> *The RIDD Strategy*
>
> *R Read the problem*
> *I Imagine the problem*
> *D Decide what to do*
> *D Do the work*

RIDD is effective because it combines several strategies, such as visualization, reflection, and thoughtful questioning, all of which serve to increase understanding and retention of learning. Furthermore, RIDD allows the student to recognize that there are multiple cognitive processes involved between reading a problem and rushing to do the mathematics involved. This learning strategy, like most, is effective if used regularly, increasing the likelihood that it will become a permanent part of the student's study skills toolkit.

English Language Learners

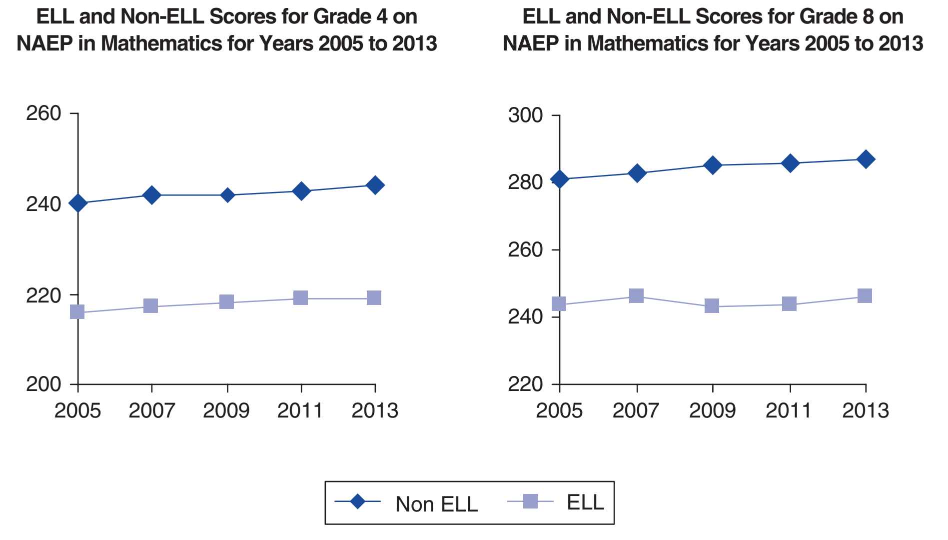
English language learners (ELLs) are the fastest-growing population in U.S. public schools, the largest portion of them being native Spanish speakers. ELL students have difficulty learning mathematics, as evidenced by their scores in Grades 4 and 8 on the National Assessment of Educational Progress (NAEP, 2013) over recent years: They are consistently lower than those of non-ELL students (Figure 7.7). Clearly, there is an achievement gap in mathematics that educators need to address.

The chart for Grade 4 indicates that, although the scores of ELL students are lower than those of non-ELL students, the ELL scores have risen about the same amount as the non-ELL scores from 2005 to 2013. For Grade 8, however, the ELL students have made little progress over the same time period, while the non-ELL scores have risen. What are some of the issues involved, and what can be done to improve the achievement of ELL students in mathematics?

Language Issues

We already discussed in Chapter 1 how the brain relies on three cerebral systems—visual processing, symbolic processing, and language

Figure 7.7 These charts compare the mathematics scores of ELL and Non-ELL students on the NAEP from 2005 to 2013 (NAEP, 2013).



processing—when dealing with quantities. Still, many people, including some educators, believe that mathematics is a nonverbal discipline. That mathematics processing relies heavily on language systems is reason enough to allow ELL students, whenever possible, to master basic mathematics in their native language before trying to learn mathematics in English. Language is a major concern in mathematics teaching because most of the content is conveyed through oral language, as teachers tend to do the majority of the talking in mathematics classes. ELL students do not derive a significant portion of their learning from reading mathematics textbooks.

The language issue is becoming more significant now because the Common Core State Standards for Mathematics (National Governors Association Center for Best Practices & Council of Chief State School Officers, 2010) curriculum shifts instruction in mathematics from more emphasis on numbers to more emphasis on word problems. Consequently, to understand and be successful in mathematics, students need to be able to read, solve problems, and communicate using technical language in a specialized context—and to properly discuss and explain mathematics content, teachers must use technical language. Students lacking proficiency in the English language and in the specialized language of mathematics understandably frustrate teachers who are faced with an increasing number of ELL students in their classrooms.

Two Planning Objectives. Teachers also face challenges when working with ELL students. ELL teachers may not be well trained in mathematics, and mathematics teachers are typically not well trained in working with ELL students. Regardless, when planning a lesson, teachers need to decide on a language objective in addition to the mathematics content objective. While the language objective includes those English mathematical terms and expressions that describe the problem and the operations, the content objective demonstrates the steps involved in solving it. Understandably, the language of mathematics presents an array of challenges to ELL students.

Grammar and Vocabulary Issues. Features such as symbolic notation, graphs, technical vocabulary, and complex grammatical phrases all pose substantial barriers to understanding. For example, the phrase "7 multiplied by 12" is very different from "7 increased by 12." Similarly, "divided by" and "divided into" will produce very different results. Even number notation can pose problems. For instance, some countries use a comma to separate whole units from decimals, instead of the period commonly used in North America, and use a period to separate thousands (e.g., 1 million dollars in Europe is written as $1.000.000,00). The difficulty of learning the already foreign language of mathematics is compounded when the instruction is also in a nonnative language.

The multiple meanings of words and the rules of English syntax allow us to interchange terms or expressions to identify the same mathematical concept. Teachers of mathematics are so accustomed to the content vocabulary that they are often not aware of the multiple terms used to describe the same operation. Addition, for example, uses *plus, total, add, combine, sum, put together, altogether, increase by, more than,* and *in all* to indicate its operation. Subtraction has its own list: *less, take away, difference, subtract, decrease by, minus, fewer than, are left, take from,* and *remain.* As a result, an