



# A Closer Look at Elementary Mathematics

## Undergraduate Elementary Programs

**KEY FINDINGS:** Only thirteen percent of the 860 programs reviewed require the coverage of the critical topics mathematicians say aspiring elementary teachers need.

### Why teacher prep programs should have strong preparation in elementary mathematics

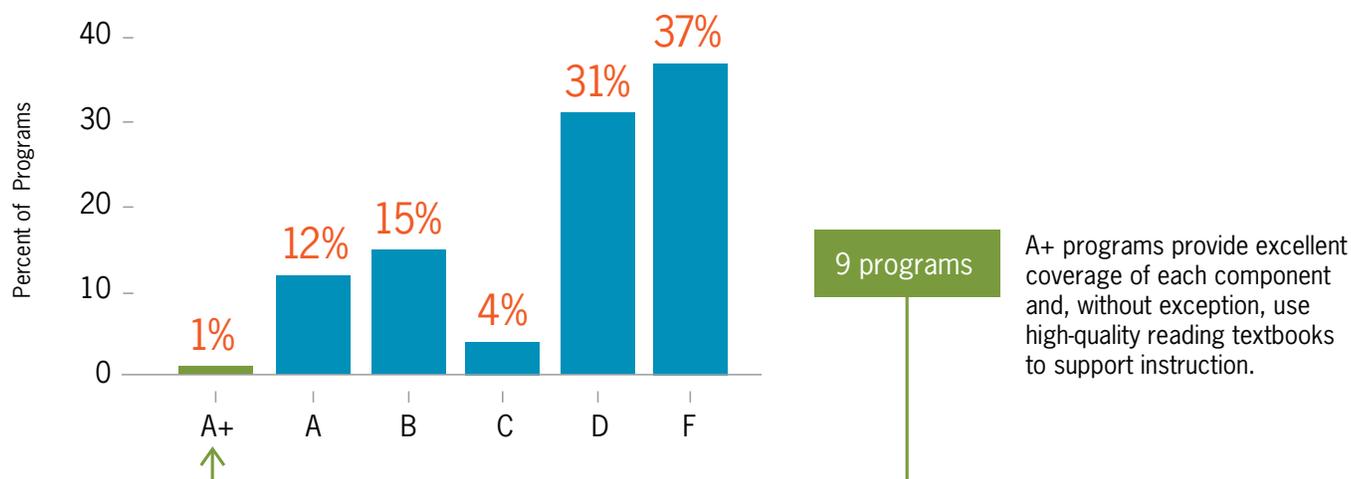
Teaching elementary children the fundamentals of arithmetic—dividing fractions, operations with signed numbers, or basic probability—requires a deep understanding of the underlying mathematics. For elementary teachers, it's simply not sufficient just to know “invert and multiply.” One must know and be able to explain why that works, building upon the more fundamental whole number operations. This requires specialized mathematics coursework specifically for prospective elementary teachers. Typical college-level coursework (such as calculus) does not address these topics.

To earn an A in elementary mathematics, a program must dedicate sufficient time for at least 75 percent of topics identified by mathematicians as being critical for elementary teachers, and require at least one course in the methods of teaching mathematics to elementary-aged children.

For more information about analysis and program grades, see the *Methodology in brief* and *Understanding program grades* sections below.

### Percentage of programs and adequacy of coverage of the critical topics of elementary mathematics

(N=860 undergraduate elementary programs)

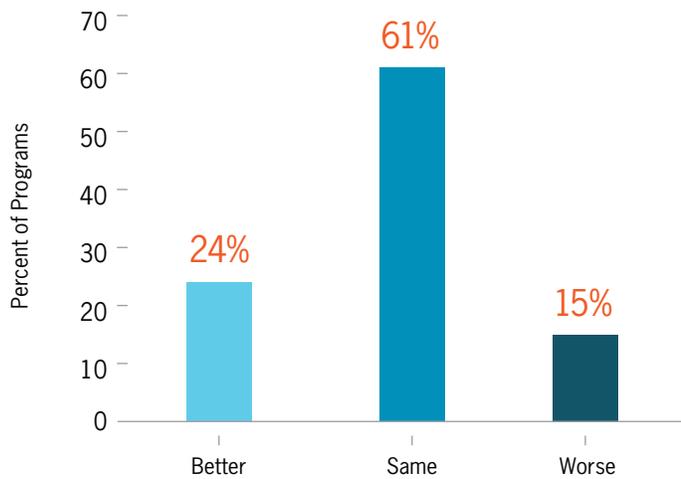


A+ programs address at least 90 percent of the critical mathematics topics, in contrast to the 75 percent required for an A.

## Changes between 2014 and 2016

Grade comparisons for the 650 undergraduate elementary programs with math grades in both 2014 and 2016

(N=650 undergraduate elementary programs)

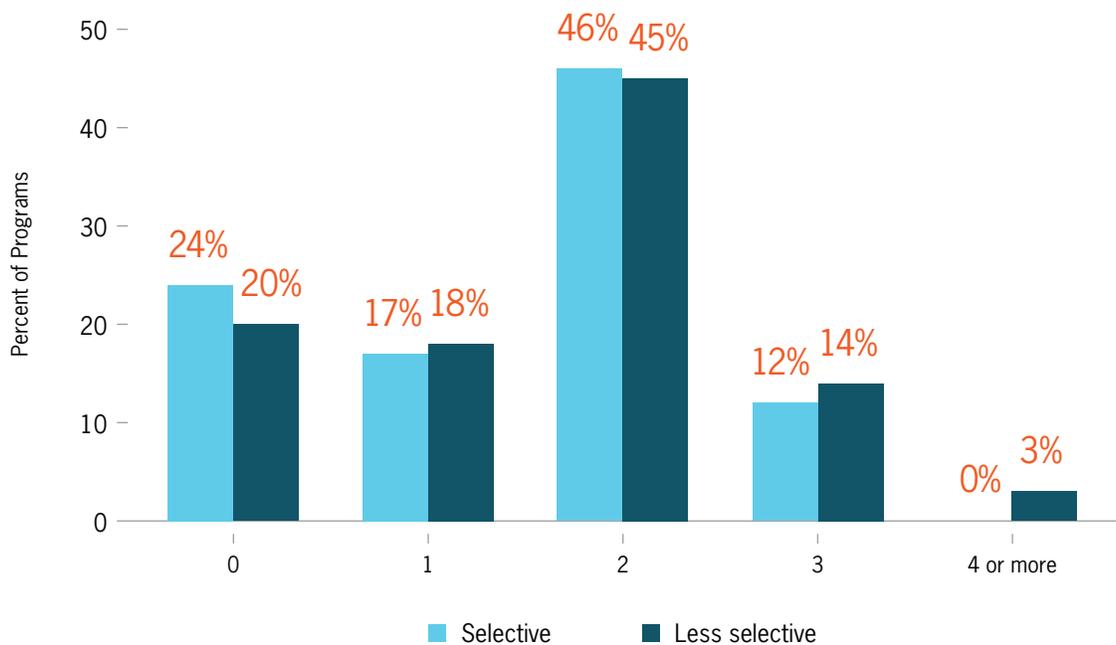


Overall, there has been little change in our elementary mathematics results between 2014 and 2016. In 2014, 8 percent of undergraduate elementary programs earned an A+ or an A. In 2016, 13 percent of programs earned those grades. In 2014, 34 percent of undergraduate elementary programs earned failing marks. In 2016, that proportion is 37 percent.

## A closer look at mathematics coursework expectations

Percentage of selective versus less selective programs requiring a number of mathematics courses (not methods)<sup>1</sup>

(N=860 undergraduate elementary programs)



1 Selective programs are those which earn at least an A on the Selection Criteria Standard.

These are raw course counts based on the listed requirements for the program.<sup>2</sup> Programs labeled as requiring no courses either require methods coursework only or offer choices of mathematics coursework not relevant for elementary teacher candidates.

### Top four textbooks to use in elementary mathematics

Unlike elementary reading, where there appears to be no end of possible textbooks, a relatively small number of textbooks are used in elementary mathematics. This Review evaluates 138 texts.

Below are the four textbooks most commonly used in courses evaluated in the Review that comprehensively and rigorously cover the mathematics concepts that elementary teachers need to know. Names of additional acceptable textbooks can be found in the [full list](#) of all evaluated texts.

#### Popular texts that provide comprehensive and rigorous coverage of elementary math topics

Title	Author	Number of courses using book in programs covered in the Review
<i>Mathematics for Elementary Teachers with Activities</i> (up through the 4th ed.)	Beckmann	181
<i>Mathematics for Elementary School Teachers</i>	Fierro	22
<i>Elementary Geometry for Teachers and Elementary Mathematics for Teachers</i> <sup>3</sup>	Parker	34

### Especially thorough coverage of the topics of elementary mathematics in coursework and methods of teaching mathematics

Nine undergraduate elementary programs earn “A+” designations for their elementary mathematics preparation of prospective elementary teachers. These programs deserve special recognition for their comprehensive coverage of the topics and accompanying mathematics methods courses:

GA ▶ Middle Georgia State University

IN ▶ Indiana University–South Bend

IA ▶ Iowa State University

MA ▶ Worcester State University

MN ▶ Winona State University

NC ▶ Elon University

OH ▶ Cedarville University

OH ▶ University of Rio Grande

WI ▶ University of Wisconsin–Madison

2 Analysis requires converting course requirements to a common unit—the semester credit hour—which is based on the institution's calendar and is weighted by the grade–span and subjects covered by the course. A course that covers grades K-8 counts less than a course that covers K-6, because the former necessarily includes mathematics topics beyond elementary school.

3 Two texts by this author that together address the four subjects evaluated are combined in NCTQ's score and this report on use.

## Methodology in brief

Mathematics experts reviewed course descriptions, syllabi, and required textbooks in math coursework. They look to see if coursework covers conceptual understanding of essential elementary math topics in numbers and operations, algebra, geometry, and data analysis and probability and whether candidates get significant and repeated exposure to the concepts. Programs earn an “A+” if required coursework covers at least 90 percent of topics and includes a coordinated methods course.

To learn more about how we evaluate programs for elementary mathematics, please see our [methodology](#).

For examples of model materials on this standard, please see the [resources](#) section.

## Understanding program grades for Elementary Mathematics

- A+** Programs address at least 90 percent of topics in coursework equivalent to at least 8 semester credit hours<sup>4</sup> (6 semester credit hours if the institution is selective<sup>5</sup>) and require a methods course in teaching elementary mathematics.
- A** Programs address at least 75 percent of topics in coursework equivalent to at least 8 semester credit hours (6 semester credit hours if the institution is selective) and require a methods course in teaching elementary mathematics.
- B** Programs address at least 75 percent of topics in coursework equivalent to at least 6 semester credit hours (4 semester credit hours if the institution is selective).
- C** Programs address at least 75 percent of topics in coursework equivalent to at least 4 semester credit hours.
- D** Programs address less than 75 percent of topics in coursework equivalent to at least 4 semester credit hours.
- F** Programs require coursework equivalent to less than 4 semester credit hours.

4 Our expert mathematicians determined that adequate coverage of all of the critical topics requires the equivalent of eight semester credit hours of course time. This does not mean we expect to see two and two-thirds courses in mathematics; practically, it means most institutions will need at least three semester-long courses.

5 The program earns at least an “A” on the Selection Criteria Standard.



National Council on Teacher Quality

1120 G Street, NW, Suite 800

Washington, D.C. 20005

Tel: 202 393-0020 Fax: 202 393-0095

Web: [www.nctq.org](http://www.nctq.org)