PEARSON

Investigations
IN NUMBER, DATA, AND SPACE®

Response to EdReports' Evaluation of *Investigations in Number, Data, and Space® ©2012* Grades 3 through 5

Based on our review of EdReports' evaluations of *Investigations in Number, Data, and Space 2nd Edition* ©2012*,* a comprehensive K-5 curriculum developed by TERC, we believe that the conclusions of the EdReports reflect a very narrow interpretation, and fall short of the true intention of the goals of the Common Core State Standards for Mathematics (CCSS-M).

In evaluating instructional materials, it is important to keep in mind that standards do not dictate a curriculum. In fact, the writers clearly state in the introduction to the CCSS-M that the standards "do not dictate curriculum" (p. 5), nor do they define a learning progression. The role and purpose of any set of standards is to *guide* curricula by providing benchmarks for learning. We believe that these standards should represent the *floor,* and not the *ceiling* in terms of expectations for student learning so that students are always encouraged to set higher goals and achieve higher expectations.

An effective curriculum requires a carefully laid-out and thoughtful learning progression that often involves concepts that may not be specifically articulated in the standards, but without exposure to these concepts, students may not achieve the expected proficiency with certain standards. Again, the writers of the CCSS-M acknowledge the difference between standards and curriculum:

> ...a teacher might prefer to teach a topic of his or her own choosing that leads, as a byproduct, to students reaching the standards for topics A and B. (CCSS-M, p. 5)

So while a curriculum may be guided by standards, it is not, and should not be, limited to the standards. It should offer learning activities that engage students and challenge them to think deeply about concepts while providing learning opportunities to develop understanding and eventually demonstrate proficiency with the standards.

In developing *Investigations in Number, Data, and Space,* the TERC authors undertook a comprehensive study of mathematics teaching and learning and did extensive field work to glean best practices that would support students' development of deep conceptual understanding, procedural fluency, and proficiency with problem solving - goals that pre-date, but are consistent with the CCSS-M. A look at the program goals highlights the close connection of the *Investigations* program to the CCSS-M:

- Support students to *make sense of* mathematics and learn that they can be mathematical thinkers
- Focus on *computational fluency* with whole numbers as a major goal

- Provide *substantive work* in important areas of mathematics—rational numbers, geometry, measurement, data, and early algebra
- Emphasize *reasoning* about mathematical ideas
- *Communicate* mathematics content and pedagogy to teachers
- Engage the *range of learners* in understanding mathematics

A Focused Curriculum

The result of many years of study and development is a program that is defined by a *focused* pathway towards algebraic readiness. The authors identified key mathematics concepts - understanding the Base 10 number system, the properties of operations and computational fluency - that help students build readiness for algebra. These concepts -- foreshadowing the idea of major work that the two assessment consortia have put forth -- represent the majority of mathematical study in the program. At each grade level, four or five of the nine units focus on number and operations and algebraic reasoning. Moreover, this focus on key mathematical ideas frames the work students do in other units.

In their evaluation of the program, the EdReports reviewers applied a very narrow standard for measuring focus that we believe compromises the intent of the CCSS-M with regard to instructional materials. The notion of categorizing sessions into groupings (major, supporting, additional) -- groupings that were set by the assessment consortia rather than the writers of the CCSS-M -- leads to a siloing of content and disregards the horizontal coherence and connections among concepts that are integral to the program, and a priority for instructional materials according to the writers of the CCSS-M. This misplaced emphasis on quantifying major work leads to a skewed view of the curriculum, placing greater importance on individual parts without looking at the whole.

Investigations was evaluated as not spending the majority of instructional time on major work of the grades, yet grade 3 was given a possible alignment of 64%, grade 4 62%, and grade 5 72%. These percentages were determined based simply on the counting of lessons without acknowledgement of the role of additional program features that support content, such as Ten Minute Math, or the depth and quality of the rich student experiences.

Some comments seem to trivialize the intent of the CCSS-M such as, *"In Grade 5, Unit 2, lesson 2.3 has students measuring cubic units in their classroom. There is no way to guarantee that these will be whole number values when working with volume and therefore is above the scope of Grade 5".* However, it clearly states on p. 78 of grade 5, Unit 2 that students round measurements to nearest meter—and all the following content use only whole numbers.

Further, as we stated earlier, we believe that the CCSS-M represent minimum, not maximum expectations at a given grade level, and therefore, support the concept of offering students

learning activities that challenge and extend their thinking. Holding all students to a minimum, in our view, once again runs counter to the purpose of the CCSS-M.

A Coherent Curriculum

The *Investigations* program was also designed around a *coherent* organization of content with explicit and embedded connections both from grade to grade and within the different mathematical domains in each grade. The units across grades represent a strong, logical vertical progression of concepts and skills. Within a grade level, students encounter and apply key concepts from unit to unit in different areas of mathematics (e.g., measurement, geometry), highlighting the interrelatedness of these concepts, the powerful connections among concepts in different domains, perhaps most important, the wholeness of mathematics.

Based on their comments, the EdReports reviewers seemingly misunderstood the approach to content development in the program, failing to see the integration and application of concepts from one domain, such as number and operations, in learning activities from other domains, such as measurement, data, and geometry.

A Curriculum Built Around Math Practices

An equally, if not even more, important aspect of the program is how students learn mathematics. In *Investigations*, students' development of mathematical concepts is fostered by practices that the CCSS-M calls the Standards for Mathematical Practices.

"The ideas described in the Mathematical Practices have been the premise of our work for over 20 years as ways students ought to interact with mathematical ideas. They are the basis of our philosophy of teaching and learning mathematics and are a part of the fabric of how a lesson and experience unfolds for students and teachers," explains Karen Economopoulos, Senior Project Director, Education Research Collaborative, TERC Cambridge, Massachusetts.

This approach has been so powerful that many math educators consider the program a hallmark of effective instruction on these habits of mind. Because *Investigations* was evaluated as not meeting expectations for focus and coherence, it did not undergo the complete evaluation, which in the spirit of a "Consumer Reports of instructional materials," would have allowed for a comprehensive assessment of the strengths and weaknesses of the program. One of its most recognized strengths is the seamless integration of content and the Mathematical Practices.

A Dynamic and Evolving Curriculum

Throughout its twenty-five years, the program has regularly undergone studies of its effectiveness in students learning. These research studies have consistently found enhanced student performance in terms of computational fluency, problem solving, and conceptual

understanding. This validates the call of the writers of the CCSS-M for focused and coherent curricula, with an emphasis on the Standards for Mathematical Practice to support student learning. These studies have also been used to either validate or revise and amend learning activities, as appropriate.

Because the *Investigations* program was developed before the release of the CCSS-M, there are some content alignment differences between the two. For example, CCSS-M sets proficiency with fraction addition and subtraction with like denominators as a Grade 4 benchmark and fraction addition and subtraction with unlike denominators as a Grade 5 benchmark, while *Investigations* students focus on fraction addition and subtraction with both like and unlike denominators in Grade 5.

The authors first addressed these divergences by providing transitional materials for the 2nd Edition, (*Investigations for the Common Core)* while they worked on a plan to ensure that *Investigations* students have ample opportunities to develop proficiency with the CCSS-M standards at the appropriate grade level. These transitional materials were designed to provide teachers with interim support as the authors planned for and worked on an update to the program.

The third edition of *Investigations* is undergoing the same rigorous development process that is a hallmark of the program. The authors have identified content needs that can reconcile the divergences between the CCSS-M grade-level expectations and current content. One example is the removal of the units on three-dimensional shapes in Grades 3 and 4.