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Digital Instructional Materials

What Are Teachers Using and What Barriers Exist?

Digital instructional materials are becoming an increasingly prominent resource for teachers. Nearly all teachers consult some form of online tools and resources: Ninety-five percent of elementary teachers and 97 percent of secondary teachers have reported using Google to plan instruction, and more than half of both elementary and secondary teachers report consulting Pinterest, Teachers Pay Teachers, and their state department of education websites to do this planning.[1] In addition, recent findings from the American Teacher Panel demonstrate that teachers' use of standards-aligned and content-specific websites has increased over the past several years.[2] The use of digital learning tools (websites, apps, and online resources used for instructional purposes) is pervasive; educators believe that digital learning tools have significant value, and many teachers would like to use digital learning tools more often.[3]

However, teachers lack information about these materials' quality and effectiveness. This information is especially necessary because evidence suggests that teachers seek supplementary materials, including those found online, to fill gaps in comprehensive curriculum materials.[4] Although efforts exist to evaluate the quality and standards alignment of comprehensive curriculum materials,[5] there is little research on the standards alignment, quality, and effectiveness of digital materials.[6] As a result, teachers might rely on trial and error or anecdotal advice from peers instead of rigorous evidence and research when selecting digital materials.[7] Moreover, the use of digital materials presents unique obstacles—for example, the need for specific technological hardware or internet access, concerns about internet safety, and teachers' perception that they lack adequate training to use digital materials.[8]

This Data Note adds new insights from English language arts (ELA), mathematics, and science teachers on their use of digital materials. Drawing on data from the spring 2019 American Instructional Resources Survey (AIRS), we share the digital materials that ELA, mathematics, and science teachers across the United States reported using regularly for instruction during the 2018–2019 school year. In addition to identifying the most commonly used digital instructional materials, we examine how teachers' use of these materials

[1] Opfer, Kaufman, and Thompson, 2016.
[2] Kaufman et al., 2018.
[3] Gallup, New Schools Venture Fund, 2019.
[4] Blazar et al., 2019.
[5] Tepe and Mooney, 2018.
[6] Sapers, 2015; Klein, 2019; Polikoff and Dean, 2019.
[7] Klein, 2019.
[8] Klein, 2019; Schoology, undated.

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AIRS was administered through the RAND American Teacher Panel in spring 2019. We present findings in this Data Note based on teachers' responses to the following AIRS survey items.[1]

- Please indicate which digital materials your students and/or you used regularly (once a week or more) for instruction this school year (2018–2019). Please indicate which digital materials your students or you used once a week or more during classroom instructional time for instruction this school year (2018–2019).
- Which of the following additional digital materials did you reference or use regularly (once a week or more) to plan your instruction this school year (2018–2019)?
- Of the curricula and digital materials you indicated using regularly, please indicate approximately what percent of instructional time you dedicate toward using them for a typical class of students each week.
- Of the curricula and digital materials you indicated using regularly, please choose the ONE main material you use the most. If there is not one main material you use most, or if you use different main materials for different sets of students, choose two to three main materials you use most.
- To what extent are each of the following barriers to using digital materials? (Examples: internet access is not available and/or reliable at my school; I do not have enough knowledge about digital materials.)
- Of the curricula and digital materials you indicated using regularly, please indicate which are provided by your district or school, either as a requirement or recommendation.

Items that asked teachers about digital materials were separate from items asking teachers about their comprehensive curriculum materials. Comprehensive curriculum materials about which teachers were asked included commonly used comprehensive published textbooks or full curricula for K–12 ELA, mathematics, or science, which might include curricula available online (e.g., EngageNY).

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[1] Participants chose from a list of commonly used digital materials, excluding digital materials that included comprehensive curricula. We compiled the list of digital materials included in the survey based on teachers' responses in previous American Teacher Panel surveys to similar questions about which digital materials they use. Teachers were asked about their use of digital materials for only one subject area (ELA, mathematics, or science), based on their response to a question at the beginning of the survey about which subject(s) they taught. If they reported teaching more than one subject (ELA, mathematics, or science), they were randomly selected to complete the survey for only one of those subject areas.

compares with their use of comprehensive curriculum materials, as well as teacher-reported barriers to digital material use. Finally, we explore several hypotheses regarding factors that might influence digital material use. For example, teachers might use digital materials to supplement comprehensive curriculum materials that do not meet state standards, or the push for standards-aligned comprehensive curriculum materials might cause teachers to seek supplementary digital materials for students who are not yet ready for the curriculum.

Definitions of Key Terms

- ***Digital materials*** are instructional materials available online for teachers and students that do not constitute a full course of study. These exclude comprehensive curriculum materials that are available in online form (e.g., EngageNY). Some commonly used examples of digital materials include Kahoot! and Quizlet (websites where teachers can generate quiz-like games), ReadWorks and NewsELA (which provide online access to articles and question sets by grade or reading level), and BrainPOP and Khan Academy (which present videos and instructional resources for those videos).
- ***Comprehensive curriculum materials*** are instructional materials intended to constitute a full, comprehensive course of study for a particular subject and grade level.
- ***Main materials*** are materials teachers indicated using regularly as the two to three materials they use the most.
- ***Supplemental materials*** are materials teachers report using for less than half of their instructional time and/or do not report using as main materials.

Majorities of Teachers Used Digital Materials, But Typically Did So to Supplement Comprehensive Curriculum Materials

Among digital materials used exclusively for planning, Teachers Pay Teachers (56 percent) and Pinterest (24 percent) topped the list, as seen in Figure 1. In addition, about two out of five teachers (41 percent) reported using search engines to search for planning materials.

The vast majority of teachers—88 percent—also indicated using digital materials during classroom instruction. Figure 2 summarizes the top five digital materials used by teachers and/or students during instructional time for each subject area. Notably, 70 percent of teachers used at least one of the top five digital materials for instruction. On average, a little less than half of the digital materials teachers used for classroom instruction were either required or recommended by their districts or schools, compared with about three-quarters of comprehensive curriculum materials (i.e., textbooks or other materials intended to make up teachers' curricula).

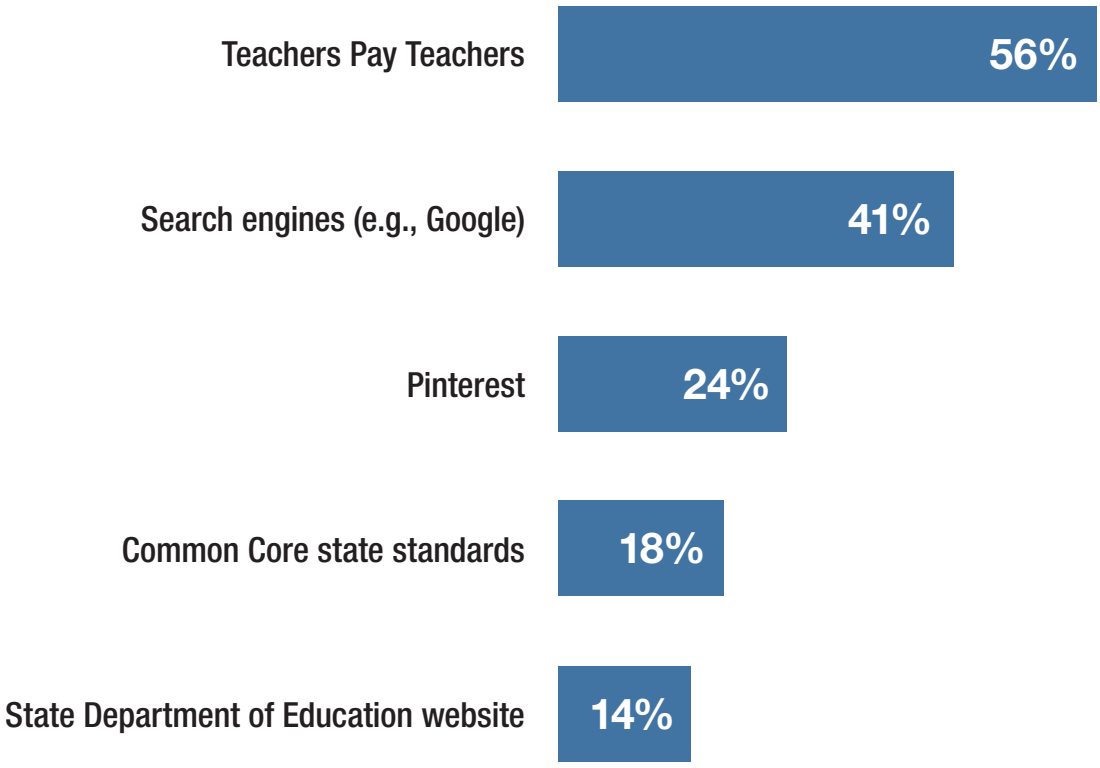
For all subjects, the top digital materials used during instructional time include a mix of cross-subject resources and content-specific resources. YouTube, Kahoot!, and Quizlet were noted as top materials, indicating the prevalent use of materials that can be used across subjects. Our results also indicate the common usage of some content-specific or standards-aligned materials, such as ReadWorks, NewsELA, or Khan Academy. Many of the most commonly used digital materials are free to use.

Compared with ELA and math teachers, high proportions of science teachers indicated using an "other" digital resource, naming more than 50 resources that were not included in our original list. The majority of these "other" digital resources were written in by only a few teachers each, with the exceptions of Discovery Education and Mystery Science, which at least ten teachers wrote in as materials used during instructional time.

FIGURE 1

Teachers Pay Teachers, Google Searches Were Used Most to Plan Lessons

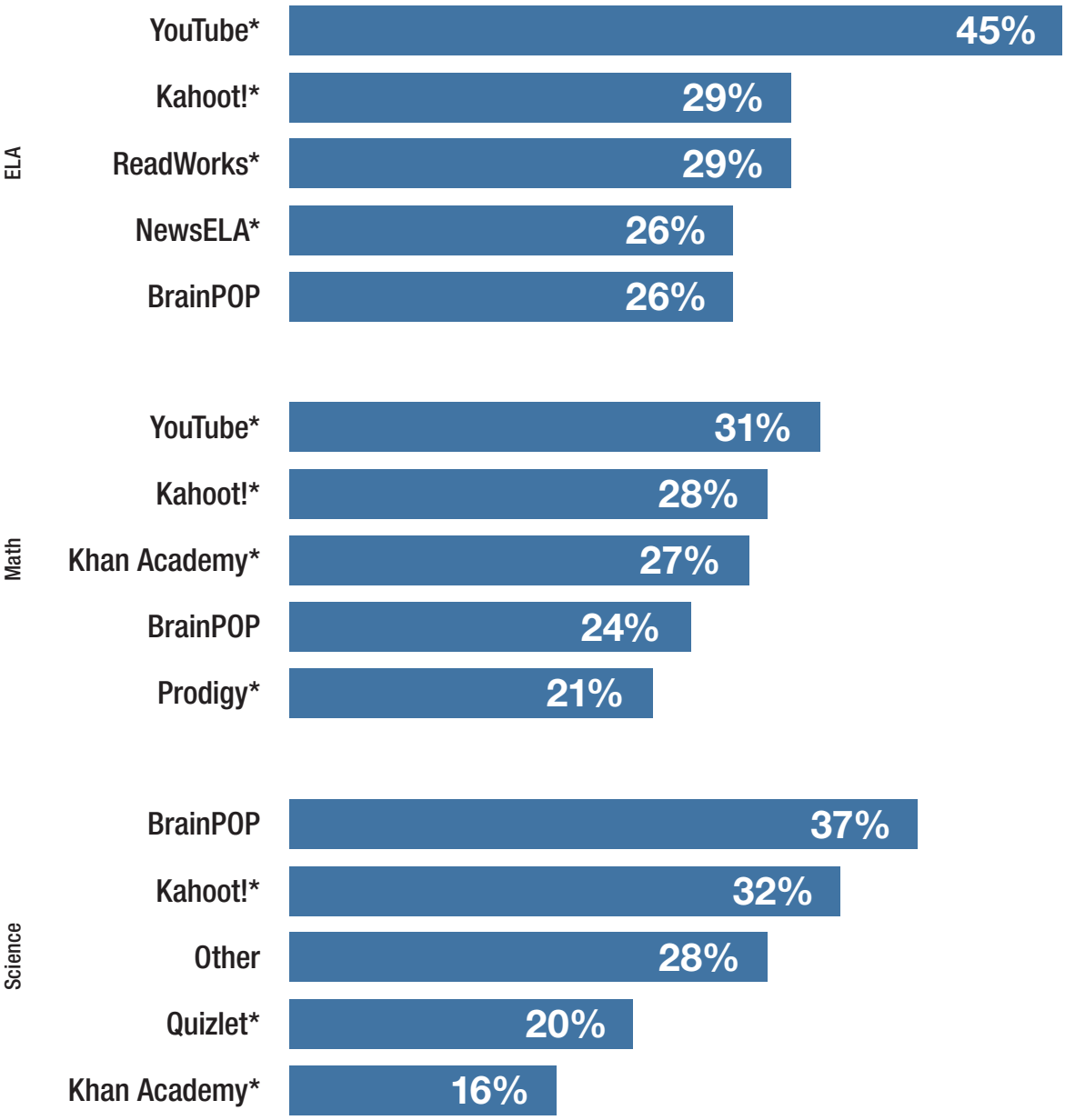
Top Five Digital Materials Used for Planning Instruction



NOTE: Percentages presented are inclusive of teacher responses across grade levels (elementary, middle, high) and subject area (ELA, mathematics, science).

FIGURE 2

Teachers Use YouTube, Kahoot!, BrainPOP in the Classroom



NOTE: This figure shows the top five digital materials that "my students use this once a week or more on their own during classroom instructional time" or that teachers report "I use this once a week or more during whole-class instructional time or to plan my instruction." This figure includes responses from all elementary, middle, and high school respondents who were offered that material as a possible digital material used during instructional time.

* Denotes materials that are available for free to students and teachers.

Digital materials typically appeared to play a supplementary role in teachers' instruction compared with comprehensive curriculum materials. Teachers used comprehensive curriculum materials (versus digital materials) for the bulk of their instructional time. Fewer than 20 percent of teachers reported using any one of their digital materials for more than half of their instructional time. Comparatively, nearly two-thirds of teachers indicated that they used a single comprehensive curriculum material for at least half of their instructional time.

Teachers also were asked to indicate whether they would classify any digital materials they used regularly as the two to three "main materials" they "use the most." Of all the materials that teachers named as their main materials, only 30 percent were digital materials. This suggests that most teachers use digital materials as supplementary material, although teachers with higher proportions of free and reduced-price lunch (FRPL)–eligible students were more likely to indicate using digital materials as a main material.

The top digital materials that ELA, math, and science teachers used as main materials are summarized in Figure 3. As we might expect, content-specific or standards-aligned digital materials, such as those from iReady, NewsELA, and Khan Academy, tended to feature more prominently than materials from such general digital sources as YouTube, especially among ELA and math teachers. (For example, iReady is an online program that assesses students and provides them with differentiated reading and math instruction; it can be used for remediation purposes.) Among the general digital resources that teachers cited as a main material, YouTube was among the most common, although only 4 percent or fewer teachers in any subject selected it.

Teachers Using Standards-Aligned Curricula, with More Low-Income Students, or Who Attended District or Charter Management Organization–Run Teacher Preparation Programs Were More Likely to Use Digital Materials

We wanted to explore how teachers' use of digital materials interacted with their use of comprehensive curriculum materials. We hypothesized that teachers might seek digital materials to address gaps in their existing comprehensive curriculum materials, especially if existing comprehensive curriculum materials do not adequately address their state standards. To explore that hypothesis further, we examined digital material use for teachers who did and did not report "regularly using" at least one standards-aligned comprehensive curriculum material among the materials. Teachers who used at least one standards-aligned[9] comprehensive curriculum material were significantly more likely to use digital materials (92 percent) than teachers who did not use any standards-aligned comprehensive curriculum materials (87 percent). Although the difference is significant, it is small, and our survey questions did not ask *why* teachers use digital materials or how digital materials might supplement their comprehensive materials, which would provide more information to understand this relationship.

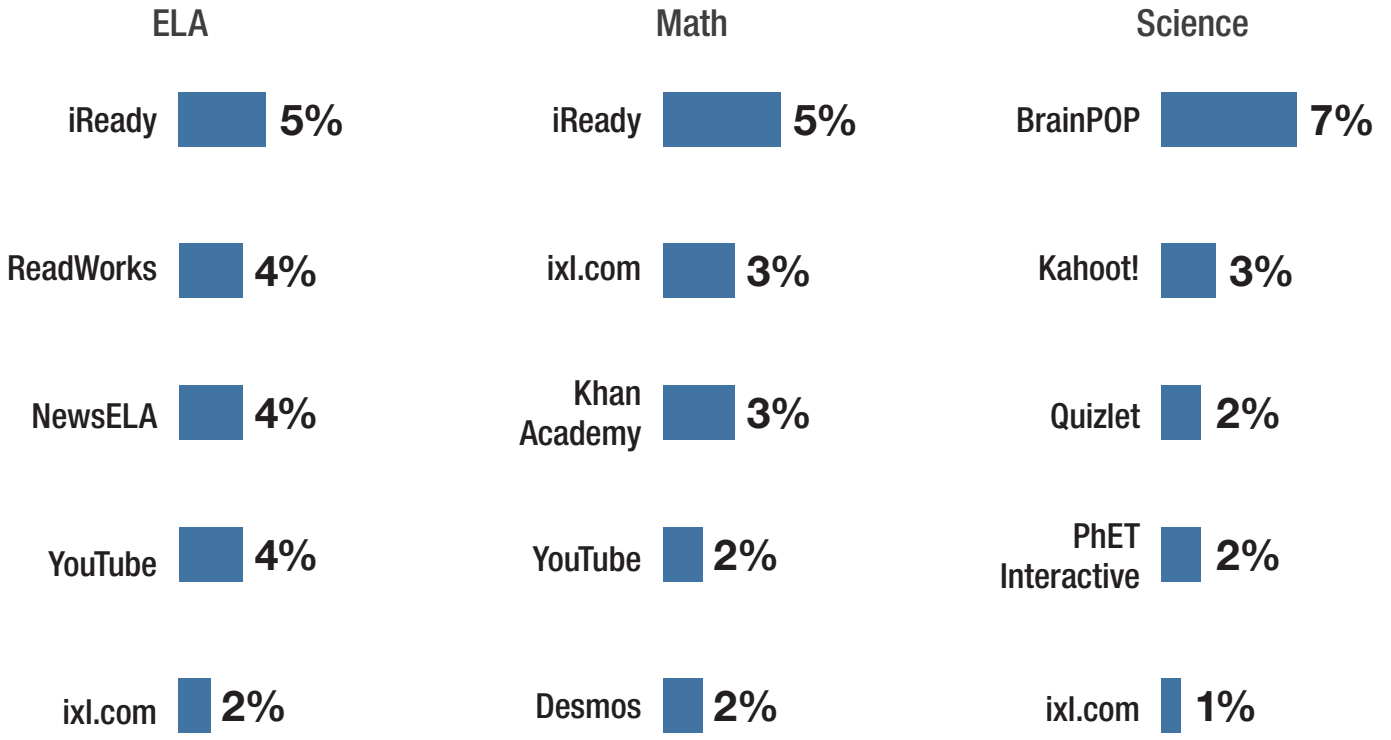
We wanted to explore whether teachers in particular contexts are more likely to use digital materials. Examining data by context might shed light on why some teachers turn to digital materials, as well as on the needs that digital materials fill. As in prior RAND research, we found that teachers in the highest-poverty schools (i.e., teachers in the highest quartile in terms of school-level percentage of students eligible for FRPL) were significantly more likely to report that they or their students used digital materials during instructional time than teachers at schools in the lowest quartile of FRPL enrollment

[9] To define standards alignment, we used EdReports ratings of whether curricula met expectations as fully aligned with standards.

FIGURE 3

iReady Most Popular Main Digital Material for ELA and Math; BrainPOP Was Most Popular for Science

Top Five Digital Materials Used as Main Materials by ELA, Math, and Science Teachers



NOTE: This figure shows the top five digital materials used by respondents as a "main material used for the majority of my classroom lessons," separated by subject. To show the overall prevalence of each material, the listed percentages are the percentages of respondents who indicated using that material as a main material among *all* respondents in that subject.

(Figure 4).[10] In previous research, authors hypothesized that teachers in low-income schools might turn to digital materials because they have fewer in-school or district curriculum resources.[11] However, we found that ELA teachers serving a higher percentage of low-income students were *more likely* to use at least one standards-aligned curriculum material and less likely to use only unrated curricula.[12]

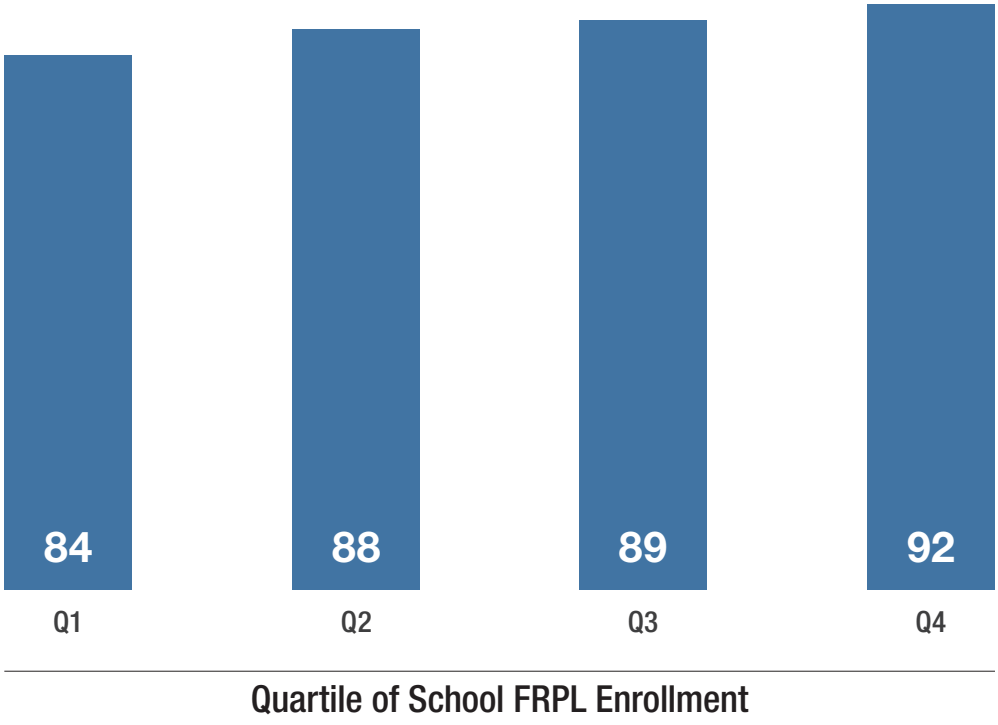
To better understand ease of access to digital materials, we asked teachers to select from among a list of potential barriers to digital materials use.[13] We found that the expenses of using digital materials, both for schools and students at home, were among the most commonly cited barriers (see Figure 5). Teachers serving more low-income students were even more likely to say that the expense of digital materials and the lack of student access to devices or reliable internet at home were major barriers to use of

[10] Opfer et al., 2016.
[11] Opfer et al., 2016.
[12] We did not find patterns related to FRPL and the use of standards-aligned curricula for math teachers.
[13] We compiled the list based on the assumed biggest barriers and included an "other" option for any barriers not listed.

FIGURE 4

Teachers with More Low-Income Students More Likely to Use Digital Materials

Percentage of Teachers Reporting That They or Their Students Use Digital Materials During Instructional Time, by School FRPL Quartile



NOTE: This figure shows the percentage of teachers indicating that either they or their students use at least one digital material during instructional time. The following pairwise comparisons were significant at the $p < 0.05$ level: quartile 1 versus quartile 3, quartile 1 versus quartile 4, and quartile 2 versus quartile 4.

digital materials.[14] On the other end of the spectrum, teachers serving more high-income students were less likely to report any barriers to using digital materials (83 percent) compared with teachers serving more low-income students (91 percent, 93 percent, and 92 percent, in the second, third, and fourth FRPL quartiles, respectively).

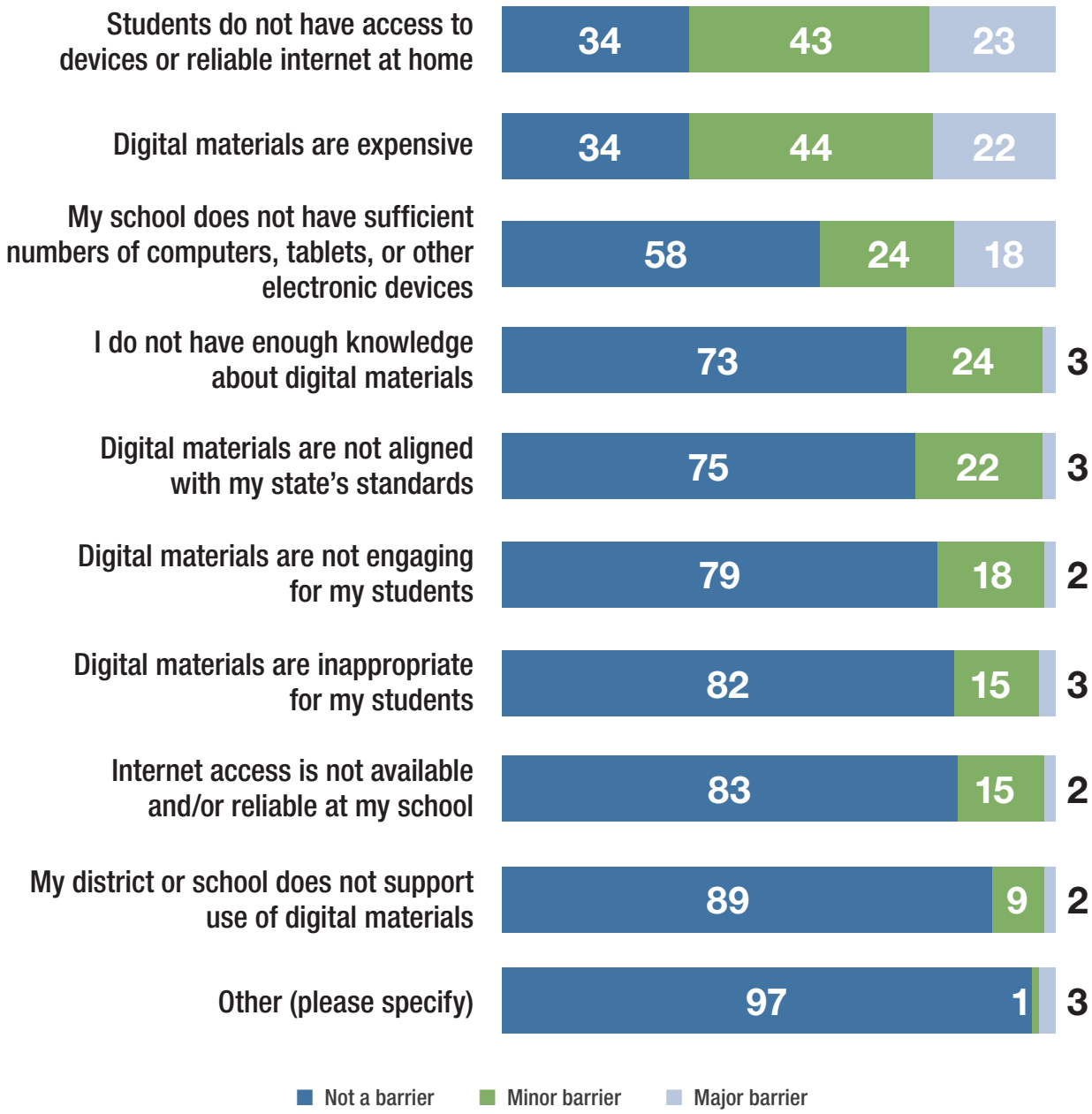
Finally, we considered whether there were any associations between certain teacher characteristics, such as years of teaching experience or type of teacher preparation program attended, and use of digital materials. The only characteristic associated with differing rates of digital material use was the type of teacher preparation program. Teachers who attended a teacher preparation program run by a district or charter management organization (CMO) were more likely to use digital materials (98 percent) compared with those who attended a university-run program (89 percent) or a program run by another entity (86 percent). Teachers who attend a district- or CMO-run preparation program might be more likely to use digital materials because they were trained in the specific digital materials supported or recommended by that district or CMO; a university-based program might not similarly promote the use of specific digital instructional materials.

[14] We did not find associations between barriers to digital material use and any other subgroup of teachers we examined.

FIGURE 5

Expense, Lack of Home Access Barriers to Digital Material Use

Percentage of Teachers Reporting Each Barrier as Not a Barrier, a Minor Barrier, or a Major Barrier



NOTE: This figure shows the percentage of teachers indicating whether each barrier on a list of potential barriers served as "not a barrier," "a minor barrier," or a "major barrier." Common responses to the category "other" included (1) teachers believing digital materials were distracting to students, (2) teachers not having knowledge or training to use digital materials, and (3) teachers not having time to incorporate digital materials into instruction. Percentage might not sum to 100 due to rounding.

Discussion

The vast majority of teachers currently use digital materials for instruction and planning, but our findings suggest that digital materials still tend to play a more supplementary role for most teachers. When teachers did report using digital materials as their main materials, those materials tended to be more content-specific. Additional research could explore more-nuanced definitions and scenarios of digital material use to deepen understanding of how teachers are using main comprehensive materials and digital materials and how and why teachers supplement their main materials.

In contrast to previous hypotheses, teachers using at least one standards-aligned comprehensive curriculum material, as well as teachers serving greater shares of underserved students, are more likely to use digital materials. Teachers serving a higher percentage of low-income students might use digital materials to support students who need additional scaffolding to master standards-aligned materials or even for enrichment; prior research suggests that teachers seek supplementary materials when their main materials are perceived as "too hard" or "too easy."[15] For teachers staffed in high-poverty schools, digital materials might offer an appealing but less-than-ideal option for providing students with instructional supports. Our survey did not ask why teachers use digital materials or why they might supplement their comprehensive materials with digital materials, and additional research is needed to explore these hypotheses.

Two-thirds of teachers reported that they face barriers related to the expenses connected with using digital materials, such as the expense of buying computers or other electronic devices for school and the expense of students' home access to devices and the internet; these barriers are even more common for teachers serving higher numbers of low-income students. Teachers of low-income students might be able to use free digital materials in a school-based setting but cannot use these materials to their full potential with at-home assignments, given students' lack of access to devices and internet at home. Districts and policymakers should assess the technology assets in schools and how they are used to better understand how existing resources are provisioned and where additional resources could remove barriers to use of digital materials.

Our insights have several possible implications for policy and practice around curriculum use. Districts and states have a role to play in setting recommendations and guidelines for the use of digital materials, including the role these materials should play in the classroom alongside comprehensive curriculum materials. Future research needs to address gaps in the knowledge base, such as digital material quality, alignment with state standards, effectiveness, and appropriateness for different subgroups of students. The sheer volume of digital materials makes this unrealistic to achieve at scale, although evaluation of the most commonly downloaded digital materials is already in place.[16] Creating a more curated set of digital resources that meet certain quality-related criteria could prove a useful resource for teachers.

[15] Blazar et al., 2019.

[16] Polikoff and Dean, 2019.

How This Analysis Was Conducted

This Data Note uses responses to the 2019 AIRS, which a sample of 5,969 respondents completed (for a 59 percent response rate). The results report sample-wide and subgroup-specific means and proportions of variables of interest. All teacher characteristic information was obtained using their 2019 AIRS responses. We use data from the 2016–2017 National Center for Education Statistics Common Core of Data to identify (1) schools' percentage of black and Latino students, (2) schools' percentage of students eligible for FRPL, (3) school urbanicity, and (4) school total enrollment. EdReports curricula ratings were used to determine whether teachers were "regularly using" at least one comprehensive curriculum material as "meeting expectations" in their grade and subject. Details about the survey sampling, administration, and weighting are available at in the Learn Together Surveys Technical Documentation at www.rand.org/t/RR4332. We conducted a series of supplemental regression analyses to assess whether grade-level and subject differences persisted when including statistical controls for select teacher characteristics, school characteristics, and state fixed effects. Results across these specifications were substantively similar to trends present within descriptive subgroup comparisons, and thus, we present only the simple weighted means and proportions in this Data Note. Comparisons in Figure 4 were adjusted for multiple comparisons using Benjamini-Hochberg procedures.

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About the AEP Data Note Series

The AEP Data Note series is intended to provide brief analyses of teacher and school leader survey results of immediate interest to policymakers, practitioners, and researchers. If you would like to know more about the dataset, please see the Learning Together Surveys Technical Documentation (RR-4332-BMGF, www.rand.org/t/RR4332) for more information on survey recruitment, administration, and sample weighting. If you are interested in using AEP data for your own analysis or in reading other AEP-related publications, please email aep@rand.org or visit www.rand.org/aep.

About This Report

The American Educator Panels (AEP) are nationally representative samples of teachers and school leaders across the country.

We are extremely grateful to the U.S. public school teachers and leaders who have agreed to participate in the panels. Their time and willingness to share their experiences are invaluable for this effort and for helping us understand more about how to better support their hard work in schools. We also thank our reviewers, Morgan Polikoff, Anamarie Whitaker, and Susan Strauss, for helpful feedback that improved this report.

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