Textbooks And Instructional Materials

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Foreword

There are few public policy issues that resonate with Kentucky constituents more than education. The Office of Education Accountability (OEA) fulfills an important legislative oversight role for this important public policy issue. Born from the 1990 Kentucky Education Reform Act, OEA fulfills two major education needs: investigating allegations of wrongdoing in public education, and researching topics related to elementary and secondary public education. This report is an important component of the OEA 2017 research study agenda, as set by the Education Assessment and Accountability Review Subcommittee.

This report examines textbooks and other instructional materials in Kentucky. Chapter 1 provides an overview of the current landscape for *instructional* materials in the commonwealth and sets out the conclusions reached by the study team. Chapter 2 looks at the governance structure pertaining to instructional materials at the state and district levels. Chapter 3 provides a longitudinal financial analysis centered on the purchases of traditional print materials relative to technology hardware and related digital instructional materials. Chapter 4 provides an overview of educational technology in the commonwealth, including district efforts to provide at least one device per student.

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Summary

Instructional materials encompass the tools that teachers use to implement prescribed curriculum and to facilitate student learning. Current literature has indicated that instructional materials can have profound direct effects on student learning, yet because of the vast array of instructional materials available in print and digital formats, it can be an arduous task for stakeholders at all levels to make sure that teachers' instructional materials have been properly vetted, and that teachers also receive adequate training and professional development to ensure proper implementation of those materials.

Current literature states that high-quality instructional materials used by well-trained teachers promote student academic success. Coming to this determination, however, has been difficult for researchers because of the vast array of materials used by teachers in modern classrooms. Whereas 20 years ago more than 70 percent of teachers indicated that published textbooks were their primary source of instructional materials used on a weekly basis, teachers now report using various materials in the classroom including materials selected by the school or district, formal or published curricula, informal or online lessons, self-developed materials, and materials that may or may not be aligned with state academic standards.

This report provides an overview of the laws governing the adoption and purchasing processes for instructional materials for public schools in the commonwealth, a breakdown of purchases of instructional materials across the state over a 10-year period, and an examination of the shift from primarily print sources to technology-related sources.

Primary data sources for this report include state grant allocation data; district-level Annual Financial Report data used to track instructional resource expenditures; education technology data taken from the Kentucky Department of Education Technology Readiness Survey; and a survey developed by the Office of Education Accountability (OEA), designed to gain insight on the adoption and purchasing processes of instructional materials at the district level.

Instructional Resource Adoption Process

704 KAR 3:455 is the primary administrative regulation that addresses guidelines for adopting and purchasing instructional resources. KRS 156.433 and 156.439 require the Kentucky Board of Education to promulgate administrative regulations
- to identify which instructional resources may be purchased with state instructional resource funds,
- to establish procedures for calculating and distributing the instructional resource allocation for districts, and
- to establish other policies and procedures required to implement the requirements pertaining to instructional resources outlined in statute.

KRS 156.405 establishes, and related statutes refer to, the State Textbook Commission, which was created to aid districts and schools with selecting and purchasing instructional materials, through the development of a list of vetted textbooks and instructional materials.

KRS 156.405(9) states that the State Textbook Commission meetings are to occur at least once per quarter and that advance notice should be given for these meetings, which are open to the public pursuant to KRS 424.110 to 424.210.

The State Textbook Commission has not met since June 2015 and has not maintained minutes or a listing of members since then. The commission has not been involved in the review process for instructional materials in recent years. Instead the review, selection, and purchasing processes are managed at the district level by district textbook coordinators and other district support staff.

Notable Conclusions From The OEA Instructional Materials Survey

The OEA Print And Digital Instructional Materials Survey was sent to all 173 public school districts; 160 districts' superintendents (92.5 percent) responded. In all, there were 174 total respondents within the 160 districts, with 13 districts using multiple respondents to complete the survey.

Linking Of Print And Digital Instructional Materials Purchases. Linking the purchases of print and digital materials was common, with nearly 70 percent of districts responding that they occasionally or often linked the purchasing of print and digital basal materials within purchasing contracts.[a]

Advantages And Disadvantages Of Using Digital Instructional Materials. Over the past 2 decades the prevalence of digital instructional materials has increased considerably in public school classrooms. This growth is thought to be directly correlated with the overall rise of technology in modern society. On its surface the rise of technology use in classrooms is assumed to be positive, but because of rapid implementation there have been some negative consequences. Survey respondents identified advantages and disadvantages of the use of digital instructional materials by students, teachers, schools, and districts.

Notable advantages were increased access to technology for students; increased personalized learning opportunities for students; frequent updates to digital materials, ensuring that content used by teachers is up-to-date; and increased levels of content organization through the use of learning management systems.

Notable disadvantages listed by survey respondents were potential for increased levels of student distraction; lack of reliable and up-to-date hardware from classroom to classroom; and the costs associated with acquiring the adequate amount of technology hardware, which can be a considerable barrier for districts.

Instructional Materials Expenditures

Expenditures at the district level for instructional materials in Kentucky's public schools originate from local, state, and federal sources. This report provides a breakdown of expenditures for instructional materials from the general fund and special revenue funding.

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[a] Basal materials serve as the primary means of instruction in a content area for a grade level or course.

The general fund appropriates funds for elementary and secondary education to the Kentucky Department of Education. The funds are then distributed to local districts through the Support Education Excellence in Kentucky funding program that the General Assembly developed in 1990 as part of the Kentucky Education Reform Act.

Direct funding appropriated by the General Assembly for instructional resources for grades K-8 is included within special revenue funding as a state appropriated grant.[b] Students in grades 9-12 do not receive these specific instructional resource funds. Instructional resource funds for grades K-8 were not appropriated for school years 2012 to 2014. During this time, districts had to rely on other funding sources (such as the general fund, grants, and fees) for instructional materials purchases.

Special revenue funds also include funds from local, state, and federal grants that are to be used for specific purposes. Special revenue funds in many cases not only require recipients to spend the money on specific purposes, but may also require recipients to meet other stated goals determined by the supplier of the funds. For instance, increased levels of professional development may be required of districts receiving specific grant funding.

A financial analysis on instructional materials purchases made from 2008 to 2017 was conducted on data from the Annual Financial Reports of local districts. Total purchases for the selected object codes summed to more than $1.5 billion over the 10-year period.[c] Expenditures for technology hardware summed to more than $634 million, which accounted for approximately 40 percent of instructional materials purchases from funds 1 and 2 over the course of the observation period. Altogether, more than 64 percent of instructional materials expenditures were used to purchase technology-related materials and hardware during this period.

Total expenditures for the selected instructional materials object codes were computed at the student level using total student membership as the denominator.[d] On average, districts spent approximately $242 per student on instructional materials each year during the observation period. On average, districts spent $88 per student on print materials annually. Districts spent $155 per student per year on technology hardware and related instructional materials.[e] Overall, districts have invested approximately $2 in technology hardware and related materials for every $1 spent on traditional print materials. Only three districts spent more on print materials than on technology hardware and related materials over the 10 year observation period.

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[b] Instructional resource funding is included within the Flex Focus funding program allocated by the General Assembly. Other expenditure categories in Flex Focus include extended school services, preschool, professional development, and safe schools. Districts have autonomy to shift funds from one Flex Focus category into another with the exception of the preschool category. Other funding categories can be added to the preschool category, but no funds can be shifted out of it.

[c] Dollar figures have been adjusted for inflation using the Consumer Price Index. Dollar figures are reported as constant 2017 dollars.

[d] District membership totals were acquired using previous data reported in the annual Kentucky District Data Profiles. OEA updates this report annually.

[e] Print materials account for object codes 640, 641, 642, 643, 644, 645, 646, and 647. Technology-related materials account for object codes 650, 734, and 735.

Education Technology In Kentucky School Districts

This study provides an overview of education technology resources in Kentucky school districts, primarily using technology information from the Kentucky Technology Readiness Survey, conducted by the Kentucky Department of Education. The survey provides annual information about the technology infrastructure in districts and schools in Kentucky, including instructional devices and ease of access; instructional device operating systems; technology leadership, service, support, and training resources; and network connectivity.

Overall, districts have increased the number of instructional devices used by students and lowered device-to-student ratios, providing more access to technology for students and teachers. Nearly 70 percent of districts responding to the OEA Print And Digital Instructional Materials Survey indicated that securing a 1:1 device-per-student ratio is, or was, a high priority in their district. In 2017, there were 1.3 students per device in Kentucky. This ratio has become closer to 1:1 since 2014, when there were 2.0 students per device. Sixty districts provided one device for every student in 2017, accounting for 34.7 percent of districts and 23.9 percent of students.

Major Findings Of The Report

Finding 2.1
KRS 156.405 establishes the State Textbook Commission to provide a recommended list of current and high-quality instructional materials to local school districts. KRS 156.405(9) states that the commission is to convene at least once per quarter in meetings that are open to the public pursuant to KRS 424.110 to 424.210. The commission has not met since June 2015 and has not maintained minutes or a list of members since then.

Finding 4.1
The 2018-2024 KETS Master Plan includes conflicting measures of student attendance. The plan's Appendix E states that technology needs standards involve three criteria, including component ratios (quantities) based on average daily attendance. The plan's Appendix H details the 2018-2014 Budget Summary using per-student average daily membership as the unit variable.

Finding 4.2
The KETS Master Plan and the Kentucky Technology Readiness Survey are available online, allowing citizens and policy makers to access information and to understand the technology strategy for Kentucky education, the status of Kentucky's technology education across districts, and the progress that has been made.

Finding 4.3
Between 2014 and 2017, Kentucky school districts increased technology devices, reduced device-to-student ratios, and updated operating systems. As discussed in the literature review, the data shows only that districts acquired the technology tools to carry out educational goals; however, the actual effects on student learning and outcomes are unknown.

Chapter 1

Introduction And Overview

Instructional materials encompass the tools used by teachers to implement prescribed curriculum and to facilitate student learning.

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This report provides an overview of laws governing adoption and purchasing of instructional materials, a longitudinal financial analysis of instructional materials purchases over 10 years, and an examination of the shift from print to digital materials.

This report provides an overview of the laws governing the adoption and purchasing processes for instructional materials for public schools in the commonwealth, a breakdown of purchases of instructional materials across the state over a 10-year period, and an examination of the shift from primarily print sources to technology-related sources.

Description Of Study

In November 2017, the Education Assessment and Accountability Review Subcommittee (EAARS) requested a study on textbooks and other instructional materials. EAARS requested that the study cover the types of materials used and the increasing role of technology in the classroom.

In November 2017, the Education Assessment and Accountability Review Subcommittee (EAARS) requested that the Office of Education Accountability (OEA) conduct a study on textbooks and other instructional materials used in Kentucky public schools. EAARS specifically requested that the report examine the various types of instructional materials used in classrooms across the state, as well as addressing the increasing role of technology in Kentucky schools. Specifically the subcommittee requested that OEA report on school districts' initiatives to obtain 1:1 device-per-student ratios, and on potential issues concerning data privacy of students when using digital instructional materials.

Background

Current literature states that high-quality instructional materials used by well-trained teachers promote student success. However, because of the vast array of materials used, reaching this determination through research is arduous.

There appears to be consensus in current literature stating that high-quality instructional materials used by well-trained teachers promote student academic success.[1] Coming to this determination, however, has been difficult for researchers because of the vast array of materials used by teachers in modern classrooms. Whereas 20 years ago more than 70 percent of teachers indicated that

published textbooks were their primary source of instructional materials used on a weekly basis, teachers now report using various materials in the classroom including materials selected by the school or district, formal or published curricula, informal or online lessons, self-developed materials, and materials that may or may not be aligned with state academic standards.[2]

Current research states that it is difficult to differentiate between strong and weak curriculum without accounting for how the curriculum is actually used. Researchers turn to qualitative methods in an attempt to better measure fidelity of implementation of instructional materials.

In conducting research on instructional materials, one difficulty centers on the fidelity of implementation of this vast array of materials used today. Research states that it is a difficult task to differentiate between strong and weak curriculum without accounting for how the curriculum is actually used.[3] Researchers turn to qualitative methods such as conducting focus groups, observing classrooms, and interviewing teachers in an attempt to better measure fidelity of implementation; however, there exists no research standard for high, medium, or low levels of fidelity.[4]

The absence of data from districts/schools on the instructional materials that are used is a major barrier to conducting research on instructional materials.

Researchers also point out that challenges exist in collecting and analyzing data on instructional materials to determine whether the materials are actually effective.[5] The absence of from districts or schools on the instructional materials that are used is a major barrier to conducting research on instructional materials.

State and local education agencies prefer that teachers have access to effective instructional materials, but the decentralized nature of educational governance can be a barrier to reforming the selection and adoption processes at the district and school levels.

While state and local education agencies would prefer that teachers have access to the most effective instructional materials, the decentralized nature of educational governance can present challenges in reforming the selection and adoption processes carried out at the district and school levels.[6] The literature points to barriers such as the political implications of collecting data on instructional materials used in schools and districts, which may be viewed by district administrators and teachers as the beginnings of a more centralized approach to instructional materials selection.[7] Another difficulty faced by state education agencies in collecting data on instructional materials used in schools and districts is the sheer volume of open educational resources and materials developed by individual teachers.[8]

Changes in curricula and instructional materials can be an effective policy lever for better academic outcomes for students.

Changes in curricula and instructional materials can be an effective policy lever for better academic outcomes for students. The difference in costs in strong versus weak curriculum materials is minimal.[9] One study found that "the average cost-effectiveness ratio of switching curriculum was almost 40 times that of class-size reduction." The use of open educational resources is also mentioned as a potential cost-saving mechanism for districts and schools across the country.[10]

Data Used For The Report

Primary data sources for this report include district-level Annual Financial Report (AFR) data used to track instructional resource expenditures; state grant allocation data; education technology data taken from the Kentucky Department of Education Technology Readiness Survey; and an OEA-developed survey designed to gain insight on the adoption and purchasing processes of instructional materials at the district level.

The OEA Print and Digital Instructional Materials Survey was sent to all 173 public school districts; of those, 160 districts (92.5 percent) responded. In all, there were 174 total respondents within the 160 districts, with 13 districts using multiple respondents to complete the survey. Table 1.1 details which parties completed the survey.[a]

Table 1.1
Survey Respondent Breakdown By Job Title

Respondent	Count	% Of Respondents
CAO/curriculum coordinator	55	31.6%
Superintendent	44	25.3
Associate/assistant superintendent	25	14.4
CIO/director of technology	17	9.8
Finance director	5	2.9
Principal	4	2.3
Other	24	13.8
Total	174	100.0

Note: Other = director of federal programs, directors—other, instructional coach, library specialist, digital learning coordinator, and director of special education. Percentages do not sum to exactly 100 percent due to rounding error. In total, 160 districts out of 173 responded to the survey, and 13 of those districts used multiple respondents to complete the survey.
Source: OEA Print And Digital Instructional Materials Survey.

Table 1.2 displays the number of survey items related to the eight themes that the OEA Print And Digital Instructional Materials Survey measured. The survey was designed to gain insight from districts pertaining to the selection and purchasing process of print and digital instructional materials, collection and ownership of student data from digital materials use, and other topics as outlined in Table 1.2.

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[a] In most districts the chief academic officer or the superintendent was the respondent. Less than 10 percent of respondents were in district technology leadership roles (chief informational officer or director of technology).

Table 1.2
Instructional Materials Survey Question Themes

Theme	Question Count
Selection and purchasing outcomes	3
Selection and purchasing process	6
Advantages/disadvantages of digital instructional materials	1
Professional development	2
Student data collection and ownership	6
Use of digital materials	5
Barriers associated with 1:1 device-per-student ratio	3
Student access to technology hardware outside of school	1
Total	27

Note: The survey also included two questions that identified the responding district and the name and title of the respondent.
Source: OEA Print And Digital Instructional Materials Survey.

Unless otherwise noted, expenditures have been adjusted for inflation using the Consumer Price Index and are reported in 2017 dollars. This report refers to school years by the year in which the school year ends.

Unless otherwise noted, expenditures in this report have been adjusted for inflation using the Consumer Price Index and are reported in 2017 dollars. This report refers to school years by the year in which the school year ends. For example, the 2016-2017 school year is called the 2017 school year.

Major Conclusions

- The State Textbook Commission established in KRS 156.405 is required by statute to meet quarterly. The commission last met in June 2015. The commission has not maintained minutes or a list of members since then. Many of the functions of the commission are now being performed at the district level.

- During school years 2008 to 2017, more than $1.5 billion ($242 per student per year) was spent from various funding sources on instructional materials of all types. Approximately 64 percent of these funds was spent on technology hardware and technology-related instructional materials.

- Technology hardware, including equipment and necessary infrastructure, accounted for $634 million, or approximately 42.7 percent of total spending on instructional materials during school years 2008 to 2017. Spending on technology hardware has declined in recent years as more and more districts obtain a 1:1 device-per-student ratio.

- Peak spending for instructional materials occurred during 2008 ($188 million), and overall spending has trended downward

since then; however, some categories of instructional materials, such as technology supplies, have increased in recent years.

- Overall, districts have invested approximately $2 in technology hardware and related materials for every $1 spent on traditional print materials. Only three districts spent more on print materials than on technology hardware and related materials over the 10-year observation period.

- According to district responses to the OEA survey, nearly 70 percent of responding districts indicated that purchases of print and technology-related materials are packaged together by vendors.

- The OEA survey responses indicate that approximately four in five districts do not share student data generated by digital instructional material use with any outside entity. The districts that do share student data indicated they require a district data agreement to gain access to student data generated by using these materials.

- Nearly 70 percent of districts responding to the OEA survey indicated that securing a 1:1 device-per-student ratio is, or was, a high priority in their district.

- In 2017, there were 1.3 students per device in Kentucky. This ratio has become closer to 1:1 since 2014, when there were 2.0 students per device. Sixty districts provided one device for every student in 2017, accounting for 34.7 percent of districts and 23.9 percent of students.

- Technology hardware funding from 2014 to 2017 was $359.39 per student and $449.09 per student device, using 2017 student membership. Technology software funding during the same period was $302.62 per student and $378.11 per student device.

- An estimated 83 percent of Kentucky students had home internet access capable of providing a good experience watching a YouTube video, a metric that reflects internet speed and quality.[b][11]

- In 2017, 157 districts offered online courses, an increase of 9.0 percent from 2014. More than half of districts awarded

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[b] The Kentucky Department of Education reports that this number was previously misreported as 80 percent and should be 83 percent.

credit based on both performance and seat time, while one-third of districts based credit on performance only.

- Formal Digital Citizenship instruction prepares students and teachers to use technology appropriately and responsibly through nine elements of digital communication and interaction. Students received Digital Citizenship instruction in 155 districts, and 115 districts taught all nine elements. Teachers received Digital Citizenship instruction in 105 districts.

- Nearly all public schools in Kentucky reported network connection speeds of 100 Mbps or greater, and 7.1 percent are located at a KEN Hub Site. EducationSuperHighway found that 100 percent of Kentucky schools meet the Federal Communications Commission minimum connectivity goal of 100 kbps per student.[12]

- Nearly all public schools in Kentucky have wireless capability to support "bring your own device" (BYOD) or 1:1 implementation.

Organization Of This Report

Chapter 1 continues with notable findings obtained from the OEA Print And Digital Instructional Materials Survey.

Chapter 1 continues with notable findings obtained from the OEA Print And Digital Instructional Materials Survey pertaining to the advantages and disadvantages of using digital instructional materials in the classroom. It concludes with a discussion of the limitations of the report.

Chapter 2 provides a description of the governance pertaining to the vetting, selection, adoption, and purchasing processes for instructional materials for Kentucky public schools.

Chapter 2 provides a description of the statutes and regulations directly pertaining to the vetting, selection, adoption, and purchasing processes for instructional materials for Kentucky public schools. An analysis of district-level policies and procedures directly related to instructional materials is also covered.

Chapter 3 provides a longitudinal financial analysis of instructional materials purchases for school years 2008 to 2017.

Chapter 3 provides a longitudinal financial analysis of instructional materials purchases for school years 2008 to 2017. This chapter provides an analysis of the various instructional materials coded within the district-level AFRs. The analysis uses specific object codes from the Uniform Chart of Accounts to determine trends in technology-related purchases as well as purchases for print materials.

Chapter 4 provides an overview of education technology resources in Kentucky school districts, primarily using technology information from the Kentucky Technology Readiness Survey.

Chapter 4 provides an overview of education technology resources in Kentucky school districts, primarily using technology information from the Kentucky Technology Readiness Survey. The survey provides annual information about the technology infrastructure in districts and schools in Kentucky, including instructional devices and ease of access; instructional device operating systems; technology leadership, service, support, and training resources; and network connectivity.

Notable Findings From The Instructional Materials Survey

Districts were asked survey questions pertaining to apparent advantages and disadvantages due to the increased use of digital instructional materials in Kentucky public schools. The responses could be categorized in three distinct levels of impact: student level, teacher level, and district level.

The survey asked districts about apparent advantages and disadvantages due to the increased use of digital instructional materials in Kentucky public schools. The responses could be categorized in three distinct levels of impact: student level, teacher level, and district level. These findings, along with a discussion of professional development connected to new instructional materials purchases, will be addressed in the following paragraphs. Other findings from the survey will be addressed in Chapters 2, 3, and 4.

Advantages/Disadvantages Of Using Digital Instructional Materials

Over the past 2 decades the prevalence of digital instructional materials has increased considerably in public school classrooms. On its surface the rise of technology use in classrooms is assumed to be positive, but because of rapid implementation there have been some negative consequences.

Over the past 2 decades the prevalence of digital instructional materials has increased considerably in public school classrooms. On its surface the rise of technology use in classrooms is assumed to be positive, but because of rapid implementation there have been some negative consequences. To measure how the increased use of digital materials has affected Kentucky public school classrooms, the survey asked districts to list advantages and disadvantages associated with using digital instructional materials. An analysis of the responses indicates that the impact of both the advantages and disadvantages is most significant for students, followed by teachers, and districts and schools.

Respondents indicated that student-level advantages from using digital instructional materials center on increased levels of technology access, increased levels of student engagement, more personalized learning opportunities, and development of skills sought by employers.

Student-Level Advantages. The advantages of using digital instructional materials that districts identified at the student level were centered on the increased level of access to technology, which respondents indicated may lead to increased levels of student engagement, more personalized learning opportunities for students, and the development and enhancement of skills sought by employers. The potential benefits for students in terms of personalized learning apply to all student skill levels; for instance, students at the secondary level who fall behind their peers have options such as credit recovery software programs designed to

place these students on the path to timely graduation. One district official noted:

> We [are] able to offer our students a wider range of class options through digital instructional materials. We are able to offer more defined [Response to Intervention] programs to assist our students with interventions. Digital instructional materials also allow for learning to occur outside of our classroom walls.

Student-Level Disadvantages. The survey identified several issues pertaining to apparent disadvantages connected to the use of digital instructional materials and general technology use in the classroom. Respondents indicated that technology use can lead to increased potential for student distraction brought on by general misuse of devices or software. Others stated that in some cases technology may lead to an overabundance of "screen time" that may generate negative unintended consequences for students. Device breakage was also listed as a prominent student-generated negative outcome.

Many respondents acknowledged that not all students in their districts have adequate access to technology at home, because of a lack of school-supplied devices and/or because of a lack of reliable internet connection. In speaking of the disadvantages encountered when using instructional materials, one instructional supervisor noted:

> [Students lack] home internet access; [there is too much of a] reliance on the program rather than teacher instruction; [and] using too many digital programs can cause a dilution in effectiveness.

Teacher-Level Advantages. Survey respondents emphasized that for the most part vendors update digital content frequently. Frequent updates allow teachers to have more confidence that the material they are teaching is relevant and up-to-date. Frequent updates to digital content have also led to increased levels of professional development for teachers to better ensure fidelity of content delivery and optimal use of technology hardware and software.

Respondents also expressed positive opinions about the student data collection and reporting features offered with certain digital curriculum materials. The data collection at the student level fosters data-based decision making by teachers and in many cases

may lead to a wider range of content delivery options in the classroom (flipped classrooms, for instance).[c]

Enhanced communication with parents, and with students outside of regular school hours, was also identified as a positive outcome brought on by increased use of digital instructional materials. However, some communities struggle to provide adequate access to high-quality internet service for all citizens, which may temper the gains in communication. In speaking of the advantages of instructional materials, one district official noted:

> The use of digital instructional materials in our classrooms has increased considerably and the advantages have been seen in whole group instruction as well as small group differentiated instruction to address achievement gaps. Teachers are able to use many different sources online in different parts of their lessons. Teachers use real-life examples to show students the relevance of studying a topic, instructional videos are used to "take students" to different parts of our country and world in order to experience different cultures, landforms, or historical moments. Teachers design differentiated lessons so students working in small groups can access their instructional level/independent levels to refine skills they have learned in large group instruction. Much of the digital instructional materials being used are free online sources or [are available for] a small yearly fee. The online subscription-based sites have provided progress monitoring tools with questions that adapt to students' individual proficiency levels. This data is then used for individual students as well as for the school/district for program decisions.

Teacher-Level Disadvantages. Respondents indicated that classrooms that lack reliable and up-to-date hardware can present challenges with content delivery and overall instruction, and that in many cases even if a classroom has an adequate number of devices, technology glitches occur frequently and can disrupt instruction. Other responses focused on teacher "buy-in" and the fact that some teachers are not comfortable using digital instructional materials. Professional development would be a likely remedy for this problem, but some respondents fear that cuts to this type of training may exacerbate this issue. In discussing

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[c] *Flipped classrooms* refers to an instructional model where the core instruction is delivered at home via instructional videos and class time is used for students to solve problems and work on projects.

disadvantages of digital instructional materials, one district official noted:

> Technology glitches can totally disrupt instructional blocks of time and decrease the amount of learning that can take place when this occurs. If there are digital-based assignments, all students do not have access to technology at home.

Survey respondents reported that the use of digital instructional materials can produce cost savings for districts and schools due to lower printing and copying expenses, decreased need for large-scale print textbook purchases, and increased levels of content organization through the use of learning management systems.

District/School-Level Advantages. Survey respondents reported that the use of digital instructional materials can produce cost savings for districts and schools due to lower printing and copying expenses, decreased need for large-scale print textbook purchases, and increased levels of content organization through the use of learning management systems. One district official noted that with the lack of state textbook funds, his district has been able to make up the difference by using digital resources:

> With the loss of textbook funds from the state, we have not been able to buy new resources[;] with technology, we are able to bring our students the latest in instructional information, due to the use of digital materials. Technology has put our district in the forefront of instruction.

Some survey respondents indicated that the use of digital instructional materials provided cost savings in some budgeted areas, but that the cost of acquiring the adequate amount of technology hardware to achieve a 1:1 device-per-student ratio was, and still is, a major barrier to optimal technological utilization in the classroom.

District/School-Level Disadvantages. Some respondents indicated that the use of digital instructional materials provided cost savings in some budgeted areas, but that the cost of acquiring the adequate amount of technology hardware to achieve a 1:1 device-per-student ratio was, and still is for some districts, a major barrier to optimal technological utilization in the classroom. Respondents also listed maintenance costs for existing hardware, issues with local network reliability, students' home broadband access, and recurring license agreements for digital content as other cost-related barriers associated with digital instructional material use. One district official noted that, although broadband access has improved for the school, not all students have the same advantage at home:

> In the past a disadvantage [to digital instructional materials] was access to high speed internet; however, that has improved in the last several years. The other disadvantage has been students having this same access to online materials at home. Many students do not have access to high speed internet services at home.

Professional Development Connected To New Instructional Materials Purchases

The effectiveness of chosen materials relies on the fidelity of implementation. To ensure that new materials are implemented with fidelity, most districts and/or schools use professional development for teachers.

The overall effectiveness of chosen materials relies heavily on the fidelity of implementation in the classroom.[13] To ensure that new instructional materials are being implemented with fidelity, most districts and schools use some form of professional development for teachers. This training can in some cases be directly provided by the vendor supplying the instructional materials, or the district or individual schools may use print sources.

Survey respondents indicated that vendor-provided professional development for digital instructional materials purchases occurs more often than the corresponding training for print materials.

Vendor-provided professional development associated with digital instructional materials purchases occurs "often" for more than 41 percent of survey respondents and "always" for approximately 17 percent of them. Districts use vendor-provided professional development opportunities for print materials less frequently ("often" = 35 percent, and "always" = 13 percent).

Professional development provided by schools or districts also occurs more often for digital content than for print materials.

In terms of district- and school-provided professional development connected to instructional materials, training associated with digital materials was provided "often" for nearly 38 percent of respondents and "always" for more than 15 percent of them. Once again, training associated with print materials seems to be provided less frequently ("often" = 31 percent, and "always" = 13 percent).

Limitations

This report provides an analysis of district-level, not school-level, policies and procedures pertaining to print and digital instructional materials. Some expenditures included in the longitudinal financial analysis in Chapter 3 could not be fully identified as solely for instructional purposes.

704 KAR 3:455 stipulates that the quantities of instructional resources needed for each student are determined at the school level. KRS 160.345(2)(g) establishes that school-based decision-making councils (SBDMs) are responsible for determining which textbooks and other instructional materials shall be used in the schools. The councils provide this information to their local boards of education, and the local boards then determine the allocation of funding for instructional resources to individual schools based on need. [d] Thus policies and procedures outlining the processes for instructional materials review and purchasing are developed at the school-level, but this report does not provide an analysis of these school-level policies and procedures. Instead, district-level policies and procedures are discussed in Chapter 2 to determine whether district level policies and procedures are noticeably different from` the model policies and procedures developed by the Kentucky School Boards Association (KSBA).

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[d] KRS 160.345(2)(g) states that the school council shall consult with the school librarian concerning maintenance of the school library media center and concerning purchases of instructional materials and equipment.

It should also be noted that some of the expenditures cited in Chapter 3 could not be fully identified as intended solely for instructional purposes.

Chapter 2

Instructional Materials

Background

> *Instructional materials* are tools to facilitate student learning. *Instructional resources* are print, nonprint, or electronic media to assist student learning.

KRS 156.395 defines *instructional materials* as tools that are used to facilitate student learning as defined in administrative regulation. 704 KAR 3:455 defines *instructional resources* as any print, nonprint, or electronic medium designed to assist student learning.

> The Kentucky Department of Education (KDE) categorizes these materials primarily into two groups: basal and supplemental materials. KDE defines *basal materials* as materials that serve as the primary means of instruction within a specific content area for a grade level or course. As for supplemental materials, KDE provides a list of categories of approved supplemental materials that may be purchased with instructional resource funds.

The Kentucky Department of Education (KDE) categorizes these materials primarily into two groups: basal and supplemental materials. KDE defines *basal materials* as materials that serve as the primary means of instruction within a specific content area for a grade level or course. As for supplemental materials, KDE provides a list of categories of approved supplemental materials that may be purchased with instructional resource funds.[a][b] Approved supplemental materials include resource tools, supplemental print materials, subscriptions to web-based resources, and wireless reading devices. KDE also establishes categories of supplemental materials that are not approved for purchase with instructional materials funds, such as computers, televisions, and assessment and testing programs.

Governance

> The governance of instructional materials encompasses a complex array of statutes and regulations that pertain to processes including the instructional resource adoption process and the purchasing of instructional materials.

The governance of instructional materials in Kentucky's public schools encompasses a complex array of statutes and regulations that pertain to processes including the instructional resource adoption process and the purchasing of instructional materials. Table 2.1 provides a list of current statutes and regulations that are addressed in this report.

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[a] KDE further defines *approved supplemental materials* as nonconsumable and as materials used to address Kentucky Academic Standards.
[b] Instructional resource funding is included within Flex Focus state grant allocations. Funding for this category has been erratic over the course of the observation period within this report. In fact, during school years 2012 to 2014, instructional resource funding was not included at all.

Table 2.1
Regulations And Statutes Pertaining To Instructional Materials

Statute/Regulation	Summary
KRS 156.400	School subject adoption groups and purchasing cycle guidelines
KRS 156.405	State Textbook Commission
KRS 156.407	Selection of textbook reviewers
KRS 156.410	Evaluation of textbooks and programs
KRS 156.415	Conditions for textbook and program adoption and purchases
KRS 156.433	Kentucky Board of Education shall promulgate administrative regulations identifying instructional materials eligible for purchase with state funds. Kentucky Department of Education shall establish a list of recommended instructional materials for use by school personnel.
KRS 156.435	Adoption of textbook lists and publication; execution of contracts
KRS 156.439	Kentucky Board of Education shall promulgate administrative regulations for calculating and distributing the instructional materials allocation to districts.
KRS 156.440	Superintendents can request sample copies from vendors of instructional materials selected and placed on the list compiled by the State Textbook Commission.
KRS 156.445	Use of recommended titles as basal materials; exceptions
KRS 156.460	School officials and employees prohibited from acting as book agents
KRS 156.465	Forbids awards for adoption of instructional materials
KRS 156.470	Copy of recommended materials to be kept in specified location during adoption period
KRS 156.474	Conditions prescribed by Kentucky Board of Education for multiple textbook adoptions
KRS 157.100	Commonwealth of Kentucky shall provide funds for instructional materials without cost to students attending K-12 public schools.
KRS 157.110	Establishment of rental fees for instructional materials for students in grades 9-12. Students unable to pay fees will not be denied access to materials.
KRS 158.6451	Model curriculum framework
KRS 160.345	Role of school-based decision-making councils in instructional materials adoption and purchases
704 KAR 3:455	Instructional resource adoption process: selection, funding sources used, purchasing guidelines, etc.
702 KAR 3:246	School council allocation formula and Kentucky Education Technology System District Administrative System Chart of Accounts
702 KAR 3:120	Uniform school financial accounting system

Source: Staff compilation of Kentucky Revised Statutes and Kentucky Administrative Regulations.

KRS 158.6451 provides a set of goals for curriculum development for local school districts. The framework was designed to aid districts and schools in curriculum development.

Model Curriculum Framework. KRS 158.6451 provides a set of goals for curriculum development for local school districts. The framework was designed to aid districts and schools in curriculum development. The framework identifies teaching strategies and provides guidance on adopting instructional materials for local school districts and schools with the goal that districts and schools would develop effective curricula designed to foster student achievement.

Instructional Resource Adoption Process. 704 KAR 3:455 is the primary administrative regulation in relation to the adoption and purchasing guidelines for instructional resources. KRS 156.433 and 156.439 require the Kentucky Board of Education

- to promulgate administrative regulations to identify which instructional resources may be purchased with state instructional resource funds,
- to establish procedures for calculating and distributing the instructional resource allocation for districts, and
- to establish other policies and procedures required to implement the requirements pertaining to instructional resources outlined in statute.[c] [d]

> **704 KAR 3:455 is the primary administrative regulation in relation to the adoption and purchasing guidelines for instructional resources. KRS 156.433 and 156.439 require the Kentucky Board of Education to promulgate administrative regulations for allocating instructional resource funding.**

KRS 156.405 establishes, and related statutes refer to, the State Textbook Commission (STC), which was created to aid districts and schools with instructional materials selection and purchasing through the development of a list of vetted textbooks and instructional materials. KRS 156.405(9) states that the State Textbook Commission meetings are to occur at least once per quarter and that advance notice is to be given for these meetings, which are open to the public pursuant to KRS 424.110 to 424.210. The State Textbook Commission has not met since June 2015 and has not maintained minutes or a list of members since then.

> **The State Textbook Commission was created to aid districts and schools with instructional materials selection and purchasing through the development of a list of vetted textbooks and instructional materials. The commission is required to meet quarterly but has not met since June 2015.**

The State Textbook Commission has not been involved in the review process for instructional materials in recent years. Instead the review, selection, and purchasing processes are managed by district textbook coordinators and other district support staff. KRS 156.445(2) allows SBDMs to select basal textbooks and programs not from the recommended list. SBDMs are required to send notification to the commission through their superintendent. The commission has not met since 2015 and has not received notifications that districts are selecting textbooks and other instructional materials that are not on the recommended list as statutorily required.

> **The State Textbook Commission has not been involved in the review process for instructional materials in recent years. Instead the review, selection, and purchasing processes are managed by district textbook coordinators and other district support staff.**

The functions of the State Textbook Commission outlined in statute coincide with the recommendations from current literature that support the creation of centralized listings of high-quality

> **The commission's statutory functions coincide with recommendations from literature that support centralized listings of high-quality materials as a resource for schools when selecting materials.**

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[c] 704 KAR 3:455 is related to the following statutes: KRS 156.027, 156.400 to 156.476, 157.100 to 157.190, and 160.345.

[d] Instructional resource funds allocated by the General Assembly are a funding category included within fund 2 as part of state grant funding. In practice, districts and schools use general fund allocations as well as grant funds (from local, state, and federal sources) and textbook fees to purchase instructional materials. Chapter 3 provides an analysis of instructional materials purchased during school years 2008 to 2017.

materials.[14] Centralized listings of materials can provide valuable information to district-level stakeholders to ensure that the most effective materials make it into the hands of teachers.

Finding 2.1

KRS 156.405 establishes the State Textbook Commission to provide a recommended list of current and high-quality instructional materials to local school districts. KRS 156.405(9) states that the commission is to convene at least once per quarter in meetings that are open to the public pursuant to KRS 424.110 to 424.210. The commission has not met since June 2015 and has not maintained minutes or a list of members since then.

Districts that plan to purchase any basal textbook or program are now required to complete and submit a District Off-List Notification form to KDE. KDE provides materials for review by content area or groups as listed in 704 KAR 3:455 and the related statutes.

Districts that plan to purchase any basal textbook or program are now required to complete and submit a District Off-List Notification form to KDE.[15] KDE provides materials for review by content area or groups as listed in 704 KAR 3:455 and the related statutes. The content adoption groups established in KRS 156.400 and 704 KAR 3:455 were designed to provide guidance for districts in terms of an adoption cycle for instructional resources. Table 2.2 lists the adoption group numbers and content areas as prescribed by the Kentucky Board of Education.[e] The contracts for the six adoption groups were intended to cover a period of 6 years on a staggered schedule to allow for one content group to be up for adoption each year.[f]

Table 2.2
Adoption Group Numbers And Content Areas In 704 KAR 3:455

Content Area	Adoption Group
Language Arts and Reading	1
Social Studies	2
Science	3
Mathematics	4
Vocational Studies, including Career and Technical Education, and Practical Living	5
Arts and Humanities	6

Source: 704 KAR 3:455.

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[e] KRS 156.400 states that the chief state school officer shall arrange the elementary, middle, and high school subjects included in the state courses of study as prescribed by the Kentucky Board of Education in six adoption groups.
[f] KRS 156.400 does provide some flexibility during times when sufficient funding is not available for instructional resources by allowing the chief state school officer to delay instructional resource purchases.

KDE is responsible for preparing annual instructional resource budgets and allocating instructional resource funds to districts for purchases for grades K-8 exclusively.

704 KAR 3:455 states that KDE is responsible for preparing annual instructional resource budgets and allocating instructional resource funds to districts for purchases for grades K-8 exclusively. Thus, instructional resources for students in these grades are provided at no charge to the students or their families.

Grades 9-12 do not receive direct instructional resource funding but rely on general fund dollars and special revenue funding to purchase instructional materials. KRS 157.110 and 704 KAR 3:455 establish the use of fees to be used for instructional materials purchases for grades 9-12.

Grades 9-12 do not receive direct instructional resource funding but instead rely on general fund dollars and other special revenue funding, including grants and fees, to purchase instructional materials. KRS 157.110 and 704 KAR 3:455 establish the use of fees to be used for instructional materials purchases for grades 9-12. 704 KAR 3:455, sec. 22 states that students shall not be denied full participation in any educational program because of the inability to purchase instructional materials. Thus, local districts are required to provide instructional materials for students in grades 9-12 who are eligible for the free and reduced-price lunch program at no cost to the student or family.

Quantities of instructional resources for each student are determined at the school level. School-based decision making councils (SBDMs) determine which materials the schools use. The local board allocates funding for resources to individual schools based on need.

704 KAR 3:455 stipulates that the quantities of instructional resources needed for each student are determined at the school level. KRS 160.345(2)(g) establishes that SBDMs are responsible for determining which textbooks and other instructional materials shall be used in the schools. The SBDMs provide this information to the local board of education, which then determines the allocation of funding for instructional resources to individual schools based on need. [g]

The OEA-administered survey revealed that district personnel, school-based staff, students, parents, and other members of the community played a role in selecting digital and print instructional materials.

Parties Involved In Selection And Vetting Process For Digital And Print Instructional Materials. From preliminary interviews with district personnel, it was ascertained that several parties could potentially be involved in the selection and vetting process for print and digital basal materials. The OEA-administered survey revealed that district personnel (superintendents, principals, district textbook coordinators, etc.), school-based staff, students, and other members of the community (including parents) all played a role in selecting digital and print instructional materials.

Table 2.3 shows how often districts responded that the education community was involved "occasionally" or "often" in selecting and vetting print or digital basal materials.

Table 2.3 shows how often districts responded that a member of the education community was involved "occasionally" or "often" in the selection and vetting of print or digital basal materials. Survey responses indicated that principals and teachers (other than those on an SBDM) are heavily involved in this process, but

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[g] KRS 160.345(2)(g) states that the school council shall consult with the school librarian concerning maintenance of the school library media center and concerning purchases of instructional materials and equipment.

central office personnel (district textbook coordinators and district curriculum leaders) were also determined to be heavily involved.

Table 2.3
District Survey Responses Regarding Involvement By Members Of Education Community In Selection And Vetting Of Print And Digital Materials School Year 2018

Member Of Education Community	Percent Of Districts Indicating Involvement "Occasionally" Or "Often"	
	Print	Digital
Superintendent	51.7%	60.1%
District textbook coordinator	84.5	81.1
District curriculum leader	93.2	87.1
District chief information officer	49.7	58.1
Director of special education	82.4	81.1
Principals	98.6	95.3
SBDM, if applicable	84.4	82.3
Teachers, other than through SBDM	98.6	92.6
Parents, other than through	33.1	36.1
Students	39.2	37.7
Members of the community	19.0	15.6

Note: Not all school districts responded to all survey items. SBDM = school-based decision-making council.
Source: OEA Print And Digital Instructional Materials Survey.

Table 2.4 shows which outside groups districts consulted with before selecting instructional materials. School- and district-level selection committees are the groups contacted most by districts in selecting both digital and print instructional materials

Resources Used In The Selection And Vetting Process For Digital And Print Instructional Materials. Table 2.4 shows which outside groups districts consulted with before selecting instructional materials. School- and district-level selection committees are the groups contacted most by districts in selecting both digital and print instructional materials. Districts indicated that they often look to other public school districts in Kentucky for information during the selection process, as well as to published research materials and district- and school-level selection committees.

Table 2.4
District Survey Responses Regarding Groups That Districts Consulted
In Selection And Vetting Of Print And Digital Materials
School Year 2018

Groups Consulted	Percent Of Districts Indicating Consultation "Often" Or "Always"	
	Print	**Digital**
Other districts in Kentucky	48.0%	52.4%
Other districts outside Kentucky	4.1	11.7
Published research materials	48.0	42.8
EdReports	23.6	21.4
What Works Clearinghouse	27.7	24.8
Vendor input	40.8	39.3
Selection committee (district level)	56.5	55.6
Selection committee (school level)	81.5	71.7
Selection committee (other)	29.3	23.9

Note: Not all school districts responded to all survey items.
Source: OEA Print And Digital Instructional Materials Survey.

Student Data Collection Associated With Using Digital Instructional Materials

Digital instructional materials and platforms present options for student data organization and reporting that can inform data-driven decision making. Student data generated from using these materials may be shared with vendors and researchers.

Digital instructional materials and platforms often present teachers with options for student data organization and reporting that can be used to inform data-driven decision making in the classroom. However, this student data may also be used by software vendors or by others such as education researchers. The survey questions were centered on student data collection and storage, and on the priority level of data integration and data interoperability for districts when selecting technology hardware and programs.

Districts were asked whether they share student data with vendors. More than 80 percent of responding districts stated that vendors maintain no rights to such student data. The data is shared with vendors occasionally for purposes such as progress monitoring reports, ensuring reliability of assessments, or gathering data for a piloted digital learning platform.

Student Data Collection, Storage, And Sharing. Districts were asked whether vendors maintain any rights to student data, whether the district shares data with outside entities such as researchers, and whether the district has sole ownership of student data, generated from digital content. In terms of data sharing relationships with vendors, more than 80 percent of responding districts stated that vendors do not maintain any rights to student data generated from purchased digital materials. However, 1 in 5 responding districts indicated that student data is shared with vendors at least occasionally for purposes such as progress monitoring reports, ensuring the reliability of provided assessments, or gathering data for a piloted digital learning platform.

Approximately 82 percent of responding districts indicated that student data is never shared with other outside entities. For districts that do share data, respondents stated that in most cases a district data agreement is required.

As for sharing student data with outside entities, approximately 82 percent of responding districts indicated that student data is not shared for any reason. For those districts that do share student data in this way, respondents stated that in the majority of cases a district data agreement is required. The most common reasons for sharing student data were associated primarily with research pertaining to state and federal grants.

Data integration **refers to the connection of applications that allows data to be shared between systems by using a third application (middleware).** *Data interoperability* **refers to systems that can directly communicate with each other without middleware. More than half of responding districts indicated that both were high priorities.**

Data Integration/Interoperability Of Digital Instructional Materials. *Data integration* refers to the connection of applications that allows data to be shared between systems by using a third application referred to as middleware. *Data interoperability* refers to systems that can directly communicate with each other without middleware. The majority of districts (nearly 53 percent) stated that data integration is a high priority when selecting digital instructional materials, while more than 13 percent of districts indicated that data integration was not a priority at all. Districts responded similarly with regard to priority status of data interoperability, with more than 56 percent of responding districts listing it as a high priority and 13.5 percent stating that data interoperability was not a priority for the district.

SBDMs are responsible for developing school policies and procedures that are consistent with those developed by the district. The Kentucky School Boards Association (KSBA) creates model policies that can be directly adopted by school districts.

Policies And Procedures. SBDMs are responsible for developing school policies and procedures that are consistent with those developed by the district. The Kentucky School Boards Association creates model policies that can be directly adopted by school districts. These policies provide in-depth detail on the specific policies and procedures that local boards of education use, and they can be adopted as they appear in the model or altered to eliminate or add language that may better suit districts' educational or administrative initiatives.

Table 2.5 displays the KSBA model policies relevant to instructional materials and resources that were analyzed at the district level for this report.

Table 2.5
Kentucky School Boards Association Model Policies And Procedures, 2018

Model Policy	Policy Title	Summary
8.232	Instructional Resources	Details the ways schools and councils allocate funds to be used for instructional resources.
8.233	Library Media Center	Schools with an existing school-based decision-making council will consult with school librarians to determine the purchase of instructional materials, information technology, and equipment.
8.234	Previewing Materials	All materials used in curriculum or daily instruction should be previewed by the teacher prior to student use.
8.1131	Alternative Credit Options	Outlines the process for schools to follow in order to grant academic credit for online or dual-credit courses.
8.2321	Copyrighted Materials	Maintains that the "use of copyrighted material for educational purposes, by school personnel, shall be within the generally accepted uses delineated by applicable law."
8.2322	Review Of Instructional Materials	Defines *instructional materials* as textbooks, supplementary materials, and library books. Such materials are subject to review following citizen concern submitted to the school, in which event the school principal and superintendent shall be notified and the school-based decision-making council will review the challenged material and determine if appropriate.
8.2323	Access To Electronic Media	Outlines the safety procedures and guidelines surrounding electronic media usage and permission and agreement forms for employees and students.
9.15	Student Fees	Provides that all student rental fees and annual charges be approved by the local board and remain in effect unless the board chooses to modify the amount. Students will not be penalized if unable to pay.

Source: Staff compilation of Kentucky School Boards Association model policies.

District-Level Policies Relative To KSBA Model Policies

Most district-level policies from Table 2.5 exhibit no deviation from KSBA model policies. Instances where district policies altered model policies are outlined below.

The majority of district level policies from Table 2.5 did not exhibit deviation from the model policies developed by KSBA. The following paragraphs outline the instances where district policies were altered relative to the corresponding model policies.

Kentucky school districts have increased the number of published board policies that limit the use of leftover instructional resource funding. In previous years, school districts across the state were granted instructional resource funding but could use a remaining balance the following year for the purchase of additional instructional materials. However, this practice has increasingly been eliminated and subsequently removed from the policy language.

A total of 156 districts had a version of policy 8.232 on file; 15 had modified the model policy. Several modifications reversed the provision allowing schools to carry forward to the next fiscal year remaining allocations for instructional funds.

Instructional Resources. OEA identified that 156 districts had a version of policy 8.232 on file, and of those, 15 districts had modified the model policy by including new language or removing existing language within the model policy. Many of these modifications involved a reversal of the provision included in the KSBA model policy that allowed schools to carry forward to the next fiscal year remaining allocations for instructional funds. There were eight districts that eliminated this provision from the financial report section in their district policy.

Some districts removed the provision that reads "Any purchase exceeding the funds allocated shall be paid from other Council funds in SBDM schools"; instead they wrote policies that ensure that districts do not exceed annual allocations for instructional materials.

Other districts opted to remove the provision from KSBA model policy 8.232 that reads "Any purchase exceeding the funds allocated shall be paid from other Council funds in SBDM schools," choosing instead to write policies that ensure that districts do not exceed the annual allocations for instructional materials. In the districts that eliminated this language, the SBDMs, school boards, and administrative personnel have an increased role in developing or approving annual plans and demonstrating oversight into where instructional resources are allocated, while balancing equity and need among schools within the district. Some districts responded by establishing a rule stating that the superintendent will allocate remaining funding equally to each school within the district.

Changes to model policy 8.232 were not common, but some districts did make alterations, and many of those increased the specificity in terms of practice.

Changes to KSBA model policy 8.232 were not common, but some districts did make alterations, and many of those chose to increase the specificity in terms of practice. Policy 8.232 states that purchasing priority would be determined following the result of a survey distributed by the SBDM to teachers, meant to evaluate and identify needs for instructional resources. Following completion of the survey, district personnel should "establish an equitable method of allocating funds to purchase instructional resources," as the model policy reads. School councils remain the primary source of allocation methods within each district, although five districts supplied new language in the policies that grants increased authority to district superintendents where annual financial plans and allocations are concerned.

Districts have altered model policies to reflect increases in district oversight of selection of instructional materials.

In terms of curriculum development, districts have altered KSBA model policies to reflect modest increases in district oversight as it applies to the selection of instructional materials.

Access To Electronic Media. A significant portion of school districts added more stringent requirements to KSBA model policy 8.2323, which concerns access to electronic media. Some districts included new language within the policy that highlights the increasing role that devices—both those owned personally by

employees and those purchased by the district—play in development of curriculum.

Review Of Instructional Materials. KSBA model policy 8.2322 involves the review of instructional materials. The most notable alterations made by districts within this section were expansions of the policy to address the role of the district in reviewing complaints pertaining to instructional materials. Notable changes to the existing language included specifications on the review processes for both SBDM and non-SBDM schools, as well as descriptions of the committee established to review disputed materials. Many districts created provisions for an appeals process, in the event that an agreement could not be achieved following an initial meeting between the complainant and the school principal. Generally, districts that created such a plan specified that action at each level of review—school-based, performed within the created committee, or at the discretion of the superintendent—shall produce documentation of an action plan, or that the outcome of each meeting would be made available to the complainant within 10 days of the meeting or less.

When creating committees to review instructional materials in the event of a challenge or complaint, districts often chose to adopt a policy that pursues investigation of the matter via committee, rather than a meeting with the school board alone. According to language in the policies of several districts with at least one non-SBDM school, such committees comprise the school principal, a teacher within the school, the teacher who initially assigned the material in question (if applicable), the director of media services, and the superintendent. The language of the edited policies made clear that while the complainant would be informed of the ability to appeal, the superintendent retained the final ability to propose action to the board.

Library Media Center. There were few notable changes made to KSBA model policy 8.233—Library Media Center. Generally, if changes were made, they stated that materials selected for use in the library should be on the approved lists distributed by the National Council of Teachers of English or the American Library Association. Other changes included provisions stating that the review of the library collection would become more frequent—an annual occurrence, rather than something that occurred "at least every 2 years," or a process to take place within each 2-year period, rather than simply "periodically." In the event that a school within the district did not have an SBDM, the model language that referred to SBDMs was removed, and either the principal or

designee will serve as the point of contact for the librarian concerning maintenance of the library and the selection of library materials. A small number of districts removed language that removed the involvement of the local board with the district's school libraries in accordance with statutory requirements.

Chapter 3

Funding For Instructional Materials

Background And Funding Sources

Expenditures at the district level for instructional materials in Kentucky's public schools originate from local, state, and federal sources. The funding sources analyzed for this report are listed in Table 3.1 and are categorized into specific funds according to the Kentucky Department of Education Uniform Chart of Accounts (UCA). 702 KAR 3:120 establishes a uniform system of financial accounting and budgets for Kentucky public school districts.[a] The UCA adopted by KDE was modeled after the federal National Center for Education Statistics chart of accounts.[16]

Expenditures at the district level for instructional materials in Kentucky's public schools originate from local, state, and federal sources. The funding sources analyzed for this report are listed in Table 3.1, categorized into funds according to the KDE Uniform Chart of Accounts (UCA).

Table 3.1
Relevant Fund Sources For Instructional Materials
From Kentucky Department Of Education Uniform Chart Of Accounts

Fund	Description
General fund – fund 1	Primary operating fund for school districts. Allocated by the General Assembly in biennial budget for the commonwealth.
Special revenue – fund 2	Accounts for proceeds from specific revenue sources for specific expenditure purposes other than debt service and capital projects.
Special revenue district activity fund (annual) – fund 21	Optional fund for legally restricted district activity funds. Used as single-year fund.
Special revenue district activity fund (multiyear) – fund 22	Optional fund for legally restricted district activity funds. Used as multiyear fund.

Note: There are other funds within the Uniform Chart of Accounts that may have been used for instructional materials funding, but the combined expenditures from these funds was a small fraction of total funding for instructional materials over the observation period.
Source: Staff analysis of data from the Kentucky Department of Education Uniform Chart of Accounts.

Table 3.1 does not list all categories of funds listed in the UCA, but it lists the funds most frequently used for instructional materials expenditures.

Table 3.1 does not list all categories of funds listed within the UCA, but it lists the funds most frequently used for instructional materials expenditures. Of these funds, the bulk of expenditures for instructional materials came from funds 1 and 2.

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[a] KRS 156.070 grants authority to the Kentucky Board of Education for the management and control of common schools. KRS 156.160 grants the board the authority to regulate local school district budgets. KRS 156.200 grants KDE authority to monitor accounting procedures and reports of local boards of education.

The general fund appropriates funds for elementary and secondary education to KDE, and they are then distributed to local districts.

The general fund appropriates funds for elementary and secondary education to KDE, and they are then distributed to local districts through the Support Education Excellence in Kentucky funding program that was developed by the General Assembly in 1990 as part of the Kentucky Education Reform Act.[17]

Direct funding for instructional resources for grades K-8 is included in special revenue funding as a state appropriated grant. Grades 9-12 do not receive this funding. Instructional resource funds for grades K-8 were not appropriated for school years 2012 to 2014.

Direct funding appropriated by the General Assembly for instructional resources for grades K-8 is included within special revenue funding as a state appropriated grant.[b] As stated in Chapter 2 of this report, students in grades 9-12 do not receive these specific instructional resource funds. Instructional resource funds for grades K-8 were not appropriated for school years 2012 to 2014. During this period, districts had to rely on other funding sources, such as the general fund and grants and fees for instructional materials purchases.

Special revenue funds also include funds from local, state, and federal grant sources that are to be used for specific purposes.

Special revenue funds also include funds from local, state, and federal grant sources that are to be used for specific purposes. Special revenue funds in many cases not only require recipients to spend the money on specific purposes but may also require recipients to meet other stated goals as required by the supplier of the funds. For instance, increased levels of professional development may be required of districts receiving specific grant funding.

The UCA uses specific object codes to categorize expenditures used within the specific funds.

The UCA uses specific object codes to categorize expenditures used within the specific funds. Table 3.2 lists the specific object codes used for the financial analysis section of the report. Figure 3.A illustrates the percentage share of expenditures for these selected object codes per funding source over the 10-year period.

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[b] Instructional resource funding is included within the Flex Focus funding program allocated by the General Assembly. Other expenditure categories in Flex Focus include extended school services, preschool, professional development, and safe schools. Districts have autonomy to shift funds from one Flex Focus category into another with the exception of the preschool category; funds cannot be taken out of the preschool category, but other funding categories can be added to it.

Figure 3.A
Percentage Share Of Instructional Materials Expenditures
Per Funding Source, School Years 2008 To 2017
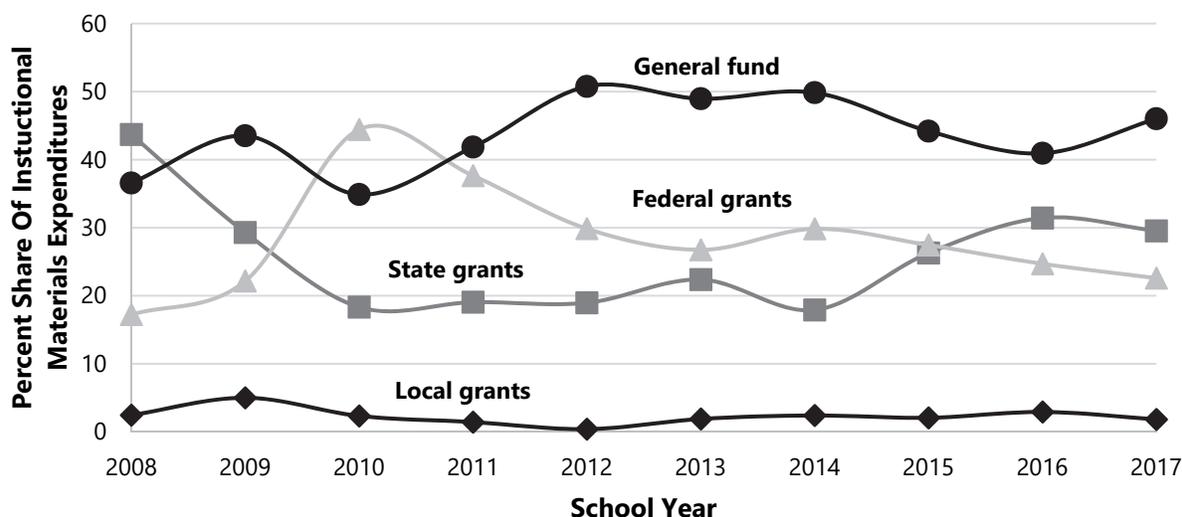
Source: Staff analysis of data from the Kentucky Department of Education Uniform Chart of Accounts.

Table 3.2
Instructional Materials Object Codes
From Kentucky Department Of Education Uniform Chart Of Accounts

Object Code Title (Number)	Description
Books and periodicals (640)	Broad category encompassing most instructional materials. This code was used frequently in the early years of the observation period, but districts have improved in their reporting and now use the proper object codes to track spending.
Library books (641)	The UCA does not provide a description for this category.
Periodicals and newspapers (642)	Expenditures for subscriptions to periodicals and newspapers.
Supplemental materials (643)	Supplemental books, study guides, and curriculum resources.
Textbooks (644)	Textbooks and other instructional materials, including electronic textbooks.
Audiovisual materials (645)	A/V materials that cannot be classified elsewhere.
Tests (646)	Formative and summative assessments, summative tests (K-PREP, EOCs, AP exams), benchmark tests (PAS, MAP, etc.).
Reference materials (647)	Amounts paid for reference materials.
Technology supplies (650)	Amounts paid for technology-related supplies that are used in conjunction with hardware or software.
Technology hardware (734)	Technology-related equipment and infrastructure.
Technology software (735)	Software for educational or administrative purposes.

Source: Kentucky Department of Education Uniform Chart of Accounts.

Trends In Expenditures For Instructional Materials

A financial analysis on instructional materials purchases made from 2008 to 2017 was conducted on data from the Annual Financial Reports of local districts. Total purchases for the selected object codes summed to more than $1.5 billion over the 10-year period.[c] Expenditures for technology hardware summed to more than $634 million, which accounted for approximately 40 percent of instructional materials purchases from funds 1 and 2 over the course of the observation period. Altogether, more than 64 percent of instructional materials expenditures were used to purchase technology-related materials and hardware during this period.

Figure 3.B illustrates annual total expenditures for the selected instructional materials object codes. Total annual expenditures for these object codes peaked in 2008 at more than $188 million. Spending on these materials was slightly below the 10-year average during school year 2017 at approximately $153 million.

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[c] Dollar figures have been adjusted for inflation using the Consumer Price Index. Dollar figures are reported as constant 2017 dollars.

Figure 3.B
Annual Instructional Materials Expenditures Funds 1 And 2 In Constant (2017) Dollars
School Years 2008 To 2017
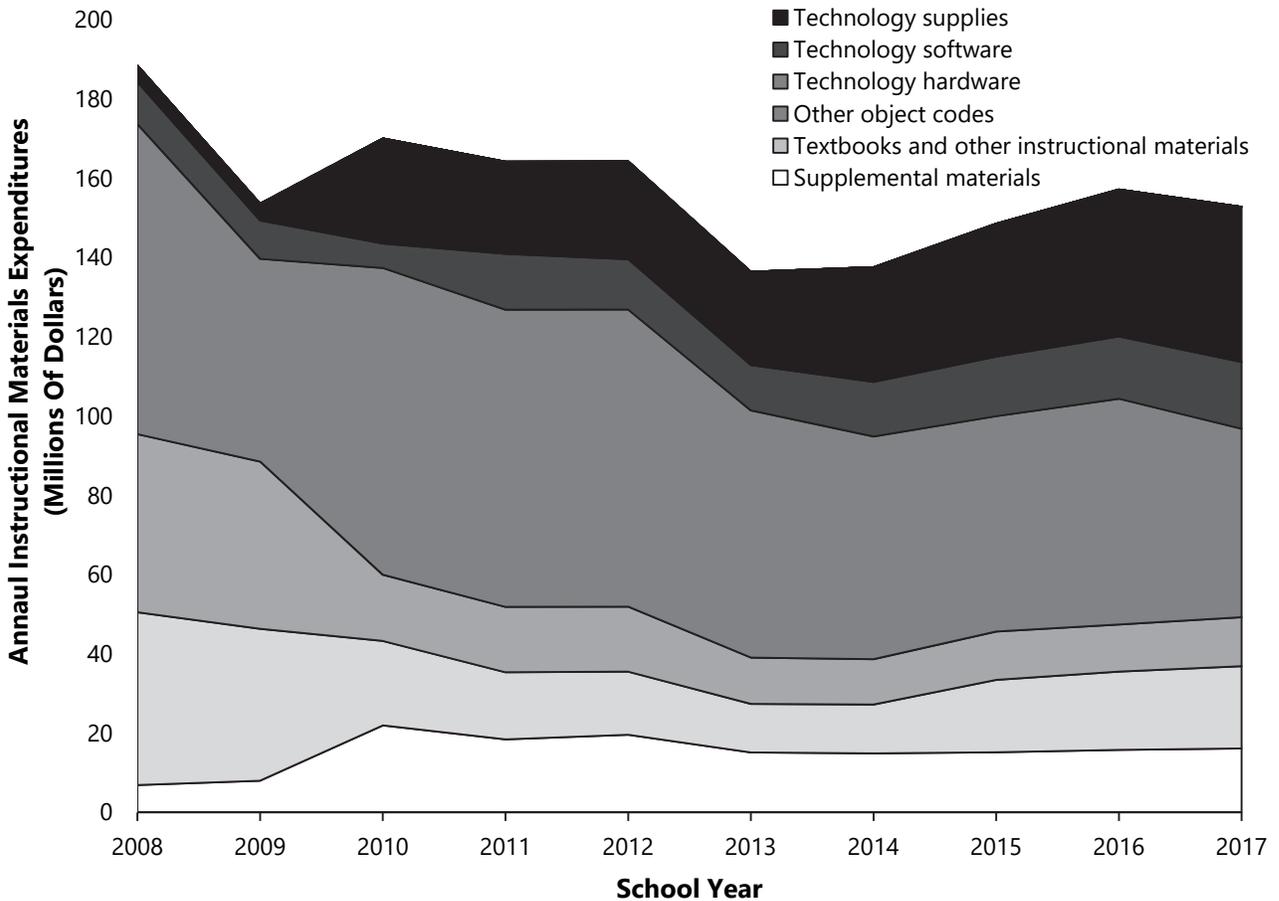
Note: Expenditures have been adjusted for inflation using the Consumer Price Index and are reported in 2017 dollars.
Source: Staff analysis of data from the Kentucky Department of Education.

Per-Student Expenditures For Instructional Materials

On average, districts spent approximately $242 per student on instructional materials each year during the observation period.

Total expenditures for the selected instructional materials object codes were computed at the student level using total student membership as the denominator.[d] On average, districts spent approximately $242 per student on instructional materials each year during the observation period. On average, districts spent $88 per student on print materials annually. Districts spent $155 per student per year on technology hardware and related instructional materials.[e]

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[d] District membership totals were acquired using previous data reported in the annual Kentucky District Data Profiles. OEA updates this report annually.
[e] Print materials account for object codes 640, 641, 642, 643, 644, 645, 646, and 647. Technology-related materials account for object codes 650, 734, and 735.

Over the 10-year observation period, investment in technology hardware and related materials accounted for nearly two-thirds of instructional materials expenditures, compared to approximately one-third for print materials.

Figure 3.C shows total annual spending per student for print and technology-related instructional materials from 2008 to 2017. During the 2008 school year, per-pupil expenditures were nearly identical for print and technology-related purchases, but during the following years districts invested heavily in technology-related materials and hardware. Over the course of the 10-year observation period, investment in technology hardware and related materials accounted for nearly two-thirds of instructional materials expenditures, compared to approximately one-third for print materials.

Further analysis on technology hardware expenditures is reported in Chapter 4 of this report.

Further analysis on technology hardware expenditures is reported in Chapter 4 of this report. Detailed listings of expenditures by source and object code are in Appendix A.

Figure 3.C
Annual Expenditures Per Student For Print And Technology-Related Instructional Materials
School Years 2008 To 2017
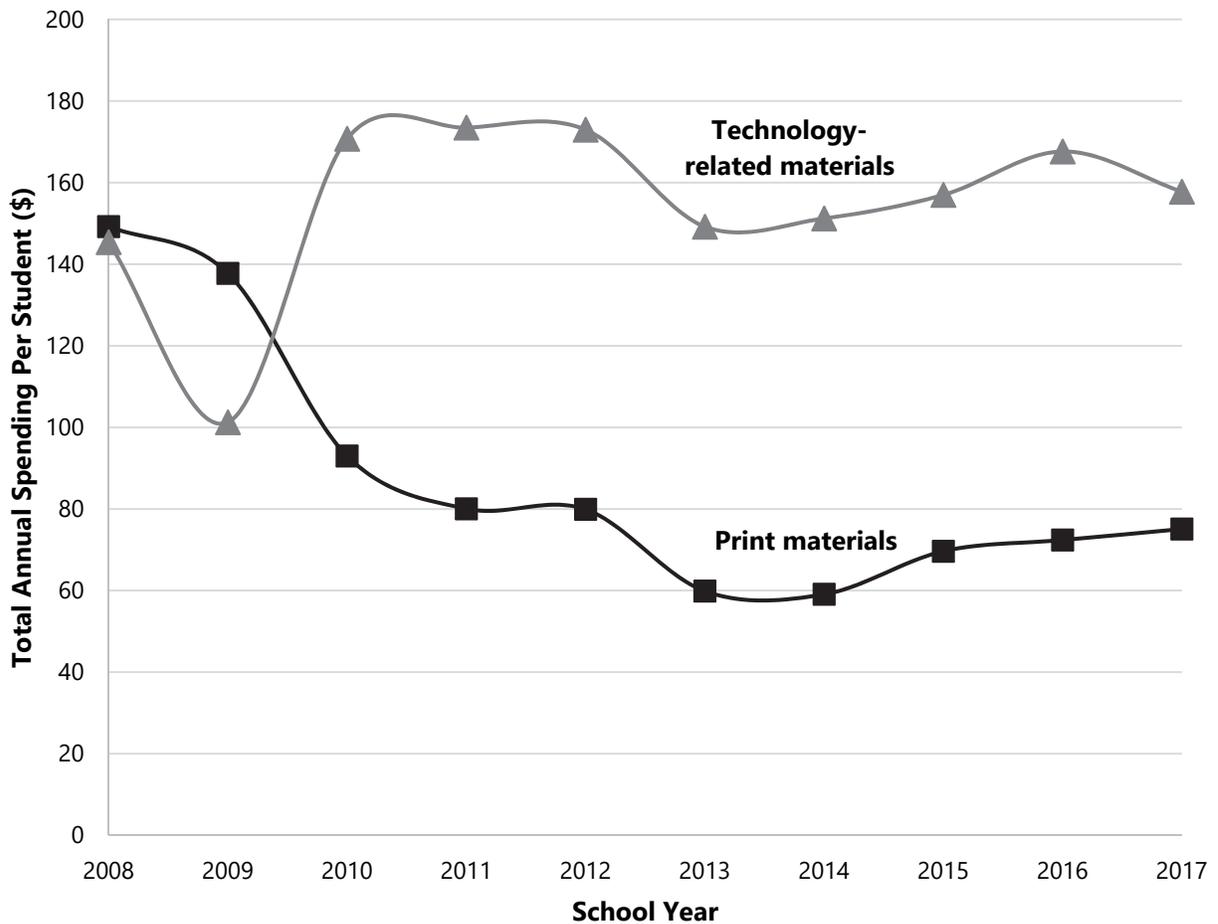
Note: Expenditures have been adjusted for inflation using the Consumer Price Index and are reported in 2017 dollars.
Source: Staff analysis of data from the Kentucky Department of Education.

Expenditures For Instructional Materials
At The District Level

Expenditures for instructional materials were analyzed by funding source at the district level to determine the ratio of technology-related purchases relative to print purchases for school years 2008 to 2017. Table 3.3 displays the average ratios for the state by funding source. The coefficient of variation metric within the table is designed to measure the extent of variability of district-level technology-to-print expenditure ratios relative to the mean ratio for the state. The higher the coefficient of variation, the higher the variance in spending per district.

Table 3.3
State-Level Technology-To-Print Expenditure Ratios
Per Funding Source
School Years 2008 To 2017

Fund	Technology:Print Expenditure Ratio	Standard Deviation	Coefficient Of Variation
General	1.7	1.1	64.7%
Special revenue	2.5	1.2	50.4
Combined	2.0	0.8	38.5

Note: Coefficient of variation = ratio of the standard deviation to the mean.
Source: Staff analysis of data from the Kentucky Department of Education.

The technology-to-print ratio for the general and special revenue funds combined was 2.0 at the state level. In other words, all districts combined spent twice as much on technology-related materials relative to print materials over the course of the observation period.

There were 73 districts that had technology-to-print expenditure ratios of 2.0 or above, while 100 districts were below the mean ratio for the state. Figure 3.D displays the technology-to-print materials expenditure ratio for each public school district from the general and special revenue funds.

Appendix B contains the technology-to-print ratios for all districts as well as maps displaying the ratios by district for the general and special revenue funds separately.

**Figure 3.D
District-Level Technology-To-Print Expenditure Ratios,
General Fund And Special Revenue Funds
School Years 2008 To 2017**

General And Special Revenue Funds Technology-To-Print Expenditure Ratio

0.90 to 1.00 (6)

1.01 to 1.50 (40)

1.51 to 2.00 (60)

2.01 to 6.50 (67)

Note: Italics indicate independent school district.
Source: Staff analysis of data from the Kentucky Department of Education.

Expenditures for print and digital instructional materials at the district level indicate that spending across districts when averaged over the course of the observation period covered a range of approximately $111 to nearly $420 per student.

District-Level Expenditures Per Student For Instructional Materials. An analysis of expenditures for print and digital instructional materials at the district level indicates that spending across districts when averaged over the course of the observation period covered a range of approximately $111 to nearly $420 per student. Figure 3.E shows district-level average per-student expenditures for all instructional materials for school years 2008 to 2017.

Figure 3.E
District-Level Expenditures Per Student For Instructional Materials
School Years 2008 To 2017

Amount Spent On Print Instructional Materials And Technology Per Student ($)

- 100 to 175 (44)
- 175 to 225 (48)
- 226 to 275 (54)
- 276 to 400 (27)

Note: Italics indicate independent school district.
Source: Staff analysis of data from the Kentucky Department of Education.

Chapter 4

Overview Of Education Technology

Introduction

This chapter discusses technology in Kentucky education and data from the Kentucky Technology Readiness Survey. The Kentucky Technology Readiness Survey provides information about the technology infrastructure in Kentucky public school districts and schools. Expenditures in this chapter have not been adjusted for inflation.

KETS Master Plan

The Kentucky Education Technology System (KETS) Master Plan guides purchasing, developing, and use of technology in Kentucky public education.

KRS 156.670 requires the Council for Education Technology to develop a master plan for education technology, submitted to the Kentucky Board of Education and the Legislative Research Commission for approval. The Kentucky Education Technology System (KETS) Master Plan guides purchasing, developing, and using technology to

- improve learning and teaching and the ability to meet individual students' needs to increase student achievement,
- improve curriculum delivery to help meet the needs for educational equity across the state,
- improve delivery of professional development,
- improve the efficiency and productivity of administrators, and
- encourage development by the private sector and acquisition by districts of technologies and applications appropriate for education (KRS 156.670(1)).

Current and previous KETS Master Plans are available on the Kentucky Department of Education website, and information is easily and quickly accessible.

2013-2018 KETS Master Plan. Although the 2018-2024 KETS Master Plan was available at the time of this writing, the goals and content of the 2013-2018 KETS Master Plan are highly relevant to recent technology decisions and prioritization that contributed to the current progress of Kentucky's educational technology, including information gathered in the current Technology Readiness Survey.

The 2013-2018 KETS Master Plan prioritizes technology in Kentucky education. The master plan emphasizes that technology is increasingly part of society and industries, and that technology-based school and classroom environments prepare Kentucky children for 21st-century success. The master plan recognizes that technology can allow flexible and personalized learning for students, grant immediate access to material and information, and support "anytime, anywhere, always-on learning." Anytime, anywhere, always-on learning is the concept that learning occurs outside of the physical classroom and beyond traditional school hours and subjects. Students, teachers, and parents can use technology to increase opportunities to learn, communicate, and be engaged.[18] The master plan pairs the importance of incorporating technology in the classroom with the continued importance of teachers, human interaction, and guidance in student development.[19]

The KETS Master Plan emphasizes that instructional devices are central to incorporating technology into the learning environment and encourages districts to attain low device-to-student ratios to provide all students with technology.

The KETS Master Plan emphasizes that instructional devices are central to incorporating technology into the learning environment and encourages districts to attain low device-to-student ratios to provide all students with technology. The KETS Master Plan states that the ideal ratio is one device for every three elementary students and one device for every one secondary student.[20] KDE determined technology needs using average daily attendance to avoid idle investment and serve the average number of users.[21] The analysis presented here uses student membership because membership includes all students in a district and represents the total amount of technology resources necessary to meet the needs of every student.

2018-2024 KETS Master Plan. The 2018-2024 KETS Master Plan continues to support the concept and principles of the 2013-2018 KETS Master Plan, with several differences and additions from the previous version.[22] The 2018-2024 KETS Master Plan differs from the 2013-2018 Master Plan in the following ways:
- Graphically represents past KETS milestones as a timeline
- Connects areas of emphasis to the Future Ready Framework and KDE strategic goals
- Incorporates technology products and services to address aspects of the Kentucky Department of Education and the Kentucky Board of Education Strategic Plans
- Aligns with the vision and educational goals of the Kentucky Board of Education and the Kentucky Department of Education Strategic Plan, and incorporates technology products and services

- Includes new studies, research, audit and survey results, customer feedback, and national and other state and district plans to inform future work
- Summarizes technology and learning standards for student achievement, architectural design and configuration standards for education technology devices and systems, and product standards regarding technology providers
- Includes modernized technology needs budget projection

To determine technology needs, 2018-2024 KETS Master Plan uses average daily membership instead of average daily attendance.[23] However, there are conflicting measures of student attendance within the 2018-2024 KETS Master Plan. The plan's Appendix E states that technology needs standards involve three criteria, including component ratios (quantities) based on average daily attendance. The plan's Appendix H details the 2018-2024 Budget Summary using per-student average daily membership as the unit variable.[24]

The 2018-2024 KETS Master Plan identifies the following as major drivers to achieve through technology-enabled tools:
- A more informative and engaging experience for students
- Addressing the different languages and teaching styles of all students and teachers
- Deepening the understanding of academic content
- Data driven decision making
- Ease of access
- Creation and production of products and content
- Gathering, analyzing, and synthesizing information
- Communication and collaboration

Finding 4.1

Finding 4.1

The 2018-2024 KETS Master Plan includes conflicting measures of student attendance. The plan's Appendix E states that technology needs standards involve three criteria, including component ratios (quantities) based on average daily attendance. The plan's Appendix H details the 2018-2024 Budget Summary using per-student average daily membership as the unit variable.

Kentucky Academic Standards For Technology

Technology literacy is the ability of students to responsibly use appropriate technology to communicate; solve problems; and access, manage, integrate, evaluate, and create information to improve learning in all subject areas and to acquire lifelong knowledge and skills.

The Kentucky Academic Standards for Technology highlight technology literacy, defined as

> [t]he ability of students to responsibly use appropriate technology to communicate, solve problems, and access, manage, integrate, evaluate, and create information to improve learning in all subject areas and to acquire lifelong knowledge and skills in the 21st century.[25]

Defining Education Technology

Education technology includes technology hardware and software to support education in Kentucky, including concepts, practices, and technical competencies that enhance learning and allow students to use technology to communicate, solve problems, and work with information.

KRS 156.660(2) defines *technology* as including, but not limited to computers, telecommunications, cable television, interactive video, film, low-power television, satellite communications, and microwave communications. Education technology includes technology hardware and software to support education in Kentucky, including concepts, practices, and technical competencies that enhance learning and allow students to use technology to communicate, solve problems, and work with information.[26] The 2018-2024 KETS Master Plan defines *technology*:

> [T]echnology is always something that (1) connects to or through the Internet or any network by a wire or wireless, and/or (2) has data, information, voice, sound, images or video created, entered, displayed, stored or flowing back and forth and/or (3) involves digital [interfacing or information] (i.e., learning/teaching, training/PD, decision making/analysis, communications, reporting or online assessment).

The Kentucky Technology Readiness Survey provides annual information about the technology infrastructure in districts and schools in Kentucky.

Kentucky Technology Readiness Survey. The Kentucky Technology Readiness Survey provides annual information about the technology infrastructure in districts and schools in Kentucky. The information collected by the survey is used to determine needs and to implement the KETS Master Plan, as well as technology funding and online applications and testing. The survey collects information about instructional devices and ease of access; instructional device operating systems; technology leadership, service, support, and training resources; and network connectivity. The Kentucky Technology Readiness Survey is available on the Kentucky Department of Education website, and data is easily and quickly accessible.

Finding 4.2

The KETS Master Plan and the Kentucky Technology Readiness Survey are available online, allowing citizens and policy makers to access information and to understand the technology strategy for Kentucky education, the status of Kentucky's technology education across districts, and the progress that has been made.

Instructional Devices

Instructional devices are technology devices used to enhance the learning environment, such as computers, laptops, tablets, e-readers, and smartphones.

Instructional devices are technology devices used to enhance the learning environment, such as computers, laptops, tablets, e-readers, and smartphones.[27] There were 635,259 instructional devices in Kentucky school districts in 2017. The total number of devices increased by 209,565 devices from 2014 to 2017, a 49.2 percent increase. In the same period, the number of students increased by 2,006 students.[a]

There were 635,259 instructional devices in Kentucky school districts in 2017. On average, districts increased their devices by 54.1 percent between 2014 and 2017.

On average, districts increased total devices by 54.1 percent between 2014 and 2017. Figure 4.A shows the change in total devices from 2014 to 2017 by district. Ten school districts had fewer total devices in 2017 than in 2014, while 163 districts increased total devices. In districts that increased total devices, the average increase was 57.9 percent.

The 10 school districts with fewer devices in 2017 than in 2014 decreased devices by 7.3 percent on average. During this time, the number of students remained the same in one district, decreased by less than 10 students in three districts, and decreased by between 10 and 210 students in six districts, averaging a decrease of 3.1 percent, and the device-to-student ratio remained the same or improved in five districts. These 10 districts reduced the number of Windows 8 and previous Windows operating systems and increased the number of Windows 10, Chrome, and Apple products.

Annual Purchases And Surplus. Between 2014 and 2017, Kentucky school districts reported surplusing 166,935 devices and acquiring 380,906 new devices, meaning that 60.0 percent of all

[a] The Technology Readiness Survey reports a membership of 656,295 students in Kentucky school districts in 2017. The District Data Profiles (DDP) compiled by the Office of Education Accountability reports 656,394 students. The Technology Readiness Survey reports 2,916 students in Corbin Independent, 40,404 students in Fayette County, and 5,655 students in Floyd County. The DDP reports 2,962 students in Corbin Independent, 40,430 students in Fayette County, and 5,677 students in Floyd County. The difference is 99 students.

devices used in Kentucky schools in 2017 had been acquired within the previous 4 years. Nearly every school district acquired new devices annually.

Districts owned 525,273 instructional devices for student use in 2017.

Student Devices. The Kentucky Technology Readiness Survey reports the number of students and the number of instructional technology devices owned by districts for student use.[28] In 2017, Kentucky school districts had a total of 525,273 student devices, an increase of 196,745 devices and a growth of 59.9 percent since 2014. The number of student devices per district ranged from 139 devices to 67,406 devices in 2017.

Forty-six percent of instructional devices were for secondary students, 36.6 percent were for elementary students, and 17.3 percent were for staff.

Student Devices By Level. The Technology Readiness Survey does not report the number of devices per school or grade, but it does report the number of elementary student devices and secondary student devices in each district. Figure 4.B shows the change in the number of elementary student devices, secondary student devices, and staff devices from 2014 to 2017. Figure 4.B shows that there were 232,812 devices for elementary school (up to grade 5) student access in 2017, an increase of 91,542 devices and a growth of 64.8 percent since 2014. In 2017, elementary student devices accounted for 36.6 percent of total devices.

Figure 4.A
Change In Number Of Devices
2014 To 2017

Percent Change

Decreased devices (10 districts)

Increased devices 0% to 50% (81 districts)

Increased devices 51% to 100% (58 districts)

Increased devices more than 100% (24 districts)

Note: Italics indicate independent school district.
Source: Staff analysis of data from the Kentucky Technology Readiness Survey.

Figure 4.B
Student And Staff Instructional Devices
2014 To 2017
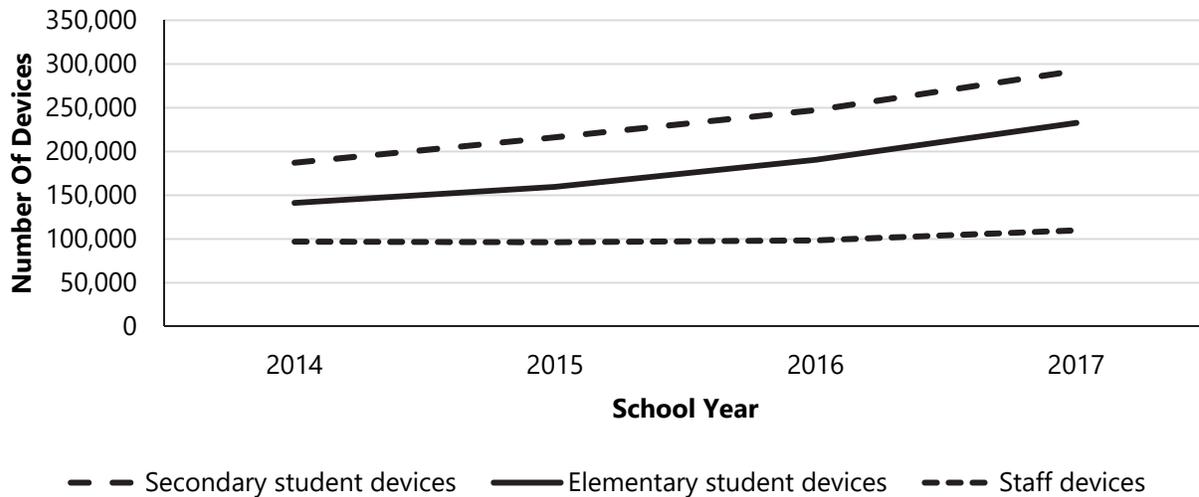
Source: Staff analysis of data from the Kentucky Technology Readiness Survey.

Figure 4.B shows that there were 292,461 devices for secondary school (grades 6-12) student access in 2017, an increase of 105,203 devices and a growth of 56.2 percent over 2014. In 2017, secondary student devices accounted for 46.0 percent of total devices.

Staff Devices. The School Report Card reports the number of full-time certified staff and teachers, and the Kentucky Technology Readiness Survey reports the number of technology devices owned by districts for use by teachers and administrators.[29] Figure 4.B shows that there were 109,986 staff devices in 2017, an increase of 12,820 devices since 2014, a growth of 13.2 percent. In 2017, staff devices accounted for 17.3 percent of total devices.

Student devices accounted for 93.9 percent of the total device increase between 2014 and 2017.

Comparing Student And Staff Devices. Between 2014 and 2017, both student and staff devices increased, although the student device increase of 196,745 devices was much larger than the staff device increase of 12,820 devices. The larger number of new student devices accounted for 93.9 percent of the total device increase during this time, while staff devices accounted for 6.1 percent of the increase. In 2017, student devices accounted for 82.7 percent of total devices, compared to 77.2 percent in 2014.

One-To-One Implementation

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One-to-one (1:1) implementation refers to the ratio of technology devices to students and teachers/administrators.

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One-to-one (1:1) implementation refers to the ratio of technology devices to students and teachers/administrators.[30] For example, a ratio of 1:2 indicates one device for every two persons. In *Digital Learning 2020: A Policy Report For Kentucky's Digital Future*, SWOT (strengths, weaknesses, opportunities, threats) analysis identifies 1:1 implementation as an opportunity and refers to findings from Project RED, a national study of education technology and 1:1 implementation in nearly 1,000 schools.[31] Project Red found that schools with 1:1 implementation tend to experience reduced disciplinary action and dropout rates and increased high-stakes test scores and graduation rates.[32]

<div style="float:left; width:35%;">

The Technology Readiness Survey does not count devices owned by students or staff; 1:1 implementation ratios in this report are likely to be conservative estimates.

</div>

Because the number of devices reported in the Technology Readiness Survey reflects only devices owned by districts and does not include devices brought in by students and staff members, the 1:1 implementation ratios are likely to be conservative estimates of the number of devices used by students and staff.[33]

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There were 1.3 students per instructional device, ranging from 3.5 students to less than 1 student per device by district in 2017.

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Students Per Device. The numbers of students and instructional devices reported in the Kentucky Technology Readiness Survey were used to calculate the number of students per device in each district. Each school within a district did not necessarily have the same device-to-student ratio as the district. In 2017, there were 1.3 students per student device in Kentucky. This ratio has moved closer to 1:1 since 2014, when there were 2.0 students per student device. The number of students per student device ranged from 0.6 students to 3.5 students in 2017. Most of the reduction in number of students per student device derived from an increase in secondary student devices, which accounted for 53.5 percent of the total device increase from 2014 to 2017. Figure 4.C shows the number of students per student device for each district in 2017.
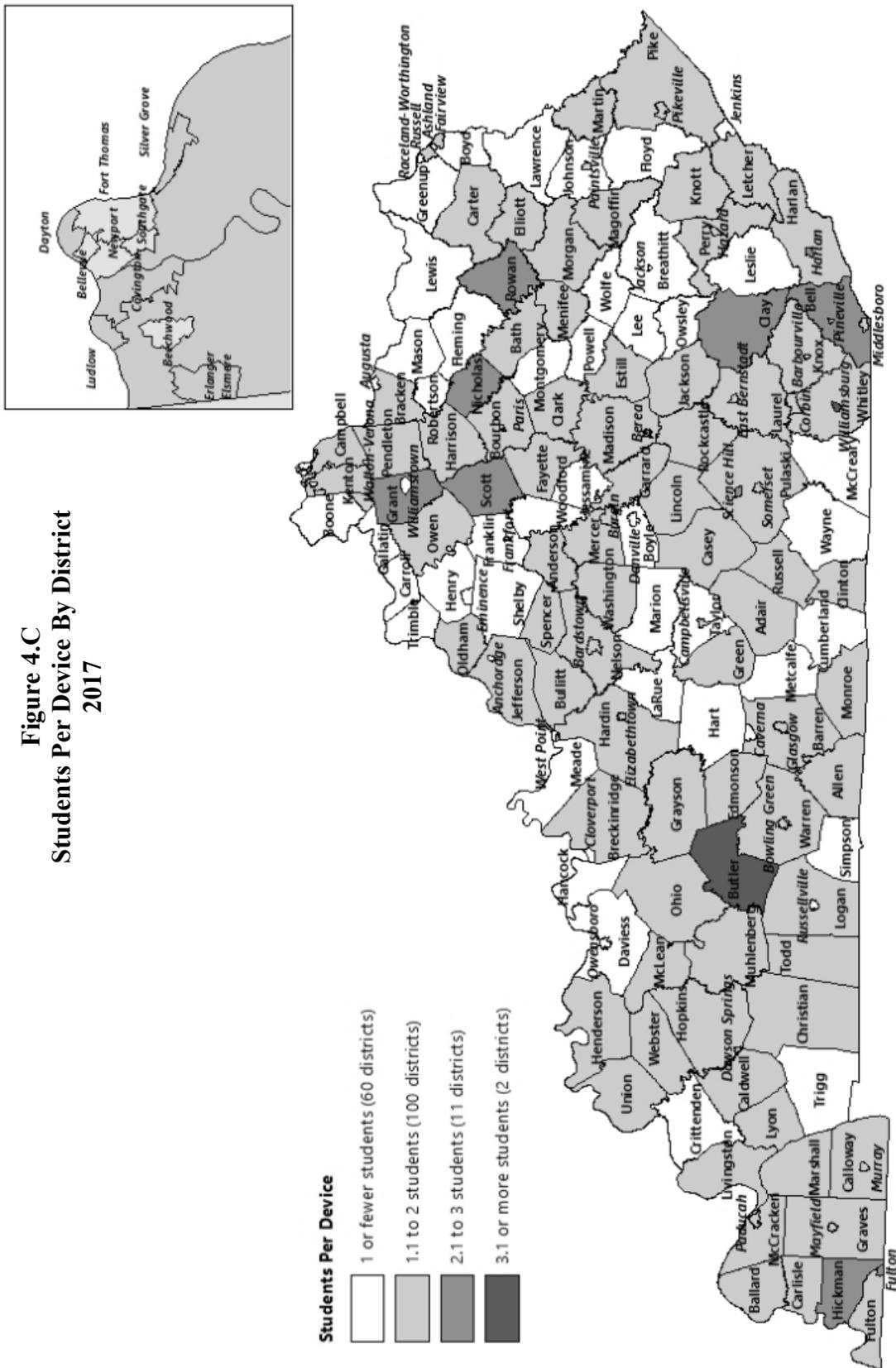
Figure 4.C
Students Per Device By District
2017

Students Per Device

- 1 or fewer students (60 districts)
- 1.1 to 2 students (100 districts)
- 2.1 to 3 students (11 districts)
- 3.1 or more students (2 districts)

Note: Italics indicate independent school district.
Source: Staff analysis of data from the Kentucky Technology Readiness Survey.

Figure 4.D shows the change in students per device from 2014 to 2017 for elementary students, secondary students, and total students by district.

Figure 4.D
Ratio Of Student Devices To Students
2014 To 2017
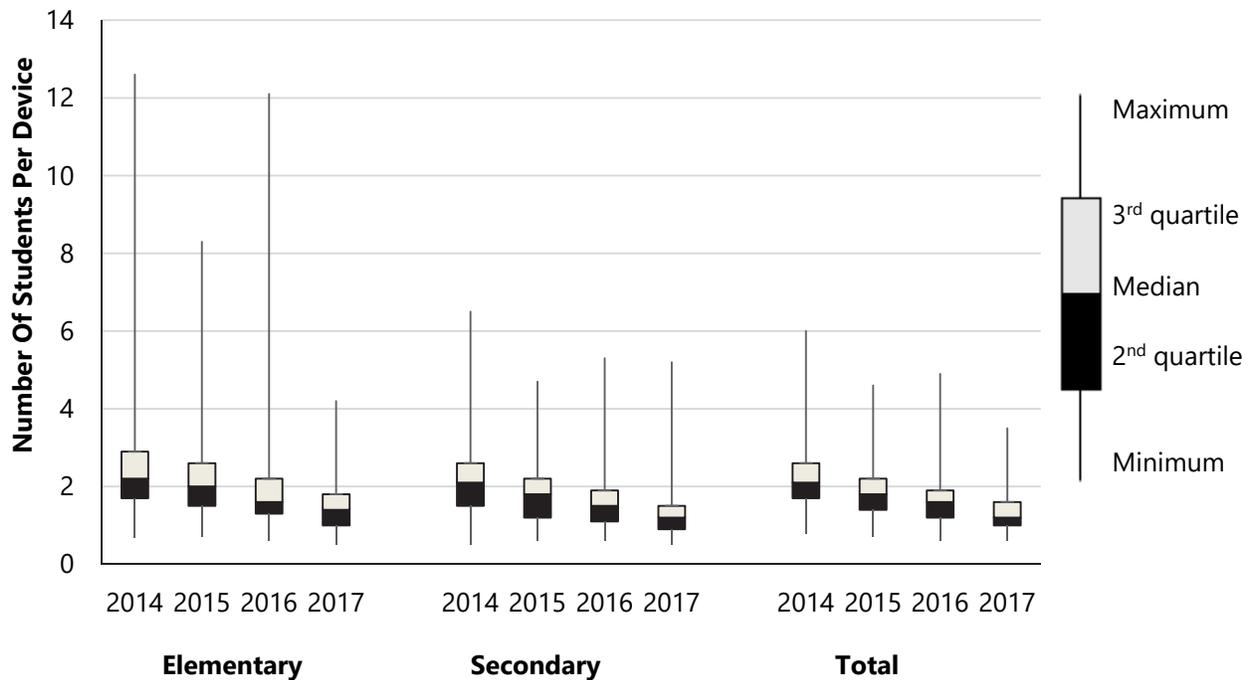
Source: Staff analysis of data from the Kentucky Technology Readiness Survey.

Overall, there were more devices for use by elementary students, secondary students, and total students in 2017 than in 2014.

Each year, the lower quartile, median, and upper quartile were lower than the previous year in each category, and the minimum number of students per device decreased every year for elementary and total students. The maximum number of students per device fluctuated but was much lower in 2017 than in 2014 for each category. There is an overall trend of fewer students per device for elementary students, secondary students, and total students from 2014 to 2017. Appendix C shows district device ratios for total students, elementary students, secondary students, and staff in 2017.

Students Per Device By Level. The Kentucky Technology Readiness Survey does not report the number of devices per school or grade, but it does report the number of devices for elementary student use and secondary student use in each district. This information was combined with elementary and secondary student membership data from the Kentucky Department of Education

School Report Card to calculate the number of elementary students per elementary student device and the number of secondary students per secondary student device.[34]

One device for every three elementary students is considered ideal. In 2017, 96.5 percent of districts had achieved this goal, accounting for 98.5 percent of elementary students.

The 2013-2018 KETS Master Plan states that one device for every three elementary students is an ideal ratio for the elementary level. In 2017, 167 districts had achieved this ratio, accounting for 96.5 percent of districts and 98.5 percent of elementary students. The state ratio of elementary student devices to elementary students was 1 to 1.3 in 2017 and 1 to 2.2 in 2014. Figure 4.C shows that ratios ranged by district from one device per 0.5 students to one device per 4.2 students. The spread of elementary students per elementary student device was smaller in 2017 than in 2014, when ratios ranged from one device per 0.7 students to one device per 12.6 students. Appendix D shows the number of elementary students per device by district in 2017.

One device for every one secondary student is considered ideal. In 2017, 36.4 percent of districts had achieved this goal, accounting for 22.0 percent of secondary students.

The 2013-2018 KETS Master Plan states that one device for every one secondary student is an ideal ratio for the secondary level. In 2017, 63 districts had achieved this ratio, accounting for 36.4 percent of districts and 22.0 percent of secondary students. The state ratio of secondary student devices to secondary students was 1.2 students per device in 2017, ranging by district from one device per 0.5 students to one device per 5.2 students, as seen in Figure 4.C. The range of secondary students per device was smaller in 2017 than in 2014, when district ratios ranged from one device per 0.5 students to one device per 6.5 students, with a state ratio of 1.8. Appendix D shows the number of secondary students per device by district in 2017.

In 2017, there was one device for every 1.3 staff members in Kentucky school districts.

Staff Per Device. The School Report Card reports the number of full-time certified staff and teachers, and the Kentucky Technology Readiness Survey reports the number of technology devices owned by districts for use by teachers and administrators.[35] These numbers were used to calculate the number of staff members per staff device in each district. Each school within a district did not necessarily have the same device-to-staff ratio as the district. The state ratio of staff devices to staff members was one device per 1.3 staff members in 2017 and 1.4 in 2014. Ratios ranged from one device per 0.3 staff members to one device per 3.1 staff members in 2017. Appendix D shows the number of staff members per device by district. The range of staff members per device was smaller in 2017 than in 2014, when there was a high of 7.1 staff members per device and a low of 0.7 staff members per device.

District 1:1 Implementation. Table 4.1 shows the number of districts providing one device for each student from 2014 to 2017. In 2017, 23.9 percent of students were in districts with successful 1:1 implementation, compared to 1.5 percent in 2014, accounting for an additional 147,039 students. An additional 51 districts achieved 1:1 implementation in 2017, compared to 2014. These findings reinforce the OEA survey finding that 60 districts provided one device for every student in 2017.

Table 4.1
Districts With 1:1 Implementation
School Years 2014 To 2017

	Districts		Students	
School Year	**Number**	**Percent**	**Number**	**Percent**
2014	9	5.2%	9,501	1.5%
2015	17	9.8	38,815	5.9
2016	32	18.5	69,153	10.6
2017	60	34.7	156,540	23.9

Source: Staff analysis of data from the Kentucky Technology Readiness Survey.

Between 2014 and 2017, 163 districts improved their device-to-student ratio and came closer to 1:1 implementation. These findings support the OEA survey result that nearly 70 percent of districts indicated that securing a 1:1 device-per-student ratio is, or was, a high priority. Of the remaining 10 districts, 5 districts maintained the same device-to-student ratio in 2017 as in 2014, and 5 districts had more students per device in 2017 than in 2014.

Table 4.2 shows that 60 districts had achieved 1:1 implementation or better in 2017 and provided at least one device per student, accounting for 34.7 percent of districts. These districts accounted for 23.9 percent of all students, meaning that an estimated 156,540 students were in districts that could provide a device for every student, and nearly half a million Kentucky students were in districts without one device for every student.

Districts with device-to-student ratios of between 1:1.1 and 1:2 accounted for 71.8 percent of students. Districts with ratios of 1:2.1 or greater accounted for 4.3 percent of students and 7.6 percent of districts, meaning that nearly all students and districts were in districts that had at least one device for every other student.

Table 4.2 shows that 27.2 percent of districts provided one device for every elementary student and 36.4 percent of districts provided one device for every secondary student in 2017.

Table 4.2
1:1 Device Implementation By District And Percentage Of Students
School Year 2017

Implementation Ratio	Elementary		Secondary		Total	
	Districts	Students	Districts	Students	Districts	Students
1:1 or better	27.2%	20.2%	36.4%	22.0%	34.7%	23.9%
1:1.1 to 1:2	55.5	69.9	52.6	67.6	57.8	71.8
1:2.1 to 1:3	13.9	8.7	8.7	9.1	6.4	3.9
1:3.1 or greater	3.5	1.5	2.3	1.3	1.2	0.4

Note: Some percentages do not sum to 100 because of rounding.
Source: Staff analysis of data from the Kentucky Technology Readiness Survey.

Districts supported 1:1 implementation by purchasing devices for specific programs, grades, schools, or the entire district.

District 1:1 Implementation Variation. Kentucky public school districts varied in carrying out 1:1 implementation. Some districts purchased devices in multiple school years, and some districts purchased devices to support implementation at different levels, focusing on the entire district, specific schools within a district, specific grades, or specific instructional programs.

Between 2014 and 2017, 91 districts reported purchasing devices to support 1:1 implementation. Seventeen districts purchased devices to focus on district 1:1 implementation, 36 districts focused on schools, 23 districts focused on grades, and 25 districts focused on program-based 1:1 implementation.

Table 4.3 shows districts' focus of 1:1 implementation between 2014 and 2017, average device-to-student ratios in 2017, and the number of districts and students for each focus. For example, districts that focused on 1:1 implementation at the district level experienced 0.8 students per device on average and accounted for 2.3 percent of districts and 0.3 percent of students.

Districts that reported purchasing devices to support 1:1 implementation but did not specify a focus were categorized as "Unspecified level" unless the district had specified a focus in a previous year, in which case the previous level of focus was used as the district scope category. Districts that specified more than one focus were categorized as "Multiple levels."

As Table 4.3 shows, districts that focused on broader levels of device implementation in general experienced lower device-to-student ratios in the district. Most districts focused on multiple levels or did not specify a particular level, accounting for about half of the students in districts that purchased devices.

Table 4.3
Focus Of 1:1 Implementation And Number Of Students Per Device
School Years 2014 To 2017

Focus of 1:1 Implementation (2014–2017)	Average Students Per Device (2017)	Districts By Focus (2017)		Students By Focus (2017)	
		Number	Percent	Number	Percent
District level only	0.8	4	2.3%	1,908	0.3%
School level only	1.0	17	9.8	40,090	6.1
Multiple levels	1.0	28	16.2	111,657	17.0
Unspecified level	1.0	19	11.0	55,897	8.5
Grade level only	1.1	7	4.0	36,157	5.5
Program level only	1.6	16	9.2	154,667	23.6
Did not purchase	1.6	82	47.4	255,919	39.0

Source: Staff analysis of data from the Kentucky Technology Readiness Survey.

Districts varied in how frequently they acquired devices between 2014 and 2017, ranging from purchasing in all 4 years to 0 years.

Districts varied in how frequently they purchased devices between 2014 and 2017. Table 4.4 shows that 36 districts purchased devices to support 1:1 implementation in all 4 years, 18 districts purchased devices in 3 of the 4 years, 12 districts purchased devices in 2 of the 4 years, 25 districts purchased devices in 1 of the 4 years, and 82 districts did not purchase devices to support 1:1 implementation in any year. Districts that purchased devices in multiple years experienced fewer students per device on average and were closer to 1:1 implementation.

Table 4.4
Average Device-To-Student Ratio In School Year 2017
And District Device Purchases In School Years 2014 To 2017

Years Purchased Between 2014 And 2017	Average Students Per Device	Districts		Students	
		Number	Percent	Number	Percent
0	1.6	82	47.4%	255,919	39.0%
1	1.2	25	14.5	68,387	10.4
2	1.2	12	6.9	37,937	5.8
3	1.1	18	10.4	59,398	9.1
4	1.0	36	20.8	234,654	35.8

Source: Staff analysis of data from the Kentucky Technology Readiness Survey.

Table 4.4 shows that 61.0 percent of students were in districts that purchased devices in at least 1 year and 39.0 percent of students were in districts that did not purchase devices in any year.

Technology Funding

Technology hardware and software funding data was provided by the Kentucky Department of Education Annual Financial Chart of Accounts. 702 KAR 3:120 requires districts to follow the KDE Uniform Chart of Accounts uniform financial accounting system, and 702 KAR 3:246 establishes the school council allocation formula used with the Uniform Chart of Accounts. The Uniform Chart of Accounts provides a description of each funding code, available on the KDE website.[36]

KRS 156.160(1)(c) requires the Kentucky Board of Education to promulgate administrative regulations to establish standards to acquire and use educational equipment for schools, and KRS 156.670(1) requires the Council for Education Technology to develop a master plan to guide purchasing, developing, and using technology. KRS 157.665 establishes the Kentucky education technology trust fund, and KRS 157.655 authorizes schools with unmet technology needs to participate in the education technology program. 701 KAR 5:110 recognizes that these funds may be insufficient to implement the Kentucky Education Technology System standards and establishes requirements governing the use of local money to reduce unmet technology need. 701 KAR 5:110 defines unmet technology needs as

> [t]he total cost of technology, meeting or exceeding the criteria established in the master plan, needed to achieve the capabilities outlined in the approved district education technology plan of the local school district.

701 KAR 5:110 also allows districts to propose waivers in the local district education technology plan for technology components that have no established KETS standards (alternative technologies), especially to achieve innovation.

Technology Hardware Funding And Instructional Devices.
Table 4.5 details six funds supporting technology hardware devices and supplies. Technology hardware includes technology-related equipment and infrastructure, which may include network equipment, services, and other peripheral devices. Technology supplies includes desktops, Chromebooks, e-readers, and similar devices. Fund 1 is the general fund and districts' primary operating fund. Funds 2, 21, and 22 are special revenue district funds related to specific revenue sources and expenditures. Funds 310, 320, and 360 relate to capital facilities, such as construction costs, debt service, renovation, and remodeling.[37]

Each year, districts allocate funds for technology hardware based on need. Because this is a 4-year snapshot, spending in previous years may explain low or high spending by some districts during the years included here. Table 4.5 shows that total hardware funding from these sources decreased by $2.1 million from 2014 to 2017 and that fund 1 and fund 2 accounted for 92.2 percent of total hardware funding. Together these funds decreased by about $800,000 between 2014 and 2017.

Table 4.5
Technology Hardware Funding
School Years 2014 To 2017

Fund	2014	2015	2016	2017
Fund 1 – general fund	$23,766,978	$21,347,887	$21,080,052	$21,673,476
Fund 2 – special revenue fund	30,583,472	31,436,134	35,260,478	31,898,573
Fund 21 – special revenue district activity fund (annual)	0	329,193	323,521	366,917
Fund 22 – special revenue district activity fund (multiyear)	0	502,954	749,157	796,172
Fund 310 – capital outlay fund	0	8,502	141,091	118,734
Fund 320 – building fund (5-cent levy)	0	24,002	0	11,143
Fund 360 – construction fund	5,863,979	3,589,719	2,764,865	3,230,762
Total	$60,214,428	$57,238,390	$60,319,162	$58,095,778

Note: Totals may not sum due to rounding. Categories included are Technology Hardware (object code 0734) and Supplies – Technology Related Devices (object code 0651).
Source: Staff analysis of data from the Kentucky Department of Education Annual Financial Report Chart of Accounts provided by KDE.

Table 4.6 shows technology hardware spending per student and per student device using total funds from 2014 to 2017 and student membership and number of devices in 2017. Technology hardware funding was $359.39 per student and $449.04 per student device. Appendix E shows how much each district allocated for technology hardware over the past 4 years per student.

Table 4.6
Technology Hardware Funding And Student Devices
School Years 2014 To 2017

Fund	Total Spending, 2014 To 2017	Per Student, 2017	Per Student Device, 2017
Fund 1 – general fund	$87,868,392	$133.89	$167.28
Fund 2 – special revenue fund	129,178,656	196.83	245.93
Fund 21 – special revenue district activity fund (annual)	1,019,631	1.55	1.94
Fund 22 – special revenue district activity fund (multiyear)	2,048,283	3.12	3.90
Fund 310 –capital outlay fund	268,327	0.41	0.51
Fund 320 – building fund (5-cent levy)	35,145	0.05	0.07
Fund 360 – construction fund	15,449,325	23.54	29.41
Total	$235,867,759	$359.39	$449.04

Note: Totals may not sum due to rounding. Categories included are Technology Hardware (object code 0734) and Supplies – Technology Hardware Devices (object code 0651).
Source: Staff analysis of data from the Kentucky School Report Card and Kentucky Department of Education Annual Financial Report Chart of Accounts provided by KDE.

Bring your own device (BYOD) is the practice of students, or staff bringing their personally owned devices to school as a learning tool. Most school districts allow BYOD for both students and staff.

Personally Owned Devices/BYOD. Bring your own device is the practice of students or staff bringing their personally owned devices to school as a learning tool. BYOD can allow districts to move toward the goal of 1:1 implementation at a reduced cost to districts.[38] Districts varied in permitting students and staff to bring personally owned devices to school. Table 4.7 shows that most school districts allowed both students and staff to bring their own devices in 2017, while only 29 districts did not allow either students or staff to bring their own devices. Appendix C shows each district's BYOD policies and the device-to-student ratios and staff ratios in 2017.

Table 4.7
Policies For School District Personally Owned Devices
School Year 2017

Policy	Student BYOD	Staff BYOD	Student And Staff BYOD*
Permitted	129	142	127
Not permitted	44	31	29

*Does not sum to 173 because column represents permitting or not permitting both student and staff BYOD. Some districts allow BYOD for one and not the other.
Source: Staff analysis of data from the Kentucky Technology Readiness Survey.

Technology Software Funding And Instructional Device Operating Systems. Technology software funding data was provided by the Kentucky Department of Education Annual Financial Report Chart of Accounts, as discussed in the previous technology hardware funding section. Table 4.8 details six funds supporting technology software and supplies. Technology software includes educational or administrative software. Technology software supplies includes items related to software and software costs and supplies related to hardware such as CDs and cables. The following information may be inflated because of such other allowable items. As with technology hardware funds, annual technology software fund allocation are based on need, and the 4-year snapshot here excludes spending in previous years that may account for low or high spending.

Table 4.8 shows that technology software funding increased by $14.7 million between 2014 and 2017, and that fund 1 and fund 2 accounted for 97.2 percent of total software funding. Together, these funds increased by $14.3 million between 2014 and 2017.

Table 4.8
Technology Software Funding
School Years 2014 To 2017

Fund	2014	2015	2016	2017
Fund 1 – general fund	$22,316,213	$25,262,967	$27,666,358	$29,060,544
Fund 2 – special revenue fund	18,737,495	21,233,637	22,959,384	26,262,951
Fund 21 – special revenue district activity fund (annual)	185,712	360,729	724,912	518,950
Fund 22 – special revenue district activity fund (multiyear)	225	173,630	419,061	432,743
Fund 310 – capital outlay fund	0	0	0	0
Fund 320 – building fund (5-cent levy)	0	0	0	0
Fund 360 – construction fund	908,069	425,480	340,781	620,573
Total	$42,147,714	$47,456,443	$52,110,495	$56,895,761

Note: Totals may not sum due to rounding. Categories included are Technology Software (object code 0735) and Supplies – Technology Related (object code 0650).
Source: Staff analysis of data from the Kentucky Department of Education Annual Financial Report Chart of Accounts provided by KDE.

Table 4.9 shows technology software spending per student and per student device using total funds from 2014 to 2017 and student membership and student devices in 2017. Technology software funding was $302.62 per student and $378.11 per student device. Appendix E shows how much each district allocated for technology software over the past 4 years per student.

Table 4.9
Technology Software Funding And Student Devices
School Years 2014 To 2017

Fund	Total Spending, 2014 To 2017	Per Student, 2017	Per Student Device, 2017
Fund 1 – general fund	$104,306,082	$158.93	$198.57
Fund 2 – special revenue fund	89,193,467	135.90	169.80
Fund 21 – special revenue district activity fund (annual)	1,790,302	2.73	3.41
Fund 22 – special revenue district activity fund (multiyear)	1,025,658	1.56	1.95
Fund 310 – capital outlay fund	0	0.00	0.00
Fund 320 – building fund (5-cent levy)	0	0.00	0.00
Fund 360 – construction fund	2,294,903	3.50	4.37
Total	$198,610,413	$302.62	$378.11

Note: Totals may not sum due to rounding. Categories included are Technology Software (object code 0735) and Supplies – Technology Related (object code 0650).
Source: Staff analysis of data from the Kentucky School Report Card and Kentucky Department of Education Annual Financial Report Chart of Accounts provided by KDE.

Districts shifted toward newer and updated operating systems on educational devices.

Table 4.10 compares instructional device operating systems in 2014 and 2017 and shows that operating systems were updated to newer versions and models in 2017, although Windows 7 was the most common operating system in both 2014 and 2017. Windows 7, Chrome OS, Windows 10, and Apple devices accounted for 95.6 percent of all operating systems used on instructional devices in Kentucky public school districts in 2017. In addition, 71.8 percent of student devices could be used for any of the state required assessments, compared to 48.0 percent in 2014. Operating systems used in end-of-course tests were primarily Windows systems and Chrome OS, with less than 5 percent using Apple products.[39]

Table 4.10
Instructional Device Operating Systems
School Years 2014 And 2017

Operating System	2014		2017	
	Number	Percent	Number	Percent
Windows 7	237,000	55.7%	201,378	31.6%
Chrome OS (Chromebook)	8,737	2.1	182,032	28.6
Windows 10	0	0.0	90,202	14.2
iOS 8.x or later	0	0.0	62,984	9.9
iOS 7.x or earlier	76,105	17.9	32,060	5.0
Mac OS X 10.10 or later	0	0.0	29,391	4.6
Mac OS X 10.9	45,345	10.7	10,960	1.7
Windows 8	16,441	3.9	5,973	0.9
Android 5.0 (Jellybean) and newer	0	0.0	4,709	0.7
Other desktop OS (for example, Linux)	782	0.2	4,356	0.7
Android 4.3 (Jellybean) or earlier	6,311	1.5	3,427	0.5
Windows – Pre Windows 7	26,770	6.3	3,375	0.5
Other Android base OS (for example, Kindle)	3,853	0.9	3,055	0.5
Windows 8 RT	4,190	1.0	2,839	0.4

Note: Mac OS X 10.9 consists of Mac OS X 10.9 (or earlier) Mac OS X 10.9 (or later), Mac OS X 10.4 (up to 10.8), and Mac OS X Pre 10.4 for 2014. Android 4.3 (Jellybean or earlier) consists of Android 4.0 and older and Android 4.1 and newer for 2014. iOS 7.x or earlier consists of iOS 6.x and older and iOS 7.x and newer for 2014.
Source: Staff analysis of data from the Kentucky Technology Readiness Survey.

Student Home Internet Access. To understand how students connect to learning at home, school districts survey parents to determine home internet quality.[40] Table 4.11 shows that slightly more than half of school districts were able to collect information on home internet access in 2017, accounting for 49.3 percent of students. The districts that could not directly collect information estimated the quality of students' home internet by surveying students.[41]

Table 4.11
Student Home Internet Access
School Year 2017

District has a meaningful way to collect student home access information.		
Response	**Number Of Districts**	**Percent Of Districts**
Yes	93	53.8%
No, with ability to estimate	80	46.2
Student home internet capable of having a good experience watching a YouTube video.		
Response	**Number Of Students**	**Percent Of Students**
Capable	527,681	80.4%*
Known to be capable	268,422	40.9
Estimated to be capable	259,259	39.5
Not capable	128,614	19.6

*The Kentucky Department of Education previously reported the percentage of students with internet capable of having a good experience watching a YouTube video as 80 percent; KDE later reported 83 percent.
Source: Staff analysis of data from the Kentucky Technology Readiness Survey.

Districts surveyed parents and students and found that an estimated four out of five students in Kentucky had a reliable home internet connection.

In total, 80.4 percent of students in Kentucky had home internet access capable of providing a good experience watching a YouTube video, a metric that reflects students' home internet speed and quality. This means that an estimated 128,614 students, or 19.6 percent of total students, did not have internet speed and quality effectively capable of streaming a YouTube video in 2017.

These findings support the OEA survey result that many districts say that not all students have adequate access to technology at home and that students' home broadband access could be a barrier to using digital instructional materials.

The percentage of students with good-quality internet access at home ranged from 30 percent to 100 percent by district, and the average was 78 percent. Appendix F shows the percentage of students whose home internet was known or estimated to support effectively watching a YouTube video in 2017 by district. These findings support the OEA survey result that many district respondents acknowledged that not all students in their districts have adequate access to technology at home, including lack of a reliable internet connection, and the finding that students' home broadband access was a barrier associated with use of digital instruction materials.

Online Courses And Digital Learning

Online courses and digital learning expand access to education and technology by offering students personalized learning and college- and career-prep courses to meet student need regardless of physical location.

Online courses and digital learning offer students personalized learning and college- and career-prep courses in a variety of subjects to meet student need regardless of physical location.[42] Credit may be given based on performance or seat time. Performance-based classes award academic credit when learning is successfully demonstrated regardless of the number of instructional hours (704 KAR 3:305, sec. 5). Seat time classes refer

to classes with 120 instructional hours, commonly known as a Carnegie unit.[43]

The Kentucky Technology Readiness Survey asked respondents whether schools in their districts offer online courses for student credit. Table 4.12 shows that 157 districts offered online courses for student credit in 2017, an increase of 9.0 percent from 2014. More than half of all Kentucky districts awarded credit based on both performance and seat time, while one-third of these 157 districts based credit on performance only. The survey also reported that 139 districts offered all online or virtual courses to students, such as AP courses, electives in a variety of subjects, world languages, business education, career and technical education, and college dual credit.[44] Districts use a variety of course providers, shown in Appendix G.

Table 4.12
Credit For Online Courses
2017

Credit Criteria	Number Of Districts	Percent Among The Districts That Offer Course Credit
Performance only	52	33.1%
Seat time only	4	2.5
Performance and seat	101	64.3

Source: Staff analysis of data from the Kentucky Technology Readiness Survey.

Education programs are often administered, documented, and reported using learning management systems (LMS). LMS includes content management, communication tools, instruction tools, gradebooks, and assessment features.[45] Districts use a variety of LMS, shown in Appendix H.

Technology Programs For Students

Technology programs for students, such as the Students Technology Leadership Program (STLP) and Digital Citizenship, teach students practical use of technology.

In addition to instructional devices, technology hardware, and technology software, districts and schools may offer programs designed to support students' practical use of technology, including the Student Technology Leadership Program (STLP) and Digital Citizenship.

STLP uses technology to build students' capabilities and create leadership opportunities by teaching students marketable technology skills and providing relevant experiences.

Student Technology Leadership Program. The Student Technology Leadership Program uses technology to build students' capabilities and create leadership opportunities by teaching students marketable technology skills and providing relevant experiences. Some schools incorporate STLP into their technology support.[46] In 2017, STLP programs were active in

75 schools in 134 districts, accounting for 53.8 percent of schools and 77.5 percent of districts. The type of STLP participation varied by district. Figure 4.E shows that, in 2017, STLP was an after-school program in 32 districts, integrated into classrooms in 18 districts, and both an after-school program and integrated into classroom content in 84 districts. Although 134 districts participated in STLP, students assisted with technology leadership, services, support, and training in only 98 districts.

Figure 4.E
Districts Participating In Student Technology Leadership Program
School Years 2014 To 2017
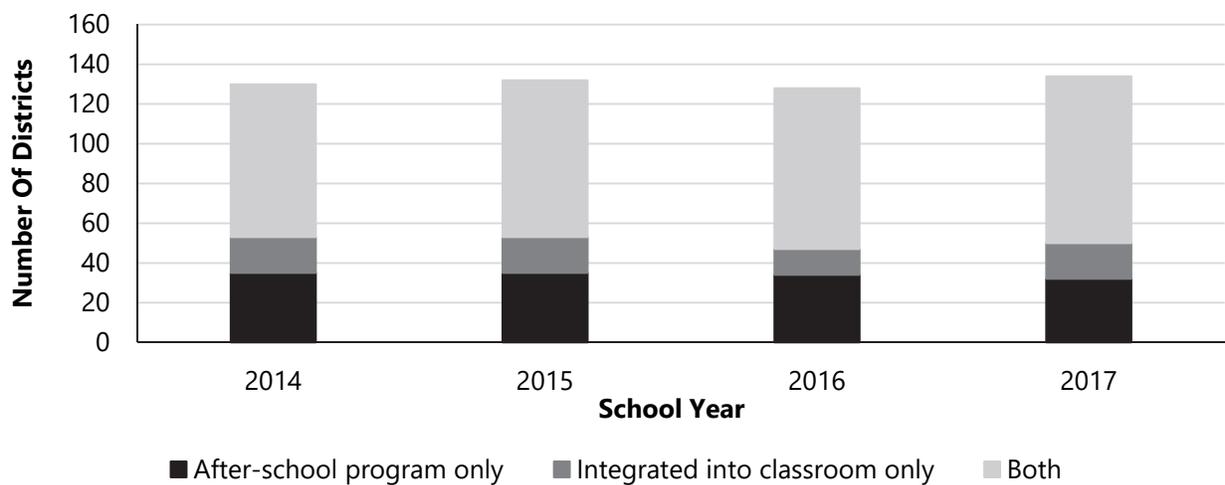
Source: Staff analysis of data from the Kentucky Technology Readiness Survey.

Digital Citizenship prepares students and teachers to use technology appropriately and responsibly through nine elements of digital communication and interaction.

Digital Citizenship For Student Learning. Digital Citizenship prepares students and teachers to use technology appropriately and responsibly through nine elements of digital communication and interaction: access, commerce, communication, etiquette, health and wellness, law, literacy, rights and responsibilities, and security.[47]

Students received Digital Citizenship instruction in 155 districts, and the number and combination of elements taught to students varied by district. Table 4.13 describes the elements of Digital Citizenship and the number and percentage of districts teaching each element. In 2017, 115 districts taught all nine elements, accounting for 66.5 percent of districts, while 37 districts taught six or fewer elements, including 11 districts that did not teach any elements. Digital literacy was covered in most districts, while digital commerce was the least taught element. Teachers received Digital Citizenship instruction in 105 districts, although the Technology Readiness Survey offers no further information about teacher instruction.

Table 4.13
Elements Of Digital Citizenship Implemented With Students
School Year 2017

Element	Definition	Districts		Students	
		Number	**Percent**	**Number**	**Percent**
Literacy	Process of teaching and learning about technology and the use of technology	159	91.9%	642,184	97.8%
Communication	Electronic exchange of information	158	91.3	638,309	97.3
Etiquette	Electronic standards of conduct or procedure	157	90.8	634,776	96.7
Rights and responsibilities	Those freedoms extended to everyone in a digital world	155	89.6	614,612	93.6
Access	Full electronic participation in society	154	89.0	634,666	96.7
Security	Electronic precautions to guarantee safety	153	88.4	616,819	94.0
Health and wellness	Physical and psychological well-being in a digital technology world	131	75.7	549,088	83.7
Law	Electronic responsibility for actions and deeds	131	75.7	555,792	84.7
Commerce	Electronic buying and selling of goods	120	69.4	523,914	79.8

Source: Staff analysis of data from the Kentucky Technology Readiness Survey.

Technology Leadership

The Kentucky Department of Education chief information officer (CIO) is responsible for the overall vision, leadership, direction, and efficacy of the education technology program, including input from all programs. Each Kentucky school district has a CIO counterpart, or education technology leader, with the same responsibilities, including collaboration and building working relationships.[48]

District-level education technology leaders direct education technology programs and may primarily focus on daily operations, on providing critical technology services, or on understanding education needs and challenges.

Education Technology Leaders. The number of days that education technology leaders were employed during the school year varied by district. The majority of districts (54.3 percent) reported employing an education technology leader for 240 days per school year in 2017, with 31.2 percent of districts employing an education technology leader for fewer than 240 days and 13.3 percent employing an education technology leader for more than 240 days. Two districts reported that they did not employ an education technology leader in 2017. This role may be filled by other technology personnel, as discussed in the following section. Education technology leaders have three areas of focus, according to the Kentucky Technology Readiness Survey. Education

technology leaders may focus on daily operations including hands-on repair, troubleshooting, or solving help desk requests; on ensuring that critical technology services are available, including managing staff and services; or on understanding educational needs and challenges of the district, including influencing district budget conversations, leading program funding efforts, and establishing direction and vision for technology use.

Table 4.14 shows that education technology leaders primarily focused on operations in 28.1 percent of districts, on critical technology services in 31.0 percent of districts, and on education and technology needs in 40.9 percent of districts in 2017. On average, education technology leaders spent 21.4 percent of their time on non-technology-related activities.

Table 4.14
District Education Technology Leaders' Primary Focus
School Year 2017

Primary Focus	Number Of Districts	Percent Of Districts
Daily operations	48	28.1%
Critical technology services availability	53	31.0
Education and technology needs	70	40.9

Note: Number of districts totals 171; two districts did not employ an education technology leader in 2017.
Source: Staff analysis of data from the Kentucky Technology Readiness Survey.

Organizational Structure Of Technology Leadership.
Table 4.15 shows that education technology leaders reported directly to superintendents in 144 districts and had districtwide technology budgetary control and influence over other budgets in 134 districts in 2017. In most districts, education technology leaders had budgetary control and reported to the district superintendent, although education technology leaders in 18 districts had budgetary control and did not report to the district superintendent.

Table 4.15
District Education Technology Leaders
School Year 2017

Education Technology Leader Responsibility	Number Of Districts	Percent Of Districts
Reported to superintendent	144	83.2%
Budgetary control	134	77.5
Reported to superintendent	116	67.1
Did not report to superintendent	18	10.4

Source: Staff analysis of data from the Kentucky Technology Readiness Survey.

Technology Service And Support

District-level technology service and support personnel include data quality managers, data stewards, technology resource teachers and technology integration specialists (TRT/TIS), school technology coordinators (STC), and internal or external technicians.

The Kentucky Department of Education collects a substantial amount of data at various levels of operation to inform decisions and support the Kentucky Board of Education's Strategic Plan. Technology service and support are important to ensuring quality of information, and there are several personnel positions within schools and districts to provide such services.[49]

Figure 4.F shows the number of districts with the following technology service and support personnel: data quality managers, data stewards, technology resource teachers and technology integration specialists (TRT/TIS), school technology coordinators (STC), and internal or external technicians.

Figure 4.F
Technology Service And Support Resources By District
School Years 2014 To 2017
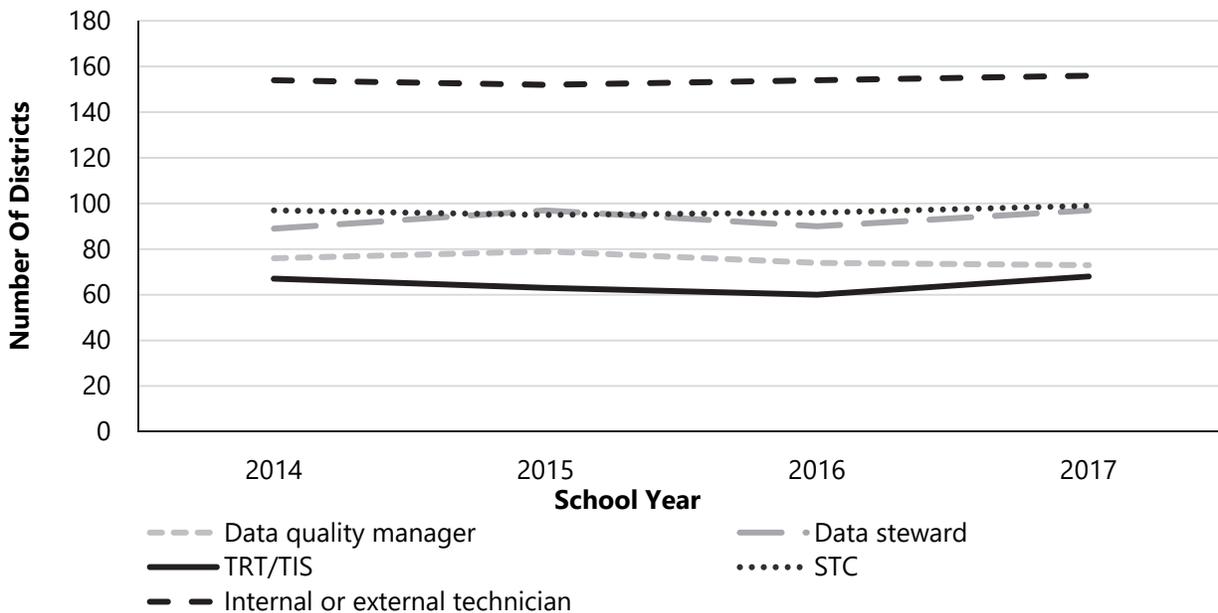
Note: TRT = technology resource specialist; TIS = technology integration specialist; STC = school technology coordinator.
Source: Staff analysis of data from the Kentucky Technology Readiness Survey.

Data stewards and data quality personnel are responsible for data subjects and data elements. About half of districts employed someone in at least one of these positions.

Data Stewards And Data Quality Personnel. Data stewards are responsible for data subjects and data elements, including expert understanding of the meaning and function of data elements, ability to answer detailed questions about data elements, and regular inspection for quality.[50] Data elements are units of information, such as average daily attendance, student ID number, course codes, and percent receiving free and reduced-price lunch.[51]

Data quality personnel are responsible for validating data and inspecting annual reporting for accuracy.[52]

Figure 4.F shows that 73 districts had designated data quality personnel and 97 districts had data stewards in 2017. Fifty-six districts had both data quality personnel and data stewards, while 59 districts had neither.

TRT/TIS support technology in curriculum and instruction. Approximately 40 percent of Kentucky school districts had at least some TRT/TIS personnel.

Technology Resource Teachers And Technology Integration Specialists. Technical resource teachers and technology integration specialists collaborate with teachers to enhance learning with technology and electronic software in the classroom. TRT/TIS are distinguished from technical support staff because TRT/TIS have curriculum and instruction expertise and provide leadership and vision to support learning and the education process with technology, whereas technical support staff have technical skills and certifications related to technology.[53]

Figure 4.F shows that in 2017, 64 districts had at least one full-time TRT/TIS and 4 districts had personnel whose responsibilities included TRT/TIS functions but were not fully TRT/TIS positions. This means that 39.3 percent of Kentucky school districts had at least some TRT/TIS personnel and 60.7 percent did not have any TRT/TIS personnel.

School technology coordinators help integrate instructional technology into classrooms. Approximately 65 percent of schools had at least one STC.

School Technology Coordinators. School technology coordinators provide support services to students, teachers, and administrators with integrating instructional technology into classrooms to support learning. Figure 4.F shows that 99 districts had at least one STC in 2017, accounting for 57.3 percent of districts. Within these districts, 908 public schools had at least one STC, accounting for 65.1 percent of schools. Of districts with an STC, 69.7 percent paid STCs a stipend. On average, STC stipends were $1,100.97 in 2017, a 13.9 percent decrease from 2014, when STC stipends were $1,279.29 on average.

Technical staff operate, maintain, and plan for technology, including installation, operation, maintenance, repair, troubleshooting, and security. Nearly all districts employed technical staff in 2017.

Technical Staff. Technical staff support technology initiatives in schools by operating, maintaining, and planning for technology, including installation, operation, maintenance, repair, troubleshooting, and security. District and school technicians may include network administrators, technical support managers, and lead systems analysts. Figure 4.F shows that 156 districts employed technicians in 2017, including 150 districts with in-house personnel only, 2 districts with outsourced technicians only, and 4 districts with both internal and external technicians.

Network Connectivity At The School Level

The connection speeds needed to support 1:1 implementation depend on how many students and devices are in the district, and there is not an established ideal connection speed for Kentucky public school districts.[54] Table 4.16 shows that nearly all public schools in Kentucky reported network connection speeds of 100 Mbps or greater while 7.1 percent of schools are located at a KEN Hub Site.[b] KEN Hub Sites are aggregation points joining school wide area network (WAN) connections with the state internet connections and are the internet distribution point for schools.[55]

Table 4.16
Public School Network Connection Speeds
School Year 2017

	Schools	
Network Connection Speeds	**Number**	**Percent**
10 Mbps or less	14	1.0%
Between 10 Mbps and 100 Mbps	50	3.6
Between 100 Mbps and 1 Gbps	777	55.7
Greater than 1 Gbps	455	32.6
Located at KEN Hub Site	99	7.1

Source: Staff analysis of data from the Kentucky Technology Readiness Survey.

EducationSuperHighway, a nonprofit research and advocacy group focused on internet usage in education, found that 100 percent of Kentucky schools provide 100 Kbps per student. EducationSuperHighway also suggests three general categories of technology use and the network speeds necessary to support each. The lowest usage category suggests that 100 Kbps can support individual classroom technology use with a basic network infrastructure for the school to support basic and media-rich technology use in all classroom, but not at the same time. The middle usage category suggests 1 Mbps can support everyday 1:1 technology use with digital curriculum in the classroom. The highest usage category suggests more than 1 Mbps can support media-rich technology use for crucial classroom instruction. [56] Table 4.16 shows that 99.0 percent of schools are operating at the highest usage category, and it is likely that all or some of the 14 schools categorized with connection speeds of up to or less

[b] The Kentucky Technology Readiness Survey notes that this assessment may, in some cases, include schools other than those with an A1 classification (for example, A5, A6, etc.) and reports a total of 1,397 schools. The survey also reports the total number of A1-D1 schools as 1,397, suggesting that the schools surveyed regarding network connection speeds are A1-D1 schools.

than 10 Mbps also fall within the high usage category.[c] EducationSuperHighway found that 100 percent of Kentucky schools provide 100 Kbps per student.

Wireless Capability. The Kentucky Technology Readiness Survey asked respondents whether schools in their districts had wireless ability to generally support BYOD or 1:1 implementation, described as dense wireless that was ready for every student to connect one or two devices and have a good user experience. Respondents could respond yes or no, meaning that responses did not distinguish between wireless that supports only BYOD, only 1:1 implementation, or both BYOD and 1:1 implementation. Because BYOD is a strategy to help districts achieve 1:1 implementation, distinguishing between BYOD and 1:1 implementation in this survey item is not necessary to understand the wireless capacity of districts. Figure 4.G shows that 95.1 percent of schools had wireless capable of supporting BYOD or 1:1 implementation in 2017 compared to 2014, when 66.3 percent had this capacity. The number of schools that could support wireless access for every student rose from 889 to 1,327, an increase of 49.3 percent.

Figure 4.G
Wireless Capability In Kentucky Public Schools
School Years 2014 To 2017
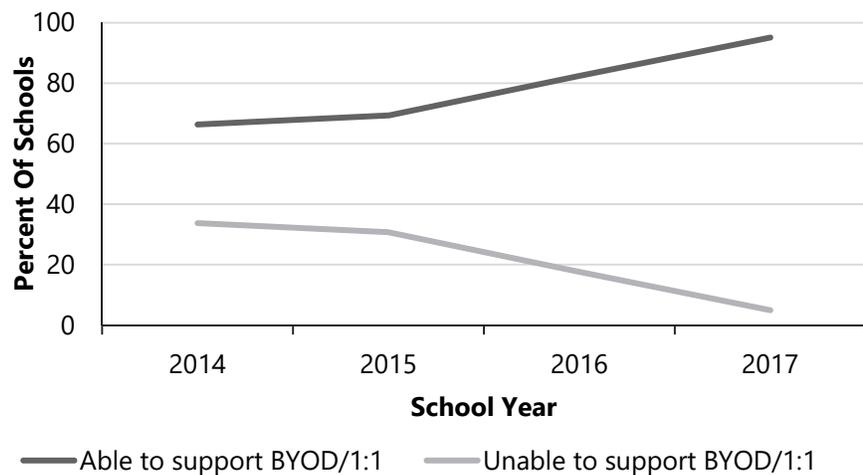
Note: BYOD = bring your own device; 1:1 = one school device per student.
Source: Staff analysis of data from the Kentucky Technology Readiness Survey.

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[c] The high usage category does not represent actual usage or adoption.

Finding 4.3

Finding 4.3

Between 2014 and 2017, Kentucky school districts increased technology devices, reduced device-to-student ratios, and updated operating systems. As discussed in the literature review, the data show only that districts acquired the technology tools to carry out educational goals; however, the actual effects on student learning and outcomes are unknown.

Appendix A

Instructional Materials Expenditures Per Object Code
For General Fund And Special Revenue Funds

Table A.1
General Fund Expenditures (Nominal Dollars)
Per Object Code, School Years 2008 To 2017

Year	Library Books (641)	Supplemental Materials (643)	Textbooks (644)	Tests (646)	Technology Supplies (650)	Technology Hardware (734)	Technology Software (735)	Other Object Codes	Annual Total
2008	$3,440,750	$1,491,568	$15,912,229	$3,440,265	$2,441,539	$19,319,093	$4,799,212	$10,814,823	$61,659,480
2009	3,361,873	1,915,443	13,345,971	3,178,916	2,457,447	19,294,939	4,152,017	11,655,638	59,362,244
2010	3,537,043	3,770,429	11,278,401	2,429,852	9,299,409	19,866,886	1,389,163	2,279,463	53,850,647
2011	4,577,612	4,146,506	12,251,635	3,511,499	10,089,875	22,723,159	4,786,244	2,144,727	64,231,258
2012	6,562,457	6,807,998	11,925,945	2,966,134	13,232,208	30,122,008	6,177,442	1,819,676	69,613,868
2013	3,354,831	4,436,357	9,721,396	3,011,836	13,457,088	24,195,767	6,172,869	1,639,422	65,989,566
2014	3,266,925	4,206,944	9,846,146	2,985,348	15,523,064	23,766,978	6,793,149	1,428,981	67,817,535
2015	3,384,635	4,011,845	7,790,864	3,313,696	17,323,462	21,347,887	7,939,505	1,357,654	66,469,548
2016	3,386,794	3,690,479	7,198,626	3,413,275	19,056,355	21,065,166	8,610,002	781,805	67,202,503
2017	3,142,212	4,074,356	11,865,606	3,760,027	19,766,663	19,048,978	9,293,881	1,115,321	72,067,044
Total	$38,015,132	$38,551,926	$111,136,819	$32,010,849	$122,647,111	$220,750,859	$60,113,484	$35,037,510	$658,263,691
Mean	$3,801,513	$3,855,193	$11,113,682	$3,201,085	$12,264,711	$22,075,086	$6,011,348	$3,503,751	$65,826,369
SD	$1,047,976	$1,442,284	$2,592,088	$373,651	$6,210,846	$3,390,177	$2,350,001	$4,104,018	$21,511,041
CV	27.6%	37.4%	23.3%	11.7%	50.6%	15.4%	39.1%	117.1%	32.7%

Note: SD = Standard deviation; CV = coefficient of variation. The coefficient of variation is the ratio of the standard deviation to the mean. The coefficient of variation metric is designed to measure volatility within the expenditure categories.
Source: Staff analysis conducted on district-level Annual Financial Report data.

Table A.2
General Fund Expenditures (2017 $) Per Object Code
School Years 2008 To 2017

Year	Library Books (641)	Supplemental Materials (643)	Textbooks (644)	Tests (646)	Technology Supplies (650)	Technology Hardware (734)	Technology Software (735)	Other Object Codes	Annual Total
2008	$3,918,449	$1,698,651	$18,121,417	$3,917,897	$2,780,512	$22,001,275	$5,465,515	$12,316,308	$70,220,024
2009	3,840,926	2,188,386	15,247,717	3,631,899	2,807,623	22,044,388	4,743,662	13,316,519	67,821,120
2010	3,975,987	4,238,337	12,678,041	2,731,395	10,453,458	22,332,351	1,561,557	2,562,343	60,533,470
2011	4,989,052	4,519,198	13,352,821	3,827,115	10,996,761	24,765,534	5,216,435	2,337,497	70,004,412
2012	7,007,026	7,269,201	12,733,861	3,167,073	14,128,616	32,162,605	6,595,928	1,942,949	85,007,260
2013	3,530,348	4,668,457	10,229,997	3,169,409	14,161,132	25,461,634	6,495,819	1,725,192	69,441,988
2014	3,383,310	4,356,818	10,196,918	3,091,702	16,076,078	24,613,684	7,035,158	1,479,889	70,233,558
2015	3,500,980	4,149,750	8,058,671	3,427,603	17,918,946	22,081,709	8,212,421	1,404,323	68,754,403
2016	3,459,226	3,769,406	7,352,580	3,486,273	19,463,906	21,515,678	8,794,141	798,525	68,639,735
2017	3,142,212	4,074,356	11,865,606	3,760,027	19,766,663	19,048,978	9,293,881	1,115,321	72,067,044
Total	$40,747,517	$40,932,559	$119,837,630	$34,210,393	$128,553,696	$236,027,836	$63,414,518	$38,998,865	$702,723,014
Mean	$4,074,752	$4,093,256	$11,983,763	$3,421,039	$12,855,370	$23,602,784	$6,341,452	$3,899,886	$70,272,301
SD	$1,148,681	$1,496,682	$3,238,310	$378,202	$6,168,570	$3,545,169	$2,266,571	$4,734,678	$22,976,863
CV	28.2%	36.6%	27.0%	11.1%	48.0%	15.0%	35.7%	121.4%	32.7%

Note: Dollars have been adjusted for inflation using the Consumer Price Index; CV = coefficient of variation. The coefficient of variation is the ratio of the standard deviation to the mean.
Source: Staff analysis conducted on district-level Annual Financial Reports data.

Table A.3
Special Revenue Expenditures (Nominal Dollars) Per Object Code
School Years 2008 To 2017

Year	Supplemental Materials (643)	Textbooks And Other Instructional Materials (644)	Technology Supplies (650)	Technology Hardware (734)	Technology Software (735)	Other Object Codes
2008	$4,553,513	$22,382,609	$1,185,981	$49,375,084	$4,547,651	$21,791,379
2009	5,077,883	20,224,071	1,235,657	25,498,364	4,330,734	18,741,436
2010	15,759,777	7,679,945	14,281,956	49,026,073	4,092,824	6,620,986
2011	12,748,658	3,292,167	11,237,728	46,103,189	8,163,720	4,912,860
2012	11,523,595	3,004,425	9,863,999	40,122,082	5,716,315	4,016,430
2013	9,940,583	1,912,432	8,899,012	35,090,238	4,712,298	3,116,384
2014	10,161,395	2,077,601	12,415,597	30,533,207	6,503,189	3,356,731
2015	10,670,097	9,862,482	15,108,447	31,189,022	6,588,750	3,752,206
2016	11,742,895	12,164,857	17,236,954	34,741,031	6,777,522	4,045,517
2017	12,069,261	8,882,767	19,402,960	28,509,024	7,533,465	4,367,284
Total	$104,247,656	$91,483,357	$110,868,291.85	$370,187,313	$58,966,467	$74,721,212
Mean	$10,424,766	$9,148,336	$11,086,829	$37,018,731	$5,896,647	$7,472,121
SD	$3,381,926	$7,333,712	$6,114,709	$8,686,531	$1,429,937	$6,850,652
CV	32.4%	80.2%	55.2%	23.5%	24.3%	91.7%

Note: SD = Standard deviation; CV = coefficient of variation. The coefficient of variation is the ratio of the standard deviation to the mean. The coefficient of variation metric is designed to measure volatility within the expenditure categories.
Source: Staff analysis conducted on district-level Annual Financial Report data.

Table A.4
Special Revenue Expenditures (2017 Dollars) Per Object Code
School Years 2008 To 2017

Year	Supplemental Materials (643)	Textbooks And Other Instructional Materials (644)	Technology Supplies (650)	Technology Hardware (734)	Technology Software (735)	Other Object Codes	Annual Total
2008	$5,185,703	$25,490,117	$1,350,638	$56,230,114	$5,179,027	$24,816,803	$118,252,403
2009	5,801,461	23,105,918	1,411,732	29,131,776	4,947,846	21,412,013	85,810,746
2010	17,715,554	8,633,021	16,054,335	55,110,171	4,600,740	7,442,645	109,556,465
2011	13,894,517	3,588,069	12,247,783	50,246,978	8,897,481	5,354,431	94,229,260
2012	12,304,253	3,207,958	10,532,230	42,840,128	6,103,563	4,288,520	79,276,652
2013	10,460,651	2,012,486	9,364,588	36,926,078	4,958,835	3,279,426	67,002,064
2014	10,523,398	2,151,616	12,857,907	31,620,963	6,734,867	3,476,315	67,365,067
2015	11,036,876	10,201,500	15,627,792	32,261,129	6,815,235	3,881,186	79,823,718
2016	11,994,036	12,425,022	17,605,593	35,484,023	6,922,470	4,132,037	88,563,181
2017	12,069,261	8,882,767	19,402,960	28,509,024	7,533,465	4,367,284	80,764,762
Total	$110,985,709	$99,698,474	$116,455,560	$398,360,383	$62,693,529	$82,450,661	$870,644,317
Mean	$11,098,571	$9,969,847	$11,645,556	$39,836,038	$6,269,353	$8,245,066	$87,064,432
SD	$3,629,547	$8,389,014	$6,235,972	$10,617,774	$1,370,754	$7,965,489	$16,590,026
CV	32.7%	84.1%	53.5%	26.7%	21.9%	96.6%	19.1%

Note: Dollars have been adjusted for inflation using the Consumer Price Index. SD = Standard deviation; CV = coefficient of variation. The coefficient of variation is the ratio of the standard deviation to the mean. The coefficient of variation metric is designed to measure volatility within the expenditure categories.
Source: Staff analysis conducted on district-level Annual Financial Reports data.

Appendix B

Technology To Print Expenditure Ratio Per District
School Years 2008 To 2017

Table B.1
General Fund Expenditure Ratio (Nominal Dollars)
Technology Relative To Print Per District
School Years 2008 To 2017 Combined

District	Print Materials	Technology-Related Materials	Technology:Print Expenditure Ratio
Adair County	$736,077	$895,160	1.2
Allen County	630,300	474,762	0.8
Anchorage Independent	366,543	488,590	1.3
Anderson County	624,567	467,017	0.7
Ashland Independent	869,400	614,842	0.7
Augusta Independent	69,088	109,794	1.6
Ballard County	323,026	1,048,810	3.2
Barbourville Independent	122,004	146,372	1.2
Bardstown Independent	948,453	725,356	0.8
Barren County	1,587,777	377,163	0.2
Bath County	597,944	1,459,874	2.4
Beechwood Independent	1,090,212	1,453,250	1.3
Bell County	337,162	491,594	1.5
Bellevue Independent	158,767	758,188	4.8
Berea Independent	706,004	798,244	1.1
Boone County	9,413,841	9,149,349	1.0
Bourbon County	721,447	745,244	1.0
Bowling Green Independent	1,914,449	2,335,839	1.2
Boyd County	1,248,410	1,567,409	1.3
Boyle County	987,452	2,033,565	2.1
Bracken County	325,526	483,021	1.5
Breathitt County	394,500	776,497	2.0
Breckinridge County	577,278	1,358,149	2.4
Bullitt County	3,544,913	11,475,415	3.2
Burgin Independent	150,463	300,509	2.0
Butler County	648,348	63,706	0.1
Caldwell County	641,973	859,887	1.3
Calloway County	1,858,214	1,819,431	1.0
Campbell County	2,106,636	3,968,249	1.9
Campbellsville Independent	202,925	849,657	4.2
Carlisle County	362,204	192,433	0.5
Carroll County	860,896	2,720,927	3.2
Carter County	728,306	1,051,225	1.4
Casey County	611,214	606,756	1.0

District	Print Materials	Technology-Related Materials	Technology:Print Expenditure Ratio
Caverna Independent	130,958	614,055	4.7
Christian County	4,476,552	5,078,027	1.1
Clark County	2,594,729	2,843,002	1.1
Clay County	394,685	429,523	1.1
Clinton County	534,616	271,265	0.5
Cloverport Independent	81,902	501,101	6.1
Corbin Independent	1,786,275	1,596,826	0.9
Covington Independent	1,222,980	2,731,719	2.2
Crittenden County	340,129	596,836	1.8
Cumberland County	227,673	221,290	1.0
Danville Independent	589,237	1,044,464	1.8
Daviess County	3,606,049	13,526,101	3.8
Dawson Springs Independent	531,728	553,331	1.0
Dayton Independent	226,989	555,138	2.4
East Bernstadt Independent	181,353	225,541	1.2
Edmonson County	387,380	254,535	0.7
Elizabethtown Independent	1,049,570	1,553,416	1.5
Elliott County	79,130	141,832	1.8
Eminence Independent	189,622	322,668	1.7
Erlanger-Elsmere Independent	350,700	582,185	1.7
Estill County	438,959	552,472	1.3
Fairview Independent	329,497	388,481	1.2
Fayette County	24,777,798	30,979,430	1.3
Fleming County	611,217	879,989	1.4
Floyd County	629,441	1,918,222	3.0
Fort Thomas Independent	1,740,373	3,010,565	1.7
Frankfort Independent	215,740	300,935	1.4
Franklin County	3,115,198	4,644,400	1.5
Fulton County	104,317	105,834	1.0
Fulton Independent	85,982	170,433	2.0
Gallatin County	517,863	1,830,157	3.5
Garrard County	858,633	1,452,671	1.7
Glasgow Independent	663,212	909,612	1.4
Grant County	839,178	1,141,574	1.4
Graves County	1,644,807	2,044,478	1.2
Grayson County	1,085,813	1,877,814	1.7
Green County	525,806	142,186	0.3
Greenup County	599,792	1,002,476	1.7
Hancock County	754,038	2,182,874	2.9
Hardin County	5,817,310	11,957,169	2.1
Harlan County	652,167	571,689	0.9
Harlan Independent	284,654	214,727	0.8
Harrison County	528,765	682,672	1.3
Hart County	333,606	1,801,062	5.4
Hazard Independent	277,604	368,987	1.3

District	Print Materials	Technology-Related Materials	Technology:Print Expenditure Ratio
Henderson County	4,582,622	9,226,949	2.0
Henry County	740,849	1,370,290	1.8
Hickman County	456,377	436,120	1.0
Hopkins County	2,126,902	3,216,323	1.5
Jackson County	495,306	809,212	1.6
Jackson Independent	71,734	172,269	2.4
Jefferson County	51,399,970	88,983,822	1.7
Jenkins Independent	125,564	295,604	2.4
Jessamine County	2,574,617	2,436,689	0.9
Johnson County	800,186	654,589	0.8
Kenton County	3,355,378	11,022,180	3.3
Knott County	565,656	368,698	0.7
Knox County	1,141,539	1,728,261	1.5
LaRue County	1,321,829	1,272,899	1.0
Laurel County	3,868,602	4,228,900	1.1
Lawrence County	887,771	1,217,585	1.4
Lee County	278,493	484,378	1.7
Leslie County	460,930	906,637	2.0
Letcher County	537,562	549,158	1.0
Lewis County	242,775	399,132	1.6
Lincoln County	1,556,088	1,046,758	0.7
Livingston County	455,340	640,711	1.4
Logan County	859,947	2,067,595	2.4
Ludlow Independent	271,648	609,317	2.2
Lyon County	188,608	510,428	2.7
Madison County	3,344,507	7,905,089	2.4
Magoffin County	595,408	521,169	0.9
Marion County	1,517,961	2,274,354	1.5
Marshall County	2,246,522	2,093,941	0.9
Martin County	402,701	318,198	0.8
Mason County	1,025,714	3,680,465	3.6
Mayfield Independent	812,998	1,050,551	1.3
McCracken County	3,238,082	6,786,588	2.1
McCreary County	1,125,358	768,612	0.7
McLean County	559,655	403,508	0.7
Meade County	1,686,809	2,884,574	1.7
Menifee County	406,910	591,965	1.5
Mercer County	1,031,262	1,123,596	1.1
Metcalfe County	390,443	678,221	1.7
Middlesboro Independent	416,937	306,614	0.7
Monroe County	201,424	903,926	4.5
Montgomery County	2,982,988	3,689,951	1.2
Morgan County	790,051	1,042,372	1.3
Muhlenberg County	2,707,585	3,315,598	1.2
Murray Independent	416,600	1,292,676	3.1

District	Print Materials	Technology-Related Materials	Technology:Print Expenditure Ratio
Nelson County	1,599,596	2,023,026	1.3
Newport Independent	502,576	1,367,361	2.7
Nicholas County	204,868	-36,269	-0.2
Ohio County	1,672,421	2,052,485	1.2
Oldham County	2,784,735	3,256,973	1.2
Owen County	338,554	1,471,323	4.3
Owensboro Independent	868,361	5,893,858	6.8
Owsley County	54,401	33,385	0.6
Paducah Independent	1,863,729	732,669	0.4
Paintsville Independent	358,682	405,058	1.1
Paris Independent	181,548	644,196	3.5
Pendleton County	605,744	1,832,571	3.0
Perry County	663,185	494,472	0.7
Pike County	2,032,560	1,970,450	1.0
Pikeville Independent	634,177	636,130	1.0
Pineville Independent	180,598	179,152	1.0
Powell County	418,385	960,472	2.3
Pulaski County	1,853,180	1,739,562	0.9
Raceland-Worthington Independent	381,855	206,883	0.5
Robertson County	93,348	114,499	1.2
Rockcastle County	674,814	1,149,377	1.7
Rowan County	904,704	862,732	1.0
Russell County	826,551	818,054	1.0
Russell Independent	1,218,916	1,746,361	1.4
Russellville Independent	685,578	863,195	1.3
Science Hill Independent	89,818	212,364	2.4
Scott County	4,101,405	3,330,565	0.8
Shelby County	2,980,593	4,406,879	1.5
Silver Grove Independent	110,742	138,815	1.3
Simpson County	1,026,212	1,700,775	1.7
Somerset Independent	540,294	811,080	1.5
Southgate Independent	125,312	154,910	1.2
Spencer County	1,086,875	1,040,944	1.0
Taylor County	739,828	1,033,425	1.4
Todd County	726,024	4,565,660	6.3
Trigg County	743,950	2,203,137	3.0
Trimble County	489,835	539,445	1.1
Union County	1,036,903	1,390,139	1.3
Walton-Verona Independent	745,646	2,117,371	2.8
Warren County	4,991,472	7,396,321	1.5
Washington County	515,614	538,954	1.0
Wayne County	562,517	463,205	0.8
Webster County	427,994	1,283,057	3.0
West Point Independent	3,790	2,653	0.7
Whitley County	1,041,451	708,068	0.7

District	Print Materials	Technology-Related Materials	Technology:Print Expenditure Ratio
Williamsburg Independent	232,445	81,015	0.3
Williamstown Independent	387,240	525,896	1.4
Wolfe County	229,261	104,645	0.5
Woodford County	1,978,068	3,437,931	1.7
Total	$254,662,908	$403,331,747	1.6
Mean	$1,472,040	$2,331,397	1.7
SD	$4,398,375	$7,349,290	1.1
CV	298.8%	315.2%	67.7%

Note: Figures may not sum because of rounding. Dollar figures are for school years 2008 to 2017 combined, in nominal dollars.
Source: Staff analysis conducted on district-level Annual Financial Report data.

Table B.2
Special Revenue Fund Expenditure Ratio (Nominal Dollars)
Technology Relative To Print Per District
School Years 2008 To 2017 Combined

District	Print Materials	Technology-Related Materials	Technology:Print Expenditure Ratio
Adair County	$858,339	$2,941,468	3.4
Allen County	859,574	2,292,176	2.7
Anchorage Independent	112,212	255,757	2.3
Anderson County	883,131	2,394,277	2.7
Ashland Independent	803,477	2,903,388	3.6
Augusta Independent	113,925	448,686	3.9
Ballard County	401,933	1,112,422	2.8
Barbourville Independent	337,631	273,272	0.8
Bardstown Independent	677,533	1,699,132	2.5
Barren County	1,438,690	2,466,862	1.7
Bath County	688,710	2,699,713	3.9
Beechwood Independent	289,309	849,117	2.9
Bell County	1,480,934	2,221,661	1.5
Bellevue Independent	377,364	618,723	1.6
Berea Independent	476,282	557,097	1.2
Boone County	9,273,406	14,949,477	1.6
Bourbon County	815,477	1,798,066	2.2
Bowling Green Independent	2,182,125	3,664,271	1.7
Boyd County	997,899	2,917,425	2.9
Boyle County	621,970	1,652,310	2.7
Bracken County	572,753	1,129,432	2.0
Breathitt County	974,954	4,596,955	4.7
Breckinridge County	1,484,849	1,681,713	1.1
Bullitt County	5,074,589	9,567,938	1.9
Burgin Independent	52,035	200,436	3.9
Butler County	374,257	1,279,178	3.4

District	Print Materials	Technology-Related Materials	Technology:Print Expenditure Ratio
Caldwell County	476,766	859,225	1.8
Calloway County	1,275,336	1,257,398	1.0
Campbell County	3,027,663	3,528,082	1.2
Campbellsville Independent	604,403	1,822,327	3.0
Carlisle County	163,380	511,488	3.1
Carroll County	665,411	1,956,128	2.9
Carter County	1,207,996	5,189,098	4.3
Casey County	704,977	1,720,116	2.4
Caverna Independent	218,035	843,740	3.9
Christian County	5,549,925	7,577,696	1.4
Clark County	1,829,442	3,602,887	2.0
Clay County	2,219,806	2,466,280	1.1
Clinton County	680,353	927,463	1.4
Cloverport Independent	193,791	360,475	1.9
Corbin Independent	573,986	3,241,573	5.6
Covington Independent	2,760,192	4,902,347	1.8
Crittenden County	722,327	1,258,507	1.7
Cumberland County	343,992	1,237,389	3.6
Danville Independent	968,545	1,407,311	1.5
Daviess County	3,607,739	8,554,159	2.4
Dawson Springs Independent	457,509	484,751	1.1
Dayton Independent	526,883	804,765	1.5
East Bernstadt Independent	253,400	445,966	1.8
Edmonson County	395,073	1,069,557	2.7
Elizabethtown Independent	936,231	1,976,366	2.1
Elliott County	596,959	478,777	0.8
Eminence Independent	158,531	1,778,518	11.2
Erlanger-Elsmere Independent	500,811	1,026,163	2.0
Estill County	1,044,836	2,837,661	2.7
Fairview Independent	303,669	396,804	1.3
Fayette County	20,046,131	23,620,633	1.2
Fleming County	631,781	2,518,832	4.0
Floyd County	3,817,535	8,413,554	2.2
Fort Thomas Independent	889,064	1,386,527	1.6
Frankfort Independent	607,937	729,324	1.2
Franklin County	2,990,550	3,690,011	1.2
Fulton County	261,360	567,121	2.2
Fulton Independent	243,335	317,554	1.3
Gallatin County	448,914	963,303	2.1
Garrard County	584,666	1,501,005	2.6
Glasgow Independent	794,310	2,177,748	2.7
Grant County	1,134,579	2,270,923	2.0
Graves County	599,094	2,775,692	4.6
Grayson County	1,750,996	3,704,923	2.1
Green County	590,755	1,136,561	1.9

District	Print Materials	Technology-Related Materials	Technology:Print Expenditure Ratio
Greenup County	760,959	1,864,292	2.4
Hancock County	375,803	1,107,843	2.9
Hardin County	7,480,850	13,502,761	1.8
Harlan County	1,680,672	4,471,120	2.7
Harlan Independent	253,327	302,590	1.2
Harrison County	832,722	1,401,850	1.7
Hart County	1,183,419	2,343,125	2.0
Hazard Independent	263,403	676,884	2.6
Henderson County	3,312,480	6,610,919	2.0
Henry County	604,988	1,446,248	2.4
Hickman County	245,074	432,801	1.8
Hopkins County	4,455,292	8,097,997	1.8
Jackson County	1,254,645	2,182,455	1.7
Jackson Independent	114,860	273,837	2.4
Jefferson County	51,657,351	85,352,388	1.7
Jenkins Independent	275,827	426,070	1.5
Jessamine County	2,680,770	4,885,634	1.8
Johnson County	1,157,529	2,494,192	2.2
Kenton County	4,602,233	7,658,863	1.7
Knott County	1,033,695	1,847,025	1.8
Knox County	2,037,107	5,911,194	2.9
LaRue County	1,212,231	3,195,024	2.6
Laurel County	5,667,133	7,604,647	1.3
Lawrence County	1,056,763	1,993,770	1.9
Lee County	754,218	1,178,055	1.6
Leslie County	1,187,952	2,058,639	1.7
Letcher County	1,667,721	2,649,202	1.6
Lewis County	999,140	2,049,616	2.1
Lincoln County	1,612,336	3,440,033	2.1
Livingston County	420,701	1,355,961	3.2
Logan County	1,633,379	4,062,156	2.5
Ludlow Independent	156,724	1,096,901	7.0
Lyon County	223,330	491,524	2.2
Madison County	5,379,351	7,504,779	1.4
Magoffin County	595,555	1,808,683	3.0
Marion County	1,462,492	2,514,371	1.7
Marshall County	1,033,642	2,221,102	2.1
Martin County	495,440	3,208,338	6.5
Mason County	1,569,035	2,130,818	1.4
Mayfield Independent	268,152	1,239,091	4.6
McCracken County	1,752,779	4,664,344	2.7
McCreary County	3,027,415	4,036,849	1.3
McLean County	345,652	1,250,514	3.6
Meade County	1,278,208	3,157,924	2.5
Menifee County	391,102	730,823	1.9

District	Print Materials	Technology-Related Materials	Technology:Print Expenditure Ratio
Mercer County	1,440,291	3,409,212	2.4
Metcalfe County	754,410	2,529,377	3.4
Middlesboro Independent	488,565	2,017,316	4.1
Monroe County	310,469	888,237	2.9
Montgomery County	1,080,542	3,369,904	3.1
Morgan County	669,133	1,831,050	2.7
Muhlenberg County	1,322,495	3,206,685	2.4
Murray Independent	341,316	1,334,811	3.9
Nelson County	1,304,077	3,362,008	2.6
Newport Independent	1,353,729	2,967,295	2.2
Nicholas County	313,421	677,523	2.2
Ohio County	1,779,287	3,602,027	2.0
Oldham County	2,429,261	7,717,496	3.2
Owen County	655,485	1,040,908	1.6
Owensboro Independent	2,132,342	5,888,945	2.8
Owsley County	572,703	1,578,996	2.8
Paducah Independent	1,225,683	2,981,198	2.4
Paintsville Independent	205,041	569,201	2.8
Paris Independent	195,121	712,544	3.7
Pendleton County	413,234	1,960,187	4.7
Perry County	1,849,999	5,834,073	3.2
Pike County	2,182,103	7,176,703	3.3
Pikeville Independent	623,993	1,552,433	2.5
Pineville Independent	110,408	441,549	4.0
Powell County	1,399,401	2,902,721	2.1
Pulaski County	2,574,734	6,604,093	2.6
Raceland-Worthington Independent	312,467	522,203	1.7
Robertson County	212,562	234,292	1.1
Rockcastle County	1,760,979	2,703,645	1.5
Rowan County	766,858	2,314,264	3.0
Russell County	541,994	1,995,405	3.7
Russell Independent	683,803	930,465	1.4
Russellville Independent	788,822	942,653	1.2
Science Hill Independent	132,744	206,178	1.6
Scott County	2,271,421	3,747,559	1.6
Shelby County	1,921,538	3,956,514	2.1
Silver Grove Independent	70,652	74,701	1.1
Simpson County	826,473	3,769,463	4.6
Somerset Independent	739,491	1,228,384	1.7
Southgate Independent	49,715	87,067	1.8
Spencer County	967,660	1,908,345	2.0
Taylor County	701,076	2,894,261	4.1
Todd County	850,421	1,553,017	1.8
Trigg County	1,138,872	1,917,274	1.7
Trimble County	519,288	1,399,157	2.7

District	Print Materials	Technology-Related Materials	Technology:Print Expenditure Ratio
Union County	568,409	1,434,421	2.5
Walton-Verona Independent	238,364	1,125,711	4.7
Warren County	5,841,764	10,319,203	1.8
Washington County	1,012,051	1,744,056	1.7
Wayne County	1,347,503	2,480,285	1.8
Webster County	848,587	1,355,362	1.6
West Point Independent	59,647	202,755	3.4
Whitley County	2,696,703	4,496,743	1.7
Williamsburg Independent	134,451	430,767	3.2
Williamstown Independent	182,091	460,824	2.5
Wolfe County	574,209	1,181,945	2.1
Woodford County	1,447,622	4,646,179	3.2
Total	$278,971,273	$544,820,526	2.0
Mean	$1,612,551	$3,149,252	2.4
SD	$4,311,659	$6,921,737	1.3
CV	267.4%	219.8%	52.8%

Note: Figures may not sum due to rounding. Dollar figures are for school years 2008 to 2017 combined, in nominal dollars. Table does not include figures for Monticello Independent School District, 2008-2012; the district merged with the Wayne County district in 2013.
Source: Staff analysis conducted on district-level Annual Financial Report data.

Table B.3
General And Special Revenue Funds Expenditure Ratio (Nominal Dollars)
Technology Relative To Print Per District
School Years 2008 To 2017 Combined

District	Print Materials	Technology-Related Materials	Technology:Print Expenditure Ratio
Adair County	$1,594,416	$3,836,629	2.4
Allen County	1,489,874	2,766,938	1.9
Anchorage Independent	478,755	744,347	1.6
Anderson County	1,507,698	2,861,294	1.9
Ashland Independent	1,672,877	3,518,230	2.1
Augusta Independent	183,013	558,481	3.1
Ballard County	724,959	2,161,232	3.0
Barbourville Independent	459,634	419,644	0.9
Bardstown Independent	1,625,986	2,424,487	1.5
Barren County	3,026,467	2,844,025	0.9
Bath County	1,286,653	4,159,587	3.2
Beechwood Independent	1,379,521	2,302,367	1.7
Bell County	1,818,097	2,713,256	1.5
Bellevue Independent	536,131	1,376,911	2.6
Berea Independent	1,182,286	1,355,341	1.1
Boone County	18,687,247	24,098,826	1.3
Bourbon County	1,536,925	2,543,310	1.7

District	Print Materials	Technology-Related Materials	Technology:Print Expenditure Ratio
Bowling Green Independent	4,096,574	6,000,110	1.5
Boyd County	2,246,309	4,484,835	2.0
Boyle County	1,609,422	3,685,875	2.3
Bracken County	898,278	1,612,453	1.8
Breathitt County	1,369,454	5,373,453	3.9
Breckinridge County	2,062,128	3,039,862	1.5
Bullitt County	8,619,502	21,043,353	2.4
Burgin Independent	202,499	500,946	2.5
Butler County	1,022,605	1,342,884	1.3
Caldwell County	1,118,739	1,719,113	1.5
Calloway County	3,133,550	3,076,828	1.0
Campbell County	5,134,299	7,496,331	1.5
Campbellsville Independent	807,327	2,671,984	3.3
Carlisle County	525,584	703,921	1.3
Carroll County	1,526,307	4,677,055	3.1
Carter County	1,936,302	6,240,322	3.2
Casey County	1,316,191	2,326,872	1.8
Caverna Independent	348,994	1,457,795	4.2
Christian County	10,026,478	12,655,722	1.3
Clark County	4,424,171	6,445,889	1.5
Clay County	2,614,491	2,895,803	1.1
Clinton County	1,214,969	1,198,728	1.0
Cloverport Independent	275,694	861,576	3.1
Corbin Independent	2,360,261	4,838,399	2.0
Covington Independent	3,983,172	7,634,066	1.9
Crittenden County	1,062,456	1,855,343	1.7
Cumberland County	571,665	1,458,679	2.6
Danville Independent	1,557,782	2,451,774	1.6
Daviess County	7,213,788	22,080,260	3.1
Dawson Springs Independent	989,237	1,038,082	1.0
Dayton Independent	753,871	1,359,902	1.8
East Bernstadt Independent	434,753	671,507	1.5
Edmonson County	782,453	1,324,092	1.7
Elizabethtown Independent	1,985,801	3,529,781	1.8
Elliott County	676,088	620,610	0.9
Eminence Independent	348,153	2,101,186	6.0
Erlanger-Elsmere Independent	851,511	1,608,348	1.9
Estill County	1,483,795	3,390,133	2.3
Fairview Independent	633,166	785,285	1.2
Fayette County	44,823,929	54,600,063	1.2
Fleming County	1,242,998	3,398,821	2.7
Floyd County	4,446,976	10,331,776	2.3
Fort Thomas Independent	2,629,437	4,397,093	1.7
Frankfort Independent	823,678	1,030,258	1.3
Franklin County	6,105,747	8,334,411	1.4

District	Print Materials	Technology-Related Materials	Technology:Print Expenditure Ratio
Fulton County	365,677	672,954	1.8
Fulton Independent	329,317	487,987	1.5
Gallatin County	966,778	2,793,460	2.9
Garrard County	1,443,299	2,953,676	2.0
Glasgow Independent	1,457,523	3,087,361	2.1
Grant County	1,973,757	3,412,496	1.7
Graves County	2,243,900	4,820,170	2.1
Grayson County	2,836,809	5,582,738	2.0
Green County	1,116,560	1,278,748	1.1
Greenup County	1,360,751	2,866,768	2.1
Hancock County	1,129,841	3,290,716	2.9
Hardin County	13,298,160	25,459,930	1.9
Harlan County	2,332,838	5,042,809	2.2
Harlan Independent	537,981	517,317	1.0
Harrison County	1,361,488	2,084,521	1.5
Hart County	1,517,024	4,144,187	2.7
Hazard Independent	541,007	1,045,870	1.9
Henderson County	7,895,102	15,837,868	2.0
Henry County	1,345,837	2,816,538	2.1
Hickman County	701,452	868,921	1.2
Hopkins County	6,582,194	11,314,320	1.7
Jackson County	1,749,950	2,991,667	1.7
Jackson Independent	186,594	446,105	2.4
Jefferson County	103,057,322	174,336,210	1.7
Jenkins Independent	401,391	721,674	1.8
Jessamine County	5,255,387	7,322,323	1.4
Johnson County	1,957,715	3,148,781	1.6
Kenton County	7,957,612	18,681,043	2.3
Knott County	1,599,351	2,215,724	1.4
Knox County	3,178,646	7,639,454	2.4
LaRue County	2,534,060	4,467,923	1.8
Laurel County	9,535,735	11,833,547	1.2
Lawrence County	1,944,534	3,211,355	1.7
Lee County	1,032,710	1,662,433	1.6
Leslie County	1,648,882	2,965,276	1.8
Letcher County	2,205,283	3,198,360	1.5
Lewis County	1,241,915	2,448,748	2.0
Lincoln County	3,168,424	4,486,791	1.4
Livingston County	876,040	1,996,672	2.3
Logan County	2,493,326	6,129,751	2.5
Ludlow Independent	428,373	1,706,219	4.0
Lyon County	411,939	1,001,951	2.4
Madison County	8,723,858	15,409,868	1.8
Magoffin County	1,190,963	2,329,852	2.0
Marion County	2,980,453	4,788,725	1.6

District	Print Materials	Technology-Related Materials	Technology:Print Expenditure Ratio
Marshall County	3,280,164	4,315,043	1.3
Martin County	898,140	3,526,535	3.9
Mason County	2,594,749	5,811,283	2.2
Mayfield Independent	1,081,150	2,289,642	2.1
McCracken County	4,990,861	11,450,932	2.3
McCreary County	4,152,773	4,805,461	1.2
McLean County	905,307	1,654,021	1.8
Meade County	2,965,017	6,042,498	2.0
Menifee County	798,012	1,322,788	1.7
Mercer County	2,471,553	4,532,809	1.8
Metcalfe County	1,144,854	3,207,598	2.8
Middlesboro Independent	905,502	2,323,931	2.6
Monroe County	511,893	1,792,163	3.5
Montgomery County	4,063,531	7,059,855	1.7
Morgan County	1,459,184	2,873,422	2.0
Muhlenberg County	4,030,080	6,522,284	1.6
Murray Independent	757,917	2,627,487	3.5
Nelson County	2,903,674	5,385,034	1.9
Newport Independent	1,856,304	4,334,656	2.3
Nicholas County	518,289	641,255	1.2
Ohio County	3,451,708	5,654,512	1.6
Oldham County	5,213,996	10,974,469	2.1
Owen County	994,040	2,512,231	2.5
Owensboro Independent	3,000,703	11,782,802	3.9
Owsley County	627,104	1,612,381	2.6
Paducah Independent	3,089,412	3,713,867	1.2
Paintsville Independent	563,723	974,259	1.7
Paris Independent	376,669	1,356,740	3.6
Pendleton County	1,018,979	3,792,758	3.7
Perry County	2,513,184	6,328,545	2.5
Pike County	4,214,664	9,147,153	2.2
Pikeville Independent	1,258,170	2,188,564	1.7
Pineville Independent	291,006	620,701	2.1
Powell County	1,817,786	3,863,193	2.1
Pulaski County	4,427,915	8,343,656	
Raceland-Worthington Independent	694,322	729,086	1.1
Robertson County	305,909	348,790	1.1
Rockcastle County	2,435,792	3,853,023	1.6
Rowan County	1,671,563	3,176,996	1.9
Russell County	1,368,545	2,813,459	2.1
Russell Independent	1,902,719	2,676,826	1.4
Russellville Independent	1,474,400	1,805,848	1.2
Science Hill Independent	222,562	418,542	1.9
Scott County	6,372,826	7,078,125	1.1
Shelby County	4,902,132	8,363,394	1.7

District	Print Materials	Technology-Related Materials	Technology:Print Expenditure Ratio
Silver Grove Independent	181,394	213,516	1.2
Simpson County	1,852,684	5,470,238	3.0
Somerset Independent	1,279,785	2,039,464	1.6
Southgate Independent	175,027	241,977	1.4
Spencer County	2,054,535	2,949,289	1.4
Taylor County	1,440,904	3,927,686	2.7
Todd County	1,576,445	6,118,677	3.9
Trigg County	1,882,823	4,120,411	2.2
Trimble County	1,009,123	1,938,602	1.9
Union County	1,605,313	2,824,561	1.8
Walton-Verona Independent	984,010	3,243,082	3.3
Warren County	10,833,237	17,715,524	1.6
Washington County	1,527,665	2,283,010	1.5
Wayne County	1,910,020	2,943,490	1.5
Webster County	1,276,581	2,638,419	2.1
West Point Independent	63,437	205,408	3.
Whitley County	3,738,153	5,204,811	1.4
Williamsburg Independent	366,896	511,782	1.4
Williamstown Independent	569,331	986,720	1.7
Wolfe County	803,470	1,286,590	1.6
Woodford County	3,425,690	8,084,111	2.4
Total	$533,634,180	$948,152,273	1.8
Mean	$3,084,591	$5,480,649	2.0
SD	$8,674,388	$14,172,177	0.8
CV	281.2%	258.6%	38.6%

Note: Figures may not sum because of rounding. Dollar figures are for school years 2008 to 2017 combined, in nominal dollars.
Source: Staff analysis conducted on district-level Annual Financial Report data.

Appendix C

1:1 Device Implementation And District BYOD Policies

One-to-one device implementation refers to the ratio of technology devices to student and teachers/administrators.[57] According to the 2017 Kentucky Technology Readiness Survey, Kentucky public school districts vary in their ratio of technology devices to students, ranging from one device per 0.6 students to one device per 3.5 students. The ratio of devices to elementary students ranged from one device per 0.5 students to one device per 4.2 students. The ratio of devices to secondary students ranged from one device per 0.5 students to one device per 5.2 students. The ratio of devices to certified staff, certified teachers, and classified staff ranged from one device per 0.3 staff members to one device per 3.1 staff members.

Bring your own device (BYOD) is the practice of students or teachers/staff bringing their personally owned devices to school as a learning tool. BYOD can allow districts to move toward the goal of 1:1 implementation in practice at a reduced cost to districts.[58] According to the 2017 Kentucky Technology Readiness Survey, districts vary in whether students and staff may bring personally owned devices to school. In 2017, 127 districts allowed both students and staff to bring their own devices and 29 districts did not allow either students or staff to bring their own devices.

Table C.1 shows the device-to-student/staff ratio and BYOD policy by district. Because the number of devices reported in the Technology Readiness Survey reflects only devices owned by districts and does not include devices brought in by students and/or staff members,[59] the following 1:1 implementation ratios are likely to be conservative estimates of the number of devices for student and staff use.

Table C.1
Students And Staff Per Device And BYOD Policy By District
2017

	Number Per Device				BYOD Policy	
School District	**Total Students**	**Elementary Students**	**Secondary Students**	**FTE Staff And Teachers**	**Students**	**Staff**
Adair County	1.1	1.1	1.2	0.9	Yes	Yes
Allen County	1.6	2.0	1.3	1.4	No	No
Anchorage Independent	0.9	0.9	1.0	1.3	No	No
Anderson County	1.6	1.5	1.8	1.0	Yes	Yes
Ashland Independent	1.3	0.9	2.1	1.0	Yes	Yes
Augusta Independent	0.7	0.9	0.7	1.0	Yes	Yes
Ballard County	1.9	2.6	1.6	1.5	Yes	Yes

| School District | Number Per Device | | | | BYOD Policy | |
	Total Students	Elementary Students	Secondary Students	FTE Staff And Teachers	Students	Staff
Barbourville Independent	2.0	4.1	1.4	1.6	Yes	Yes
Bardstown Independent	1.4	1.3	1.4	1.4	Yes	Yes
Barren County	1.8	1.4	2.3	1.8	Yes	Yes
Bath County	1.6	1.8	1.4	1.2	Yes	Yes
Beechwood Independent	1.0	1.2	0.9	1.7	Yes	Yes
Bell County	2.2	1.4	5.2	3.0	No	No
Bellevue Independent	1.0	1.0	1.1	1.2	Yes	Yes
Berea Independent	2.9	4.2	2.3	2.0	Yes	Yes
Boone County	1.0	0.9	1.1	1.3	Yes	Yes
Bourbon County	1.2	1.1	1.4	2.4	Yes	Yes
Bowling Green Independent	1.2	1.2	1.1	1.0	Yes	Yes
Boyd County	1.0	1.0	1.1	1.5	Yes	Yes
Boyle County	0.8	0.7	0.8	1.6	Yes	Yes
Bracken County	1.6	2.3	1.3	1.8	Yes	Yes
Breathitt County	0.9	0.8	1.0	2.2	Yes	Yes
Breckinridge County	2.0	1.6	2.5	1.2	Yes	Yes
Bullitt County	1.2	1.4	1.1	1.0	Yes	Yes
Burgin Independent	1.2	1.7	1.0	1.0	Yes	Yes
Butler County	3.5	3.8	3.3	2.8	Yes	Yes
Caldwell County	1.3	1.5	1.2	1.2	Yes	Yes
Calloway County	1.6	1.5	1.8	1.8	Yes	Yes
Campbell County	1.2	1.1	1.3	1.4	Yes	Yes
Campbellsville Independent	1.2	1.9	0.8	1.6	Yes	Yes
Carlisle County	1.6	1.4	1.9	0.9	Yes	Yes
Carroll County	0.8	1.1	0.6	1.3	Yes	Yes
Carter County	1.2	1.3	1.1	2.0	Yes	Yes
Casey County	1.6	1.7	1.5	1.3	Yes	Yes
Caverna Independent	0.8	0.8	0.8	2.2	No	No
Christian County	1.2	1.0	1.3	1.1	Yes	Yes
Clark County	1.9	2.6	1.5	1.2	Yes	Yes
Clay County	2.5	2.1	3.3	2.1	Yes	Yes
Clinton County	1.2	2.0	0.9	1.4	Yes	Yes

| School District | Number Per Device | | | | BYOD Policy | |
	Total Students	Elementary Students	Secondary Students	FTE Staff And Teachers	Students	Staff
Cloverport Independent	0.8	0.8	0.8	0.8	No	Yes
Corbin Independent	1.2	1.3	1.1	1.3	Yes	Yes
Covington Independent	1.8	2.6	1.3	1.6	No	Yes
Crittenden County	0.9	2.2	0.5	1.8	Yes	Yes
Cumberland County	0.8	0.9	0.8	0.8	Yes	Yes
Danville Independent	0.9	0.9	0.9	1.0	Yes	Yes
Daviess County	0.9	1.0	0.7	0.8	Yes	Yes
Dawson Springs Independent	1.3	1.5	1.2	1.3	Yes	Yes
Dayton Independent	1.4	2.4	0.9	1.5	Yes	Yes
East Bernstadt Independent	1.2	1.3	0.9	0.9	No	Yes
Edmonson County	1.2	1.3	1.2	1.3	No	No
Elizabethtown Independent	1.2	1.2	1.2	1.2	Yes	Yes
Elliott County	1.8	1.4	2.3	1.6	No	No
Eminence Independent	1.0	1.0	1.0	1.5	Yes	Yes
Erlanger-Elsmere Independent	1.4	1.5	1.2	1.1	Yes	Yes
Estill County	1.7	1.8	1.7	1.6	Yes	Yes
Fairview Independent	0.7	1.0	0.6	0.9	No	No
Fayette County	1.2	1.1	1.4	1.9	Yes	Yes
Fleming County	1.0	0.8	1.2	0.9	Yes	Yes
Floyd County	0.8	1.3	0.6	0.9	No	No
Fort Thomas Independent	0.9	0.8	0.9	0.8	Yes	Yes
Frankfort Independent	0.8	0.7	0.8	0.8	Yes	Yes
Franklin County	0.7	0.9	0.5	1.0	Yes	Yes
Fulton County	1.3	2.3	0.9	1.3	Yes	Yes
Fulton Independent	2.4	3.0	1.9	1.4	No	No
Gallatin County	1.0	1.4	0.8	1.3	No	No
Garrard County	1.9	2.1	1.8	1.9	No	No
Glasgow Independent	1.4	1.1	1.8	1.7	Yes	Yes

| School District | Number Per Device | | | | BYOD Policy | |
	Total Students	Elementary Students	Secondary Students	FTE Staff And Teachers	Students	Staff
Grant County	2.4	2.7	2.1	1.5	Yes	Yes
Graves County	2.0	1.7	2.4	1.7	Yes	Yes
Grayson County	1.7	1.4	1.9	1.7	Yes	Yes
Green County	1.1	1.1	1.1	2.8	No	No
Greenup County	1.0	1.0	1.0	1.7	No	No
Hancock County	0.9	1.4	0.7	1.0	Yes	Yes
Hardin County	1.1	1.1	1.1	0.9	Yes	Yes
Harlan County	1.7	3.9	1.1	2.7	No	No
Harlan Independent	2.8	3.0	2.6	2.2	Yes	Yes
Harrison County	1.8	2.0	1.7	1.2	Yes	Yes
Hart County	1.0	0.9	1.1	2.5	No	No
Hazard Independent	1.7	2.5	1.3	0.8	Yes	Yes
Henderson County	1.3	1.0	1.8	0.7	Yes	Yes
Henry County	1.0	0.9	1.1	1.2	Yes	Yes
Hickman County	2.5	2.6	2.4	2.0	No	Yes
Hopkins County	1.1	1.5	0.9	1.0	Yes	Yes
Jackson County	1.1	1.3	0.9	1.1	Yes	Yes
Jackson Independent	0.6	0.8	0.5	1.4	Yes	Yes
Jefferson County	1.4	1.7	1.2	1.2	Yes	Yes
Jenkins Independent	0.7	0.7	0.7	0.7	No	Yes
Jessamine County	1.0	1.5	0.7	1.2	Yes	Yes
Johnson County	0.9	1.1	0.8	1.3	Yes	Yes
Kenton County	2.0	1.6	2.5	1.2	Yes	Yes
Knott County	1.8	2.8	1.4	1.9	Yes	Yes
Knox County	1.1	0.8	1.5	2.7	Yes	Yes
LaRue County	0.9	1.3	0.7	1.4	No	No
Laurel County	1.7	1.9	1.6	1.2	No	Yes
Lawrence County	0.9	1.0	0.8	2.7	Yes	Yes
Lee County	0.6	0.6	0.5	0.7	Yes	Yes
Leslie County	1.0	1.7	0.7	2.0	No	No
Letcher County	1.3	1.1	1.5	1.8	Yes	Yes
Lewis County	1.0	1.0	1.1	2.0	Yes	Yes
Lincoln County	1.3	1.3	1.3	1.0	Yes	Yes
Livingston County	1.2	1.2	1.2	1.8	No	No
Logan County	1.2	1.4	1.1	1.2	Yes	Yes
Ludlow Independent	1.6	1.4	1.8	1.4	No	No
Lyon County	1.5	1.4	1.6	1.1	Yes	Yes

| School District | Number Per Device | | | | BYOD Policy | |
	Total Students	Elementary Students	Secondary Students	FTE Staff And Teachers	Students	Staff
Madison County	1.4	1.5	1.2	2.1	Yes	Yes
Magoffin County	1.2	1.2	1.2	1.7	No	No
Marion County	1.0	1.4	0.7	1.1	Yes	Yes
Marshall County	1.5	1.3	1.7	1.8	Yes	Yes
Martin County	1.6	1.7	1.6	1.4	Yes	Yes
Mason County	1.0	1.3	0.8	1.7	Yes	Yes
Mayfield Independent	1.8	2.5	1.4	1.7	Yes	Yes
McCracken County	1.5	1.9	1.2	2.6	No	No
McCreary County	0.8	0.9	0.7	0.7	Yes	No
McLean County	1.6	1.7	1.5	2.0	Yes	Yes
Meade County	0.8	0.5	1.9	0.3	Yes	Yes
Menifee County	1.4	1.8	1.2	0.9	No	No
Mercer County	1.7	1.4	2.0	1.8	Yes	Yes
Metcalfe County	0.9	0.9	0.8	1.4	Yes	Yes
Middlesboro Independent	1.1	1.5	0.9	1.3	Yes	Yes
Monroe County	1.4	1.3	1.5	1.4	Yes	Yes
Montgomery County	1.0	1.5	0.8	1.1	No	Yes
Morgan County	1.4	1.8	1.1	1.5	No	Yes
Muhlenberg County	1.3	1.2	1.5	1.5	Yes	Yes
Murray Independent	1.4	1.7	1.3	1.4	Yes	Yes
Nelson County	1.2	1.4	1.0	1.2	Yes	Yes
Newport Independent	0.8	0.9	0.8	1.1	No	Yes
Nicholas County	2.4	2.2	2.5	1.6	No	No
Ohio County	1.2	1.8	0.9	1.4	Yes	Yes
Oldham County	1.7	2.0	1.5	0.9	Yes	Yes
Owen County	1.6	1.9	1.4	0.8	No	No
Owensboro Independent	1.0	1.8	0.7	2.1	No	Yes
Owsley County	0.7	0.5	0.9	1.3	Yes	Yes
Paducah Independent	1.3	1.3	1.3	1.2	No	Yes
Paintsville Independent	1.4	1.8	1.2	1.8	Yes	Yes
Paris Independent	1.1	1.8	0.8	0.9	Yes	Yes
Pendleton County	1.1	1.1	1.1	1.1	Yes	Yes
Perry County	1.6	2.5	1.2	2.9	Yes	Yes
Pike County	1.3	0.9	2.5	1.3	No	No

| School District | Number Per Device | | | | BYOD Policy | |
	Total Students	Elementary Students	Secondary Students	FTE Staff And Teachers	Students	Staff
Pikeville Independent	1.2	1.1	1.3	1.7	No	No
Pineville Independent	1.1	0.9	1.3	1.4	Yes	Yes
Powell County	1.0	1.1	0.9	0.6	Yes	Yes
Pulaski County	1.4	1.3	1.4	2.6	Yes	Yes
Raceland-Worthington Independent	1.0	1.5	0.8	1.0	Yes	Yes
Robertson County	0.8	0.9	0.8	0.9	No	No
Rockcastle County	1.8	1.8	1.8	1.6	No	Yes
Rowan County	2.8	3.0	2.7	3.1	Yes	Yes
Russell County	1.7	2.1	1.5	2.4	Yes	Yes
Russell Independent	1.8	1.9	1.7	1.9	Yes	Yes
Russellville Independent	0.8	0.6	0.9	0.8	Yes	Yes
Science Hill Independent	2.8	3.2	2.3	1.6	Yes	Yes
Scott County	2.2	2.2	2.2	1.3	Yes	Yes
Shelby County	0.9	0.9	0.9	1.3	Yes	Yes
Silver Grove Independent	1.2	1.2	1.1	1.4	No	No
Simpson County	0.8	1.0	0.7	1.4	Yes	Yes
Somerset Independent	1.4	3.9	0.9	1.8	Yes	Yes
Southgate Independent	0.7	0.7	1.1	1.2	Yes	Yes
Spencer County	1.5	1.4	1.7	1.6	Yes	Yes
Taylor County	0.8	3.0	0.5	1.0	Yes	Yes
Todd County	1.4	1.4	1.5	2.1	No	Yes
Trigg County	0.7	0.9	0.6	1.7	Yes	Yes
Trimble County	0.8	1.0	0.7	0.9	Yes	Yes
Union County	1.5	1.7	1.4	2.2	Yes	Yes
Walton-Verona Independent	1.7	2.2	1.4	2.2	Yes	Yes
Warren County	1.5	1.3	1.7	1.0	Yes	No
Washington County	1.2	1.2	1.2	1.5	Yes	Yes
Wayne County	0.8	1.0	0.6	1.3	Yes	Yes
Webster County	1.4	1.7	1.2	1.0	Yes	Yes
West Point Independent	0.9	1.4	0.5	2.1	Yes	Yes

| | Number Per Device | | | | BYOD Policy | |
School District	Total Students	Elementary Students	Secondary Students	FTE Staff And Teachers	Students	Staff
Whitley County	1.4	1.4	1.4	1.2	No	Yes
Williamsburg Independent	3.2	2.6	4.3	1.8	Yes	Yes
Williamstown Independent	0.9	0.7	1.3	1.5	Yes	Yes
Wolfe County	0.9	0.9	0.9	1.8	No	No
Woodford County	1.0	1.3	0.9	1.1	No	Yes

Note: Total Students = elementary and secondary students; Elementary Students = kindergarten through grade 5; Secondary Students = grades 6 through 12; FTE Staff And Teachers = certified and classified staff; BYOD Policy = policies permitting students and/or staff to bring their personally owned devices to school as a learning tool.
Source: Staff analysis of data from the Kentucky Technology Readiness Survey and the Kentucky School Report Card.

Appendix D

Student And Staff Per Instructional Device

One-to-one device implementation refers to the ratio of technology devices to student and teachers/administrators. The 2013-2018 KETS Master Plan states that one device for every three elementary students and one device for every one secondary student are ideal ratios, but it does not specify the ideal number of devices per staff members. Figure D.A shows the number of elementary students per device by district. Figure D.B shows the number of secondary students per device by district. Figure D.C shows the number of staff members per device by district. Because the number of devices reported in the Technology Readiness Survey reflects only devices owned by districts and does not include devices brought in by students and/or staff members, the following 1:1 implementation ratios are likely to be conservative estimates of the number of devices for student and staff use.

Figure D.A
Elementary Students Per Device By District
School Year 2017

Elementary Students Per Device

☐ 1 or fewer students (47 districts)
▨ 1.1 to 2 students (96 districts)
▨ 2.1 to 3 students (24 districts)
■ 3.1 or more students (6 districts)

Note: Italics indicate independent school district.
Source: Staff analysis of data from the Kentucky Technology Readiness Survey.

Figure D.B
Secondary Students Per Device By District
School Year 2017

Secondary Students Per Device

- 1 or fewer students (63 districts)
- 1.1 to 2 students (91 districts)
- 2.1 to 3 students (15 districts)
- 3.1 or more students (4 districts)

Note: Italics indicate independent school district.

Source: Staff analysis of data from the Kentucky Technology Readiness Survey.

**Figure D.C
Staff Per Device By District
School Year 2017**

Staff Per Device

☐ 1 or fewer staff members (41 districts)

▨ 1.1 to 2 staff members (109 districts)

▧ 2.1 or more staff members (23 districts)

Note: Italics indicate independent school district.
Source: Staff analysis of data from the Kentucky Technology Readiness Survey.

Appendix E

Technology Hardware And Software Funding Allocation
Per Student And Per Student Device

Each year, districts allocate funds for technology hardware and technology software based on need. Because this is a 4-year snapshot, spending in previous years may explain low or high spending by some districts during the years included here. Funding data for technology hardware and software was provided by the Kentucky Department of Education Annual Financial Report Chart of Accounts.

Figure E.A shows how much each district allocated for technology hardware devices and supplies over the past 4 years per student using technology hardware spending from 2014 to 2017 and student membership in 2017. *Technology hardware* includes technology-related supplies and infrastructure, which may include network equipment, services, and other peripheral devices. Technology supplies include desktops, laptop notebooks, e-readers, and similar devices. Technology hardware spending includes funds supporting technology hardware devices and supplies from seven funds:
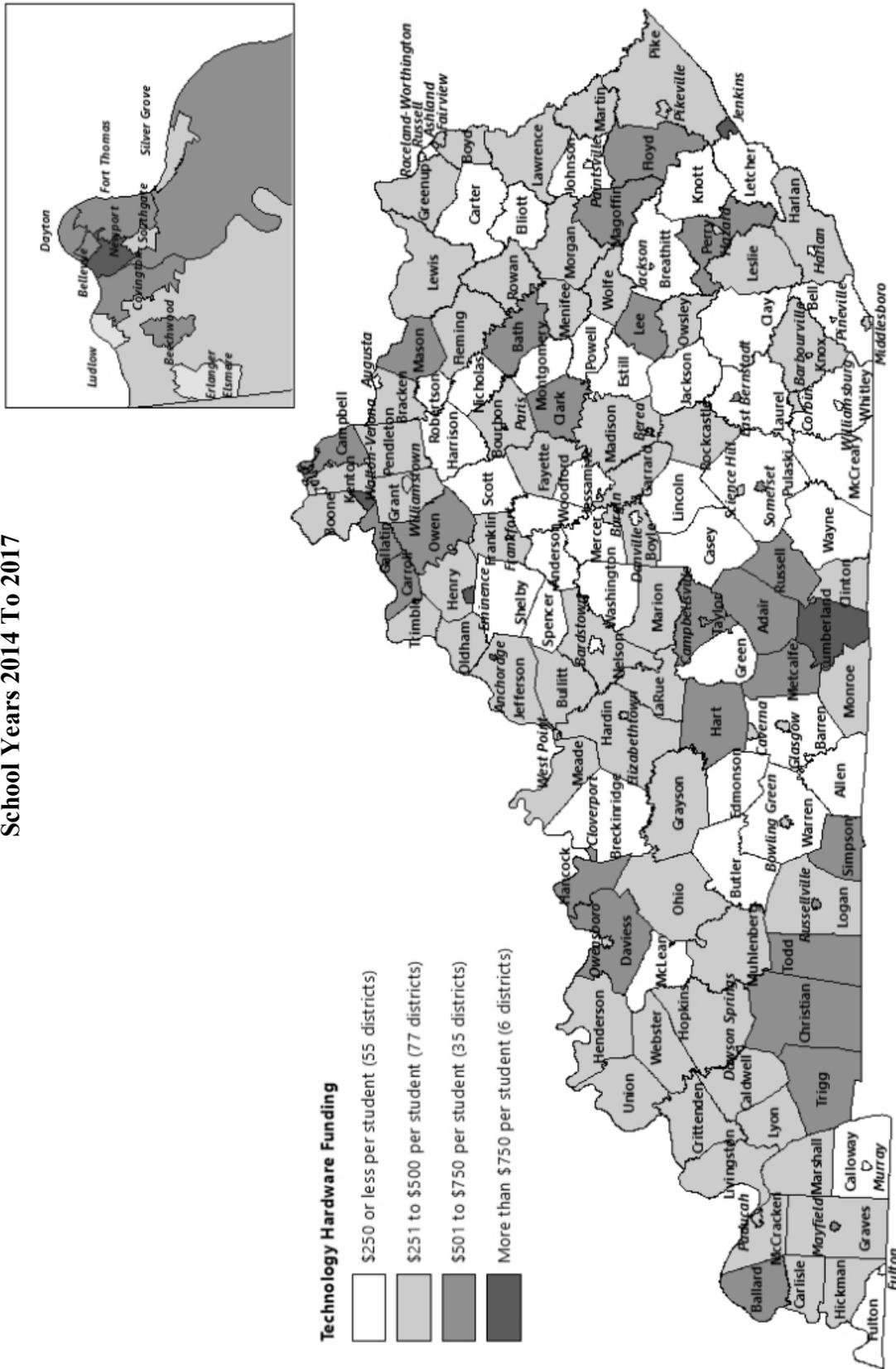- Fund 1, General Fund
- Fund 2, Special Revenue Fund
- Fund 21, Special Revenue District Activity Fund (annual)
- Fund 22, Special Revenue District Activity Fund (multiyear)
- Fund 310, Capital Outlay Fund
- Fund 320, Building Fund (5 Cent Levy)
- Fund 360, Construction Fund

In the data shown in Figure E.A, technology hardware spending varied from $1.61 per student to $1,192.19 by district in 2017.
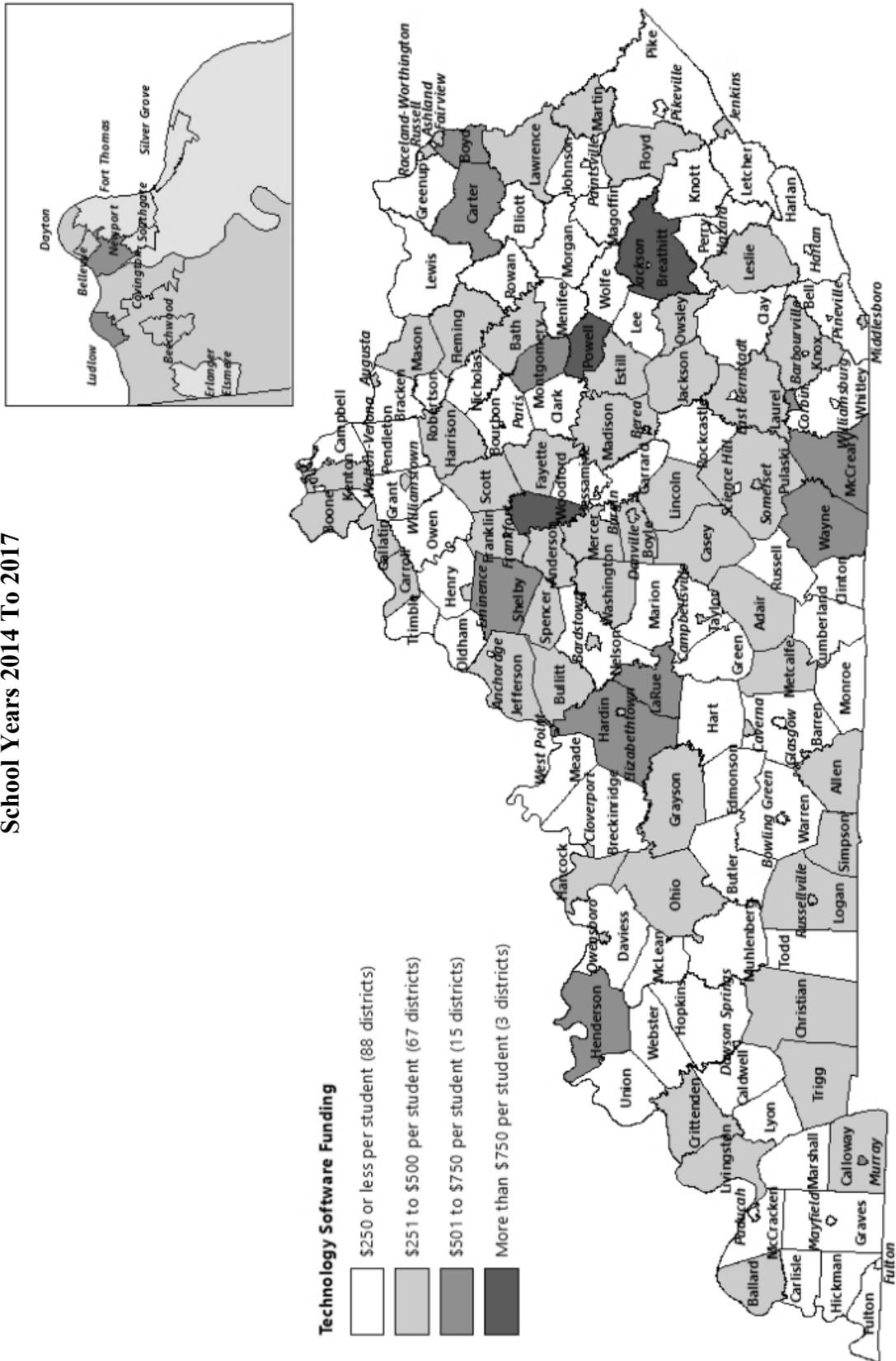
Figure E.B shows how much each district allocated for technology software and supplies over the past 4 years per student using technology software spending from 2014 to 2017 and student membership in 2017. *Technology software* includes educational or administrative software, and it also encompasses technology software supplies, which includes items related to software and software costs, as well as supplies related to hardware, such as CDs and cables. The following information may be inflated because of such other allowable items. Technology software spending includes funds supporting technology software and supplies from the seven funds listed above.

In the data shown in Figure E.B, technology software spending varied from $0.86 per student to $1,033.56 by district in 2017.

Figure E.A
Technology Hardware Spending Per Student
School Years 2014 To 2017

Technology Hardware Funding

$250 or less per student (55 districts)

$251 to $500 per student (77 districts)

$501 to $750 per student (35 districts)

More than $750 per student (6 districts)

Note: Italics indicate independent school district.
Source: Staff analysis of data from the Kentucky Technology Readiness Survey.

Software Figure E.B
Technology Hardware Spending Per Student
School Years 2014 To 2017

Technology Software Funding

$250 or less per student (88 districts)

$251 to $500 per student (67 districts)

$501 to $750 per student (15 districts)

More than $750 per student (3 districts)

Note: Italics indicate independent school district.
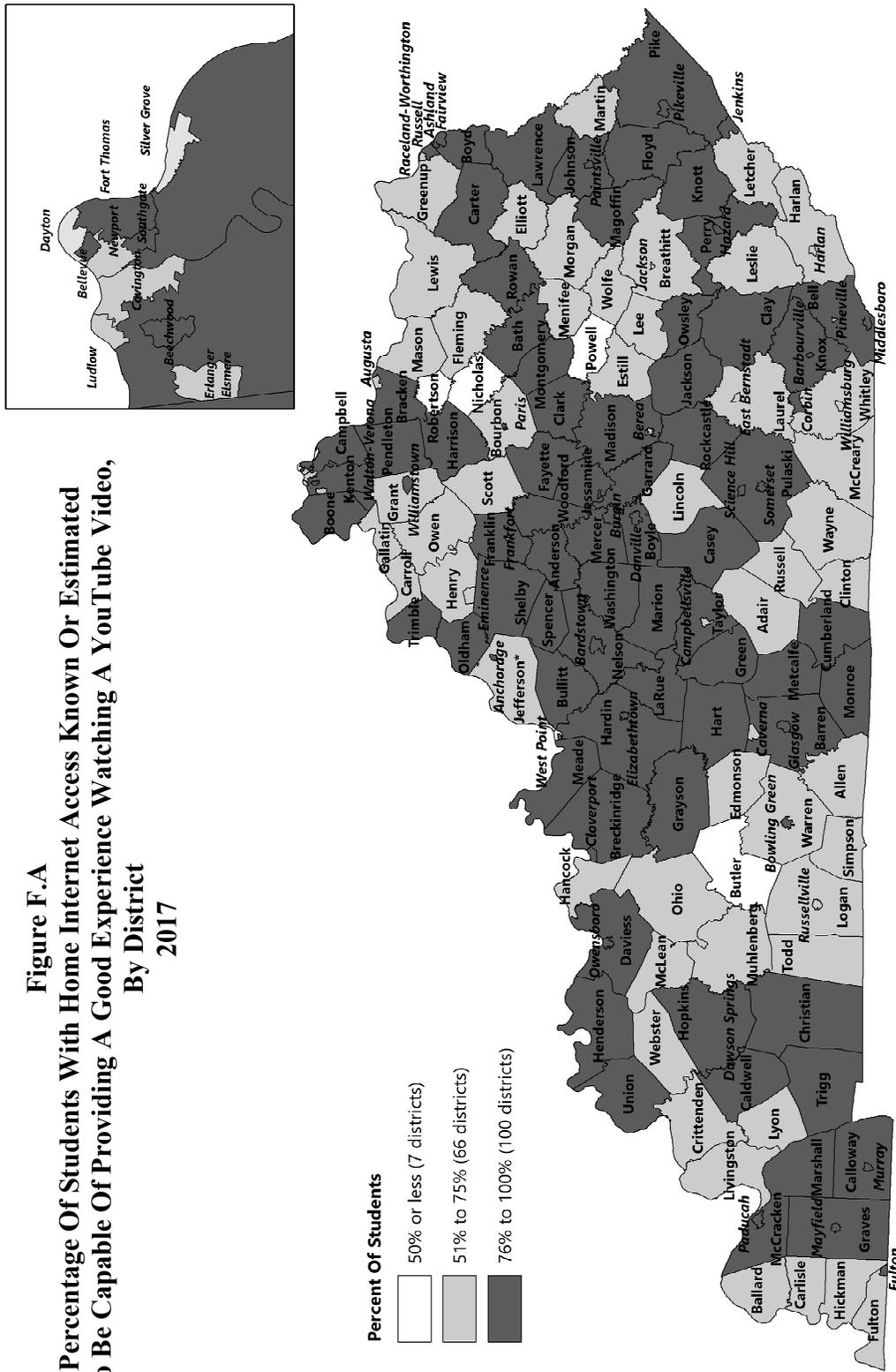Source: Staff analysis of data from the Kentucky Technology Readiness Survey.

Appendix F

Student Home Internet Access By District

To understand how students connect to learning at home, school districts survey parents to determine home internet quality.[60] In the data shown in Figure F.A, slightly more than half of school districts were able to collect this information in 2017, accounting for 49.3 percent of students. When districts could not directly collect information, they estimated the quality of student home internet by surveying students.[61] The metric used to reflect internet speed and quality was whether students' home internet was capable of providing a good experience watching a YouTube video.

The percentage of students with known or estimated good quality home internet access ranged from 30 percent to 100 percent by district, and the average was 78 percent.[a] Figure F.A shows the percentage of students whose home internet was known or estimated to support a good experience watching a YouTube video.

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[a]The Kentucky Department of Education reports that student home internet access in Jefferson County was previously misreported as 73 percent and should be 95 percent. This does not change the average across districts.

Figure F.A
Percentage Of Students With Home Internet Access Known Or Estimated
To Be Capable Of Providing A Good Experience Watching A YouTube Video,
By District
2017

Percent Of Students

☐ 50% or less (7 districts)

☐ 51% to 75% (66 districts)

☐ 76% to 100% (100 districts)

Note: Italics indicate independent school district.
* The Kentucky Department of Education initially reported the percentage of students in Jefferson County with home internet access known or estimated of providing a good experience watching a YouTube video as 73 percent; it later reported that figure to be 95 percent.
Source: Staff analysis of data from the Kentucky Technology Readiness Survey.

Appendix G

Virtual Course Providers

Online courses and digital learning offer students personalized learning and college- and career-prep courses in a variety of subjects to meet student needs regardless of physical location. The 2017 Kentucky Technology Readiness Survey asked respondents about the virtual course provider used in their district. The results are below. Districts used a variety of virtual course providers. Table G.1 shows that Apex Learning, Edgenuity, and Odysseyware were the most common virtual course providers used by Kentucky public school districts in 2017. Although 105 districts used only one virtual course provider, accounting for 60.7 percent of districts, 27 districts used two providers, 5 districts used three providers, and 2 districts used four providers.

Table G.1
Virtual Course Providers Used By Districts
School Year 2017

Virtual Course Provider	Number Of Districts	Percent Of Districts
AnyWhere Learning System	4	2.3%
Apex Learning	39	22.5
BAVEL	8	1.6
Blackboard	1	0.6
Canvas	1	0.6
Certiport	1	0.6
College and Technical Colleges	7	4.0
Edgenuity	39	22.5
Edmentum	5	2.9
edX	1	0.6
Fuel Education	3	1.7
JCPS Online	11	6.4
KET	13	7.5
Middlebury	1	0.6
Odysseyware	34	19.7
Plato Learning Environment	15	8.7
Proximity Learning	1	0.6
Renaissance	1	0.6
Summit Learning Basecamp	2	1.2

Source: Staff analysis of data from the Kentucky Technology Readiness Survey.

Appendix H

Learning Management Systems Used By Districts

A learning management system (LMS) is software to administer, document, and report educational programs and includes content management, communications tools, instructional tools, gradebooks, and assessment features.[62] The 2017 Kentucky Technology Readiness Survey asked respondents about the learning management system used in their district. The results are below. Table H.1 shows the LMSs used in 2014 and 2017. Google Apps for Education and Google Classroom were the most common LMSs used by districts in 2017 (118 districts), followed by Edmodo (38 districts), Edgenuity (23 districts), and Schoology (22 districts). Slightly less than half of all districts (46.8 percent) used more than one LMS in 2017, and 113 districts used at least one LMS.

Table H.1
Learning Management Systems Used By Districts
School Years 2014 And 2017

	2014		2017	
Learning Management System	**Number Of Districts**	**Percent Of Districts**	**Number Of Districts**	**Percent Of Districts**
Apex Learning	1	0.6%	1	0.6%
AR/United Streaming	1	0.6	0	0.0
Blackboard	13	7.5	13	7.5
BrainPop	0	0.0	1	0.6
Canvas	6	3.5	7	4.0
Compass Learning	1	0.6	1	0.6
Converge	0	0.0	3	1.7
CourseSites	0	0.0	1	0.6
Desire2Learn	0	0.0	0	0.0
Discovery Education	1	0.6	0	0.0
eBackpack	2	1.2	0	0.0
Edgenuity	1	0.6	23	13.3
Edmentum	1	0.6	0	0.0
Edmodo	73	42.2	38	22.0
Google Apps for Education/Google Classroom	6	3.5	118	68.2
Haiku Learning	1	0.6	1	0.6
Hapara Teacher	1	0.6	0	0.0
Hive Learning	0	0.0	1	0.6
Infinite Campus	66	38.2	17	9.8
iReady Adaptive Instruction	0	0.0	1	0.6
Kiddom	0	0.0	1	0.6
Lexia Learning	0	0.0	1	0.6
Local Wiki Server	1	0.6	0	0.0
Mastering Biology	0	0.0	1	0.6
MasteryConnect	0	0.0	1	0.6

Learning Management System	2014		2017	
	Number Of Districts	Percent Of Districts	Number Of Districts	Percent Of Districts
Microsoft Classroom	0	0.0	2	1.2
MobyMax	0	0.0	1	0.6
Moodle	33	19.1	16	9.2
My Big Campus	1	0.6	0	0.0
Navigo	0	0.0	1	0.6
Odysseyware	3	1.7	2	1.2
Office 365	0	0.0	1	0.6
Oldham County High School	1	0.6	0	0.0
Plato Learning Environment	1	0.6	1	0.6
Quizlet	1	0.6	0	0.0
ReadingPlus	0	0.0	1	0.6
Renaissance Learning	1	0.6	0	0.0
Schoology	12	6.9	22	12.7
SchoolPointe	4	2.3	2	1.2
SharePoint	2	1.2	0	0.0
Summit Learning	0	0.0	2	1.2
The Holler	7	4.0	10	5.8

Note: Number of districts does not total 173 because districts can use more than one learning management system.
Source: Staff analysis of data from the Kentucky Technology Readiness Survey.

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