

## The Unique Importance of Grade 6 in the K-12 Mathematics Curriculum

Steve Leinwand

For years, the word was that grade 4 was the nightmare year for math. Grade 4 teachers faced an abundance of new, important, and often tricky-to-teach content. All sorts of topics were moved down to 4<sup>th</sup> grade to make room for more in grades 5 and 6 and all sorts of mathematics were moved up to grade 4 to ensure that grades 2 and 3 were developmentally appropriate. The result was that grade 4 became the repository of a giant hit on fractions, expected mastery of multiplication and division and made measurement a major focus. But that was in the pre-Common Core era before we built a curriculum around coherent progressions, a teachable scope and sequence and an leveling out of the curriculum. Until we get to grade 6!

With the Common Core, and its similar cousins, all of a sudden, to enable significant and appropriate algebra, geometry and statistics in grades 7 and 8, grade 6 has taken on critical importance as perhaps the most challenging and most impactful grade to teach in the entire preK-12 curriculum. This is *not* because of too much content, in fact, there is enough time to do 6<sup>th</sup> grade right with 60 minutes per day, but because of the newness and complexity of so many of the grade 6 standards. Let me try to be more specific about both the context and the content.

For most students, grade 6 is the first year of middle school. It is often the first or second year of a differentiated mathematics period with a single mathematics teacher. Therefore, for all disciplines, grade 6 is where we send all students a clear message that you are now beyond elementary school. You will finally start to be treated as young adults and not children, and accordingly, our expectations are higher. When this transition is done effectively, it carries through all of middle school and into high school.

But in the discipline of mathematics, grade 6 is critical for several curriculum content reasons as well. Again, when Grade 6 is successful, weaknesses from elementary school can be offset and students can be ready for grades 7 and 8. However, when 6<sup>th</sup> grade fails – students often never catch up. Just look at what makes the grade 6 curriculum so unique and so important:

- With the sole exception of dividing a fraction by a fraction, which is the only new topic within the number and operations strand, the first quarter of grade 6 is – or at least should be – a much needed review and consolidation of the mathematics of grades 3-5. That is, the first large unit focuses on solving problems involving the addition, subtraction, multiplication and division of whole numbers, fractions and decimals. It solidifies the essential skill of given data or a numeric situation, do I add, subtract, multiply or divide and WHY? It focuses on what's a reasonable estimate and is my answer reasonable – all embedded in realistic contexts like menus, data lists, price lists and other data rich situations. When done well, students are ready to move on. When

skipped or not done well, all the problems with knowledge and skill gaps are only exacerbated.

- And then grade 6 has the audacity (thank goodness) to introduce ratios and rates. Like all learning of important topics, initial experiences can empower or poison. We know how many students have been disemboweled by mediocre teaching of ratios and rates, how impossible the rest of middle school becomes, and how rare it is to catch up in high school. We know that for the fractions progression, grades 3 is key to making grades 4 and 5 work. That is exactly the case in grade 6 where rates and ratios are introduced and build the foundation for grade 7 and proportional reasoning. If this large and critical unit in grade 6 seems easy, consider what I believe to be among the most important and most difficult of *all* mathematics standards for students:

Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations.

- a. Make tables of equivalent ratios relating quantities with whole-number measurements, find missing values in the tables, and plot the pairs of values on the coordinate plane. Use tables to compare ratios.
- b. Solve unit rate problems including those involving unit pricing and constant speed. *For example, if it took 7 hours to mow 4 lawns, then at that rate, how many lawns could be mowed in 35 hours? At what rate were lawns being mowed?*
- c. Find a percent of a quantity as a rate per 100 (e.g., 30% of a quantity means 30/100 times the quantity); solve problems involving finding the whole, given a part and the percent.
- d. Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities.

Note how far we have finally moved from the mindlessness of merely “solve problems involving ratios and rates” and “cross multiply and divide.” Note too that this content needs somewhere close to a quarter of grade 6 to do right. Once again, when done well, students tend to thrive throughout the rest of middle school. When done poorly, many students never recover.

- As if that wasn't enough, another quarter of the year needs to be devoted to the equally critical topic of variables, expressions and equations. That is, the core elements of the entire algebra strand essentially begins in grade 6 and continues through high school. Just as 6<sup>th</sup> graders are being asked to reason proportionally – a new and confusing notion – they are *also* being asked to move from arithmetic reasoning to algebraic reasoning – the shift from numbers to variables that represent quantities. This is exactly what other high performing countries have done for years and that the US has not. And this too makes student success in grade 6 so important.

Given these realities, I have argued for nearly ten years that one of pillars of ensuring a strong and successful mathematics program is assigning some of the best upper elementary and middle school teachers to grade 6 and providing them with the training needed to get grade 6 right.

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