.26	76.98	80.35	86.57	85.51
Proportionality Concepts	7.39	8.45	19.97	35.21	64.02
Proportionality Problems	26.30	33.45	43.74	46.46	55.37
Slope & Trigonometry	2.61	3.42	5.07	7.26	10.05
Patterns, Relations & Functions	75.87	74.82	66.40	69.15	69.86
Linear Equations	17.39	21.58	25.67	31.58	41.36
Other Equations & Inequalities	18.04	31.29	33.44	45.01	50.23
Representing & Interpreting Data	87.39	87.23	90.65	94.19	93.93
Probability & Uncertainty	60.87	62.59	68.62	76.95	68.22
Sets & Logic	9.35	8.27	15.53	24.14	26.17
Other Topics	23.26	31.65	29.00	34.85	34.81

When we compare the teachers' reported time spent on topic/grade combinations depicted in the intended curriculum of top achieving TIMSS countries, the desired situation would be 100 percent of PROM/SE teachers reporting that they taught specific topics at specific grade levels. Conversely, for those topics not covered at specific grade levels in high achieving TIMSS countries the desired situation would be zero percent of PROM/SE teachers teaching the topics. In the PROM/SE data neither one of these desirable outcomes occurs.

Nearly all the PROM/SE teachers (more than 97 percent) reported having taught the topic of whole number meaning in grades one through five. More than 90 percent reported teaching whole number operations and properties in each of the five grade levels. Virtually all the PROM/SE teachers reported not teaching the topic of slope in grades one to three.

The overall percentage of teachers' reported time spent on topics at specific grade levels was 59 percent. In statistical terms, maximum variability occurs at 50 percent; the average topic/grade combination of 59 percent for PROM/SE teachers suggests that there is considerable variation in the reported topic coverage across grade levels.

We would expect at grade levels one and two there might be equality of reported content coverage, as the students are just being introduced to formal mathematical ideas. This does not appear to be the case, as we have evidence of a wide range of content coverage reported, with 3 percent of teachers reportedly addressing the topic of slope (probably in an elementary way) to 98 percent having taught the topic of place value. The topic of basic shapes is reportedly taught by 63 and 75 percent of teachers in grades one and two, respectively.

At this point it might be useful to translate the findings reported above in concrete terms using actual classrooms and students affected by such variability. If we take the percentage of teachers who report teaching basic shapes in grades one and two and convert those percentages to actual PROM/SE classrooms, we find that while nearly two-thirds of the 460 grade one classrooms and three-quarters of the 556 second grade classrooms cover basic shapes, about one-third of the first grade classrooms and one-quarter of second grade classrooms did not address the topic. This means that in about 152 PROM/SE first grade classrooms and 139 second grade classrooms the topic of basic shapes was not addressed. We can take this illustration one step further. If we make an assumption that each classroom has 25 children, then we realize that the decision not to cover the topic of basic shapes means that 7,275 children do not have the opportunity to learn the topic that other children in other classrooms did.

As illustrated in Table 2**,** even by fourth and fifth grades not all the PROM/SE children seem to have the opportunity to learn about geometric shapes such as circles and polygons—about 20 percent of fourth graders and 15 percent of fifth graders do not have this opportunity.

We now turn our attention to an important topic in mathematics—the topic of fractions. This topic is intended for coverage by a majority of the top achieving countries in grades three through six and by *all* such countries at grades four and five. The percentage of classrooms in which fractions is reportedly covered goes from 86 percent in grade three and 90 percent in grade four to 95 percent in grade five. Although the percentages seem small, when we translate these percentages into numbers of classrooms and students we find that 2,200 children in grade three would not have an opportunity to study the topic of fractions. As the study of fractions is one of the most important topics in early mathematics, this has serious implications for the learning of more advanced mathematics topics that are introduced in the middle grades.

In our discussion of teachers' reported time spent on mathematics topics it is not enough to simply address the issue of coverage. We need to also be concerned about the grade level at which the topic is covered. If a topic is covered at too early a grade then it is likely that the coverage will lack depth because the children may not have the prerequisite knowledge to understand the content. Postponement of content coverage may affect the coverage of topics whose understanding depends on the postponed content.

To understand this critical component of content coverage that reflects a coherent progression through the curriculum, we looked at teachers' reported coverage of topics that appear in the curriculum of TIMSS top achieving countries (Table 1). When we look at those topic/grade combinations there is much less variability, and in the aggregate there is reasonable alignment with that model. However, there are many topic/grade combinations that are not covered in all classrooms. In each of those instances, children in PROM/SE classrooms may not have an opportunity to learn some essential topics at a critical grade level to develop a solid foundation for more advanced mathematics concepts.

In addition to the topics of geometric shapes and fractions that were discussed earlier in this report, we find that at fourth grade, 81 percent of the teachers reported covering decimals and 72 percent covered the relationship of decimals and fractions. In fourth and fifth grades, the properties of decimals and fractions were covered by 63 percent and 74 percent of the teachers, respectively. In fifth grade, 64 percent of the teachers reported covering proportionality concepts.

The topics identified above are crucial to children's understanding of basic number, fractions, decimals, ratios and whole number and their properties. The PROM/SE data suggest that between 20 and 35 percent of the classrooms may not be getting the opportunity to learn these topics.

Which Topics and What Grades and for What amount of Time?

Knowledge about which topics are covered by teachers gives us one kind of information about students' opportunity to learn. Knowing how much time is spent on each topic provides an idea of the depth with which the teachers cover the topics. In TIMSS studies we noted that in the U.S. the mathematics coverage seemed to be "a mile wide and an inch deep." Earlier international studies had also concluded that the mathematics curriculum in the U.S. was characterized by excessive repetition and review and with little intensity of coverage.

There is no standard for the amount of time that should be spent on each topic. However, there is some agreement among the researchers that topics covered in depth lead to a deeper understanding than shallow, superficial coverage. Teachers often make decisions regarding time allocations based on a variety of factors such as grade level, abilities of students, importance of a topic in high stakes assessments, etc. As teachers ultimately make decisions regarding content coverage, variation in amount of content coverage together with the variation in topic choices influences children's opportunity to learn.

In the previous section, equality of opportunity was somewhat easier to define. If no teachers covered a topic (0 percent coverage) or if 100 percent of the teachers covered the topic, the opportunity to learn was the same for all children. To the extent that percentage of coverage was somewhere between 0 percent and 100 percent we consider that the opportunity to learn mathematics was not equal for all children. When the question is about depth of coverage, the focus then shifts to an analysis of time spent on each topic.

The 2,625 PROM/SE teachers were not only asked to indicate what topics they covered, they also indicated the number of periods over the year in which they taught each topic. We converted class periods into percent teaching time and also number of instructional days. For purposes of this report we use 160 as the total number of instructional days per year.

Unlike the discussion in the previous section, we do not expect that all teachers would spend the same amount of time over the year, even at the same grade level. Differences in opportunity to learn would be evident if, in the aggregate, one second grade classroom receives a markedly different amount of instructional time on a topic than another second grade classroom.

Thus, in this section our focus is not on an average amount of time spent on a particular topic but on having some measure of how this time varies across all classrooms at a particular grade level. To obtain a measure of this variability, for each of the 29 topics at a given grade level we first determined a range of time allocations. To determine the range we eliminated the extreme 10 percent of time allocations and calculated a 90 percent range, which provided us an indication of the time allocations for 90 percent of the teachers for a particular topic at a particular grade level. We then summarized these time allocation values over all 29 topics. The average of these values is considered the variability for a typical topic. A small value for the average would be indicative of little variation in the 90 percent range for topics. A larger value for the average would suggest that some topics have appreciably smaller or larger ranges.

Figure 2 shows the box-and-whisker plot for the 90 percent range for grades one through five. The average (median) value which indicates typical variability for a topic goes from about 15 days in grade one to about 11 days in grade four. This implies that for a typical topic taught in the elementary grades, it would be typical that in one classroom the children would study the topic about 11 to 15 more days than children in another classroom at the same grade level. These days translate into a difference of two to three weeks in the depth of content coverage.

It is important to note that the largest variations are in the early grades, where the foundation of arithmetic is established. Given the cumulative nature of mathematics, this variability can have a serious impact on subsequent learning. As we drill deeper to determine which topics have the greatest variability, we find that in the first grade the three topics that have the most variability are the topics to which teachers have allocated the most time. The topics of whole number operations and place value are two of these topics. These topics are identified as intended topics at first and second grade by the TIMSS top achieving countries. Across the 460 PROM/SE first grade classrooms, on an average, the time allocated to these two topics was around 26 days each. The 90 percent range for these topics indicated a difference of about 45 days for each topic. These data would suggest that some first grade classrooms spent 50 to 60 days on each of the two topics while in other first grade classrooms the topics are covered in 5 to 10 days.

When we look at the data on reported coverage on the topic of fractions we find that, although this topic is not covered in first and second grade in top achieving TIMSS countries, about two-thirds of the PROM/SE teachers report covering fractions in first grade. The amount of time may be relatively small. Typically teachers may spend about 8 days on the topic. However, when we consider the 90 percent range value then it is clear that in some classrooms teachers spend almost a month on fractions while in other classrooms the time spent is no more than a couple of days. Our analysis of state mathematics standards indicates that 76 percent of the states intend for fractions to be covered at first grade. This may shed light on why teachers choose to spend time on the topic. However, it does not explain the variation in the coverage of the topic.

Figure 1. How to Read a Box and Whisker Plot

A box and whiskers plot, sometimes called a box plot, provides a visual summary of many important aspects of a distribution. The "box" stretches from the 25th percentile to the 75th percentile, thus containing the middle half of the scores in the distribution. The Median, or 50th percentile, is shown as a line across the "box". The "whiskers" stretch from the 25th and 75th percentiles to the 5th or 95th percentiles, respectively.

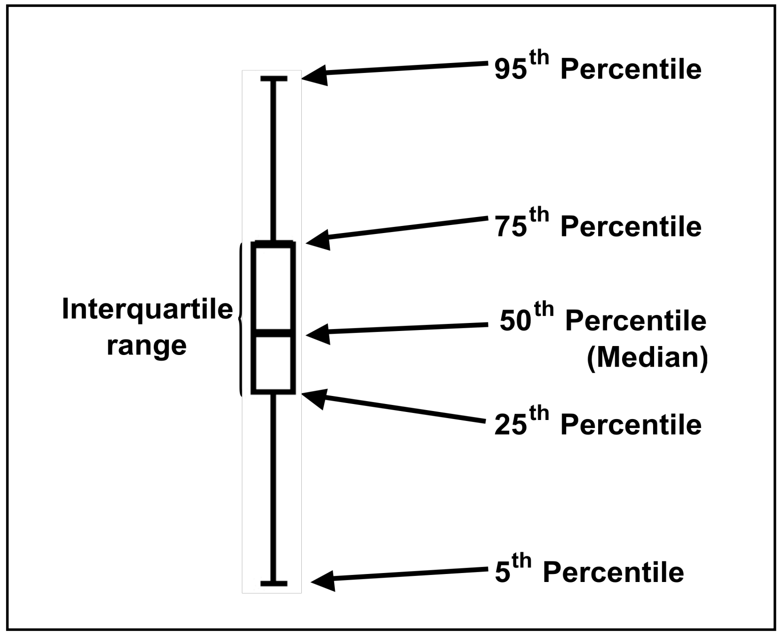


Figure 2. Box Plot of the Range of Teachers' Instructional Days on Topic/Grade Combination by Grade Level

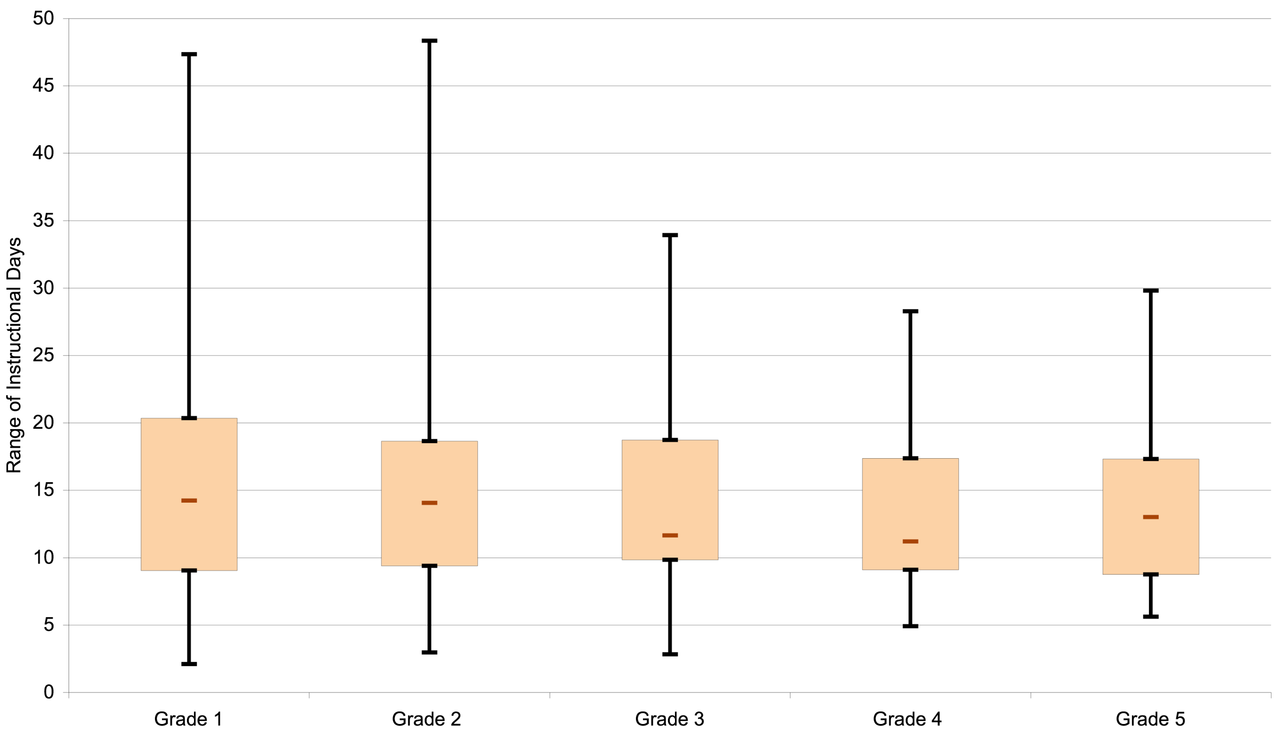


Figure 3. Box Plot of Teachers' Instructional Days on Broad Topic Category of Arithmetic by Grade Level

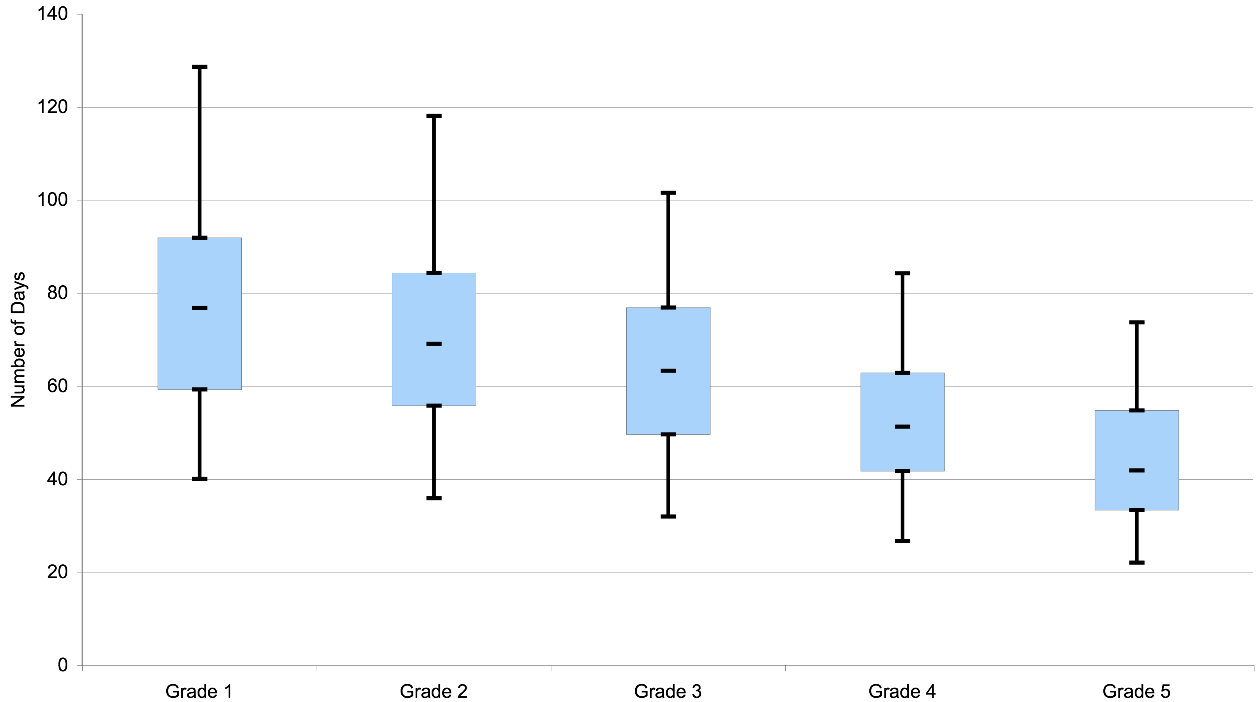
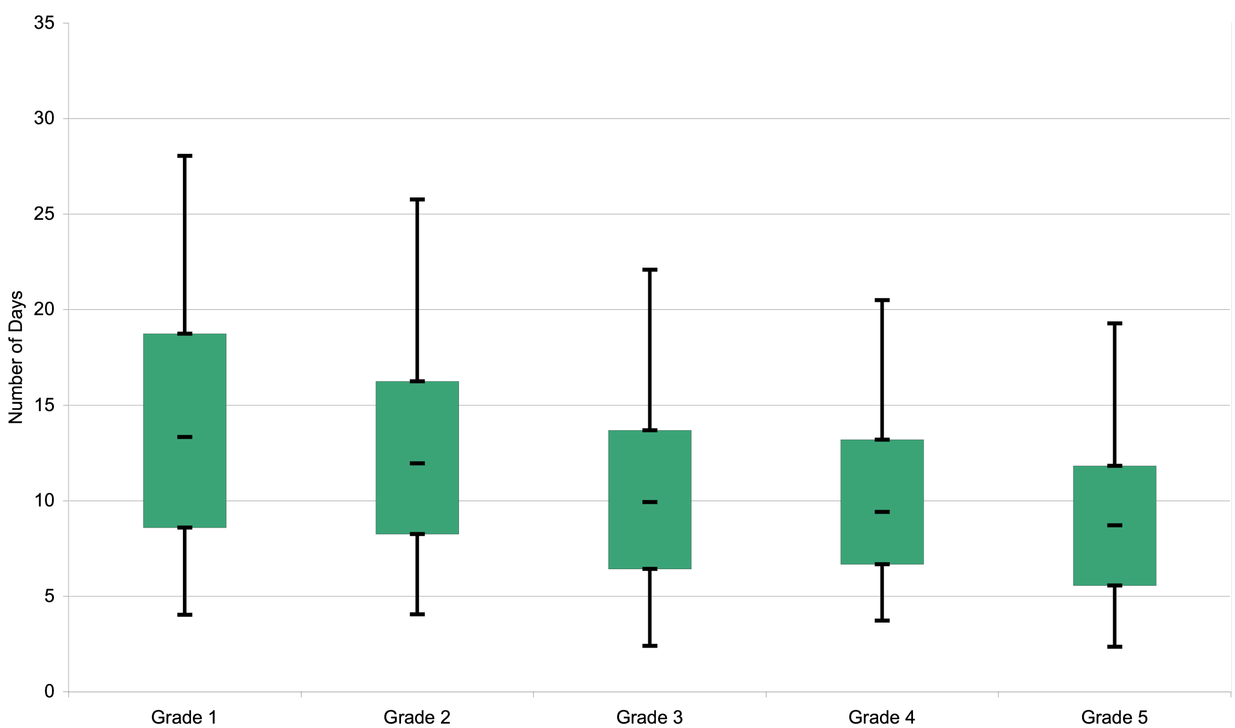


Figure 4. Box Plot of Teachers' Instructional Days on Broad Topic Category of Data Representation by Grade Level



Variation in Coverage of Broad Topic Areas

In our analysis we aggregated topic coverage data from the 29 topics to broader categories such as arithmetic, transition arithmetic, data representation, algebra and geometry. These broad clusters of topics represent meaningful categories of mathematics. We determined the typical time teachers allocated to these broad areas and the 90 percent range. In Figures 3-5, box-and-whisker plots for the areas of arithmetic, data representation and geometry are presented.

It is not surprising that in the first two grades most of the teacher time is focused on arithmetic. What is surprising is the variation: Some teachers report spending about one-fourth of the year while in other classrooms teachers spend more than three-quarters of the year.

For the category of data representation (Figure 4) the variability across classrooms is much smaller. Across all the elementary grade levels the average amount of content coverage is about 13 days and a 90 percent range of 28 days.

Geometry (Figure 5) is a content area in mathematics where U.S. students' performance on international assessments has not been very favorable. What is surprising is that even the U.S. high school students enrolled in advanced placement classes (AP) didn't do well in comparison to similar students in other countries. When we consider the coverage of geometry in the early grades we find considerable variation. In the first two grade levels the typical coverage is around 30 days: However, we find that instruction can vary from around eight days to around 55 days.

One broad topic category that gains salience in mathematics as children reach upper elementary grades is transition arithmetic (Figure 6). Transition arithmetic includes topics such as fractions, decimals, percents, ratio, and proportionality. This category of topics prepares children for more advanced content related to algebra. This group of topics is intended for coverage by the TIMSS top achieving countries in the fifth grade.

In a typical PROM/SE fifth grade classroom, on average about 55 days would be spent on this content area. In some classrooms the time spent on transition arithmetic may be about half as much (28 days). At the other end of the distribution we find some classrooms where about half the year is spent on the topics related to transition arithmetic. If we only focus on the middle 50 percent of the distribution of instructional days on transition arithmetic we find that there is a difference of more than 15 days of instruction. This kind of variability has implications for the variation in depth of preparation children will have for advanced mathematics topics they will likely encounter in higher grades.

Figure 5. Box Plot of Teachers' Instructional Days on Broad Topic Category of Geometry by Grade Level

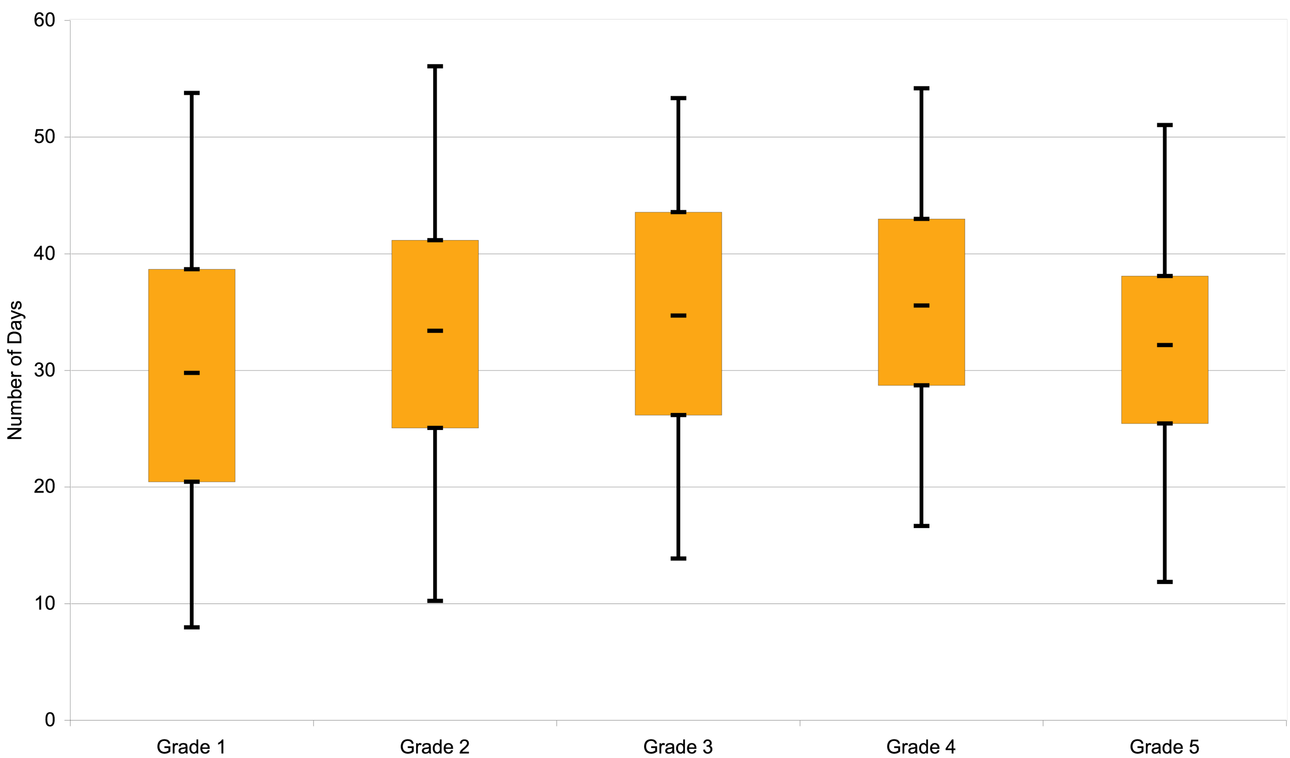
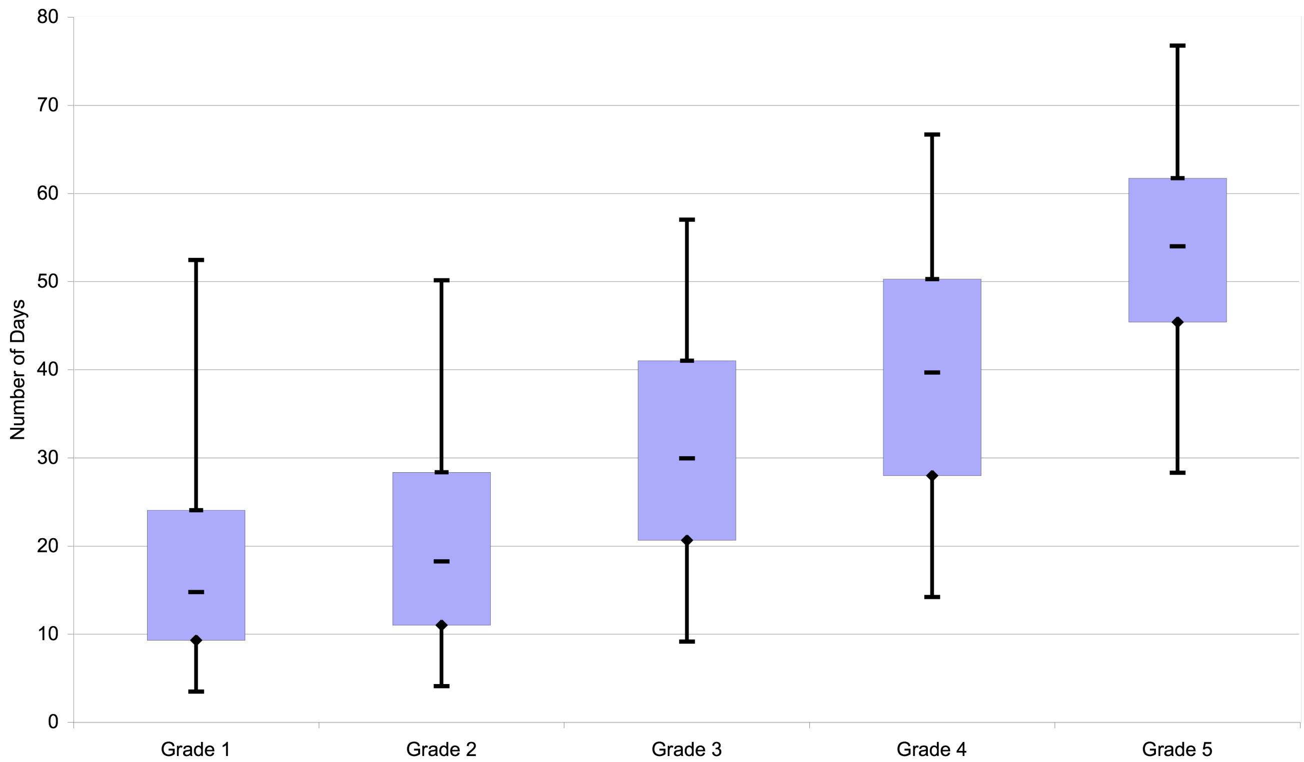


Figure 6. Box Plot of Teachers' Instructional Days on Broad Topic Category of Transition Arithmetic by Grade Level



What Do These Findings Mean for the PROM/SE Students?

These report findings show that inequalities don't just exist at the level of intended curriculum at the state/district level but also in terms of what is actually delivered or implemented in the classroom.

While recognizing the limitations of self-reported data and the complexity of obtaining coverage data, this report finds a wide variability in reported coverage of individual mathematics topics and broad content categories. There appear to be enormous inequalities in students' opportunities to learn mathematics at the elementary level.

Given the hierarchical nature of mathematics some topics may be essential at a critical grade level for the development of mathematical literacy. The kinds of gaps we've identified may prove detrimental to students' understanding of content that follows in higher grades. The cumulative nature of mathematics implies that gaps in student understanding may lead to cumulative deficits.

From a parent's perspective differences in coverage may not be very visible and parents may be assuming that their children are "getting what they need". What they might be getting may be different depending on the classroom they're assigned to. This surprising variability extends not only between districts but also across the hallway within the same school.

One suggestion for reducing some of these inequalities is to provide a common planning period for teachers teaching the same grade level within the same school. This might foster discussions of content coverage within various classrooms.

Teachers need a thorough understanding of content trajectories. Professional development workshops with the teachers, such as those led by PROM/SE, have focused on issues related to mathematics content trajectories and alignment. Teachers attending this type of professional development are becoming more sensitive to the hierarchical nature of mathematics content and the need to appropriately sequence lessons. An upcoming report on PROM/SE teacher data will shed some light on the nature of the changes in content coverage.

Unequal learning opportunities at the elementary level can have serious implications for future learning. If schools are to fulfill their mission to provide equality in education, then all students need equal opportunity to learn and districts owe them no less.

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