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Implementing the Common Core State Standards for Mathematics: What We Know about Teachers of Mathematics in 41 States

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Abstract

The adoption of the Common Core State Standards in Mathematics (CCSSM) by nearly every state represents an unprecedented opportunity to improve U.S. mathematics education and to strengthen the international competitiveness of the American labor force. The mere adoption of the Common Core, however, will amount to little if it is not implemented appropriately. Successful implementation will require coordinated efforts on the part of all education leaders: state education agencies, college/university faculty, school district administrators, curriculum specialists, and teachers. Teachers are particularly important as they operate in the critical arena where educational intentions are translated into learning opportunities and experiences for students. Teachers must digest what students are expected to learn as embodied in standards and in concert with the pedagogical material found in existing textbooks and craft appropriate learning experiences for their students. Indeed, the primary importance of other education leaders is in their support of the efforts of teachers in the classroom.

IMPLEMENTING THE COMMON CORE STATE STANDARDS FOR MATHEMATICS: WHAT WE KNOW ABOUT TEACHERS OF MATHEMATICS IN 41 STATES

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The adoption of the Common Core State Standards in Mathematics (CCSSM) by nearly every state represents an unprecedented opportunity to improve U.S. mathematics education and to strengthen the international competitiveness of the American labor force. The mere adoption of the Common Core, however, will amount to little if it is not implemented appropriately. Successful implementation will require coordinated efforts on the part of all education leaders: state education agencies, college/university faculty, school district administrators, curriculum specialists, and teachers. Teachers are particularly important as they operate in the critical arena where educational intentions are translated into learning opportunities and experiences for students. Teachers must digest what students are expected to learn as embodied in standards and in concert with the pedagogical material found in existing textbooks and craft appropriate learning experiences for their students. Indeed, the primary importance of other education leaders is in their support of the efforts of teachers in the classroom.

Beginning in the spring of 2011¹ the Center for the Study of Curriculum at Michigan State University conducted a survey of school district curriculum directors/supervisors and teachers of mathematics in the 41 states that had officially adopted the new Common Core State Standards for Mathematics (CCSSM). The Center's goal was to provide baseline information to inform and guide the efforts of states, local districts, and schools as each move towards implementation of the newly adopted CCSSM. The challenge of implementing the world-class and demanding CCSSM is likely to vary from state to state. Responses from teachers and curriculum directors alike differed by state giving credence to the hypothesis that the challenge of implementing the CCSSM will vary from state to state depending, for example, on the age and quality of a state's former mathematics standards.

This report presents results from an online survey of over 12,000 teachers of mathematics in grades 1-12. Samples were drawn to be representative for each state. Sample sizes varied by the number of teachers in the state. For example, the number of teachers responding was a little less than 100 for some of the smaller states, e.g., Rhode Island,

¹ Surveys were conducted between June 8 and December 20, 2011.

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Vermont, Wyoming, and well over 600 for the larger states such as California, Florida, and New York. The goals of the survey were to assess teachers' current awareness of the CCSSM, their perceptions and attitudes towards the standards, to obtain an indication of current practice with respect to specific CCSSM topics, and to document the current state of progress of local districts' efforts in planning implementation of the CCSSM.

By design, the majority of teachers surveyed, a little more than 60 percent, taught one or more of the primary grades (1-6) and about 20 percent each taught either the middle grades (7 or 8) or high school. A little over 10 percent of those teaching at the primary grades level taught two or more grades. Nearly 40 percent of those teaching the middle grades taught two or more grades. Only 5 percent of those in the high school sample taught grade levels other than those in high school.

Attitudes and Perceptions

Teachers appeared to be less aware of the CCSSM than the district curriculum directors (CDs) surveyed. All of the CDs reported that they were aware of the CCSSM but slightly less than 90 percent of surveyed teachers reported having heard of them although this did vary by state from a low of 68 percent to 100 percent. Across all states surveyed, most teachers, 82 percent, also reported that they had read at least the standards for the grade they taught. Again, this varied by state from a minimum of 65 percent to the maximum of 97 percent.

Despite their reported familiarity with the standards and the fact that all teachers surveyed were in states that had already officially adopted the CCSSM, only 55 percent indicated that they were aware that their state had adopted them. The vast majority of CDs, 93 percent, had read the CCSSM and 58 percent indicated they thought that they were either "somewhat" or "pretty much" the same as their state's former mathematics standards. A similar proportion of teachers agreed with this assessment (57 percent). However after being presented with selected CCSSM standards for their grade, around 77 percent of teachers thought the CCSSM were the same as their former state standards.

Perhaps as a result of the emphasis on standards in the past decade or more teachers reported that their classroom teaching was primarily influenced by standards rather than their textbook (see Table 1). Even the "something else" that teachers reported determining what they taught was standards oriented as the most frequent responses listed a combination of district and state standards or some combination of these with professional standards such as the NCTM *Curriculum Focal Points* (NCTM, 2006). That teachers are looking primarily to standards to inform what they teach in the classroom suggests that we can expect the changes in the standards to be reflected in the classroom. To the extent that textbooks and other supporting pedagogical materials are designed to faithfully reflect the CCSSM even those teachers who look primarily to their textbooks their classroom teaching could be expected to reflect the CCSSM emphases.

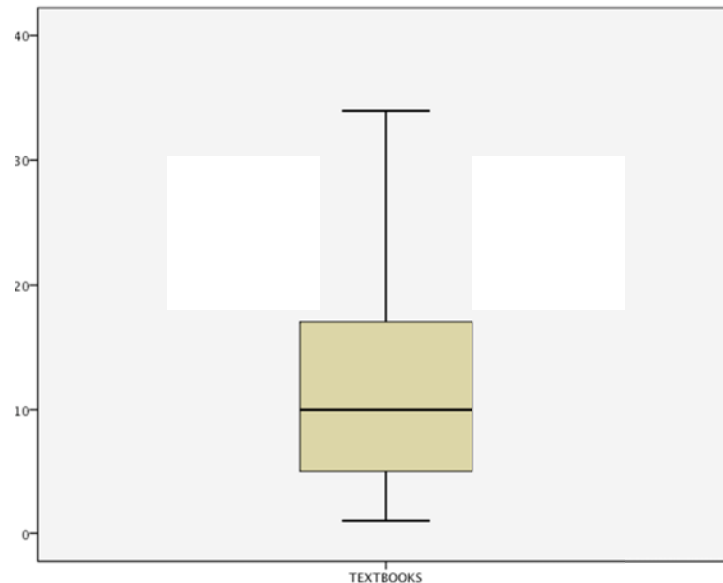
Table 1. Percent of Teachers Indicating What Primarily Determines the Mathematics Topics They Teach

<i>Grade Level Taught</i>	<i>District Standards</i>	<i>State Standards</i>	<i>Textbook(s) Adopted</i>	<i>Something Else</i>
1 – 3	17	62	17	4
4 – 6	15	69	12	4
7 – 8	14	75	6	5
9 – 12	15	68	9	8
<i>All Teachers</i>	<i>15</i>	<i>68</i>	<i>12</i>	<i>5</i>

It will most likely take some time, however, for textbooks that fully embody the coherence and focus of the CCCCM to be widely available to influence classroom instruction. Until then, teachers will be faced with navigating the often competing visions of a mathematics curriculum reflected in textbooks, standards documents, and district or professional organizations’ interpretations of these. For the most part, textbooks still embody the distinctive “mile wide, inch deep” mathematics curriculum that uniquely characterized the U.S. in the Third International Mathematics and Science Study (TIMSS) (Schmidt, McKnight, & Raizen, 1997). Until revised textbooks that fully embody the focus and coherence of the CCSSM are available, appropriate implementation of them may be more of a challenge in the primary grades as a larger proportion of these teachers look to textbooks to guide their instruction than teachers at the upper grades (Table 1). The triage required in deciding among the competing curriculum vision presented by the CCSSM and textbooks is particularly problematic for primary grades teachers as they are the least well prepared to mathematically and, consequently, to make these critical decisions (National Mathematics Advisory Panel, 2008). This conjecture found some support in the teacher focus groups we conducted in a small number of districts. Primary grades teachers were enthusiastic supporters of the CCSSM but also voiced some frustration in fitting everything required by standards and textbooks into their instruction. It seemed that these teachers were reluctant to exclude anything in the textbook from their teaching for fear that their students would be disadvantaged in some way in the future.

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Display 1. Boxplot for States' Percent of Teachers Indicating That Textbooks Primarily Determines the Mathematics Topics They Teach



The challenge that textbooks represent in the appropriate implementation of the CCSSM is not distributed uniformly across the 40 states surveyed. A boxplot of the mean percent of teachers for each state indicating that they rely primarily on their textbook for determining what they teach reveals that there are no such teachers in at least one state and as many as 35 percent of the teachers surveyed in another (Display 1). This suggests that the challenges of implementing the Common Core will be quite different between these two states, as well as others, regardless of the textbooks adopted and/or used.

In general teachers at all grade levels indicated that they liked the idea of having Common Core Standards for mathematics. Across all teachers surveyed 94 percent liked the idea and this varied little across the states from a minimum of 88 percent to a high of 98 percent. When asked to provide a reason why they liked the idea of Common Core standards the vast majority of teachers responded with reasons either that they were likely to provide increased equal and/or quality learning opportunities to students or that the CCSSM were more focused and coherent than the current ones. For example, one teacher wrote, "I like the Common Core State Standards for Mathematics especially when a student transfers to another state, we all would be on the same standard. The student would not be far behind or too far ahead." Another teacher expressed this saying, "I like the idea that our students here in [state] will have the same opportunities and be prepared to take the same math content that students in other states are taking." Other teachers volunteered ways in which they viewed the CCSSM to be superior: "I very much like the Common Core because they are more focused each year on the key topics. The articulation between each year and as a progression through the years is very well thought out. The current [state] standards try to cover too many topics. The Common Core will allow us to focus more. Essentially, less is better!"

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Table 2. Percent of Teachers Indicating Each to be an “Extremely Important” Reason for Having Common Core Standards

	<i>U.S. Mean</i>	<i>Minimum State Mean</i>	<i>Maximum State Mean</i>
Provide a consistent, clear understanding of what students are expected to learn.	82	75	90
Provide a high quality education to our children.	81	67	92
Reflect the knowledge and skills students will need for success in college and careers.	71	58	84
Make our system fair in providing equal opportunities to all students.	69	54	81
Help our students fill the job positions needed in the future in terms of science, healthcare, engineering, etc.	68	58	85
Raise our expectations of what our children can learn.	68	53	79
Let us have common tests across all states so that student achievement can be measured the same way across all states.	59	45	77
Provides a high quality education by international standards for our children.	56	35	70
Improve our global standing in math and science.	50	36	67
Help the United States’ economic growth.	47	30	65
Hold teachers accountable for their effectiveness in teaching children the material they need to know.	40	30	54

Teachers were presented with 11 possible reasons that have been given for why common standards are needed in the U.S. Consistent with their spontaneous reasons offered as to why they like the CCSSM most teachers indicated that the quality education opportunities afforded students were the most important (Table 2). Differences do appear among the states but the relative importance of these various reasons didn’t appear to change. In thinking about why common standards are important teachers are most concerned about their students and providing them with the most advantageous educational opportunities.

The CCSSM are more than just another set of standards. They include an emphasis on a set of mathematical practices that are intended to be used in teaching every content standard and they provide a more focused and coherent approach to what is taught (Dacey & Polly, 2012). Most teachers are in the early stages of their familiarity with the common core but we wanted to know what types of support they thought would be most helpful to them in their efforts to teach them in their classrooms. In the survey they were given a list of various supports including workshops, new textbooks, and additional teacher coaches. The most often selected supports involved providing teachers with practical assistance in developing ways to teach the new standards through some type of professional development or an online, interactive website. The third most popular support teachers endorsed was providing new online resources for students. Only about 40 percent of teachers selected new textbooks.

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A similar proportion of teachers, about 38 percent, indicated the lack of textbooks that support the CCSSM to be a challenge in their implementation of the standards. The lack of alignment between state assessments and the CCSSM were perceived by a similar number of teachers to be a challenge. Both of these were more often cited as challenges to implementing the standards than was “student ability to learn the material.” More than half of all teachers surveyed indicated that “lack of parental support” was likely to present some difficulty in implementing the CCSSM. Given the overwhelming support parents expressed for common and challenging standards in the surveys conducted by our center this concern among teachers seems somewhat surprising. Although the survey did not explore this issue further we do have evidence from the focus groups conducted that this concern may stem from a small number of parents who do not understand standards in general and particularly those for mathematics. The focus group discussions and the fact that this teacher concern is widespread suggests that there are a relatively small but vocal set of parents in most every district/school for which this holds true. The persistence of this finding suggests that employing one of the successful models for engaging and informing parents about the CCSSM may be a key component in their successful implementation and the school and classroom level.

Current Practice According to the CCSSM

To obtain an indication of how current practice compares to what is expected in the Common Core State Standards for Mathematics teachers were presented with a list of selected CCSSM topics appropriate to the grade level they were teaching. They were asked to indicate if they: 1) taught the topic now, 2) felt well prepared to teach the topic, and 3) thought the topic too difficult for students at the grade taught. Most of the topics teachers saw came from the CCSSM for the grade they taught. However, two of the topics came from the grade above the one taught and two of the topics came from the CCSSM for the previous grade to the one taught. The exceptions to this scheme were that first grade teachers were not presented with any previous grade topics and eighth grade teachers were not presented with any of the high school topics. The good news to report from this part of the survey is that the vast majority of teachers reported that they are already teaching the selected CCSSM topics for their grade level (*on-grade topics*; see Table 3) and far fewer, less than half as many, reported teaching CCSSM topics to their students intended for a grade other than the one they taught (*off-grade topics*). There were a few topics at each grade for which greater than 90 percent of the surveyed teachers reported teaching the topic now, none reached the criteria of being taught by all teachers of that topic’s grade, e.g., all third-grade teachers. This likely reflects the current, pre-CCSSM lack of consensus about what needs to be taught at each grade level. Even though some three-quarters or more of the teachers indicated they were teaching the on-grade topics now, this leaves up to a quarter of them not doing so. This is a sizeable number of teachers who will not only have to adjust to the increased rigor for the topics they are teaching, but must also start teaching topics they have not taught in the past.

Table 3. Percent of Teachers Indicating They Teach Each Type of CCSSM Topics by Grade Taught

<i>Grade Taught</i>	<i>On-grade Topics</i>	<i>Off-grade Topics</i>
1	83	38
2	83	41
3	76	40
4	78	39
5	85	46
6	80	39
7	81	36
8	81	38

Table 4 shows the percent of teachers indicating their agreement with the three prompts averaged across all the CCSSM topics for that grade. The last three columns are derived from teachers' responses to the prompts. The means for each grade show that fewer teachers reported feeling well prepared to teach topics than were actually teaching them. This was also true for every individual topic included in the survey. Previous research found evidence that how well prepared teachers report they were to teach specific topics was related to whether they covered these topics in their classroom teaching (PROM/SE, 2006). Teachers in the early elementary grades were the least likely to indicate they felt well prepared to teach their grade-level topics. High school teachers were most likely to indicate that they were well prepared to teach the high school topics even though they may not actually be teaching them, e.g., a Geometry teacher may not be teaching any of the Algebra II topics. How well prepared to teach the various topics in the CCSSM has been suggested to be one way for teachers to begin to familiarize themselves with and prepare to teach the CCSSM (Dacey & Covey, 2012).

Table 4. Average Percent of Teachers Indicating Their Current Practice and Perspective on the Selected CCSSM Topics for the Grade Taught

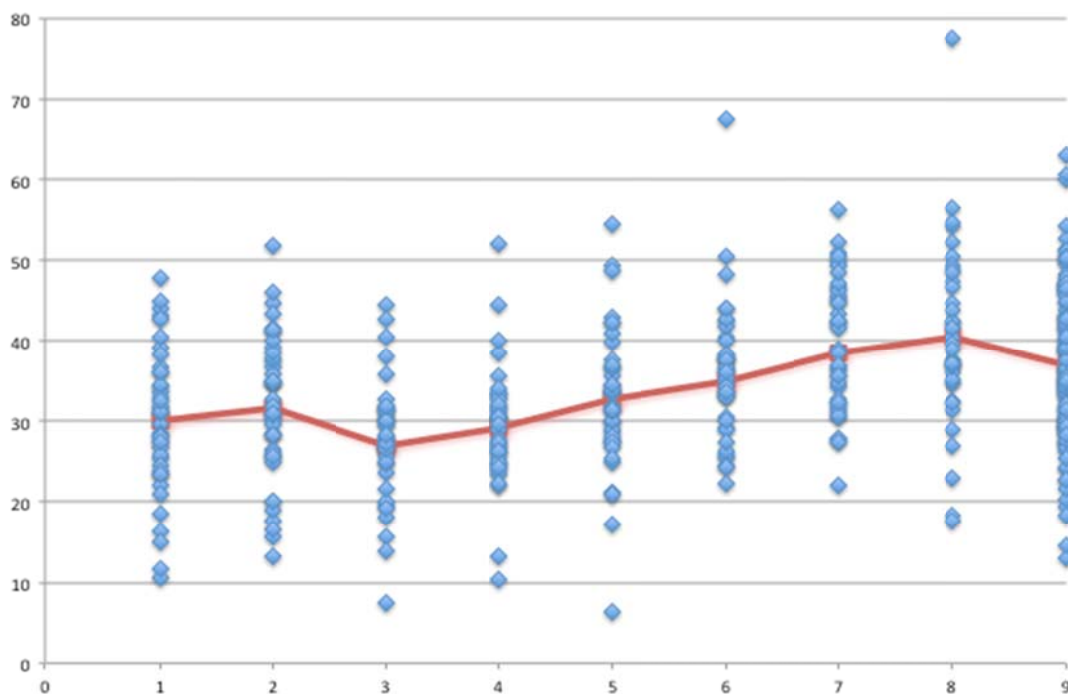
<i>Grade/ Course</i>	<i>I feel well prepared to teach this topic</i>	<i>I think this topic is too difficult</i>	<i>I teach this topic now</i>	<i>I teach & feel well prepared</i>	<i>I teach but don't feel well prepared</i>	<i>DON'T teach but feel well prepared</i>
1	63	17	83	31	52	15
2	65	17	83	44	39	15
3	62	26	76	37	39	18
4	64	22	78	38	40	19
5	67	18	85	45	39	13
6	73	22	80	47	33	18
7	72	14	81	47	33	19
8	75	20	81	51	30	20
Algebra I	81	22	80	51	30	18
Algebra II	84	21	77	36	41	15
Geometry	85	20	83	44	38	13

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To illustrate the variation both within and between states, Appendix 1 has the average percent of teachers indicating that they feel well prepared to teach the topics at their grades level for each of the 40 states.

Teacher preparedness to teach the CCSSM topics is not uniformly distributed across the states. Some states have considerably more teachers at every grade indicating that they are prepared to teach the CCSSM than other states. Table 5 shows these results for each of the 40 states. Display 2 summarizes these results by presenting a plot of the mean percent of teachers for each state indicating they are well prepared to teach the CCSSM topics for that grade level (grade 9 represents all the high school CCSSM topics).

Display 2. Plots for State Averages of the Percent of Teachers Indicating They are Well Prepared to Teach the Topics for Their Grade.



Current Practice According to the CCSSM

These results create a portrait of where teachers are at the outset of the effort to implement the Common Core State Standards for Mathematics. Teachers are supportive of the idea of “common” standards, but up to a third of them find themselves not well prepared to teach them, yet they are committed to the task. Most do not see that the CCSSM content is not what they have been teaching even though the name of the topics to be taught might be the same, the coverage of the topics is more rigorous as to the depth to which content is covered and more coherent as to the way in which they are related to other topics. The results presented in this report suggest that this might be the other most

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serious challenge – the failure on the part of the teacher to recognize the extent to which the Common Core Math Standards are in fact quite *different* from what has gone before, an ignorance due in part to the traditionally fragmented, incoherent character of the U.S. mathematics curriculum.

Appendix 1. Average Percent of Teachers in Each of 40 States Indicating They Feel Well Prepared to Teach Topics.

Grade/ Course	Ala bama	Ari zona	Arkan sas	Califor nia	Colorado	Connec ticut	Florida	Georgia	Hawaii	Idaho	Illinois	Indiana	Iowa	Kansas	Ken tucky	Louis iana	Mary land	Massa chu- setts	Michigan	Missis sippi
1	38	44	48	47	39	35	48	41	50	56	52	28	26	49	52	54	33	40	44	42
2	55	52	55	41	51	50	48	48	60	50	44	46	38	56	49	49	51	56	46	56
3	53	51	46	48	48	43	47	49	56	23	42	55	54	46	49	43	53	46	46	55
4	34	53	51	48	63	57	47	53	71	56	41	48	30	53	56	44	58	50	44	50
5	45	58	36	47	44	54	49	42	46	45	43	51	59	34	52	45	59	40	42	58
6	38	59	49	47	59	55	59	49	57	49	57	66	47	50	56	68	70	44	65	42
7	50	66	51	55	70	41	66	61	56	46	64	59	50	58	53	63	61	54	60	56
8	57	61	53	56	59	63	68	52	65	50	68	68	60	64	71	61	46	50	72	45
Algebra I	60	64	71	60	81	72	62	82	72	55	67	84	59	83	78	62	73	63	61	60
Algebra II	70	76	83	62	81	72	72	83	69	58	73	82	85	91	70	68	76	69	62	63
Geometry	58	69	73	63	78	74	72	84	73	53	71	87	81	88	68	67	74	70	65	56

Grade/ Course	Missouri	Nevada	New Hamp shire	New Jersey	New Mexico	New York	North Carolina	Ohio	Okla homa	Oregon	Pennsyl- vania	Rhode Island	South Carolina	South Dakota	Tennes see	Utah	Vermont	West Virginia	Wisconsin	Wyoming
1	60	50	38	38	28	43	53	49	52	51	53	20	38	52	46	53	41	26	36	52
2	54	53	54	39	26	46	46	44	61	57	48	17	45	38	41	52	57	31	34	25
3	53	36	43	41	43	47	47	43	32	57	42	27	48	58	45	50	61	6	51	72
4	53	56	38	40	65	48	43	50	51	56	48	40	47	68	40	47	50	44	51	56
5	49	54	11	41	33	50	48	51	64	58	54	43	41	68	63	44	64	54	51	38
6	49	37	50	50	62	55	47	58	85	62	58	23	68	58	50	57	73	39	62	68
7	62	0	62	48	56	56	59	64	68	73	55	48	65	64	52	76	41	68	58	64
8	62	40	51	52	36	61	51	62	71	71	60	45	60	73	53	78	36	56	59	100
Algebra I	70	43	65	58	70	48	69	65	70	67	75	91	59	75	60	75	54	58	66	71
Algebra II	74	85	68	67	79	61	69	76	59	74	75	93	70	74	67	74	64	64	74	71
Geometry	70	81	64	65	84	58	69	70	62	74	75	84	70	68	61	80	63	62	72	71

References

- Dacey, L., & Polly, D. (2012). CCSSM: The Big Picture. *teaching children mathematics*, 18(6), 378-383.
- National Council of Teachers of Mathematics (NCTM). (2006). *Curriculum Focal Points for Prekindergarten through Grade 8 Mathematics*. Reston, VA: National Council of Teachers of Mathematics.
- National Mathematics Advisory Panel. (2008). Foundations for Success: The Final Report of the National Mathematics Advisory Panel (pp. 120). Washington, D. C.: U.S. Department of Education.
- Promoting Rigorous Outcomes in Mathematics and Science Education (PROM/SE). (2006). Knowing Mathematics: What We Can Learn from Teachers *Research Report* (Vol. 2, pp. 24). East Lansing, MI: Michigan State University.
- Schmidt, W. H., Cogan, L. S., Houang, R. T., Markle, B. K., Middlestead, A. J., & Wang, H. A. (2002). Mirroring the U.S.: Initial findings from the PRISM Initiative (pp. 54). East Lansing, MI: Michigan State University.
- Schmidt, W. H., McKnight, C., & Raizen, S. (1997). *A Splintered Vision: An Investigation of U.S. Science and Mathematics Education*. Dordrecht/Boston/London: Kluwer.
- Schmidt, W. H., McKnight, C., Valverde, G. A., Houang, R. T., & Wiley, D. E. (1997). *Many Visions, Many Aims, Volume I: A Cross-National Investigation of Curricular Intentions in School Mathematics*. Dordrecht/Boston/London: Kluwer.