Use of Open Educational Resources in an Era of Common Standards

A Case Study on the Use of EngageNY

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Preface

EngageNY is a popular website maintained by the New York State Education Department that provides educational resources to teachers. The purpose of this report is to better understand the use of EngageNY in order to shed light on channels through which open educational resources could better support teachers and the implementation of state standards. In this report, we use data from Google Analytics, as well as surveys and interviews with teachers from the RAND Corporation's American Teacher Panel, to provide evidence about who is using EngageNY, as well as reasons for its use and the extent to which it is supporting teachers to address standards for mathematics and English language arts.

This research has been conducted by RAND Education, a unit of the RAND Corporation. Funding to support the evaluation has been provided by the Bill & Melinda Gates Foundation. For more about RAND Education, visit www.rand.org/education.

For more about the RAND American Teacher Panel and how to take advantage of this resource, see www.rand.org/education/projects/atp-aslp.

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Summary

While most states have adopted more-challenging K–12 standards for mathematics and English language arts (ELA) over the past several years, publishers have struggled to make corresponding changes to the rigor and content of instructional materials to ensure they are aligned with those standards. School districts with tight budgets and limited resources also face challenges in finding money to pay for new textbooks that align with their standards.

Open educational resources (OER) could serve an important role in the implementation of state standards by connecting educators with free, standards-aligned online instructional materials. Yet obstacles persist in widespread use of OER, including limited coherence across materials and little clear evidence of quality and standards alignment among lesson plans and activities in current OER repositories. In particular, current K–12 OER tend to be individual classroom activities or lessons within searchable repositories, rather than full sets of curriculum materials. We define *curriculum materials* as a comprehensive set of instructional materials—including student textbook(s), teachers' guides, and sets of lesson plans—that address a set of content standards at particular grade levels.[1]

EngageNY represents one of the first efforts to create coherent, standards-aligned OER curriculum materials. EngageNY is composed of free resources developed and maintained at EngageNY.org by the New York State Education Department (NYSED) to support the implementation of NYSED education policies and goals, including standards. In particular, EngageNY's OER include full sets of ELA and mathematics curriculum materials aligned with New York state standards for use in K–12 classrooms. Text Box S.1 provides more information about EngageNY, including its goals and contents. Early evidence suggests that EngageNY is one of the most widely used OER for K–12 teachers and students in the United States. Given its popularity, EngageNY represents a unique opportunity to understand uptake of open online curricula and challenges in using such curricula.

This report presents evidence on the use of EngageNY throughout the United States in order to shed light on the channels through which OER could offer better support to teachers and students. Our investigation focused on the following questions:

- Who is using EngageNY curricula and what curricular elements are they using most?
- What explains the high uptake of EngageNY?
- How is EngageNY supporting teaching and learning?

[1] For more on curricum materials, see the definition in Ball and Cohen, 1996.

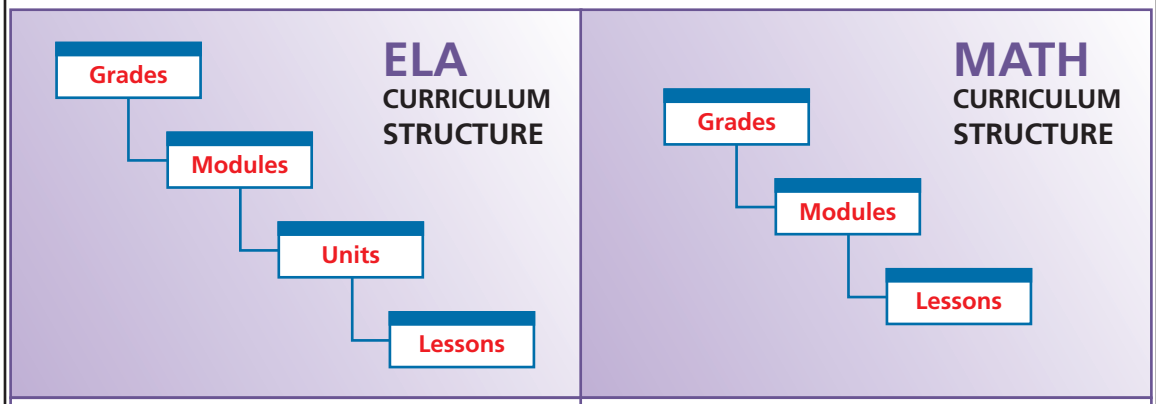
Data and Methods

To answer our research questions, our RAND Corporation research team drew on data from multiple sources collected over the course of the 2014–2015 and 2015–2016 school years. First, we examined Google Analytics reports provided to us by NYSED to understand more about the states and areas of the United States with particularly high uptake of EngageNY curriculum materials, as well as which aspects of those materials are most popular. Second, we drew on survey findings from the October 2015 survey of the American Teacher Panel, a nationally representative panel of American K–12 public school teachers across the United States. In the

Text Box S.1
What is EngageNY?

EngageNY.org is a website created and maintained by the New York State Education Department (NYSED). It became operational in 2011 and includes a variety of free online resources intended to support the implementation of the New York State Board of Regents Reform Agenda (EngageNY, undated-b). The resources provided by EngageNY include curriculum and professional development materials for teachers and leaders, as well as guidance to parents and families on standards and how to support their children's learning. This report focuses only on the mathematics and ELA curriculum materials available through EngageNY. Through federal funding from Race to the Top, NYSED worked with publishers to develop the mathematics and ELA curriculum materials to be aligned with New York State Common Core Learning Standards. The curriculum materials include full lesson plans and instructional activities organized into units and modules, from pre-K to 12th grade. The EngageNY website emphasizes that all EngageNY curriculum materials are optional and "designed to be adopted or adapted" (EngageNY, undated-a).

The ELA and mathematics curricula are organized into grades, modules, units, and lessons, as illustrated in the snapshot below. For each lesson, an overview or objective is provided on a corresponding web page. However, all materials for that lesson (e.g., readings, lesson plans, performance tasks, worksheets, and adaptions for special needs students) are only accessible by downloading associated files linked to the web page.



Curriculum materials for ELA subjects are structured into 4 levels of hierarchy. You can navigate by grade, then by various modules within the grade. Each module is divided into units, and each unit is further divided into lessons.

Curriculum materials for Mathematics subjects are structured into 3 levels of hierarchy. You can navigate by grade, then by various modules within the grade. Each module is then divided into lessons.

RAND *RR1773-S.1*

October 2015 survey, mathematics and ELA teachers responded to many questions about the curriculum materials and instructional resources they used in their classrooms, what influenced their use of those materials, and how those materials helped them address their state standards. Lastly, we drew on interviews with teachers from California and New York to better understand teachers' use of EngageNY and instructional materials more generally.

Findings

Who is Using EngageNY and What Curricular Elements are they Using Most?

Our findings suggest that EngageNY is among the most commonly used curriculum materials for mathematics and ELA over the period of analysis. Key takeaways on the use of EngageNY:

- Google Analytics suggested particularly heavy use of EngageNY curriculum materials in New York state, but the mathematics and ELA curriculum materials were also accessed in every other state and use was particularly high in some states that have adopted Common Core or similar standards.
- EngageNY mathematics curriculum materials were used at about three times the rate of ELA curriculum materials across the United States. However, our survey data suggests that ELA teachers may have used EngageNY materials more comprehensively than mathematics teachers.
- While we know something about the extent to which users and teachers drew on EngageNY curriculum materials, how they were used in the classroom likely varies considerably from teacher to teacher.

What Explains the High Uptake of EngageNY?

Data from the American Teacher Panel suggests that high use of EngageNY curriculum materials across the United States was at least partly driven by educators' desire to help students meet state standards and prepare for assessments that are aligned with state standards. In particular, teachers in states that adopted Common Core or similar standards were 65 percent more likely to use EngageNY than those in non–Common Core states. The survey data also suggest that school district requirements and recommendations may be a prime reason why teachers used EngageNY. Some relevant survey findings are that:

- Nearly one-half of teachers indicated that their district required use of EngageNY for their ELA and mathematics instruction, and between 80 and 90 percent indicated that their district either required or recommended its use.
- A majority of both mathematics and ELA teachers indicated that district curriculum frameworks and state standards influenced their use of EngageNY materials "a great deal."
- State standards and district assessments influenced ELA teachers' use of EngageNY more than their use of any other ELA curriculum materials we asked about in our survey.
- While the open nature of EngageNY resources may encourage their use, teachers did not cite "availability" more often as an influence for their use of EngageNY compared with other instructional materials.

How is EngageNY Supporting Teaching and Learning?

Our survey data suggest that EngageNY gives students more opportunities to participate in some standards-aligned practices than other instructional materials. In particular:

- Compared with other curriculum materials they used for their instruction, mathematics teachers were more likely to indicate that EngageNY provided their students with opportunities to explain and justify their work, as well as address three instructional goals—conceptual understanding, procedural skills, and application to real-life contexts—with equal time and intensity.
- Similarly, compared with other curriculum materials, ELA teachers were more likely to indicate that EngageNY provided their students with opportunities to read nonfiction texts of sufficient grade-level complexity, use a range of vocabulary, connect literacy instruction to other content, and participate in a range of collaborations with diverse partners.

Interview data suggest that EngageNY offers materials at a high level of rigor, but rigor and pacing may present both advantages and challenges to teachers and students. Furthermore, the online format of EngageNY curriculum materials may present unique challenges for instruction compared with traditional textbooks.

Implications

Given that state standards and districts appear to be such a large driver of EngageNY, OER providers—and any providers of online instructional materials—should ensure that their materials are clearly aligned with standards and provide explicit evidence in that regard. In particular, if online materials are provided in progressions that are well aligned with state standards progressions, teachers may be more apt to use those materials on an ongoing basis for their instruction, and districts could be more apt to recommend and require use of those materials.

Online providers may also consider offering additional tools that support implementation of OER across schools and districts. If, indeed, adoption of online curriculum materials is district-wide—rather than represented by individual teachers—providers have an opportunity to leverage district and intradistrict networks to provide curriculum implementation support opportunities to a large number of teachers.

States, districts, and others supporting teachers' work in schools also have an important role in supporting use of OER. To get high-quality OER into the hands of teachers, rigorous vetting and review of curricula to examine alignment with standards and assessments could be performed by researchers, states, and other organizations. A bigger question is how teachers can be supported and encouraged to use OER in ways that will help students master the standards and achieve at higher levels. States, districts, and schools may thus consider how to integrate the content of recommended curricula into professional learning opportunities on a regular basis and, perhaps more importantly, create and grow networks of expert users who can support each other through online and in-person professional learning communities.

Acknowledgements

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Abbreviations

ATP	American Teacher Panel
CCLS	Common Core Learning Standards
CCR	College and Career Ready
CCSS	Common Core State Standards
CKLA	Core Knowledge Language Arts
ELA	English language arts
ELL	English language–learner
HTTP	hypertext transfer protocol
NCTM	National Council of Teachers of Mathematics
NYSED	New York State Education Department
OER	open educational resources
PDF	Portable Document Format
SAP	Student Achievement Partners
URL	uniform resource locater

CHAPTER ONE

Introduction

Most states have adopted Common Core State Standards (CCSS) or College and Career Ready (CCR) standards, which are similar to the Common Core. While some states are considering further changes, the increased demands of these new standards compared with previous state standards, require a corresponding increase in the rigor and content of instructional materials that teachers use in their classrooms (Porter et al., 2011). Recent studies suggest that some of the most widely used instructional materials are not well aligned with CCSS and CCR standards, despite claims to the contrary by many publishers and sources of online materials (Polikoff, 2015; Heitin, 2015; Herold and Molnar, 2014). Many state education agencies and school districts are struggling to fill the void in standards-aligned curricula and instructional materials to help students meet their state standards (Rentner, 2013; Rentner and Kober, 2014).

Open educational resources (OER) could serve a key role in implementation of state standards by connecting educators with free, standards-aligned online curricula and lesson activities. OER are freely accessible, openly licensed documents and media that can be used for teaching and learning. OER can include "full courses, course materials, modules, textbooks, streaming videos, tests, software and any other tools, materials or techniques used to support access to knowledge" (The William and Flora Hewlett Foundation, 2016). The free nature of OER stands in contrast to some of the more popular commercial online resource repositories that many teachers have begun using in recent years to both sell their own lesson ideas and purchase resources that others have created, including websites like Teachers Pay Teachers, Educents, Teachwise, and TES (Gomes, 2015).

The past decade has seen increasing efforts to develop and support use of OER. OERCommons.org, for example, was founded in 2007 and represents a growing collection of OER K–12 and higher education curricula, lesson plans, and activities, and similar repositories exist at OpenEd.com, LearnZillion, Curriki, Share My Lesson, and Better Lesson. Some states and districts have done considerable work to develop and identify high-quality OER and share those resources across their networks (Ash, 2012; Achieve, 2013). Perhaps more importantly, in Fall 2015, the U.S. Department of Education began a #GoOpen campaign to encourage states, school districts, and educators to use OER. This push to get OER into the hands of educators may be contributing to growth in the use of OER. Nearly 73 percent of U.S. teachers surveyed last year by TES Global reported that they used OER more than textbooks (TES Global, 2016).

However, some challenges exist with respect to the use of OER. The TES Global survey suggests that limited access to hardware and internet connectivity is an issue for OER use among about one-quarter of teachers. It is possible that this percentage is actually higher, given that those who lack technology to access OER are also less likely to respond to online surveys such as TES Global. Furthermore, access could vary considerably depending on the techno-

logical tools and resources within the state, district, or school where a teacher is working. Such digital divides may keep technology away from the educators and children who could benefit from it most.

Another key challenge for use of OER is that the most popular resources may range considerably in their quality and often exist as individual lessons or activities. Thus, it may be challenging for teachers to assess their quality or be clear on how to integrate them cohesively with existing curricula. The National Council of Teachers of Mathematics (NCTM), for example, released a statement in October 2016 noting that while educators—and districts and schools—have "greater access than ever" to online instructional materials, "the skill required to develop high-quality curriculum materials is both vast and complex, but neither widely understood nor appreciated" (NCTM, 2016). NCTM recommends providing educators with considerable time with colleagues in professional learning communities that focus on use of instructional materials and tools alongside assessments and other resources to create coherent instructional programs. To add to this challenge, current OER repositories are often unclearly organized and exist in silos with no connections to each other, even when materials in different repositories are very similar (e.g., address the same standards) or could support teachers better when used together (Drabkin, 2016). Furthermore, the search mechanisms for many of these repositories may guide teachers to the most popular resources, rather than to those that are high-quality and well-aligned with state standards. Lack of clarity in regard to licensing and commercial use of lesson resources may also limit their use (Wiley, 2016; Levin, 2016).

EngageNY represents one of the first efforts to create coherent, standards-aligned OER curriculum materials. Developed and maintained by the New York State Education Department (NYSED), EngageNY was intended to support educators in New York by providing free access to curricula, instructional resources, and other support to implement New York's Common Core Learning Standards (CCLS).[1] CCLS are strongly aligned with CCSS. For mathematics, the nonprofit Great Minds developed all of EngageNY's curriculum materials, including materials for pre-K through grade 8, as well as Algebra I, Geometry, Algebra II, and "Precalculus and Advanced Topics." For English language arts (ELA), several vendors developed curricula including The Core Knowledge Foundation (for pre-K through grade 2); Expeditionary Learning (for grades 3 through 8); the Public Consulting Group (for grades 9 through 12); and Odell Education (for grades 6 through 12). On the EngageNY website, NYSED stresses that these are optional curriculum materials and are "designed to be adopted or adapted."[2]

Early evidence suggests that EngageNY may be among the most widely used OER for K–12 teachers in the United States. Between its launch in 2011 and fall 2014, EngageNY's website reportedly received more than 15 million visits, with 26,000 weekly visits.[3] The number of visits has grown tenfold since then; September 2016 saw more than one million total visits to the EngageNY website.[4] In addition, surveys of the RAND Corporation's American Teacher Panel (ATP)—a nationally representative survey of teachers across the United States—indicated that about 30 percent of mathematics teachers are using EngageNY to sup-

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1 For more information, see EngageNY, undated-a.

2 See EngageNY, undated-b.

3 See U.S. Department of Education, 2014.

4 Estimate from SimilarWeb, 2017.

port their instruction, as are a little more than 25 percent of ELA teachers (Opfer, Kaufman, and Thompson, 2016).

Users may be looking to EngageNY because they believe the content is strongly aligned with their state standards and may, thus, raise student performance on standardized tests intended to measure mastery of those standards. Indeed, while EngageNY was designed to align specifically with New York's K–12 standards, New York standards themselves are closely aligned with CCSS, which have been adopted in some form by 42 U.S. states.[5] There is some objective evidence that EngageNY curricula are aligned with CCSS. In 2015, EdReports reviewed 26 well-known K–8 mathematics textbooks for their alignment with CCSS and found Eureka Math (which is a commercial variant of the free and open version featured within EngageNY) to be well-aligned with CCSS for the grade levels and CCSS-related areas for which they were reviewed. More recently, EdReports reviewed seven ELA textbooks for grades 3 through 8 and found Expeditionary Learning (the ELA curriculum for grades 3 through 8 that is part of EngageNY) to be well aligned with CCSS for the CCSS-related areas and grade levels for which it was reviewed.

In part, teachers may believe EngageNY will support them in teaching to the standards because states (or districts) have signaled that to be the case. While we do not have systematic data on which states recommend EngageNY, we know that at least some states provide links to EngageNY or encourage its use as a resource to support standards implementation. New York is, of course, a primary example, given that it developed and maintains the EngageNY materials. In other examples, the Arizona Department of Education provides a link to EngageNY as "college and career ready" resources,[6] and the California State Department of Education links to EngageNY materials in its collection of resources to support implementation of CCSS.[7] The Louisiana Department of Education also recommends Eureka Math—which is one of the curricula available within EngageNY and also a stand-alone set of commercial curriculum materials—as "Tier 1–Exemplifying Quality" on their website, which is likely one reason Louisiana teachers have been found to use EngageNY and Eureka Math significantly more than their peers in other states.[8]

EngageNY may also be widely used because it constitutes one of the few sources of free and open curriculum materials, with full units and lessons covering the range of topics and content necessary to support students over the course of the whole year. School districts may be more apt to recommend EngageNY materials—and educators may be more apt to use them—because they are freely available—although the materials are not completely free, given that many users opt to create printed copies at a cost.[9]

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[5] See Common Core State Standards Initiative, 2016, for a map of the states that have adopted CCSS or state standards adapted from the Common Core.

[6] See Arizona Department of Education, 2016.

[7] See California Department of Education, undated.

[8] See Kaufman, Thompson, and Opfer, (2016,) for more on the use of standards-aligned materials and instructional practices among Louisiana teachers.

[9] Furthermore, copying and printing EngageNY materials could become more costly or challenging in the future. The publisher of EngageNY's Eureka Math curricula—Great Minds—is suing FedEx in federal court in New York, claiming that FedEx needs to compensate Great Minds for the money it makes copying materials for schools and teachers under the particular Creative Commons license governing use of EngageNY materials (Cavanagh, 2016). If such a lawsuit leads to higher prices or prohibitions from copying EngageNY resources for use in classrooms, those materials will likely not be as widely used or shared.

Given its popularity and that it is one of the first OER curricula aligned with CCSS and most state standards, EngageNY represents a unique opportunity to understand uptake of open online curricula and challenges in using such curricula. While there is some evidence regarding how many teachers use EngageNY, we know less about geographical locations where use is highest and which parts of EngageNY are being used most. We also do not have clear information about how and why teachers are drawing upon EngageNY resources, including what sources of information have influenced teachers to use EngageNY and how they are using EngageNY materials in their classrooms. Finally, we have little evidence for how OER like EngageNY could be improved to provide better support for teaching and learning.

Purpose of This Report

The purpose of this report is to better understand the uses of EngageNY in order to shed light on the channels through which OER could better support teachers and the implementation of the CCSS. Our investigation provides answers to the following questions:

- Who is using EngageNY curricula and what curricular elements are they using most?
- What explains the high uptake of EngageNY curricula?
- How is EngageNY supporting teaching and learning?

The organization of our report follows the order of these questions. Our findings are based on three main sources of data: Google Analytics data provided to RAND by NYSED; findings from a nationally representative survey of the ATP; and interviews with mathematics and ELA teachers who use EngageNY. This mixed-methods analysis provides rich information about EngageNY use and how it is supporting teachers' work in schools.

CHAPTER TWO

Data and Methods

Data and information from a number of sources have helped us explore the use of EngageNY curriculum materials, reasons for their use, and the extent to which those materials support teaching and learning. The Google Analytics data provided to us by NYSED enabled us to understand more about the states and areas of the United States with particularly high uptake of EngageNY, and which parts of EngageNY are most popular. RAND ATP data allowed us to focus in on one particular group of EngageNY users: teachers. ATP data have given us the opportunity to examine teachers' reports about their use of EngageNY compared with other published instructional resources. ATP data have also provided insights on the factors influencing teachers' use of EngageNY and how they think EngageNY helps their students participate in work aligned with their state standards. Interview data have enabled us to examine teachers' opinions about EngageNY in greater depth, how they use EngageNY in their classrooms, and their suggestions for its improvement. Below, we provide more-detailed information about these methods.

Google Analytics

Google Analytics is a web analytics service offered by Google. Web analytics services are used to measure web traffic and assess the effectiveness of websites, and are frequently used to support market research. Google Analytics uses a *page tagging* approach to measure website traffic, which involves applying a small snippet of JavaScript code to the content of each web page associated with a website. This code is executed within the browser on a user's computer each time a web page is requested, and details of that request (e.g., which web page was viewed, time spent on that web page) are then sent to Google Analytics. Customers that use Google Analytics first create a Google Analytics account and apply the corresponding code snippet to the pages at their website. The site owner is then granted secure access to an online Google Analytics dashboard in which traffic statistics about their website are available. In the case of our study, NYSED (the owners of EngageNY.org) signed up for a Google Analytics account, applied the designated code snippet, and then accessed information about EngageNY.org web traffic via their account's dashboard.

Google Analytics makes a variety of types of web traffic data available. Below, we provide an overview of the measures that are relevant to our research.

- **Page views:** A page view is arguably the most fundamental class of web analytics data in that it represents a request for a web page. For our research, the page views metric

allows us to determine the relative popularity of different pages on the EngageNY site. Page view information includes the specific uniform resource locator (URL) of the page being viewed and the date and time stamp of the page request. In addition, hypertext transfer protocol (HTTP) cookies enable Google Analytics to determine whether the user requesting the page is a first-time user or a returning user.[1]

- **Downloads:** Download events represent requests for downloadable content, such as Portable Document Format (PDF), Word, and Excel files. Similar to page views, download events include data about the file URL, the date and time stamp, and total compared with unique downloads. EngageNY consists of a large amount of downloadable curriculum content, including lesson plans and student materials that are not available except through downloads. Thus, the ability to measure downloads helps to determine which curriculum materials are being retrieved the most, although downloads, in and of themselves do not tell us which curriculum materials are actually being used with students in classrooms.
- **Location data:** Google Analytics provides geographical information about the computer from which a request originates. The location data consist of region (e.g., a state in the case of requests within the United States) and city. Location information is important to our research because it enables the determination of where demand for EngageNY originates, especially when considering requests from outside New York state.

Throughout this report, we present data on page view counts and download counts because each provides unique information regarding use of EngageNY. The majority of mathematics and ELA curriculum materials on EngageNY is contained in files that are linked to web pages and must be downloaded. Downloading likely occurs when a user first visits a web page containing the linked downloadable file (which would register a page view count) and then clicks on the corresponding link (which would register a download count). However, page views and download quantities may differ because a link to a downloadable file could be copied and shared and, thus, an individual could access the downloadable material directly without first visiting the page on which the file was linked (i.e., a download count may be registered without a page view count being registered). It is also possible that a user may visit a page and choose to not download the linked curriculum material.

In addition, we should note an important caveat regarding the download counts presented here. Specifically, once material is downloaded, it could be shared electronically (e.g., emailed) or physical copies could be printed and distributed. For example, a school district could have a single administrator who visits EngageNY, downloads a set of lessons, and then distributes the material throughout the district. In these cases, Google Analytics cannot capture use of those materials.

One additional caveat is that location data generated by Google Analytics are based on a computer's Internet Protocol (IP) address and the location of the associated Internet Service Provider. There are several factors that could lead to errors in this approach to location approximation. For example, virtual private networks (that allow users to securely tunnel into the networks of their employer) cause the IP address to register as the location of the employer rather than that of the user. Nevertheless, as Internet access has become more widespread,

[1] HTTP cookies are small sets of data stored in a user's web browser and are used by a website to remember information about users when they revisit the site.

these methods of determining location have continually improved. At the least, our analysis can provide general approximations regarding the use of EngageNY across the United States.

The administrators of EngageNY subscribe to the free version of Google Analytics (paid versions are also available, such as Google Analytics 360 Suite[2]) and are given secure access to a dashboard in which data corresponding to each of the above metrics can be viewed and exported. RAND did not directly access EngageNY's Google Analytics dashboard. Instead, the Google Analytics research for this project proceeded as follows: The RAND team reviewed the content layout of EngageNY.org and determined the URLs reflecting all the pages for EngageNY's mathematics and ELA curriculum materials. The RAND team submitted requests for this specific content to the EngageNY web management team at NYSED. The NYSED team used the Google Analytics dashboard to export data reports based on the queries and then returned the corresponding comma-separated values (CSV) files to the RAND team. The RAND team processed the data using the R statistical package, Excel, and ArcGIS.[3] The data provided by NYSED to RAND through Google Analytics did not include any personally identifiable information. In particular, the resolution of the location data is no finer than the city level.

Given the enormous volume of traffic that many sites generate, Google Analytics limits the number of records being displayed in its dashboard to 5,000. Hence, website traffic data analyzed in Google Analytics are subject to sampling. Sampling involves generating a subset of data from the complete set to speed up the generation of data reports. Sampling is a common technique in the field of statistical analysis and, if conducted randomly, provides statistics that are similar to what would be found if all of the data were analyzed. Specifically, Google Analytics considers the number of web sessions that are associated with the date range of a particular data query and applies a random sampling algorithm so that the sample set has a distribution of sessions per day that is equivalent to the corresponding distribution for the entire data set.[4]

The sampling rules applied to Google Analytics data lead to a margin of error that has implications for the analysis contained in this report. In particular, if the complete set of data available during the date range contains significantly more than 5,000 records and the data are dominated by a few popular web pages, then it is possible that the relatively less popular web pages can be lost in the margins and will be poorly characterized. This challenge is common in sampling of data that includes the presence of rare events. For example, in our case, it means that geographical locations with a very small number of page views tend not to appear in the sampled data. As a result, the data presented in this report are likely helpful for interpretations regarding relative use (e.g., understanding whether there is more use of the mathematics materials than the ELA materials) but cannot provide precise use estimates.

Google Analytics data provided to RAND capture web traffic in an 18-month period between January 1, 2015, and June 30, 2016.[5] The Information Technology (IT) department within NYSED did not have access to Google Analytics before January 2015 because that is

[2] Google Analytics 360 Suite costs approximately $150,000 per year.

[3] ArcGIS is a geographic information platform that allows users to create maps using zip code or other geographical data.

[4] For more information about how sampling in Google Analytics works, see Google, undated.

[5] During this period, EngageNY.org was organized into six categories of material: (1) Common Core, of which mathematics and ELA curriculum materials are a part; (2) Teacher/Leader Effectiveness; (3) Data Driven Instruction; (4) Video Library; (5) Professional Development; and (6) Parents and Families.

when their IT department took over the management of EngageNY. Our Google Analytics analysis thus only captures more-recent use patterns, despite the fact that EngageNY has been operating since 2011.

In addition to limitations in the time period of the data analyzed for this report, readers should keep two other limitations in mind when drawing conclusions from this data: (1) Google Analytics provides an indication of views and downloads of materials, but it does not provide information about actual use of those materials with students; and (2) Google Analytics provides information about anyone who could be using EngageNY, including teachers, parents, students, or anyone else who could be interested in EngageNY curricula for a variety of reasons.

Our analysis focuses only on the Common Core mathematics and ELA curricula available on EngageNY.[6] The EngageNY Common Core curriculum materials consist of content at each grade level for ELA and mathematics. The content is encapsulated in module or unit overviews, lesson plans, and activities that consist of web pages and curriculum materials that can be downloaded as PDF, Word, and ZIP files. Our findings for this section focus on three key metrics in relation to this web content: page views, downloads, and the geographic location of the computer performing these actions.

The mathematics curriculum content is called Eureka Math and is produced by a single publishing company, Great Minds. Eureka Math is organized hierarchically by grades, modules, topics, and lessons (i.e., grades contain modules contain topics contain lessons). The mathematics content grades range from pre-K through grade 8, followed by Algebra I, Geometry, Algebra II, and Precalculus. As shown in Figure 2.1, the ELA materials range from pre-K through grade 12 and are produced by four publishing companies: Core Knowledge Language Arts (CKLA), Expeditionary Learning, Odell Education, and the Public Consulting Group. The ELA content is organized hierarchically by grades, modules, units, and lessons (i.e., grades contain modules contain units contain lessons), with the addition of supplemental units separated from the modules for grades 6 through 12. CKLA produced all ELA materials for pre-K through grade 2, which are organized into two strands (a "Skills" strand and a "Listening and Learning" strand). Expeditionary Learning created materials for the modules, units, and lessons in grades 3 through 8. The Public Consulting Group produced module, unit, and lesson materials for grades 9 through 12, and Odell Education produced supplemental unit materials for grades 6 through 12.

We first identified key URL patterns that corresponded to the various classes of curriculum content. These patterns were then organized into regular expressions to enable efficient query submission to Google Analytics about data of interest.[7] For example, all mathematics core curriculum content associated with a page view for pre-K had a URL containing the pattern "resource/prekindergarten-mathematics". Hence, we could use this pattern to query pre-K mathematics for pre-K mathematics material or to process a set of URLs returned from a broader query to Google Analytics. More generally, the mathematics content consisted of fairly consistent patterns across grade levels (e.g., page views were characterized as "resource/*-mathematics" where * represented a particular grade). In contrast, ELA patterns had far more

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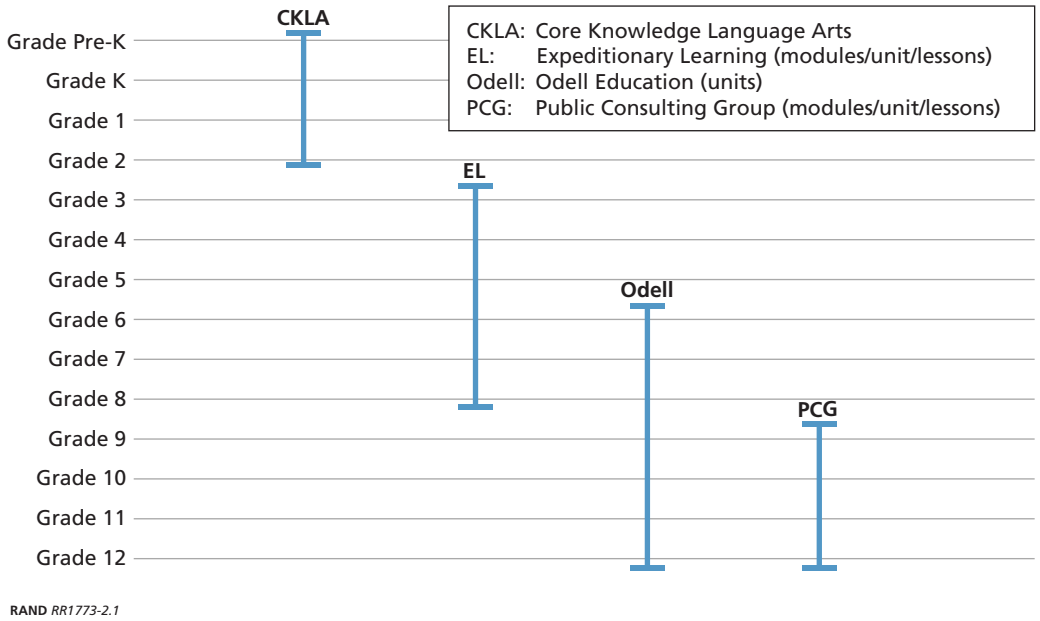
6 See EngageNY, undated-a.

7 A *regular expression* is a computer science and language concept for formally representing patterns of text. Many readers may be familiar with wild-card notation (e.g., *.pdf represents all PDF files within a directory); a regular expression generalizes and extends this concept. For additional info, see Microsoft Developer Network, undated.

Figure 2.1
English Language Arts Publishers by Grade



variations with a range of exceptional cases. The complexity of the ELA patterns can be attributed to the additional set of publishers who contributed content.

American Teacher Panel Survey Data

Survey findings were drawn from the October 2015 survey of the ATP. The ATP is a randomly selected, nationally representative panel of American K–12 public school teachers across all 50 states. For the October 2015 survey, only mathematics and ELA teachers were surveyed. The survey included questions to teachers about the resources upon which they draw the most for their classroom instruction. Then, for each of the four materials teachers reported using most often, they were asked a series of questions about which elements of those specific materials they drew upon the most, the factors that influenced their use of those specific resources, and how those resources helped them to address state standards.

In our findings, we highlight significant differences in teachers' reports about EngageNY compared with their reports about other instructional materials. We consider differences in teachers' reports to be significant when they are unlikely to have occurred by chance (i.e., a *p*-value of 0.10 or lower in statistical tests comparing responses concerning EngageNY with those concerning other instructional materials).[8] One caveat to note here is that *p*-values from significance tests comparing EngageNY materials with other materials may be slightly inflated given that the statistical tests from which these values are derived assume that all survey responses are independent. The same teacher could respond about up to four different cur-

[8] For any items where we compared responses about EngageNY to responses about other curricula, we used the Benjamini-Hochberg procedure to adjust for multiple comparisons, applying a false discovery rate of 0.10. For more information, see Benjamini and Hochberg, 1995.

ricula, and teachers' responses about EngageNY and responses about other curricula could be associated for the same teacher. We therefore could be presenting fewer instances of significant differences than might occur if only one teacher responded about each curriculum. In future work, we may attempt to model and account for this interdependence.

In October 2015, there were 2,018 mathematics and ELA teachers in the ATP and 1,168 responded to our survey, for a response rate of 58 percent and a maximum margin of error of 4.5 percent (See Table 2.1). Teachers were paid a small monetary incentive to complete the surveys. ATP response rates are similar to those of other national surveys, but nonresponse could lead to some bias in our estimates.[9] To address this potential bias, the weighted estimates provided in this report are based on a model for nonresponse that gives more weight to teachers in subgroups that were less likely to respond to our surveys.[10]

Table 2.1
Number and Percentage of Survey Respondents for English Language Arts and Mathematics

Subject	Number of Teachers (N = 1,168)	Percentage of Teachers
ELA teachers	951	81.4
Teachers who answered the ELA-specific survey items	674	57.7
Mathematics teachers	815	69.8
Teachers who answered the mathematics-specific survey items	494	42.3

NOTE: Teachers of both mathematics and ELA were randomly assigned to complete the survey questions about their ELA instruction or their mathematics instruction. Thus, some ELA teachers did not respond to the ELA questions in the survey and, likewise, some mathematics teachers did not respond about the mathematics questions.

Interviews with Teachers in California and New York

Interview data provide some additional qualitative evidence to confirm and support survey data, and provide potential explanations for some of our survey trends. For our interviews, we targeted teachers in two case study states: California and New York. We chose New York because EngageNY was developed as a key support for New York teachers in particular, and we wanted to better understand how New York teachers regarded those materials. We chose California because our ATP data indicate that California teachers' responses to survey questions

[9] Response rates for large, national surveys have been in decline, and this tendency accelerated after the emergence of web questionnaires. A metastudy of 68 surveys in 49 studies by Cook, Heath, and Thompson (2000) found an average 40-percent response rate among national survey studies. Similarly, Nulty (2008) found that responses to web-based surveys ranged between 20 and 47 percent.

[10] Weights were based on a model for nonresponse that incorporates such characteristics as teacher subject, school level, region size, and the school's rate of free or reduced-price lunch eligibility. The following differences were observed between those who responded to the October 2015 survey and those who did not (and thus accounted for in the weighting): (1) teachers from the Midwest region of the United States responded at higher rates than teachers from other regions, and teachers from the Northeast region of the United States responded at lower rates than teachers from other regions; (2) teachers from larger schools responded at lower rates than teachers from medium-sized schools; and (3) elementary teachers responded at higher rates than secondary teachers. No other major subgroup differences were observed in the original model for nonresponse. Thus, the above differences were the only ones accounted for in the final nonresponse model used for weighting.

about their practices and perceptions are similar to responses of teachers across the United States. Thus, California could be regarded as a bellwether for the United States more generally.

The sample of teachers from which we requested interviews were ATP teachers from those two states who indicated in our October 2015 survey that they used EngageNY and that they would consent to participate in an interview regarding their use of instructional resources. Among the ELA teachers who took the October 2015 survey and reported using EngageNY, 20 teachers from California and 45 teachers from New York agreed to be interviewed. Among the mathematics teachers who took the October 2015 survey and reported using EngageNY, 22 teachers from California and 29 teachers from New York agreed to be interviewed.

We contacted all teachers in the interview sample to request an interview, and we followed up with nonrespondents a total of three times. We were able to schedule and complete 31 interviews in total. Twenty-three of the 31 interviewees (74 percent) were from New York and eight (26 percent) were from California. While some of these teachers taught both ELA and mathematics, they were only interviewed about their use of EngageNY for one of the subjects. Fourteen interviews (45 percent) focused on use of EngageNY materials for ELA, and 17 (55 percent) focused on use of EngageNY materials for mathematics. Table 2.2 includes additional information about the interviewees.

Because most of our interviewees were from New York, our interview findings focus on all teachers rather than comparing teachers in the two states. We do, however, present some comparisons between use of EngageNY for mathematics and for ELA.

Interviews were recorded and then transcribed from the recordings. Dedoose qualitative software was used to code for the main themes that surfaced in the interviews.[11] In our first round of qualitative coding, we examined key themes related to use of EngageNY, reasons for using EngageNY, and how EngageNY supports teaching and learning. Following that first round of coding, key themes were discussed in more detail among all of those who conducted interviews for this work to identify subthemes. Then, in a second round of qualitative coding,

Table 2.2
Number and Percentage of Interviewees Reporting on Their Use of EngageNY for English Language Arts or Mathematics

Subject of EngageNY Use	Total Teachers (N = 31)	California Teachers	New York Teachers	Grades K through 5 Teachers	Grades 6 through 12 Teachers
ELA					
Number	14	2	12	4	10
Percentage	45	6	39	13	32
Mathematics					
Number	17	6	11	12	5
Percentage	55	19	35	39	16

[11] Dedoose is a qualitative software package that allows researchers to upload and code interview transcripts. Multiple coders can work together to code a single document in Dedoose. For this study, one researcher did all the coding, but the coding was confirmed by a second researcher. For more information, see Dedoose, undated.

those themes were analyzed in more depth, and some subcodes were used to identify additional themes related to teachers' perceptions of EngageNY.[12]

[12] In coding and subcoding, we followed typical procedures for qualitative analysis. See Lincoln and Guba (1985) and Corbin and Strauss (1998) for elaboration on these procedures.

CHAPTER THREE

Who Is Using EngageNY Curricula and What Elements Are They Using Most?

This section provides an overview of who is using EngageNY resources. We start with Google Analytics data, which provide some information about the numbers of people who view and download EngageNY curricular resources, including lesson plans, maps, assessments, and other resources. Google Analytics data can also provide insight on the relative popularity of EngageNY across states, the grade levels for which EngageNY curricula are most popular, and the kinds of resources that are downloaded most frequently.

Following our examination of Google Analytics, we turn specifically to teachers who used EngageNY. To examine the use of EngageNY among teachers, we drew on data from the October 2015 survey of the ATP, and we used interview data from teachers in California and New York to discuss the variations of what "use" of EngageNY might mean to teachers. Key takeaways across all these data sources are summarized in Text Box 3.1, and they are also captured as headings throughout this section.

Text Box 3.1
Who Is Using EngageNY? Key Takeaways

- EngageNY curriculum materials were used heavily in New York state but were also accessed by users in every other state, with particularly less use in states that have not adopted Common Core or similar standards.
- EngageNY mathematics curriculum materials were used at about three times the rate of ELA curriculum materials, although the EngageNY ELA materials may have been used more comprehensively by teachers than the mathematics curriculum materials.
- How teachers use the EngageNY curriculum materials in their classrooms likely varies considerably from teacher to teacher.

Who Is Using EngageNY: Google Analytics Findings

Among all accesses to EngageNY content that were reported to us, requests for the mathematics and ELA curricular content within the Common Core curricula category accounted for 28 percent of the total requests, while the other five categories (Teacher/Leader Effectiveness; Data Driven Instruction; Video Library; Professional Development; and Parents and Families) accounted for 29 percent of the site requests. The remaining 43 percent of requests were for the EngageNY home page. The relative popularity of the home page makes sense, given that most users reach the interior content by way of the home page rather than by accessing it directly. Furthermore, some visitors may come to the home page and never explore further. From this point forward, we focus on the requests for Common Core materials. We first present a national perspective on which Common Core content on the site was most requested, followed by how the accesses were distributed across the United States.

Access counts were significantly higher for the EngageNY mathematics curricula compared with the ELA curricula; overall, a high percentage of accesses originated in New York and from states that have adopted Common Core or similar standards.

The number of accesses to EngageNY mathematics curriculum content was significantly greater than that for ELA content. During our period of analysis, there were a total 9.69 million page views of mathematics content versus 2.48 million page views of ELA content. EngageNY accesses from New York far exceeded accesses from any other state, in terms of the number of page views and downloads. For example, approximately 60 percent of ELA page views and 65 percent of ELA downloads were attributed to computers within New York. In the case of mathematics content, the disparity between accesses from New York and other states was less prominent but still substantial, with 51 percent of both mathematics page views and downloads coming from New York.

Tables 3.1 and 3.2 show the total page views per state (including the District of Columbia) for mathematics and ELA, respectively; page views do not include downloads. For the period of our analysis, EngageNY also received a small amount of traffic from outside of the United States that is not represented here. Grey cells in the tables indicate states that had not officially adopted the CCSS as of this writing. Minnesota has adopted the CCSS for ELA but not for mathematics. Indiana, Oklahoma, and South Carolina all adopted the standards but then repealed their adoption in 2014. As can be seen in the tables, states that have not adopted Common Core or similar standards generally tended to be states that were ranked lower in terms of total page views. However, this was not always the case. For example, Texas—which has not adopted the Common Core—was 24th out of 50 states in terms of numbers of page views of the EngageNY mathematics curriculum. Furthermore, as a reminder, any estimated numbers based on Google Analytics are extrapolations based on a sample of all data. Thus, states with a very small number of page views tended to not appear in the sampled data. In the case of mathematics total page views, states without data included North and South Dakota. In the case of ELA total page views, states without data included Montana, North and South Dakota, and Vermont. These states had all adopted CCSS or standards adapted from CCSS.

The data shown in Tables 3.1 and 3.2 represent the total number of page views in the state (as opposed to unique computers accessing content); hence, some of the data represent repeated requests by the same visitor. For example, in New York, the total number of page views for mathematics was 4,708,378, while the number of unique page views for mathematics

Table 3.1
Mathematics Page Views in Rank Order, by State

State	Page Views	State	Page Views
NY	4,708,378	ID	48,560
CA	1,088,916	MD	45,337
AZ	639,380	NM	32,179
IL	510,922	NJ	31,923
WA	238,051	KY	25,129
NV	214,841	VT	24,404
CO	188,307	NH	23,355
WI	183,889	CT	22,741
LA	169,215	SC	22,633
OR	152,398	IN	18,658
MI	149,649	UT	17,970
OH	128,174	WV	16,777
MA	114,109	RI	15,691
FL	104,709	MS	11,931
TN	104,162	DE	9,833
NC	88,980	MT	6,507
GA	86,157	WY	6,184
PA	73,002	OK	6,146
DC	67,972	IA	4,628
AR	63,525	HI	3,507
KS	59,946	MN	3,146
AL	53,942	ME	2,169
MO	52,787	VA	976
TX	49,534		

NOTE: These page views were collected in the period from January 1, 2015, to June 30, 2016. States that have not adopted the Common Core or similar standards are shaded in gray.

was 3,397,564. Hence, more than 1.3 million page view requests for mathematics content from New York represented repeated requests from site visitors.

However, direct comparisons between the number of page views in a state like New York and a state like Maine do not provide clear information about relative use within those states, given that there is a significant difference in their respective populations. To help normalize the use of EngageNY by state, we compared unique page view and download requests with respect to teacher population by state. The goal was to determine which states most actively used EngageNY resources on a per capita basis in a manner that takes into account the state's total population and, in particular, total numbers of teachers serving students. Unique requests provide a better sense of the number of individuals using the site than do the total number of requests (which count repeat usage by individuals). To accomplish this, we use public school data from the National Education Association to calculate the ratio of page views (and downloads) by state per population of teachers in public K–12 schools in that state (National Edu-

Table 3.2
English Language Arts Total Page Views in Rank Order, by State

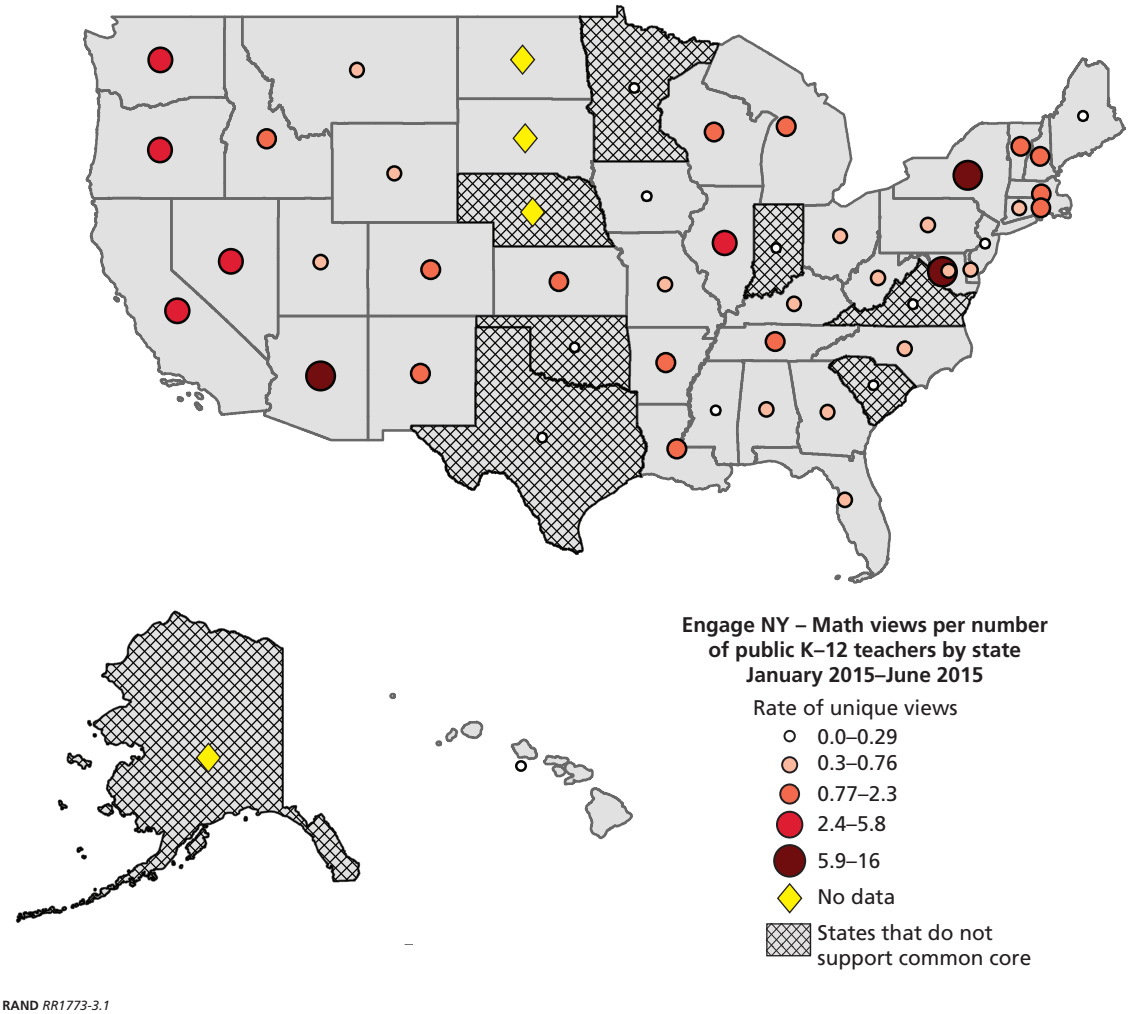
State	Page Views	State	Page Views
NY	1,615,175	WA	8,135
IL	182,774	AL	4,519
NJ	113,784	KS	4,447
CA	98,117	NH	4,302
AZ	63,304	OR	3,578
NV	63,158	ID	3,398
NC	34,019	RI	3,326
MA	27,695	IN	3,037
MI	26,935	TX	2,566
LA	24,005	UT	2,494
CO	24,004	WV	2,242
FL	20,282	SC	1,699
TN	17,102	WY	1,662
MO	17,064	NM	1,627
WI	16,307	OK	1,627
CT	14,824	MD	868
GA	13,305	MN	759
PA	12,542	DE	542
AR	10,088	VA	470
DC	9,726	HI	289
KY	8,932	IA	253
OH	8,897	ME	253
MS	8,531		

NOTE: These page views were collected in the period from January 1, 2015, to June 30, 2016. States that have not adopted the Common Core or similar standards are shaded in gray.

cation Association, 2014). Readers should keep in mind that total teacher numbers will likely not capture all of those using EngageNY. However, it may be preferable to looking at use of EngageNY by the total population in each state, given that educators would be expected to use EngageNY far more than other populations.

Figure 3.1 shows the mathematics curriculum page view data by teacher population in each state. From this perspective, the top states in terms of requests were Arizona, California, the District of Columbia, Illinois, New York, Nevada, Oregon, and Washington. Figure 3.2 shows similar results for downloads of the EngageNY mathematics curriculum, with the top number of requests per teacher coming from four states: Arizona, the District of Columbia, Nevada, and New York. Figures 3.3 and 3.4 suggest high use of the EngageNY ELA curricula

Figure 3.1
Unique Mathematics Page Views, per Teacher Population



RAND *RR1773-3.1*

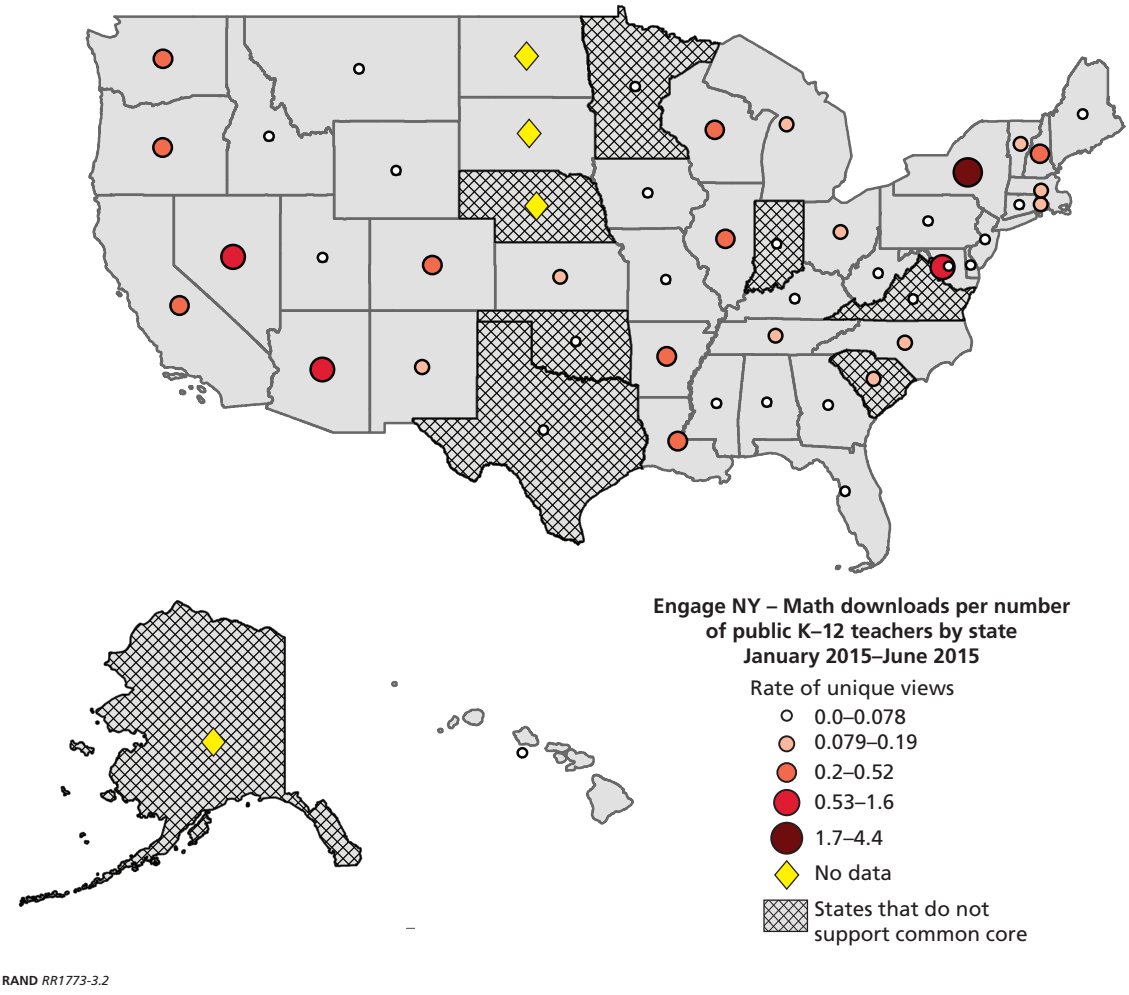
in similar states to those where there was higher use of the mathematics curricula: New York, Arizona, the District of Columbia, Illinois, New Jersey, and Nevada.[1]

For both mathematics and ELA, the number of downloads was less than the number of page views. This makes sense because downloads are likely to be accessed from a page view, even though download URLs can be accessed directly. Downloads might better signal "use" of EngageNY, compared with page views, because downloads include curriculum content, lesson plans, worksheets, and activities.

The ratio of unique mathematics downloads to unique page views was 0.16, averaged across all states (with a standard deviation of 0.9), suggesting fewer downloads than page views.

[1] Figures 3.1–3.4 all use the Jenks natural breaks classification method. The Jenks natural breaks method groups data into classes so that the variance in each class is minimized while the distances between the means of the classes is maximized. For additional info, see Expert Health Data Programming, 2014.

Figure 3.2
Unique Mathematics Downloads, per Teacher Population

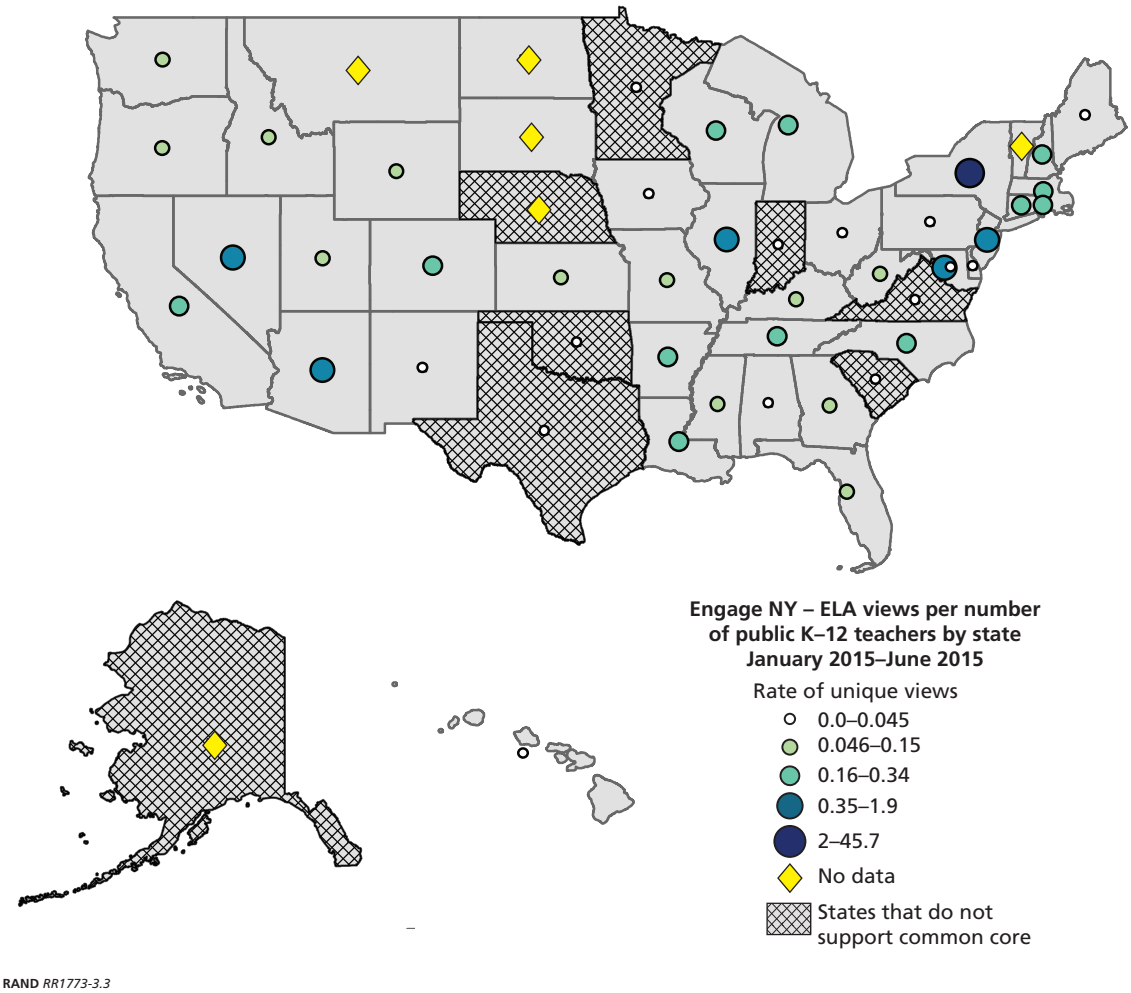


RAND *RR1773-3.2*

This might be expected, given that users might first explore the site and understand all the curriculum resources before downloading specific lesson plans and materials. As one example, in California, the ratio of unique mathematics downloads to unique page views was 0.15. New York saw a comparatively high ratio of unique mathematics downloads to unique page views of 0.28, indicating that there were many more downloads per page view compared with all but six other states. South Carolina was also notable with a very high ratio of 0.38, particularly given that it had not adopted the Common Core standards during the period of analysis. It could be that—compared with those in other states—South Carolina teachers tended not to explore the EngageNY website and view all of the curriculum resources available there (which would be reflected in page views), but instead went to the website specifically to download lessons.

Comparing downloads with page views is of interest, given the types of content on EngageNY. Some of the materials available for download on EngageNY is curriculum content suitable for use by teachers, while other material is more suitable for distribution to students.

Figure 3.3
Unique English Language Arts Page Views, per Teacher Population

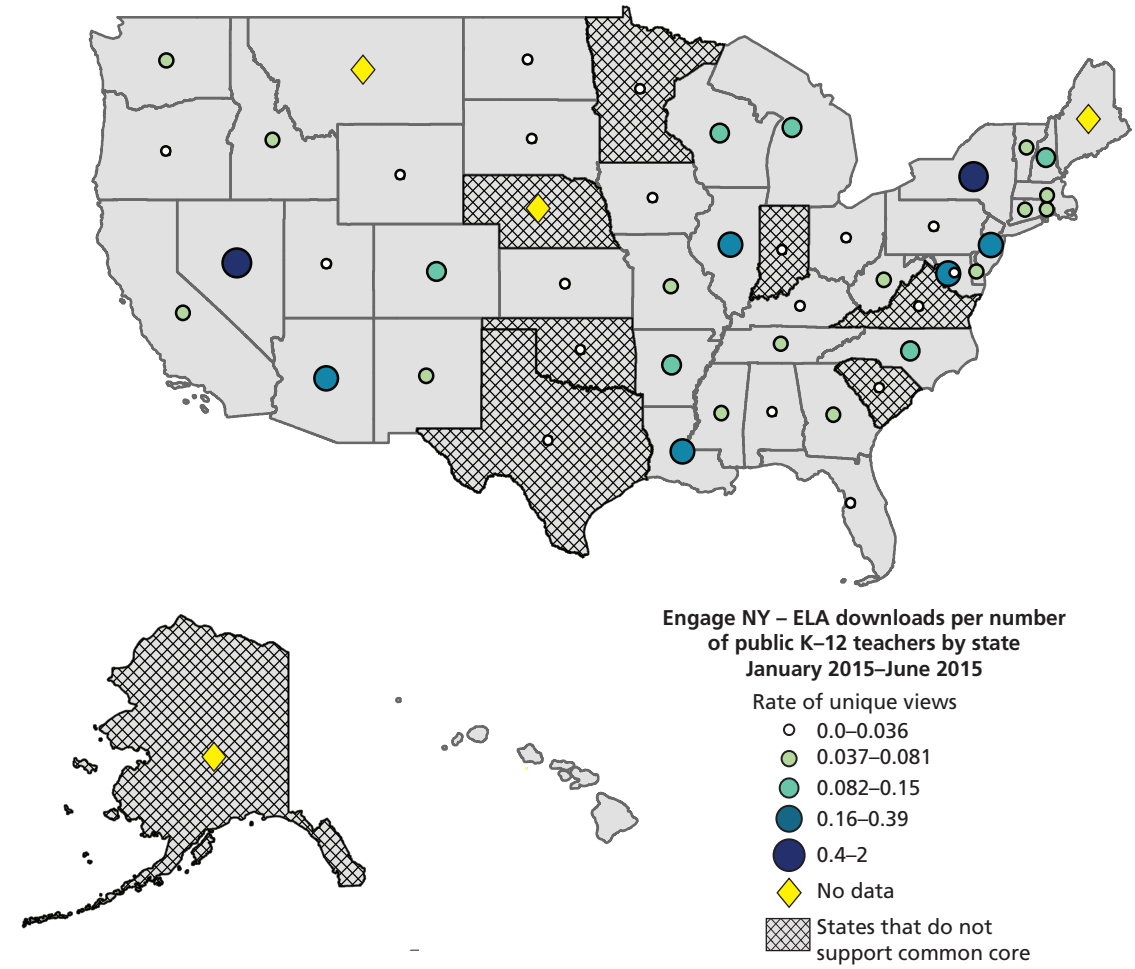


RAND *RR1773-3.3*

For example, the Odell Education unit material (grades 6 through 12, ELA) is separated into four categories: Unit Plan and Texts, Handouts, Model Tools, and Tools. The Handouts, Model Tools, and Tools categories consist of "student-facing" material that can be directly downloaded and used by students (i.e., a teacher could direct students to specific URLs or students could discover the materials on their own). In contrast to the downloadable material, the Common Core pages of EngageNY (for which page views are generated and links to downloads are provided) consist almost exclusively of "teacher-facing" material that is designed for consumption by educators and not students.

The EngageNY mathematics download URLs are structured so that we can determine if teacher- or student-facing material is downloaded. At the least, such data can provide some indication about whether users are accessing the teacher-facing or student-facing materials more often. Table 3.3 shows the number of unique mathematics downloads for student material, teacher material, and their ratio, respectively. Panel A includes states in which more

Figure 3.4
Unique English Language Arts Downloads, per Teacher Population



RAND *RR1773-3.4*

teacher files were downloaded; Panel B shows states in which more student files were downloaded. States that have not actively adopted the Common Core standards as of this writing are shown in gray.

Readers should exercise caution in interpreting data from states with very small numbers of downloads (e.g., North Dakota and Virginia), given potential limitations in sampling already discussed. Nevertheless, for states with higher frequencies (e.g., more than 1,000), the table provides an indication of how teachers may have chosen to use the EngageNY material. In states with higher ratios, and thus more use of teacher materials compared with student materials, users may have been using EngageNY as a traditional textbook or curriculum where they drew whole lesson plans from EngageNY and used them in their classrooms. In states with lower ratios, and thus more use of student materials, users could be using the materials less comprehensively (e.g., handing out a worksheet drawn from EngageNY for homework or bringing it into a lesson that is not drawn from EngageNY).

Table 3.3
Unique Mathematics Downloads for Teacher and Student Content, by State

Panel A: More Teacher-Facing Files Downloaded

State	Teacher	Student	Teacher/Student Ratio
ND	144	36	4:1
VA	144	36	4:1
TX	3,173	1,152	2.75:1
LA	21,166	10,028	2.11:1
DC	1,806	865	2.09:1
NM	8,484	4,221	2.01:1
WI	14,275	7,357	1.94:1
CA	59,382	31,878	1.86:1
IA	795	433	1.84:1
NV	1,660	1,046	1.59:1
CT	1,911	1,225	1.56:1
NY	460,837	306,810	1.5:1
MO	2,565	1,729	1.48:1
MS	1,372	937	1.46:1
AZ	57,829	42,367	1.36:1
ME	615	468	1.31:1
VT	3,176	2,776	1.14:1
ID	3,571	3,207	1.11:1
MI	10,904	9,986	1.09:1
AR	13,253	12,240	1.08:1
NH	4,407	4,191	1.05:1
RI	506	504	1:1
HI	180	180	1:1

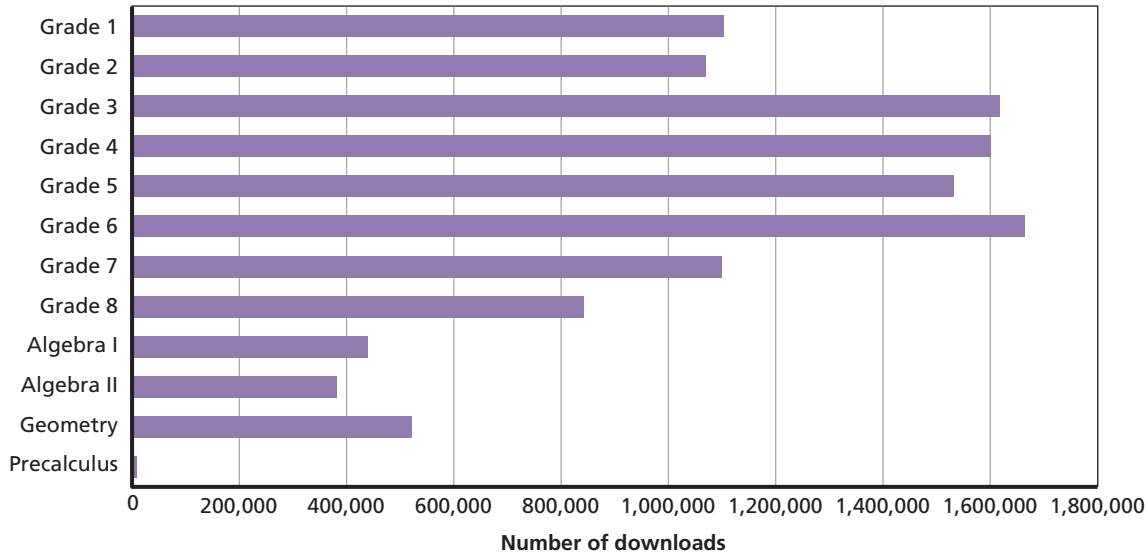
Panel B: More Student-Facing Files Downloaded

State	Teacher	Student	Teacher/Student Ratio
IL	29,085	29,728	1:1.02
UT	938	973	1:1.04
DE	650	684	1:1.05
MA	8,231	8,938	1:1.09
FL	2,595	3,025	1:1.17
WV	792	936	1:1.18
MT	974	1,154	1:1.18
OH	6,143	8,034	1:1.31
OR	2,165	2,846	1:1.31
WA	15,740	22,661	1:1.44
WY	180	289	1:1.61
KS	975	1,586	1:1.63
TN	1,913	3,172	1:1.66
MD	2,454	4,184	1:1.71
GA	4,729	8,549	1:1.81
CO	5,267	9,707	1:1.84
NC	4,843	8,956	1:1.85
KY	794	1,477	1:1.86
IN	975	1,838	1:1.89
AL	1,516	3,207	1:2.12
NJ	2,991	6,343	1:2.12
PA	4,149	9,602	1:2.31
SC	360	2,054	1:5.71
AK	0	0	N/A
MN	216	0	N/A
NE	0	0	N/A
OK	252	0	N/A
SD	0	0	N/A

EngageNY's high school curricula were used much less frequently than curricula for grades K through 6, with particularly high use of the EngageNY mathematics curriculum in grades 3 through 5.

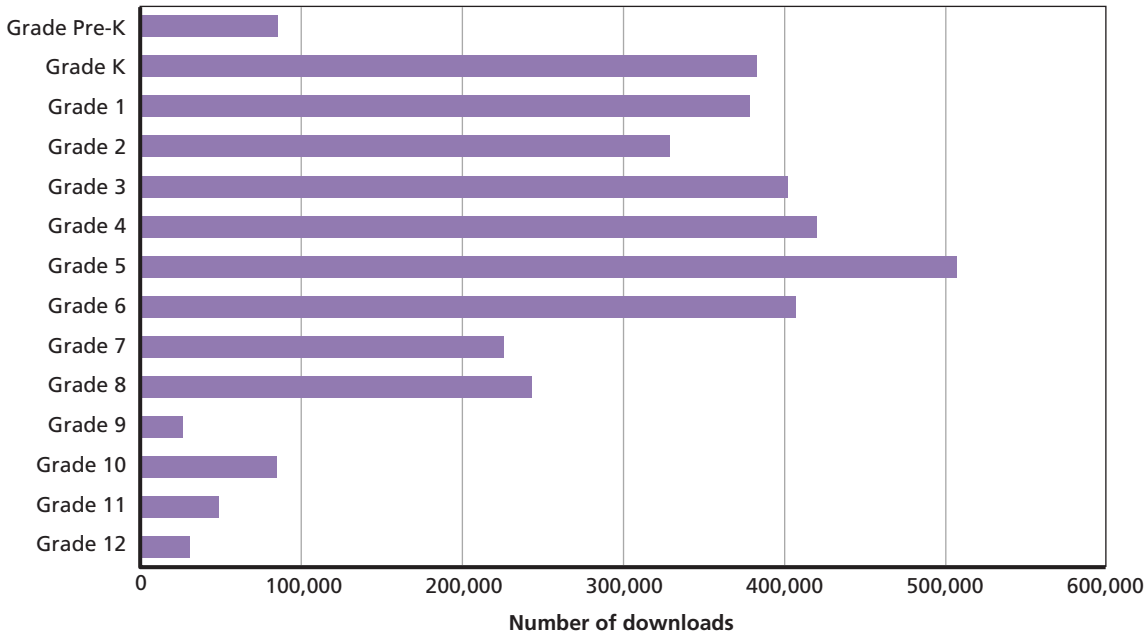
Figures 3.5 and 3.6 show unique mathematics and ELA downloads per grade, respectively. The unique downloads for both mathematics and ELA content showed lower frequencies in the high school grades. For ELA use by grade level in Figure 3.6, keep in mind that any downloads for ELA in grades K through 2 were for the CKLA curriculum, while any downloads in grades 3 through 5 were for the Expeditionary Learning curriculum. Downloads for ELA materials in grades 6 through 8 could have been either Expeditionary Learning or Core Proficiencies modules, whereas downloads of ELA materials in grades 9 through 12 could have

Figure 3.5
Unique Mathematics Downloads, by Grade



RAND *RR1773-3.5*

Figure 3.6
Unique English Language Arts Downloads, by Grade



RAND *RR1773-3.6*

been either Expeditionary Learning or Public Consulting Group curricula. Unfortunately, we have no way of knowing whether lower use of ELA materials at higher grade levels—and particularly in grades 9 through 12—is an indication that teachers at those grade levels were less likely to use EngageNY, or because teachers preferred not to use the specific curricula avail-

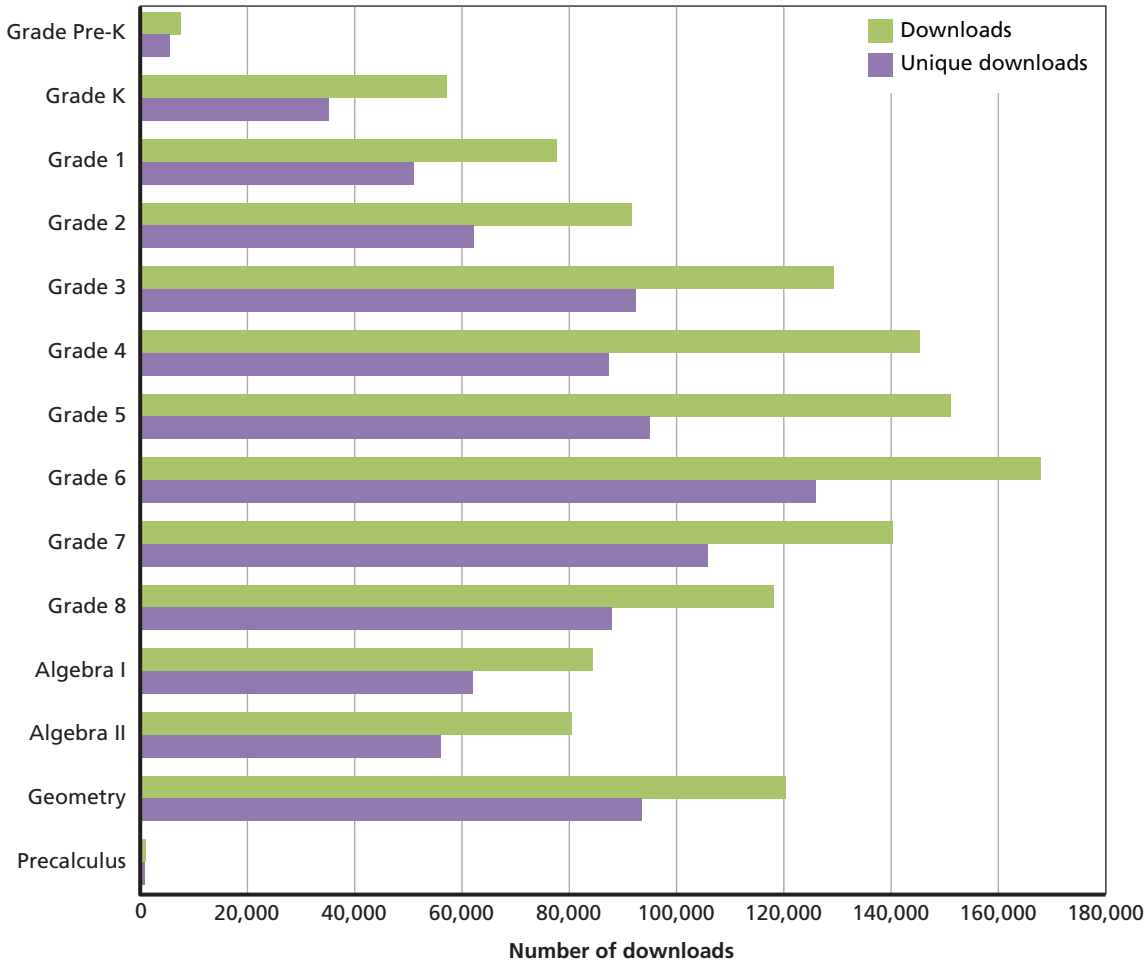
able at higher grade levels. But, given that two curricula were available for grades 9 through 12—including one curriculum that was also available for grades 6 through 8 and drawn upon more heavily in grade 6—we suspect that a teachers' grade level may influence their use of EngageNY. We examine this hypothesis further when we compare teachers' responses to the ATP in the next section.

Two points worth noting were the particularly low numbers of downloads for the precalculus material (11,214 downloads) and for ninth-grade ELA material (27,732 downloads). The low numbers for high school downloads in both mathematics and ELA may be due to fewer requirements for annual state testing in upper grades and less emphasis on standards in those grades (although we point out that this trend is different for New York teachers, as discussed below). In their study of K–12 standards implementation, Opfer, Kaufman, and Thompson (2016) noted that secondary mathematics teachers were less likely to cite state standards and district assessments as factors influencing their use of instructional resources compared with elementary teachers. According to Opfer, Kaufman, and Thompson (2016), secondary teachers were also more likely to develop their own resources compared with their elementary counterparts. Opfer, Kaufman, and Thompson (2016) surmise that standards-aligned resources may be less available at secondary levels, which might explain why standards and assessments appear to have less influence at those grade levels. However, given that EngageNY has some demonstrated alignment with state standards, the data in this report suggest that secondary teachers may also be less inclined to seek out additional standards-aligned resources such as EngageNY than elementary teachers.

In each grade, New York also consistently contributed the largest share of unique download requests for both ELA and mathematics while the relative contribution of other states varied somewhat. For example, New Jersey was home to the second-highest number of downloads for ELA curriculum in grades 1, 7, 10, and 11, whereas Illinois had the second-highest number of downloads in grades 3, 4, and 8. On the other hand, New York, California, Illinois, and Arizona consistently had the highest downloads of mathematics curriculum resources for grades 2 through 5. Appendix A provides more information about the top states downloading EngageNY curriculum resources in each grade.

Although we did not analyze differences in use by particular grade levels systematically across all states, we examined variation in use patterns more closely for a few states to better understand the extent to which policies and assessments could influence use at different grade levels. In New York, for example, the number of downloads of mathematics materials increased steadily from kindergarten to sixth grade and then decreased steadily through Algebra II, although downloads of geometry materials were somewhat higher than for the two algebra curricula (see Figure 3.7). As with the overall number of downloads, we tracked very few downloads of precalculus material in New York. This makes some sense, given that calculus is not emphasized in the New York state learning standards, and calculus is also not a part of the Regents examinations, whereas Algebra I, Geometry, and Algebra II are. In California, in contrast, mathematics downloads steadily increased from kindergarten to fourth grade and then decreased through Algebra I, with very little use of Algebra II or Geometry materials (see Figure 3.8). California's summative mathematics exams for high school do integrate content from Algebra I, Algebra II, and Geometry, so it is difficult to know why EngageNY was used less for Algebra II and Geometry than for Algebra I. Nevertheless, these differences in use by grade level in California and New York suggest that state requirements, policies, and recommendations could play a role in use of EngageNY materials.

Figure 3.7
New York Mathematics Downloads, by Grade



RAND *RR1773-3.7*

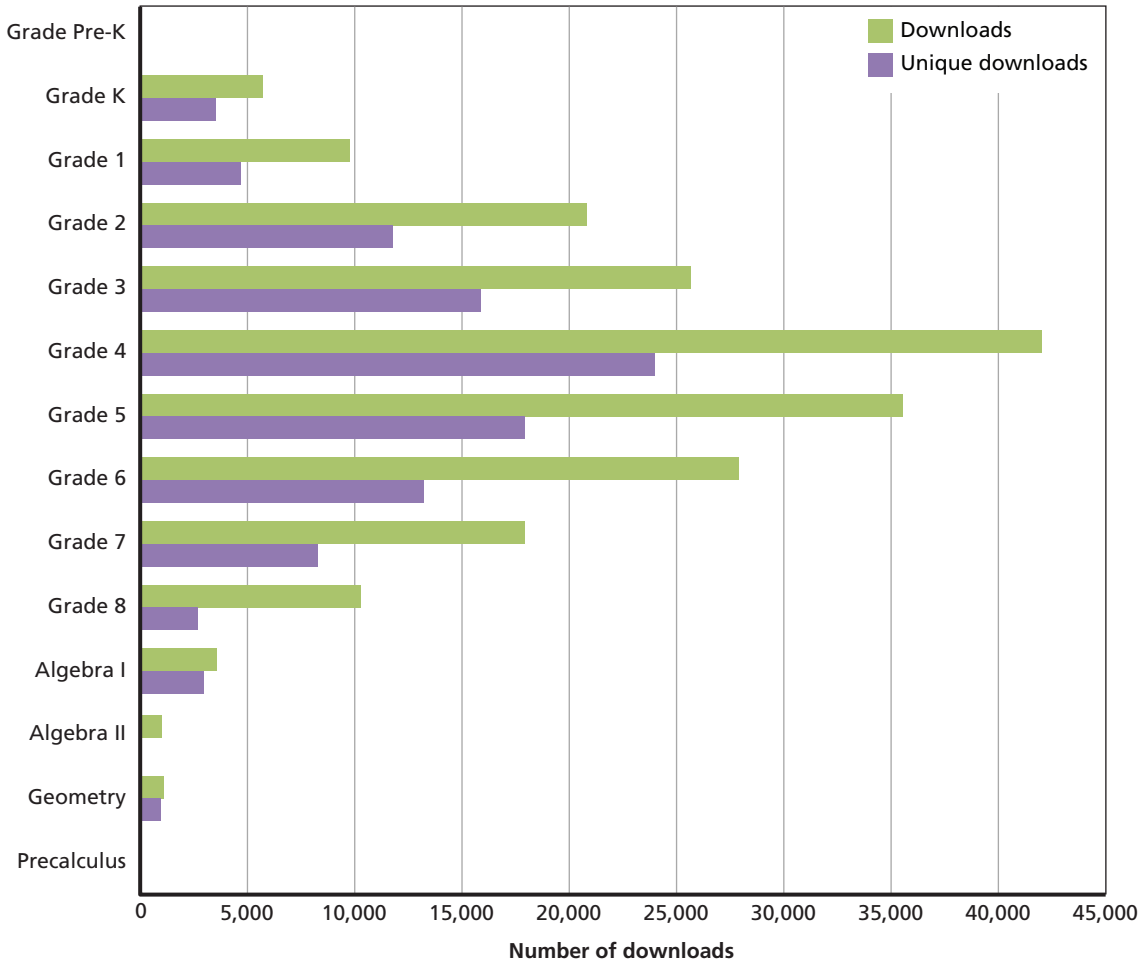
Who is Using EngageNY: Teacher Survey and Interview Data

Google Analytics data are limited in that they cannot provide information about which EngageNY resources are actually being used in classrooms and schools. Google Analytics data cannot specify whether accesses are coming from teachers, students, or other individuals. The ATP enables us to gather data from a representative sample of the nation's teachers and estimate the percentage of teachers using EngageNY for mathematics and for ELA instruction. ATP data can also provide information on the frequency of use of EngageNY curriculum materials.

EngageNY materials were some of the most commonly used instructional materials among mathematics and ELA teachers, particularly in states that have adopted CCSS or similar standards.

The October 2015 ATP survey asked teachers to report on how much they drew upon a wide range of instructional materials for their mathematics and their ELA classroom lessons thus far in the 2015–2016 school year. The survey asked about the most commonly used published resources in late spring 2014 based on market share information gathered by Student Achieve-

Figure 3.8
California Mathematics Downloads, by Grade



RAND *RR1773-3.8*

ment Partners (SAP).[2] Beyond asking about the use of specific published resources for ELA, we also asked about use of "leveled readers" and "trade books" more generally. However, readers should keep in mind that some published resources could also be classified as leveled readers (e.g., RAZ-Kids, Reading A-Z, and Accelerated Reader).

Table 3.4 illustrates the top ten instructional materials by percentage use for elementary and secondary mathematics and ELA teachers in response to the question, "Please indicate the frequency with which you draw upon the following instructional materials for your [mathematics or ELA] classroom lessons." As can be seen in the table, EngageNY is the most commonly used published instructional resource used by ATP teachers for elementary mathematics; a little more than one-third of mathematics teachers reported using it for their instruction. For secondary mathematics, one-quarter of teachers reported using EngageNY. Those report-

[2] SAP is an organization that is devoted to supporting student achievement through high-quality implementation of state standards. They have fielded surveys to teachers to understand use of instructional materials and asked about particular instructional materials based on market share information. SAP generously provided us access to their survey, and from it we drew information about which instructional materials to ask about.

Table 3.4
Top Published Instructional Materials Used for Mathematics and English Language Arts Classroom Lessons

		Instructional Materials	Percentage Use
Mathematics Teachers	Elementary Teachers	EngageNY materials	35
		Everyday Mathematics/Everyday Learning (McGraw Hill)	32
		Envision Math (Pearson Scott Foresman)	30
		Harcourt Math or Harcourt School Publishers (HSP) Math (Houghton Mifflin Harcourt)	28
		Investigations in Number, Data & Space (Pearson Scott Foresman)	26
		Go Math (Houghton Mifflin Harcourt)	25
		Holt McDougal Mathematics (Holt McDougal-Houghton Mifflin Harcourt)	16
		Math in Focus or Singapore Math (Great Source-Houghton Mifflin Harcourt)	15
		Math Expressions (Houghton Mifflin Harcourt)	14
		Eureka Math (Great Minds)	9
	Secondary Teachers	Glencoe Math (McGraw Hill)	43
		Go Math (Houghton Mifflin Harcourt)	33
		Holt McDougal Mathematics (Holt McDougal-Houghton Mifflin Harcourt)	30
		Connected Mathematics (Pearson Prentice Hall)	30
		EngageNY materials	25
		Prentice Hall Math (Pearson Prentice Hall)	25
		Everyday Mathematics/Everyday Learning (McGraw Hill)	22
		Algebra I (Pearson Prentice Hall)	22
		Math Connects (MacMillan/McGraw Hill)	22
		Bridge to Algebra or Carnegie Learning (Carnegie Learning)	21
ELA Teachers	Elementary Teachers	Leveled readers/texts	98
		Trade Books	89
		Reading A-Z (Learning A-Z)	65
		Accelerated Reader (Renaissance Learning)	48
		RAZ-Kids (Learning A-Z)	48
		Book It! Program	37
		Houghton Mifflin Reading (Houghton Mifflin Harcourt)	31
		EngageNY materials	28
		Journeys (Houghton Mifflin Harcourt)	28
		Harcourt Reading (Houghton Mifflin Harcourt)	26
	Secondary Teachers	Leveled readers/texts	84
		Trade Books	56
		Literature or Elements of Literature (Holt McDougal)	41
		Prentice Hall Literature (Pearson Prentice Hall)	28
		Accelerated Reader (Renaissance Learning)	25
		EngageNY materials	25
		Great Source (Houghton Mifflin Harcourt)	23
		MacMillan (McGraw-Hill)	23
		Houghton Mifflin Reading (Houghton Mifflin Harcourt)	21
		Read 180 (Scholastic)	19

ing use of Eureka Math could also be using the version of Eureka Math within EngageNY, although we do not include reports of use for Eureka Math with reports of those using EngageNY. For ELA, about one in four teachers also reported using EngageNY. These percentages underscore the popularity of EngageNY among teachers across the United States.

ELA teachers may have been using EngageNY curricula more comprehensively than mathematics teachers.

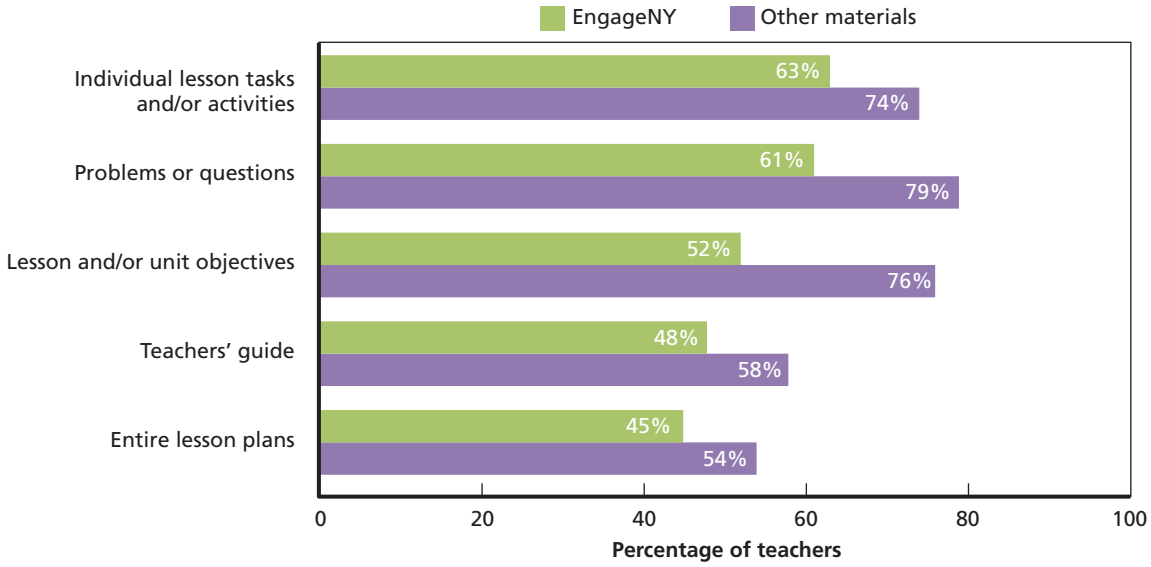
To understand better how teachers used their main published resources, we asked them, "How often do you use each of the following elements from [name of specific published textbook]?" Figure 3.9 illustrates some of the main differences between EngageNY and other materials with respect to which elements mathematics teachers reported drawing upon "daily" or "often." Figure 3.10 illustrates the same for ELA materials. Taken together, the figures suggest that EngageNY may have been used somewhat more comprehensively for ELA than for mathematics. For example, two-thirds or more teachers reported using every element of the EngageNY ELA curriculum materials we asked about in our survey. In addition, more ELA teachers also reported using EngageNY teachers' guides and entire lesson plans compared with ELA teachers reporting use of the same materials within other published curricula. These findings suggest that ELA teachers may have relied on EngageNY for entire lessons, whereas they may not have done so as much when using other ELA curricula. In contrast, less than half of teachers reported drawing upon the teachers' guide or entire lesson plans within the EngageNY mathematics materials. We also observed no differences in teachers' reports on use of EngageNY for mathematics compared with their use of other mathematics materials.

The nature of mathematics standards and the EngageNY curricula may lend itself to this pattern of use. Mathematics state standards, including CCSS, are organized by topic area and the specific content students should learn within each topic area. The EngageNY curriculum is organized similarly, with curriculum overviews that highlight the specific content taught at particular grade levels and for particular units and modules. If teachers want to provide learning opportunities for a particular mathematics topic, they could scan the EngageNY curriculum overviews for that topic and then identify a particular lesson task or set of problems that address that topic. There is no need for them to download whole lessons. Because EngageNY curricula are particularly well aligned with CCSS, choosing particular tasks or problem sets on which to focus becomes more straightforward for teachers in states that have adopted CCSS or similar standards. On the other hand, ELA standards are not organized by topic area in the same way. Instead, students are expected to learn reading, speaking, writing, and listening skills that become progressively more advanced over time. Such standards do not lend themselves to teachers "picking and choosing."

What it means to "use" EngageNY appears to vary considerably from teacher to teacher.

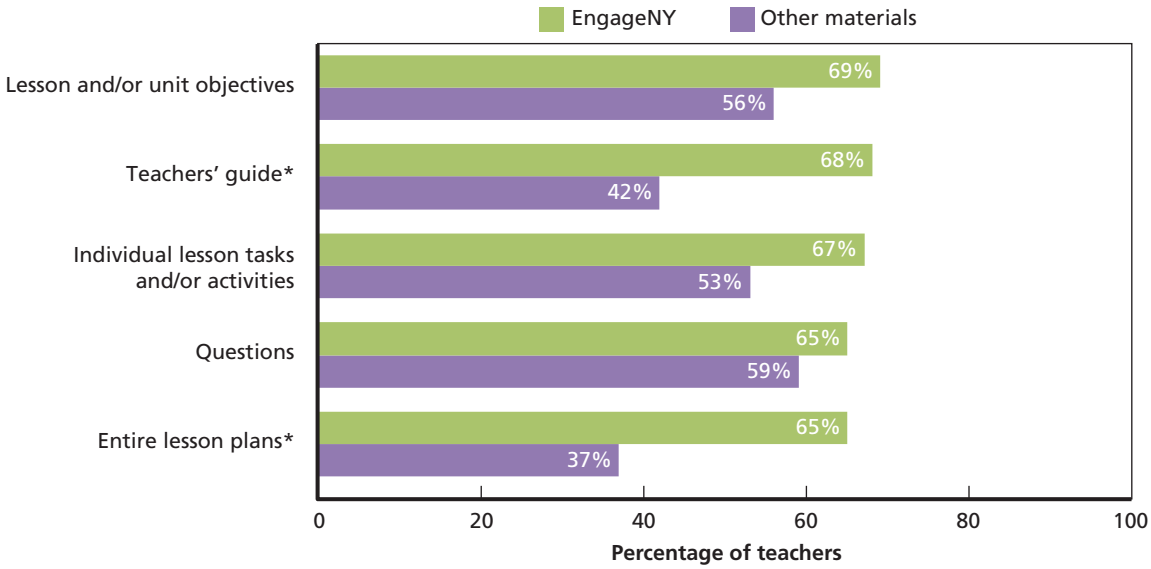
Findings thus far give us some picture of the percentages of teachers using EngageNY and what pieces of EngageNY they use most. But they do not give us a full picture about what *use* means. Although interview data were collected for teachers in only two states, these data suggest that *use* may vary a great deal from teacher to teacher. Only eight (26 percent) of the teachers with whom we spoke used EngageNY exactly as, or very closely to, what is scripted in the lesson plans. The remaining teachers with whom we spoke (74 percent) said they adapted EngageNY lessons and tasks, often with an eye toward timing and pacing. Several users—including both mathematics and ELA teachers—told us that they had to pick and choose pieces of lessons or

Figure 3.9
Elements of EngageNY and Other Materials Used "Daily" or "Often" for Mathematics Classroom Lessons



RAND *RR1773-3.9*

Figure 3.10
Elements of EngageNY and Other Materials Used "Daily" or "Often" for English Language Arts Classroom Lessons



NOTE: An asterisk denotes that the difference between the percentage of teachers reporting use of particular elements in EngageNY and teachers reporting use of particular elements in curricula besides EngageNY was significantly different ($p<.05$).

RAND *RR1773-3.10*

activities because they would not be able to teach an entire lesson as scripted in the time available. One mathematics teacher told us, "I read [the lesson] over so I kind of see what they're asking, [but] because I don't have the same length of time as the lesson always asks for, I have to modify it. . . I use the concept that they're recommending, the skill, but I do not follow it word-for-word." Similarly, an ELA teacher said, "I don't ever use [the ELA modules] in complete form because you couldn't teach one of those in a school year. . . I just pick and choose what I like and what I think will work with my kids within, you know, 40 minutes a day for 40 weeks." Another ELA teacher commented, "If you've seen [EngageNY] modules, you'd know that they're enormous. . . I have 100-minute classes [so I] either stretch them out or cram them into larger differently shaped periods for students."

Teachers also adapted EngageNY for many reasons beyond just needing to fit the lessons into a given schedule or time block. Some teachers made modifications based on their perceptions of their students' needs. For instance, some teachers spoke about using graphic organizers to make the readings more accessible or changing the font or layout of the materials to improve their usability (e.g., making the spaces in the worksheets larger so students had more space to write). A mathematics teacher took the modules and "reformed almost everything into a discovery group work lesson."

Teachers' modification of EngageNY lessons does not necessarily indicate that teachers did not like EngageNY or did not make the choice to use EngageNY voluntarily. That said, teachers could be using EngageNY for various reasons. In some cases, they may have found EngageNY on their own. In other cases, their district or school may be recommending its use. In the next section, we explore potential explanations for the widespread use of EngageNY, and we consider whether the open nature of EngageNY may encourage more widespread use.

CHAPTER FOUR

What Explains the High Uptake of EngageNY?

A number of factors might explain the high use of EngageNY among teachers, as indicated by the ATP data. If teachers and districts believe that EngageNY is well aligned with CCSS and their state standards, they may draw on it for that reason. In addition, the free and open nature of EngageNY likely makes it easier to draw on than commercial published textbooks, both from financial and accessibility perspectives. In this section, we use the survey and interview data to explore reasons why teachers are using EngageNY resources, and we also analyze data from Google Analytics to consider why users in particular states may be drawing upon EngageNY.

Text Box 4.1
What Explains the Use of EngageNY? Key Takeaways

- High use of EngageNY curriculum materials was at least partly driven by state standards and assessments; the majority of teachers indicated that state standards influenced their use of EngageNY.
- State standards influenced ELA teachers' use of EngageNY more so than the other ELA curriculum materials addressed in our survey.
- A majority of teachers using EngageNY indicated that their school district recommended or required its use.

Findings

Teachers in states that have adopted the Common Core or similar standards were 65 percent more likely to use EngageNY than those in non–Common Core states.

Most of the ATP teachers who reported using EngageNY are in states that have adopted Common Core or similar standards, particularly for mathematics. In fact, in the eight states that opted not to adopt CCSS, only 6 percent of mathematics teachers and only a little more than 10 percent of ELA teachers reported using EngageNY. We did not find different use of EngageNY among ATP teachers in lower-income schools (i.e., those with higher percentages of students receiving free or reduced-price lunches) or those serving more English language–learners (ELLs) compared with their counterparts serving fewer low-income students or ELLs.

To better understand the factors that predict use of EngageNY, we conducted logistic regression where the dependent variable was "use of EngageNY"—as measured in the survey—and independent variables included demographic variables of survey respondents (e.g., whether the teacher was in a state with Common Core or similar standards), and other teacher and student characteristics. The results show that no factor other than being in a Common Core state was a significant predictor of EngageNY use. In fact, teachers in states with Common Core or similar standards were 65 percent more likely to report use of EngageNY than their counterparts in states that have not adopted CCSS, even when taking into account income status of students, ELLs that a teacher serves, subject, and whether a teacher serves elementary or secondary students.

In the interviews, teachers also indicated that EngageNY's alignment with CCSS and state assessments was a key reason for its use. While our interview data were only collected from teachers in two states, they provide some potential explanations and elaboration for the survey finding that state standards may be a key reason teachers were using EngageNY. One mathematics teacher noted that EngageNY was a resource "that is easy to follow, not a whole lot of prep, and has the Common Core Standards. I know that if I'm teaching [an EngageNY] lesson, it's hitting the standards that I need my third graders to meet." Likewise, some teachers looked to EngageNY as, in the words of one ELA teacher, a "source for knowing exactly what the standards are." More specifically, teachers expressed that the resources were helpful in providing concrete illustrations of what specific standards mean. One mathematics teacher said that EngageNY showed him what students are supposed to be able to do and how to do it. Another ELA teacher noted that because EngageNY cross-references standards, it was easy for her to see what students needed to learn and what she needed to teach at a glance. Other teachers, both in New York and California, noted that EngageNY materials were good preparation for state assessments, given their alignment with state standards. A teacher in California likened it to "a textbook for the Smarter Balanced Assessment Consortium test." Similarly, a teacher from New York noted that EngageNY had "taught me how to teach to the test, which maybe isn't the nicest thing to say about it, but. . . that's really what was useful about it."

Taken together, our survey and interview data suggest that teachers were motivated to use EngageNY because of its alignment with CCSS and state assessments in Common Core states. However, it is also possible that districts in these states are simply requiring or recommending it more than other curricula or that other factors are driving teachers' use, such as their impressions of EngageNY's usability or accessibility. Thus, we explored other factors that

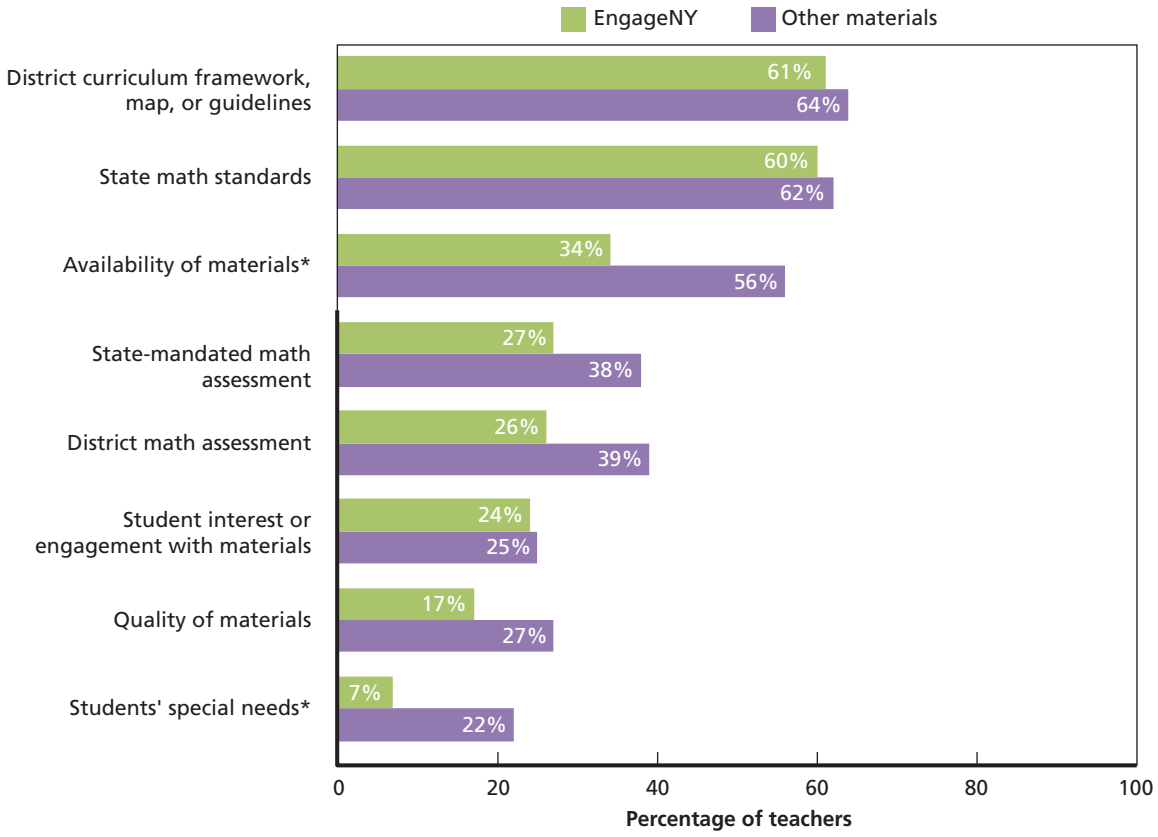
might influence use of EngageNY specifically among teachers in the 42 states with CCSS or standards similar to the Common Core.

Use of EngageNY in Common Core states was driven more by district and state expectations than by students' special needs and interests.

Teachers' responses to questions about what factors influence their use of materials indicate that state standards and district expectations have a big influence on the use of EngageNY. When we asked ATP teachers in Common Core states what factors influenced their use of curriculum materials, teachers were most likely to indicate that district and state standards, guidelines, and assessments drove their use.

For mathematics, state standards and district guidelines actually appeared to influence use of *any* materials—not just EngageNY—among almost two-thirds of all teachers. (Figure 4.1). However, for ELA, teachers in Common Core states were more likely to mention state standards and district assessments as reasons for their use of EngageNY than they were to cite these reasons for use of other materials (Figure 4.2). About two-thirds of ELA teachers reported that their state standards had a "great deal" of influence on their decision to use EngageNY, whereas only 39 percent of ELA teachers said the same for their use of other materials. Similarly, more

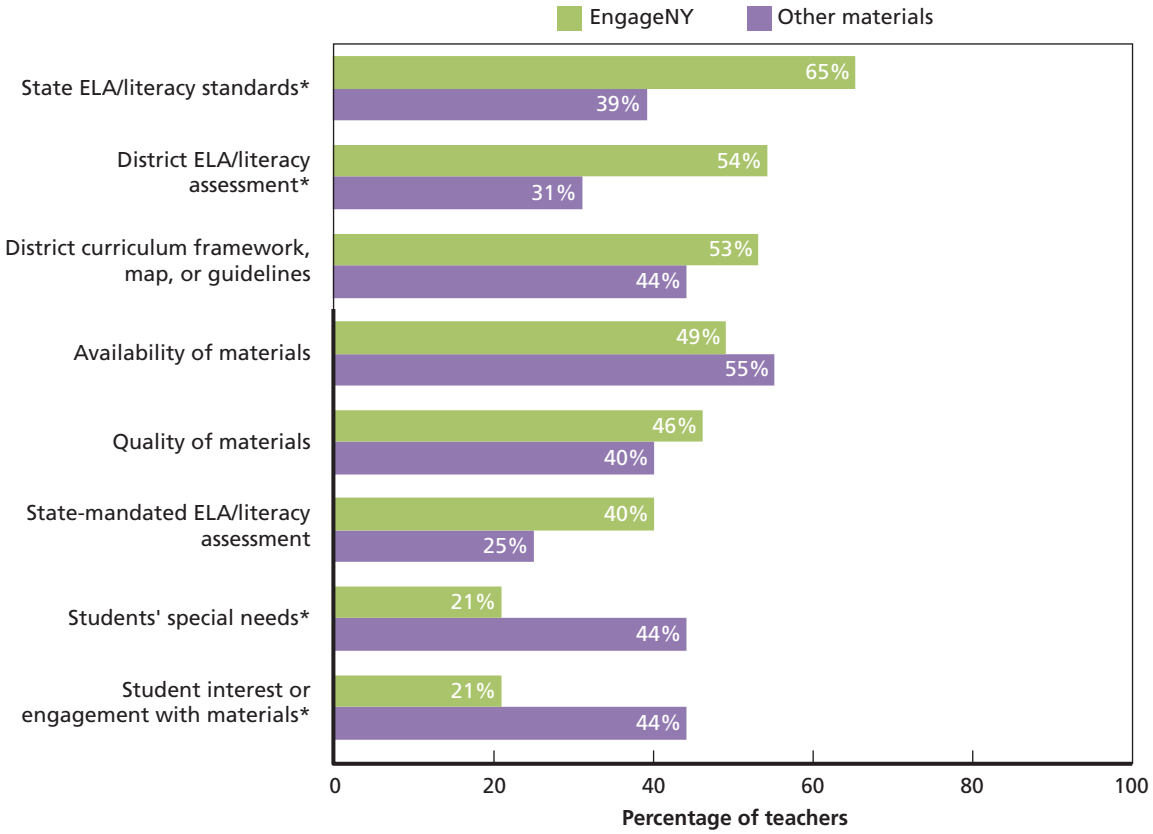
Figure 4.1
Factors with a "Great Deal" of Influence on Use of EngageNY Compared with Other Published Mathematics Materials for Teachers in Common Core States



NOTE: An asterisk denotes a significant difference between the percentage of teachers reporting particular factors influencing their use of EngageNY and the percentage of teachers reporting those factors as influencing their use of other materials ($p < 0.05$).

RAND *RR1773-4.1*

Figure 4.2
Factors with a "Great Deal" of Influence on Use of EngageNY Compared with Other Published English Language Arts Materials for Teachers in Common Core States



NOTE: An asterisk denotes a significant difference between the percentage of teachers reporting particular factors influencing their use of EngageNY and the percentage of teachers reporting those factors as influencing their use of other materials ($p < 0.05$).

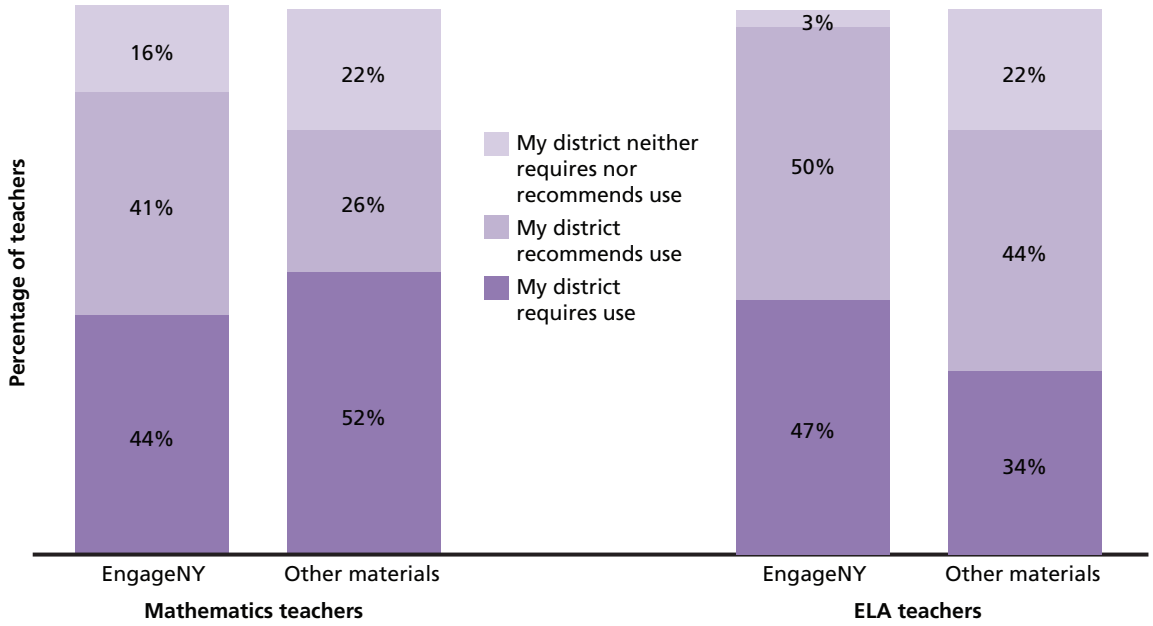
RAND *RR1773-4.2*

than half of ELA teachers reported that district assessments influenced their use of EngageNY a great deal compared with 31 percent for their use of other materials.

One might assume that teachers would perceive availability as a major factor for use of EngageNY, over and above other resources, given its open and free nature. But that does not appear to be the case. While availability was among the top reasons teachers in Common Core states reported using any curricula, it was actually mentioned significantly less often as a big influence for use of EngageNY for mathematics than it was for other published mathematics materials. For ELA, we observed no difference in availability as a major reason for use of EngageNY compared with other published ELA materials.

We also asked teachers whether their district requires or recommends use of their top four instructional materials. As seen in Figure 4.3, more than three-quarters of teachers reported that their district either recommended or required use of at least some of their main materials. Slightly higher percentages of teachers indicated that EngageNY ELA materials were recommended or required by their district ($p < 0.10$) compared with those responding about EngageNY's mathematics materials.

Figure 4.3
District Requirements for Use of Mathematics and ELA Materials According to Surveyed Teachers in Common Core States



RAND *RR1773-4.3*

Similarly, 61 percent of the teachers we interviewed in New York and California indicated that their district had asked them to use EngageNY for some portion of instruction. More than half of those teachers indicated that they were required to use EngageNY as their main instructional materials, but others indicated they were expected to use it as a supplement. For example, one mathematics teacher noted that teachers were expected to use EngageNY for a fractions unit, but not for other units. Sixty-one percent of teachers also believed that a key reason why districts mandated or recommended EngageNY was that the materials were well aligned with CCSS and related state assessments. Only four teachers we interviewed (13 percent) explicitly indicated that the online and open nature of EngageNY was a key reason for their district deciding to use EngageNY. However, teachers may not have been privy to reasons for districts' curriculum decisions.

Overall, this evidence indicates that use of EngageNY is primarily driven by state and district expectations, as is the use of teachers' other main instructional materials. However, for ELA, district expectations may be a stronger driver of teachers' use of EngageNY compared with other materials.

CHAPTER FIVE

How Is EngageNY Supporting Teaching and Learning?

In this final findings section, we consider how EngageNY is supporting teaching and learning in schools. We consider ways that EngageNY is supporting implementation of state standards and the factors that could be limiting its use and success. Data are drawn from the ATP survey, as well as our interviews with 31 teachers on their use of EngageNY.

Text Box 5.1
How is EngageNY Supporting Teaching and Learning? Key Takeaways

- Teachers using EngageNY's mathematics materials were more likely than those using other mathematics materials to indicate that EngageNY provides opportunities for students to explain and justify their work, and that it addresses conceptual understanding, procedural skills, and application to real-life contexts with equal time and intensity.
- Teachers using EngageNY's ELA materials were more likely to indicate that EngageNY provides students with opportunities to read nonfiction texts of sufficient complexity and use a range of vocabulary, among other standards-aligned practices.

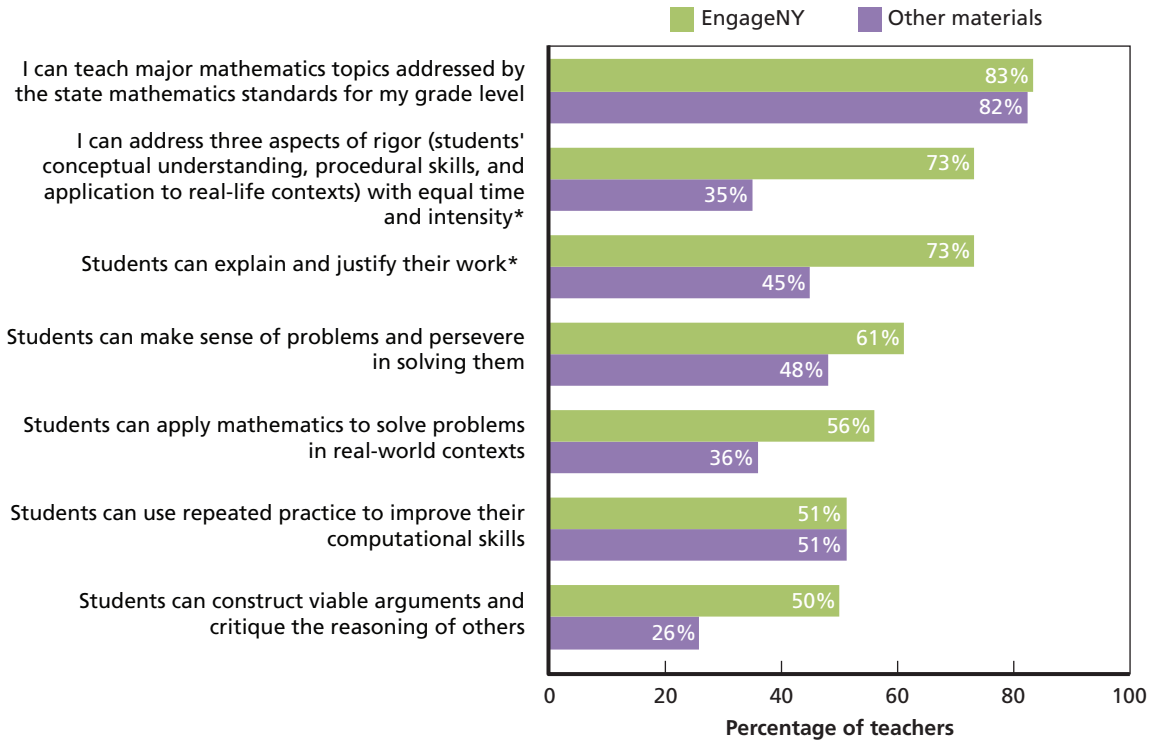
Findings

Teachers in Common Core states reported that EngageNY gives students more opportunities to participate in some standards-aligned practices compared with other instructional materials.

For the curriculum materials that teachers indicated using most often, teachers were asked to comment on the extent to which those materials gave students opportunities to engage in practices aligned with CCSS. Given that teachers only responded about the one textbook or curriculum that they use most often, the number of teachers responding about any particular set of materials is quite small. Specifically, only 38 teachers reported using EngageNY materials as their top curriculum materials for mathematics, and only 11 reported so for ELA. Thus, teachers' reports of opportunities provided by EngageNY compared with other materials yielded few significant differences, and the results for ELA in particular should be interpreted with caution. However, the results do provide some indication of how EngageNY compares with other materials in teachers' eyes, in terms of how it addresses standards-aligned practices.

Figure 5.1 displays the proportions of teachers who reported that their top curriculum materials provided various instructional opportunities to a great extent. Mathematics teachers using EngageNY were more likely to report that those curriculum materials provided an opportunity to address three aspects of rigor (conceptual understanding, procedural skills, and

Figure 5.1
Reports from Mathematics Teachers in Common Core States on Teacher and Student Opportunities Provided "To a Great Extent" by EngageNY Versus Other Materials



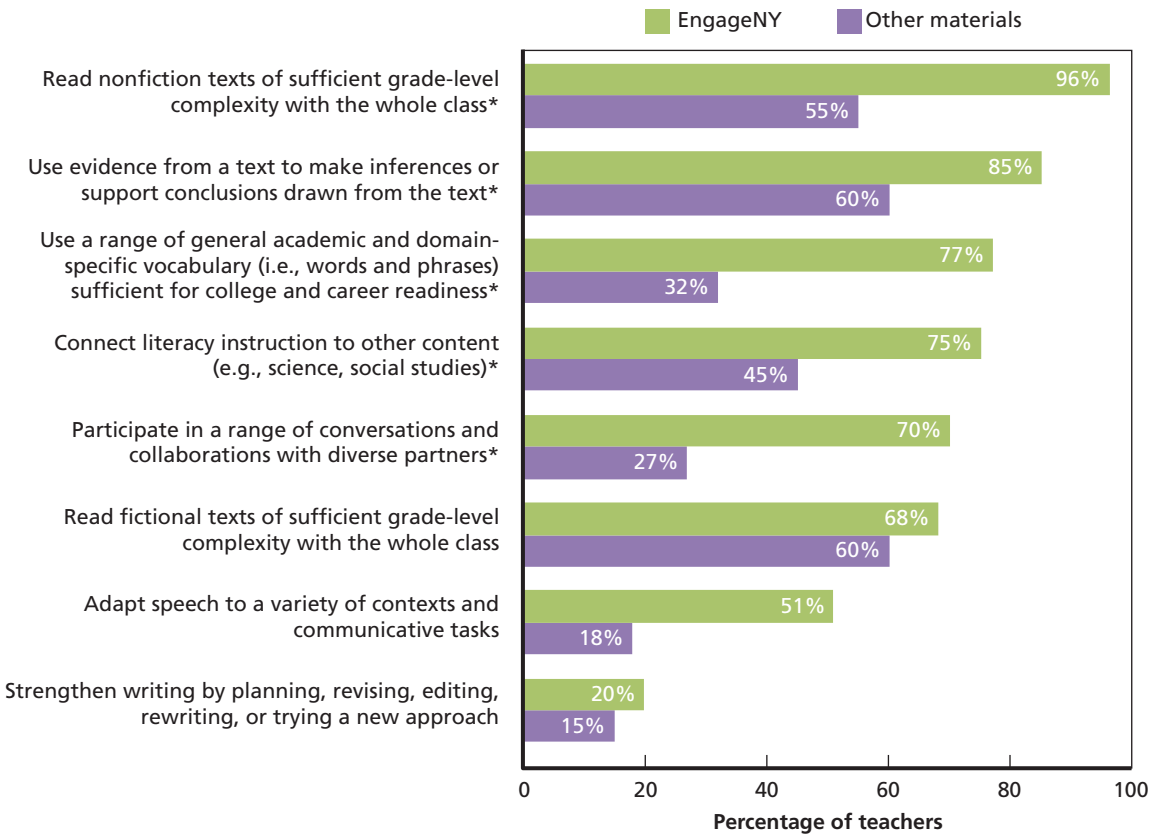
NOTE: An asterisk denotes a significant difference between the percentage of teachers reporting particular opportunities provided by EngageNY and opportunities provided by other materials ($p<.05$).

RAND *RR1773-5.1*

application to real-life contexts) with equal time and intensity "to a great extent" compared with mathematics teachers using other materials; this was true for about three-quarters of EngageNY users and only about one-third of teachers using other materials. Similarly, almost 75 percent of mathematics teachers reported that EngageNY gave students the opportunity to explain and justify their work "to a great extent" compared with fewer than half of mathematics teachers using other materials. Teachers rated EngageNY higher on other opportunities provided, but the differences were not significant.

Compared with ELA teachers responding about other curricula, higher percentages of ELA teachers reported that EngageNY gave students an opportunity to read nonfiction texts of sufficient grade-level complexity; use evidence from the text to make inferences or support conclusions drawn from the text; use a range of general academic and domain-specific vocabulary; connect literacy instruction to other content; and participate in a range of conversations and collaborations with diverse partners, than did users of other materials (see Figure 5.2). Note, however that the sample size for the ELA analysis was very small.

Figure 5.2
Reports from ELA Teachers in Common Core States on Student Opportunities Provided "To a Great Extent" by EngageNY Versus Other Materials



NOTE: An asterisk denotes a significant difference between the percentage of teachers reporting particular opportunities provided by EngageNY and opportunities provided by other materials ($p<.05$).

RAND *RR1773-5.2*

Rigor and pacing of EngageNY materials may present both advantages and challenges to teachers and students, particularly for mathematics.

The interview data provided some unique perspectives on the usefulness of the EngageNY curricula beyond what the survey or Google Analytics data could provide. However, as we indicated earlier in this report, the interview data represent a limited sample of teachers and cannot be generalized to all teachers who use EngageNY. Nonetheless, teachers we interviewed had specific perspectives on the advantages and challenges of using EngageNY in classrooms. These were mostly related to the rigor and pacing of EngageNY materials. This may not be surprising, given that EngageNY's content is intended to reflect the CCSS, which are generally perceived as more rigorous than previous standards.

Mathematics teachers we interviewed generally agreed that EngageNY materials were rigorous and challenging, and many noted this as a positive aspect of the curriculum. For example, 82 percent noted that the rigor and conceptual focus of EngageNY's mathematics curricula helped their students make impressive strides. One teacher commented, "I'm amazed at what [my students] are doing and the problems that they're solving at the end of first grade." Other teachers explicitly linked the rigor and conceptual focus of the materials with higher student engagement. One remarked that her students were engaged through opportunities to approach problems in multiple ways. Another commented, "It challenges them to think more. I think that was engaging them because it wasn't just working through step one, step two, step three. They actually had to think about it and try to figure out different strategies."

Almost all the mathematics teachers we interviewed (88 percent) also felt that EngageNY had improved their teaching, partially because of its rigor and challenge. One teacher said that EngageNY "broadened [my] thinking" and "made the teaching deeper" and more conceptual. For instance, she noted that instead of teaching students to add fractions by following an algorithm, she has worked on helping students understand "that fractions that are the same denominator are the same size pieces, which when added together just tell you how many of those size pieces you have." Several teachers mentioned that EngageNY had helped them learn how to use multiple strategies to teach a concept, like using both arrow notation and number bonds for adding and subtracting.

On the other hand, four of the mathematics teachers we interviewed (24 percent) also believed that the materials were sometimes too difficult for students, hindering their usefulness. Some teachers, for example, commented that EngageNY could have provided scaffolds or more-differentiated materials for students at various levels. One noted, "We [teachers] spend a lot of time planning and a lot of time scaffolding because there is not an easy entry point for my students." Another found the word problems "impossible," saying:

> We have to. . . teach children how to pull those words apart to make sense of what's being asked of them. We spend a lot of time diagramming the sentences and pulling the numbers and trying to make sense of what's being required. That takes a tremendous amount of teaching.

A few teachers also noted that their students felt defeated or frustrated by the challenge of the materials.

Of the ELA teachers we interviewed, more than 70 percent provided positive comments about the impact of EngageNY's ELA curricula on student learning, and many referenced the rigor of the demands. One teacher said of the Public Consulting Group curriculum for grades

9 through 12, "It has raised the level of what I do. I would never have [had] beginning students write persuasively, and now I do." Another commented that, now that her eighth-graders have had three years of Expeditionary Learning—one of EngageNY's ELA curricula, "they naturally tend to annotate text automatically. . . it's not as much of a struggle to get them to mark up a text or try to figure out a text they don't understand immediately." Teachers also commented that the book choices within the ELA curricula were interesting and appropriate for their students.

Like their mathematics counterparts, ELA teachers felt that EngageNY lacked support in the form of differentiated materials for learners of varying achievement levels and for ELLs. One teacher felt that ELL students, and any student who struggled with reading and comprehension, would not understand the vocabulary of the lessons. She noted, for example, that modules seldom used pictures or visuals and that the pictures did not help students read the text. Another ELA teacher discussed having to constantly modify materials because the students were not performing at grade level:

> I have to make graphic organizers to go along with the readings. I need to do a pre-close reading for it or else I would be setting myself up for a really terrible lesson. So it takes a lot on the teacher's part. There's a lot I've been doing on my own.

Many teachers (42 percent) also mentioned the sheer amount of curriculum materials and content for individual lessons as an issue. One estimated that a single ELA module would take a quarter of a school year to get through if she did not adapt or modify it, and others made similar comments about the mathematics modules. Moreover, many teachers thought that the EngageNY lessons required them to move through materials too quickly.

The rigor of EngageNY materials, and their conceptual focus, may present particular issues for parents. About a third of teachers discussed parents' responses to EngageNY materials, which were overwhelmingly negative and mostly referred to the mathematics curriculum. Parents reportedly found the EngageNY materials and approach to mathematics difficult, confusing, and sometimes overwhelming.

The online format of the materials may present unique challenges for instruction compared with traditional textbooks.

While the online format of EngageNY curricula may be convenient for teachers, 35 percent of the teachers we interviewed preferred to use hard copies of the instructional materials, including printed modules and lesson plans. Thus, rather than working with the materials on their computers, teachers often printed out the lengthy documents in their entirety. Five of the teachers (16 percent) with whom we spoke indicated that their districts had printed out and copied the entire curriculum and made it available to all teachers in paper form; other teachers indicated they were responsible for their own printing.

Moreover, EngageNY curricula are not interactive; students cannot go online and complete activities or tasks on a computer. The majority of the teachers we interviewed (61 percent) indicated that they typically printed out, copied, or even re-created student-facing materials like graphic organizers or problem sets when they wanted to use them in the classroom. Several teachers told us that they had spent a great deal of time in their school copy room duplicating EngageNY materials for their students. Other teachers (35 percent) had circumvented making copies by projecting the materials with a document camera or a SmartBoard. For example,

one teacher used the projector particularly for working through mathematics problem sets with students. Not all classrooms have such technology, however. Moreover, most teachers with whom we spoke said that they preferred that students have their own printed sheets or consumable workbooks to work in. A handful of the interviewees with whom we spoke noted that their school or district had opted to print and bind copies of the EngageNY mathematics materials for students' use.

Almost half the teachers with whom we spoke discussed wanting more resources to support their use of EngageNY. Some of these resources are ones that are typically provided with more-traditional texts but are obviously resources that cost money and would have to be provided separately from the open and free elements of EngageNY. Several mathematics teachers thought workbooks for students would be beneficial, recognizing that students could not be expected to organize loose printed pages. Other teachers thought it would be ideal if EngageNY provided a supply of certain materials needed for activities, such as string, measuring cups, and various manipulatives. One ELA teacher thought EngageNY's ELA curricula could include more videos or links to movie clips that provided background for a topic (related to a text students are studying). Other teachers wanted more recommended reading lists or even for EngageNY to provide physical books.

In sum, our survey and interview data suggest both advantages and disadvantages relating to the use of EngageNY. On the one hand, survey data suggest that EngageNY may be doing a better job than other materials at supporting opportunities for students to participate in practices aligned with CCSS and standards that are similar across 42 states. On the other hand, our interview data suggest that curricula that are well aligned with more-challenging standards like CCSS may have drawbacks, including that some students may struggle a great deal to master the content within that curricula and may take much more time to do so. These drawbacks may be exacerbated when curricula are provided solely in an online format to be downloaded and copied by teachers and students.

CHAPTER SIX

Conclusions and Implications

EngageNY's open educational resources are some of the most popular materials for mathematics and ELA instruction in the United States today. How has EngageNY managed to attract so many users compared with other, more established textbooks and curricula? What lessons can the example of EngageNY offer for others developing high-quality, standards-aligned OER and wanting to encourage broader access to and use of those materials? What lessons can EngageNY offer for states and districts seeking to support teachers' use of OER and other standards-aligned instructional materials?

Our findings suggest that the alignment of EngageNY's content with CCSS and the need to prepare students for assessments aligned with CCSS are key reasons for the high use of EngageNY. In particular, teachers seeking to address the Common Core and similar learning standards appear to want high-quality curricular materials that provide lessons that build upon one another and provide progressions for students to master standards and perform at higher levels on assessments. Our Google Analytics analysis found lower use of EngageNY materials in states that have not formally adopted Common Core, including Texas, Oklahoma, Indiana, South Carolina, and Virginia; a finding confirmed by survey data. Survey data also indicated that use of EngageNY material increased in the later elementary grades (grades 3 through 6) that are typically subject to state-mandated testing.

Why are teachers in Common Core states more likely to use EngageNY? Teachers in Common Core states reported that state standards and district guidelines were key reasons for their use of any mathematics curricula, including, but not limited to, EngageNY. However, for ELA, in particular, state standards appeared to play a greater role. Specifically, a higher percentage of ELA teachers reported that their use of EngageNY was influenced by state standards and district assessments than those reporting on other curricula. While district requirements and recommendations appeared to contribute to teachers' use of EngageNY, those requirements and recommendations were no higher for EngageNY than other curricula. As we noted in the introduction to this report, multiple states recommended EngageNY resources on their state department of education website, and these recommendations likely encouraged both districts and teachers to use EngageNY.

"Availability" was not cited by teachers as a major reason for their use of EngageNY any more than it was cited as a reason for use of other instructional materials, and "availability" was less frequently chosen by teachers as a major reason for their use of EngageNY's mathematics materials compared with other instructional materials. This is somewhat surprising, given that EngageNY is one of a few standards-aligned curricula freely available online. However, many teachers decided to print out and copy EngageNY resources for use in the classroom, which may be influencing teachers' perceptions of their true cost and availability.

EngageNY resources may be helping teachers address the demands of CCSS better than other resources. Teachers using EngageNY as their main instructional materials were more likely to indicate that the EngageNY website provided opportunities for students to participate in standards-aligned practices compared with other instructional materials. For example, teachers indicated that EngageNY's mathematics curricula particularly helped them address aspects of rigor with equal time and intensity, and helped students to explain and justify their work. For ELA, teachers indicated that EngageNY helped students use complex texts and use evidence from texts, among other standards-aligned practices.

While EngageNY's comprehensive, standards-aligned curricula appear to offer benefits, its use also presents some challenges. For example, teachers we interviewed often found both the mathematics and ELA modules and lessons to be far too long and often inaccessible to struggling students. And, in interviews, teachers told us that they preferred to work with hard copies of the materials, which meant a significant amount of copying.

Our evidence on how EngageNY is benefiting teaching and learning is preliminary and based on small sample sizes. In future studies with increased samples of teachers, we hope to leverage results from the ATP and other research to say more about the benefits of EngageNY. However, at the same time, these benefits may not be sustained if states make substantial changes to their standards over the next few years. New York and Arizona, for example, are both in the process of changing their standards, with the revised standards to be implemented starting in the 2017–2018 school year.[1] If states revise their standards in ways that do not align with EngageNY, students may not experience as many benefits from using those curriculum materials.

Lessons About the Development and Proliferation of Open Educational Resources

The findings on use of EngageNY from this study suggest that educators—and the district and state systems supporting them—are seeking online instructional resources that are aligned with state standards and that can help them prepare students for state assessments. In comparison with other OER, EngageNY has the particular distinction of offering comprehensive curricula to address standards, rather than piecemeal lessons or activities that teachers must search through to address one standard or another. The full curricular options provided by EngageNY are evidently valued, given the high numbers of teachers that report using them.

Given that state standards and districts appear to be such a large driver of EngageNY, OER providers—and any providers of online instructional materials—could support more use of their materials by ensuring they are clearly aligned with standards and provide explicit evidence in that regard. In particular, if online materials are provided in progressions that are well aligned with state standards progressions, teachers may be more apt to use those materials on an ongoing basis for their instruction, and districts could be more apt to recommend and require use of those materials.

Online providers could also consider more carefully how their materials can help students engage in rigorous, cognitively demanding practices that are aligned with standards, and how they can signal the connections between their materials and these practices. Online providers

[1] See Cano (2016) and Colangelo and Chapman (2016) for more on changes to standards in these states.

may not be able to give objective reviews of all their lesson tasks and give teachers such information for every lesson. However, one advantage of OER is that they could give educators the opportunity to weigh in on individual lessons and their merits. OER providers could consider asking teachers to contribute reviews—as experts who have the most relevant on-the-ground experience delivering lessons—of how lessons supported students in learning specific skills and content, how lesson tasks helped teachers support struggling learners, and opportunities within lessons to address conceptual understanding or other standards-aligned goals.

Online providers may also consider offering additional tools that support implementation of OER across schools and districts. If adoption of online curriculum materials is district-wide, rather than represented by individual teachers, providers have an opportunity to leverage the curriculum implementation support that districts supply to teachers and the support that teachers can share with one another in professional learning networks with schools and districts. For example, online providers could offer professional development videos and tools to support curriculum implementation, and they could even provide ongoing professional development opportunities within those districts. LearnZillion is one example of a provider of OER that offers district-wide professional development.

As with providers of any curricular materials, providers of OER must carefully consider how to support teachers to use materials thoughtfully and deeply. The provision of curriculum-specific professional development is one avenue to doing that. OER providers have more options than publishers of traditional textbooks, in that they can embed professional development tools directly in digital online systems to support thoughtful use of materials. Links to "quick tips" or scaffolds for challenging lessons or tasks could help teachers think about lesson content more deeply and consider how best to support their students.

Given that teachers already tend to modify and adapt lessons, as suggested in this study, online providers might also consider embedding tools in the curricula that enable teachers to "customize" their lessons in ways that could benefit students most. For example, online providers could highlight particular pieces of lessons that are key to supporting student learning and enable teachers to move tasks around, choose individual problems to use, and integrate additional tasks in an online environment. This could encourage teachers to engage with instructional materials more frequently and reflect upon which activities and tasks could support their students most. That said, we know very little about the potential of OER to engage teachers and improve their teaching, and more research in this area is warranted.

Lessons for States and Others Supporting Teachers' Work

To get high-quality OER into the hands of teachers, rigorous vetting and review of curricula to examine alignment with standards and assessments could be performed by researchers, states, and other organizations. The growing popularity of EngageNY might signal demand for standards-aligned resources and could encourage more growth in the number and kind of OER available to K–12 teachers. However, more OER in itself cannot improve classroom instruction. Only high-quality OER that is well aligned with state standards can do that. Furthermore, lessons and activities that exist by themselves within OER or commercial repositories, apart from comprehensive curricula, are likely less helpful for improving instruction than more-complete aligned curricula with lessons that build on one another to help students gain proficiency on particular standards and eventually master them. National and state organiza-

tions that wish to support state standards might consider providing websites where all current comprehensive curricula aligned with state standards and/or the Common Core are reviewed, with recommendations and suggestions for additional resources to support their use. On a similar note, based on their work with states to support and improve use of OER, Achieve (2013) has recommended that states should bring together experts from multiple sectors to discuss how to share resources and define high-quality resources, including experts with regard to standards, curriculum, and technology. Through such cross-sector work, states could ensure use of OER in ways that most support teachers.

In addition, states and national organizations could consider extending the work that has already started in NYSED by working together to develop open online curricula that are aligned with most standards. Louisiana Department of Education provides one example of such work: They have partnered with LearnZillion to create ELA curricula aligned with their standards, with multiple units at each grade level that include lessons, assessments, texts, handouts, and writing examples and prompts.[2] Both EngageNY and the LearnZillion ELA curricula are examples of resources that can be used more broadly across the United States because they are well-aligned with standards across most states.

A bigger question is how teachers can be supported to use OER in ways that will help students master the standards and achieve at higher levels. Research suggests that curriculum-specific professional learning opportunities for teachers do more to support their classroom instruction than more-general professional development that focuses, for example, on strategies for teaching math to low-achieving students. States, districts, and schools may thus consider how to integrate the content of recommended curricula into professional learning opportunities on a regular basis and, perhaps more importantly, create and grow networks of expert users who can support each other through online and in-person professional learning communities.

One way to support teachers within districts and such networks could be to engage them in curriculum-specific professional development opportunities that ask them to both try out tasks within existing OER but also add their own adaptions, expansions, and whole lessons to OER. Such kinds of opportunities could enable teachers to reflect deeply upon content within OER, question their own instructional approaches, and improve upon them. LearnZillion, for example, includes authoring tools that engage teachers in editing materials and aligning them with the scope and sequence of district curriculum blueprints and guidelines. By engaging directly with open curricular content, teachers can contribute to a growing bank of knowledge about how to implement OER at high levels and in ways that support their own professional development and, more importantly, student learning.

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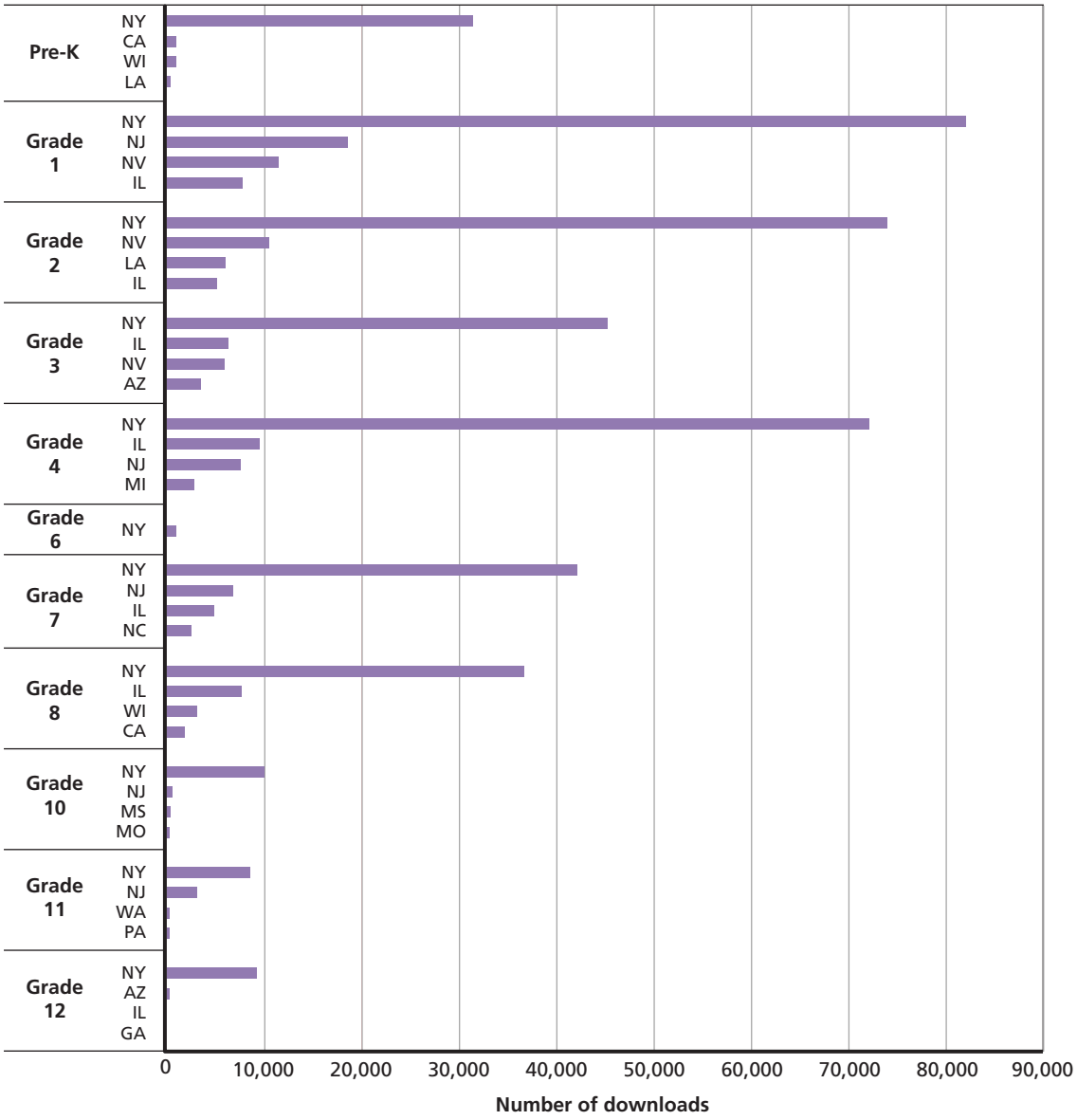
[2] See LearnZillion, 2016.

APPENDIX A

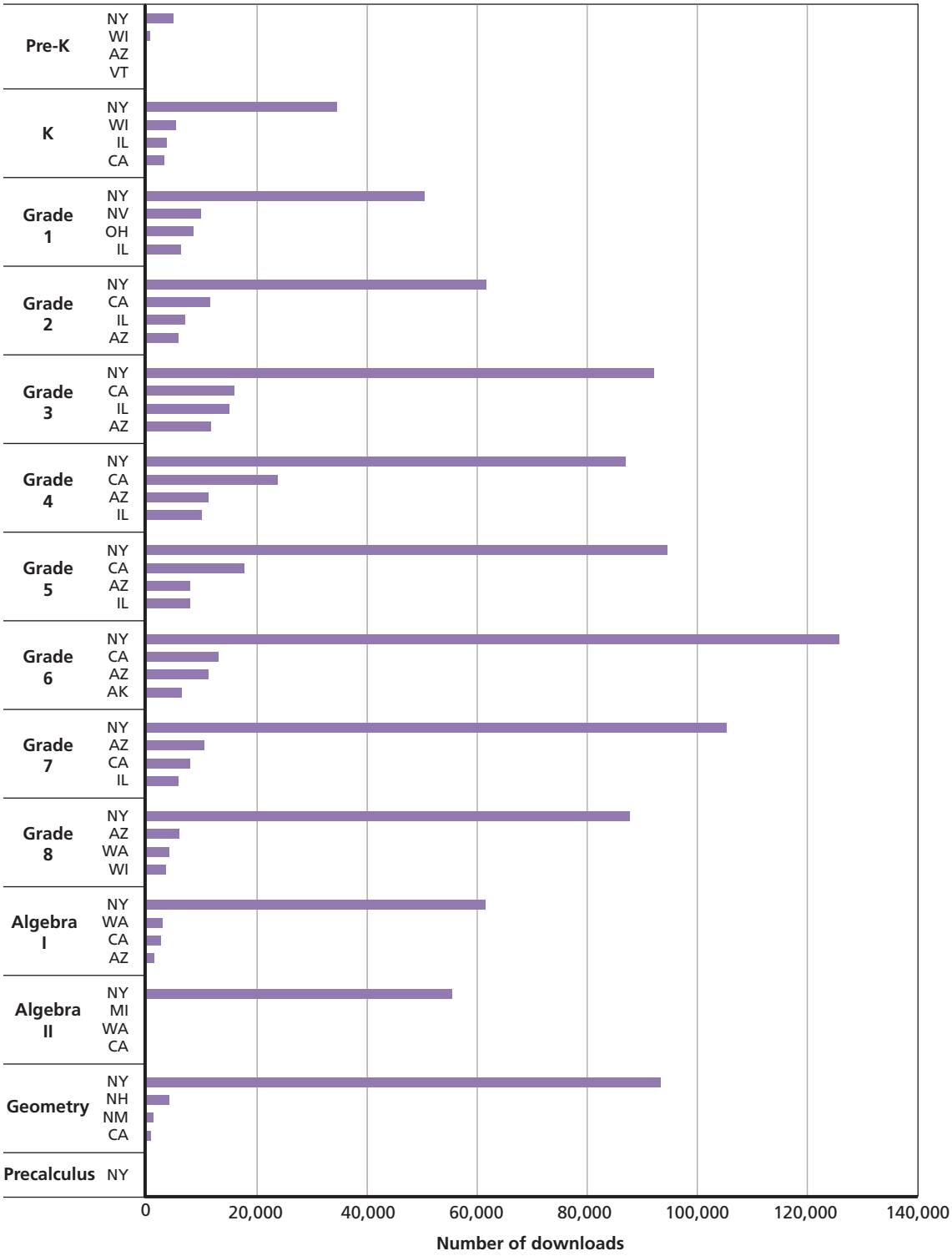
Additional Google Analytics Data

Figure A.1
States with the Most Unique English Language Arts Downloads, by Grade



RAND *RR1773-A.1*

Figure A.2
States with the Most Unique Mathematics Downloads, by Grade



RAND *RR1773-A.2*

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