

Chapter 5B

Support Services - Technology

This chapter addresses technology services as reviewed by the Office of Educational Quality & Accountability. It is divided into these sections:

- A. Introduction & Background
- B. Policies, Procedures, & Planning
- C. Infrastructure, Software, Hardware and Operations
- D. Technology Acquisition & Replacement Practices

A. INTRODUCTION & BACKGROUND

Oklahoma is striving to further implement technology into all classrooms. For example, the first goal of the 2004 Oklahoma Plan for Instructional Technology/Telecommunications was that all Oklahoma students achieve technological literacy by the eighth grade.

The Foundation for Excellence in Education Digital Learning Council introduced the *10 Elements of High Quality Digital Learning*¹ in the fall of 2010. These elements identify actions to be taken by lawmakers and policymakers to promote a high-quality education for all students. The Digital Learning 2014 State Analysis compares Oklahoma with the national average on each of the elements (**Exhibit 5B-1**). Oklahoma's areas of concern include:

- Student Eligibility – lack of requirements for online courses to earn a high school diploma;
- Quality Instruction – no statewide definition of “teacher of record” or professional development in digital learning for online or blended teachers;
- Quality Choices – lack of multiple opportunities for virtual charter schools and online vendors to apply for approval or approval for three or more years;
- Assessment and Accountability – non-use of evaluative outcomes-based student performance data of virtual charter schools, online providers and online courses, and subsequent closure due to poor performance;
- Funding – lack of course completion funding payment to providers based on student daily attendance, performance and competency; and
- Delivery – lack of state actions to ensure broadband access and effective data use.²

¹ <http://www.digitallearningnow.com/10Elements/>

² This analysis has not been updated by Digital Learning Council

However, Oklahoma scored high in providing student access to quality digital content.

Exhibit 5B-1
Digital Learning 2014 State Analysis: Oklahoma

10 Elements of High Quality Digital Learning	Oklahoma Grade & Percentage	National Average Grade & Percentage
1. Student eligibility: All students are digital learners.	D+ – 67%	D- – 61%
2. Student access: All students have access to high-quality digital content and online courses.	A – 100%	C – 75%
3. Personalized learning: All students can customize their education using digital content through an approved provider.	C – 75%	C+ – 77%
4. Advancement: Students progress based on demonstrated competency.	B- – 81%	F – 59%
5. Quality content: Digital content, instructional materials, and online and blended learning courses are high quality.	A- – 92%	A- – 93%
6. Quality instruction: Digital instruction is high quality.	B- – 82%	B- – 84%
7. Quality choices: All students have access to multiple high-quality providers.	C+ – 79%	C- – 74%
8. Assessment and accountability: Student learning is the metric for evaluating the quality of content and instruction.	F – 58%	D+ – 68%
9. Funding: Funding creates incentives for performance, options, and innovation.	C – 75%	F – 54%
10. Delivery: Infrastructure: Infrastructure supports digital learning.	F – 56%	D- – 60%

Source: Digital Learning Now: 2014 Oklahoma³

The current trend of online assessments has been a common concern for many Oklahoma school districts. Transitioning to the required specifications needed has been a challenge for all districts, but even more so for rural school districts. Oklahoma transitioned to the vendor, Measured Progress, for the Oklahoma State Testing Program (OSTP). Technology still remains a major component of the assessment process.

³ <http://www.digitalllearningnow.com/report-card/state/2014/oklahoma-3/>

The State Department of Education (SDE) has released technology guidelines⁴ for the Measured Progress assessments for schools so they will be properly equipped and ready to administer the tests in the spring and in future retesting sessions.

Exhibit 5B-2 illustrates the most current assessment technology specifications that districts in Oklahoma must consider as they administer online assessments. These include:

- Required Specifications – Unlike specifications provided in previous years, the technology guidelines are required. In the past, there were minimum and recommended specifications. These specifications provide the levels of computer and network capacity that are required to provide a smooth testing experience for students. Bolded items are new from previous specifications.

Exhibit 5B-2
Oklahoma Spring 2019 OCCT Assessment Technology Specifications

Component	Requirement
Connectivity	Must be able to connect to the Internet via wired or wireless networks
CPU	1.2 Ghz
Memory	2 GB
Screen Size	9.7” screen size or larger/“10-inch class” tablets or larger
Screen Resolution	1024 x 768
Windows Desktops/Laptops	Windows 7, 8.1, 10 32-bit, 64-bit
Mac Desktops/Laptops	10.9-10.13
Linux Desktops/Laptops	Ubuntu 14.04.5 LTS, 16.04.3 LTS, Fedora 25, 26 (64-bit only)
Windows-Based Tablets/Netbooks 2-in-1	Windows 8.1, 10 (32-bit and 64-bit)
Apple iOS	iPad running iOS 11.2.5
Chrome OS for Chromebooks	62-64
Browsers (Used for Practice Test Only)	Internet Explorer 11 Firefox 56 or newer Chrome 64 or newer Safari 9 or newer Microsoft Edge 40.15 or newer
Input Device Requirements for All Desktops/Laptops	Keyboard – wired or wireless/Bluetooth Mouse or Touchpad
Headphone/Earphone/Ear Buds	Headphones/earphones/ear buds are required for students who have a text-to-speech accommodation

Source: OCCT Guidelines⁵

⁴

https://oklahoma.onlinehelp.measuredprogress.org/wpcontent/uploads/sites/5/2018/02/OSTP_Technology_Guidelines_Spring_2018_v2.pdf

⁵ http://ok.gov/sde/sites/ok.gov.sde/files/documents/files/2014-15_MP_OCCT_Technology_Guidelines_0.pdf

The stated technology requirements further illustrate the importance of an adequate technology infrastructure and effective long-range planning to accommodate an increasing number of students participating in online testing in the coming years.

B POLICIES, PROCEDURES, & PLANNING

FINDING 5B-1

During multiple school performance reviews, consulting teams have noted that districts with full-time technology support received a higher level of satisfaction from staff, parents, and students than districts with part-time staff. Other scenarios included districts contracting with external IT vendors. Due to high costs this type of technology support was minimal due to limited contracted hours.

One district, with an enrollment of 300 students, employed a full time IT Director. As **Exhibit 5B-3** demonstrates, there was a high level of satisfaction for the technical support provided to the staff. The director supported 270 computers and technology equipment and was able to start repairs the day after the staff sent texts asking for support. The staff made several compliments of the support they received from the IT Director. Staff survey responses indicate their satisfaction with this full-time technology support.

Exhibit 5B-3
Staff Survey Response Regarding Technology Support

Survey Questions	Agree	No Opinion	Disagree
The district has adequate technology to support its operations.	77%	18%	5%
When necessary, the district's technology equipment is quickly repaired or serviced.	82%	14%	5%

Source: OEQA Archived Survey

Districts with only part-time technology support do not have someone onsite regularly to respond to daily technology questions or issues. Most often, the part-time staff support is only onsite on an as-needed basis and is paid \$25 per hour.

A 2015 nationwide survey of 173 district officials, principals, and teachers found that 71 percent believed a specific office or department should be dedicated to technology in their district. The survey also found that 53.9 percent of those surveyed felt the technology training available was insufficient.¹⁸ In a focus group with DPS teachers, the general sentiment was that there is inadequate support for technology in the district. If there is a problem, staff emails the technician. When he receives enough requests, he comes onsite to address the issues. No tracking process is in place to document the kinds of issues incurred or when they are completed

RECOMMENDATION

Develop and implement a “student as technician” program in cooperation with the nearby technology center and a teacher technician program paid with stipends to supplement technology support at the sites.

Districts should include a cross-training program. The program would ensure critical processes can be performed by multiple staff members.

Maintaining district equipment and troubleshooting assistance should be primarily handled through a technology department. However, given current budget constraints, hiring additional support staff is likely not feasible. To assist with basic troubleshooting at the sites, the district should implement a “student as technician” program.

The district is encouraged to implement this concept by working with a technology center to create and implement a “student as technician” program that benefits students and staff. The superintendent should work with the principal and the extra-duty staff assigned to technology to identify the kinds of skills that would be most helpful in a “student as technician” program.

The district should also consider a teacher technician program with staff members cross-training for equipment repair and servicing. Having sufficient technical support is critical to successful technology use, both in classrooms and in administrative offices.

FISCAL IMPACT

The fiscal impact of this recommendation depends on the number of “students as technicians” and the number of teacher technicians in the program. Recommendation of the consulting team is three “students as technicians” and three teacher technicians. A \$500 stipend is recommended for the teacher technicians and an hourly wage of \$10 per hour for the “students as technicians” for three hours per week, 15 weeks per school year.

Recommendation	2019-20	2020-21	2021-22	2022-23	2023-24
Develop a “students as technician” and teacher technician program.	(\$2,850)	(\$2,850)	(\$2,850)	(\$2,850)	(\$2,850)

FINDING 5B-2

The district lacks an instructional technology plan. The district does not currently provide professional development or training on the use of technology in the classroom and improving instructional practices beyond initial experiences.

While teachers have received some initial professional development in the use of projectors, iPads and other technology tools, staff interviews and focus groups indicate a desire to become more specialized in better using the existing technology as a meaningful part of the curriculum. In most cases, the projectors and iPads are being used more as a teacher-centered device for imparting information to students. If teachers are not innovative in integrating student-centered use of technology, they will be unable to use technology effectively to support instructional delivery and student achievement.

The consulting team found through onsite observations and interviews that technical knowledge among teachers varies from one district to another. Additionally, equipment is in place but sometimes not used. Implementing technology effectively in classroom instruction requires a teacher to have a higher level of understanding, redirected teaching methodology, much practice, and training at regular intervals.

The National Education Technology Standards (NETS), an ongoing initiative of the International Society for Technology in Education (ISTE), has defined standards for students, describing what students should know and be able to do with technology. The SDE has developed its own standards based on the NETS standards.

Building on the NETS for Students, the ISTE has also developed NETS for teachers (NETS-T)⁶ and NETS for administrators⁷, which define standards for classroom teachers and administrators with accompanying performance indicators. While the State of Oklahoma has not adopted the standards for teachers and administrators now, it should be considered a best practice as many states and districts have already incorporated NETS into training programs and established technology proficiency skill levels for teachers and administrators.

Data from the National Science Foundation (NSF)⁸ indicates that the actual impact technology has on classroom instruction is directly related to the amount of quality professional development an educator receives in a targeted context. NSF studies indicate that at least 80 hours of professional development provided over a period were needed to develop, enhance, and change the practices of teachers.

RECOMMENDATION

Develop and implement an instructional technology plan in conjunction with the district's professional development plan.

The impact of technology on student achievement revolves around how well technology is integrated into everyday activities that support student instructional objectives. This requires not only placing computers in schools and classrooms, but also providing the resources needed to

⁶ <http://www.iste.org/standards/standards-for-teachers>

⁷ <http://www.iste.org/standards/standards-for-administrators>

⁸ <http://www.nsf.gov/statistics/seind06/c1/c1s3.htm - c1s312>

incorporate technology into lesson plans and other educational activities. Professional development provided at regular intervals in a systematic fashion that emphasizes both technology applications and its integration into curriculum and classroom instruction is necessary for successful integration of technology in the classroom.

Professional development should focus on the specific needs of individual staff and be sustained through coaching and periodic updates. A technology training plan should outline the opportunities available to district staff for learning job specific technology skills. This information should be considered in developing the technology professional development plan that meets the needs of the district and is aligned with data-driven goals supported by long-term professional development activities. The district should move beyond technology acquisition and basic level integration and ensure that the hardware and software tools are being used in ways that result in ongoing improvement of classroom instruction and improved student achievement. This includes differentiated support depending upon the type of device utilized in the classroom.

A technology leadership committee and a cross-section of teachers should work to develop a district-wide program for teacher training and technology integration. Consideration should also be given to providing training opportunities for all staff in their specific job needs. This technology-training program should be part of an overall professional development plan. A first step should be for each staff member to complete a needs assessment. The committee might consider *Taking a Good Look at Instructional Technology*,⁹ which is a suite of assessment tools designed to help principals and other school leaders gather, analyze, and report information about how technology is used for teaching and learning in their schools. If administered more than once, it provides measurements of progress over time.

A second step should be to discuss and define technology integration for classrooms. Based upon this definition and interview results, the program should seek to increase teacher competencies and levels of technology integration. The program should also identify software and hardware needs necessary for successful integration. The program should be submitted to the superintendent and school board for approval.

Numerous online professional development resources should be considered, including:

- TED: Ideas Worth Spreading;¹⁰
- Classroom 2.0 Live;¹¹
- the K12 Online Conference;¹²

⁹ <http://www.testkids.com/taglit/>

¹⁰ <http://www.ted.com/>

¹¹ <http://live.classroom20.com/index.html>

¹² <http://k12onlineconference.org/>

- the Global Education Conference;¹³ and
- Simple K12 Webinars.¹⁴

The district should also consider expanding instructional technology efforts using additional resources offered through the K20 Center, the Oklahoma State Department of Education and the Oklahoma Department of Career and Technology Education. Additionally, area colleges and universities provide customized training, continuing education, professional development and other resources for K-12 teachers and administrators.¹⁵ Districts should consider forming partnerships with neighboring school districts and implementing a shared professional development initiative.

According to the Florida Center for Instructional Technology, the Technology Integration Matrix (TIM) illustrates how teachers can use technology to enhance learning for K-12 students (**Exhibit 5B-4**). The TIM incorporates five interdependent characteristics of meaningful learning environments: active, constructive, goal directed (i.e., reflective), authentic, and collaborative.¹⁶ The TIM associates five levels of technology integration (i.e., entry, adoption, adaptation, infusion, and transformation) with each of the five characteristics of meaningful learning environments.

¹³ <http://globaleducation.ning.com/>

¹⁴ <http://simplek12.com/tlc/webinars/>

¹⁵ <http://www.okhighered.org/econ-dev/business-services/>

¹⁶ Jonassen, Howland, Moore, & Marra, 2003

Exhibit 5B-4 Technology Integration Matrix

Levels of Technology Integration into the Curriculum

	Entry	Adoption	Adaptation	Infusion	Transformation
Active	Information passively received	Conventional, procedural use of tools	Conventional independent use of tools; some student choice and exploration	Choice of tools and regular, self-directed use	Extensive and unconventional use of tools
Collaborative	Individual student use of tools	Collaborative use of tools in conventional ways	Collaborative use of tools; some student choice and exploration	Choice of tools and regular use for collaboration	Collaboration with peers and outside resources in ways not possible without technology
Constructive	Information delivered to students	Guided, conventional use for building knowledge	Independent use for building knowledge; some student choice and exploration	Choice and regular use for building knowledge	Extensive and unconventional use of technology tools to build knowledge
Authentic	Use unrelated to the world outside of the instructional setting	Guided use in activities with some meaningful context	Independent use in activities connected to students' lives; some student choice and exploration	Choice of tools and regular use in meaningful activities	Innovative use for higher order learning activities in a local or global context
Goal-Directed	Directions given, step-by-step task monitoring	Conventional and procedural use of tools to plan or monitor	Purposeful use of tools to plan and monitor; some student choice and exploration	Flexible and seamless use of tools to plan and monitor	Extensive and higher order use of tools to plan and monitor

Source: <http://fcit.usf.edu/matrix/matrix.php>, December 2014

Conducting a needs assessment to determine which stages teachers are currently in with their technology instruction should be an initial activity before designing a tiered system of professional development. The TIM can provide a tool for facilitating this process. Once this is determined, the superintendent, technology director, curriculum director, and other lead teachers or staff responsible for supporting professional development should analyze the data and make appropriate recommendations for addressing instructional technology training needs.

FISCAL IMPACT

This recommendation can be implemented with existing resources.

FINDING 5B-3

Districts do not have a dedicated technology budget. These districts draw on a number of sources to fund technology expenditures including grants, E-rate monies, state and federal funds, Title programs, and the general fund. There is no clear information on the total amount spent on technology. Few districts are able to provide a written technology budget showing funding for replacements or upgrades needed to maintain the current level of computers or other hardware equipment. Most districts' system of purchasing new technology is for the staff or teachers to submit a request to the IT director who determines what is needed and then the director submits a Purchase Order to the Superintendent for review and to find funding for the purchase.

In staff surveys, when asked about the lifespan of district technology equipment, 62 percent agreed or strongly agreed that equipment was operated past its useful lifespan (**Exhibit 5B-5**). In onsite interviews and focus groups staff also expressed concerns about the age of equipment and the lack of funds needed to replace or maintain existing equipment. According to research from The Gartner Group, an independent technology research and consulting firm, the useful life of computers in public education is four to five years.

Exhibit 5B-5
Staff Survey Results on Technology Equipment Lifespan

Survey Questions	Agree	No Opinion	Disagree
The district's technology equipment is often used past its useful lifespan.	62%	23%	16%

Source: OEQA Archived Survey

To achieve satisfactory efficiency status on the International Society for Technology in Education (ISTE) Index, equipment should be placed on a four- to five-year life cycle. Some categories, such as student lab computers, may require more frequent replacement than those computers used in administrative capacities.

Technology can no longer be an afterthought or add-on in today's classrooms. It must be purposely integrated into instructional strategies and practices. In order for that to happen, funding must be available to ensure that classroom technology is up-to-date and usable. Several studies, including research by the Gartner Group, report that organizations should be budgeting between four and six percent of their overall budget to technology.

RECOMMENDATION**Establish a district technology budget that is realistic and supportive of classroom needs.**

Technology purchases should have a clear and consistent process by which they are made. Among these important elements are conducting a needs assessment, providing a rationale for technology purchases that is supported by research and best practices, establishing a timeline for purchases and expectations for implementation, along with an evaluation of the usage of the

purchases. The addition of such elements into district guidelines provides clarity to staff and establishes a more consistent process for the acquisition of technology. Without a budget, funds could be wasted on purchases that fall outside the scope of support or do not meet the district's long-range plans.

Given the district's budgetary restraints, the consulting team recommends DPS budget \$25,000 per year. A suggested breakdown is shown in **Exhibit 5B-6**.

Exhibit 5B-6
Example Technology Budget

Items	Year	Cost
Maintenance	Extra-duty teacher and/or computer technician contract to monitor and maintain connectivity throughout system Replace computers with 6+ years	\$15,000
Student Accounting System	Software Lease	\$3,000
Staff Training	SMARTBoards refresher, Technology Integration	\$2,000
Advanced technology classes	Purchase software/hardware	\$2,000
Curriculum programs for remediation and enhancement	Purchase curriculum materials and/or online textbooks	\$3,000

Source: OEQA Archived Exhibit

The superintendent should work with the technology committee and IT technician to develop guidelines for an annual technology budget. The technology budget should be closely tied to the district strategic and technology plans.

FISCAL IMPACT

This recommendation can be implemented with existing resources.

FINDING 5B-4

Districts do not have established policy or procedures for discarding out-of-date technology equipment. The superintendent should identify a reliable and reputable company for recycling and or destruction of equipment.

The Board would approve of the disposal of all old technology equipment before the equipment is placed in a central location for removal. One district found a third party, STS Electronic Recycling Inc., out of Houston, TX to handle their disposal needs at no cost to the district. STS

Electronic Recycling Inc. adheres to a no landfill policy and also performs data destruction on all out dated and useless equipment.

RECOMMENDATION

Establish policies and procedures in place for the proper disposal of obsolete technology equipment.

With technology equipment being a hazardous material with little or no residual value, there is normally a cost for any company to remove old equipment. School districts typically struggle with surplus inventory disposal. This provides little incentive for districts to dispose of obsolete equipment in a timely manner. The School Laws of Oklahoma do not provide direction for the disposal of surplus school district computer equipment, except during district annexation. In response, some districts have adopted their own policies, such as this one from Moore Public Schools:

The superintendent shall be authorized to dispose of all obsolete, excess, and unusable equipment as prescribed by Oklahoma School Law and shall report all such transactions to the Board. A public auction shall be conducted at times designated by the Board for such purpose. Other disposal methods allowed by law include sale, exchange, lease, lease-purchase, and sale and partial lease back. One of these disposal methods may be used if a greater financial benefit can be derived.

FISCAL IMPACT

This recommendation can be implemented with existing resources.

FINDING 5B-5

Many districts are now using consulting firms to assist in its E-Rate application (**Exhibit 5B-7**) and reporting process to ensure it is receiving the maximum possible funding and reporting expenditures properly. The result has been successful funding for the past several years. Typical requests funding for telecommunications services, Internet access, and basic maintenance for internal connections. The E-Rate application is reviewed by both the superintendent, and IT personnel.

**Exhibit 5B-7
E-RATE Funding for Sample Public Schools**

C1 APPLICATION - TELECOMMUNICATIONS & INTERNET ACCESS
E-RATE SUMMARY - Texhoma Indep School Dist 61 FY 2015-16
BEN: 140027

471# 1007687

Submitted:

Erate Disc: 80%

FY 2015 Voice % Reduction: 20%

Voice Lines	LD	Toll-Free	CEL	INT	100MB	Provider	SPIN	Account # Description	Att #	Monthly Eligible	Non-Recurring	Annual Eligible	FRN	Voice?	Erate %	Erate \$
12						Panhandle Telephone	143002393	130801	1	475.19		5,702.28	2772269	Y	60%	3,421.37
	11					NTS Communications	143001173	580 423 7433	2	51.48		617.76	2772283	Y	60%	370.66
		3				Pioneer Long Distanc	143001169	LD 51877	3	16.33		195.96	2772296	Y	60%	117.50
			1			Panhandle Telecomm	143004809	1960	4	66.50		798.00	2772318	Y	60%	478.80
				1		Panhandle Telephone	143002393	TEXH INT 100 Mbps	5	3,160.57		37,926.84	2772337	N	80%	30,341.47
12	11	3	1	1				TOTALS		3,770.07	-	45,240.84				34,729.87

Applicant Share: 10,510.97
Budget: 21,500.00
Applicant Amt: 32,010.97

Source: OEQA Archived Scanned Document

RECOMMENDATION

Utilize a consulting firm to assist with E-Rate funding requests and documentation.

FISCAL IMPACT

This recommendation can be implemented with existing resources.

FINDING 5B-6

Districts lack a comprehensive inventory system for recording all technology hardware. A formal method for documenting technology purchases and inventories is non-existent in most schools. There are few details outlining how many devices exist in some districts, along with serial numbers and age of devices. Without a comprehensive inventory system in place, planning for future technology implementation is difficult. While this is a good starting point, no procedure or process exists for inventorying district equipment.

Items should be recorded in a digital file by serial number, tagged, and have their location and person of primary responsibility noted, along with the date of purchase. Multiple digital copies of this file should be saved and given to the superintendent and principals. Updates should be made



as new purchases are received and obsolete equipment is retired. At a minimum, an annual inventory of all technology equipment should be conducted with pertinent device tracking information.

One district used an Access database (**Exhibit 5B-8**) that was used to inventory technology equipment, which was a great start except it did not have a column showing date of purchase. Without having this information available to review, computers or other technology equipment could be missed when planning upgrades or replacement of older equipment. Dates of acquisitions could also be used to determine warranty dates. Having the purchase date included in the inventory record would provide a long-range planning tool for replacements.

Exhibit 5B-8
Sample of an Access Database for Technology Equipment

9YBKRM1	Supt. Secretary	Dell Optiplex 780	1
7D7ZLL1	HS Secretary	Dell Optiplex 780	1
JJ2JGM1	HS Principal	Dell Optiplex 780	1
8YBKRM1	MS Secretary	Dell Optiplex 780	1
2K2JGM1	Technology Dir	Dell Optiplex 780	1
FXBKRM1	Teacher A	Dell Optiplex 780	1
818WMM1	Superintendent	Dell Optiplex 780	1
FR54GH1	Teacher B	Dell Optiplex 780	1

Source: OEQA Archived Scanned Documents

RECOMMENDATION

Adopt a formal inventory process for computers and other technology equipment that includes procedures for assignment of new equipment and keeps maintenance records on all devices.

A procedure is needed for assigning new equipment and maintaining a record of all technology devices. Procedures for developing the entire district inventory should include specific steps regarding existing computers and other technology as well as subsequent purchases. The inventory should be periodically and systematically updated. For districts with a technology director, an Excel spreadsheet maintained by him/her would be sufficient.

When equipment from future purchases is delivered, it should be received by the responsible technology designee and then processed into the inventory system. Physical inventories should be taken and status reports should be generated. Having the receiving, tagging, assignment and inventory processes standardized will prevent confusion about the count, value, age, and location of district technology assets.

FISCAL IMPACT

This recommendation can be implemented with existing resources.

FINDING 5B-7

Districts have not formalized a process for including multiple stakeholders on the technology committee. Multiple stakeholders include parents, students, community members, and businesses. Community and business partnerships could provide additional perspective in planning, implementation, and evaluation.

From a district's technology plan, a technology committee that included parents and teachers was in place, but currently no such committee exists. Including stakeholders such as parents, students, community members, and businesses could provide additional perspective in planning, implementation, and evaluation.

Although most districts' technology plan meets state and E-rate funding requirements, some are lacking several components and out of date. Many plans do not reflect the current state of technology within the district, its needs or goals. Some plans do not provide evidence of committee participation by parents or community members and indicates only participation of district personnel. Although many plans include general goals for an equipment replacement cycle, additional staff development, and increased student access, there is no specific plan for implementation or evaluation of technology and its use. Observation is listed as the key evaluation measure. The addition of these components, along with specific stakeholders, could further enhance a district's technology plan.

Budgetary information is included in these plans, including projected costs. The plan lists E-rate and general funds as revenue sources. However, plans lack details about how districts will gather or use assessment data to determine subsequent areas of need, or administrator observation and evaluation of technology use.

In several reviews no evidence of a formal needs assessment process which reflects the current state of technology in a district was readily apparent. Key to the planning process is conducting periodic needs assessments and structuring the plan around the results. Involving a variety of stakeholders in the planning process increases collaboration and an intentional focus on meeting the district's long-term technology needs.

Without a planning document, purchases could be made that are outside of the long-range plan and older network infrastructure hardware could be left in place past its useful life span.

RECOMMENDATION

Improve the technology planning process and create a long-term strategic plan for technology infrastructure and network equipment with input from a variety of stakeholders.

A long-term technology plan should be a comprehensive document that drives technology decision-making. The plan should be tied to a district comprehensive strategic plan and professional development plan. The district should formalize and utilize a process for engaging a technology committee in technology strategic planning and the development of a long-term planning document. The superintendent should direct the technology committee to develop and periodically update a comprehensive technology plan.

The plan should be achievable and based upon the current state of the district. By incorporating a clearly articulated vision statement and mission statement, followed by specific goals, measurable objectives, adequate funding and detailed evaluation process, the district ensures that technology purchases and services are in line with the goals set forth in the plan. The plan and progress should then be communicated to all stakeholders to ensure a common understanding and purpose. To facilitate effective use of technology funds, the technology committee should:

- periodically review the technology plan for accuracy and make necessary additions and deletions;
- develop hardware and software standards, and review them with all personnel;
- review the software and peripheral purchasing process to avoid purchases that cannot be supported or will not function properly on/with the district's equipment;
- recommend the types of computer equipment that should be purchased and the most effective distribution of that equipment;
- develop a training program for all staff; and teachers
- establish a policy on the purchase of extended warranties for hardware and the standardization of operating systems, antivirus, applications, and office software

The Oklahoma State Department of Education (SDE) identifies the following 13 minimum requirements for district technology plans in order to receive state Ed Tech funds:

1. strategies for improving academic achievement and teacher effectiveness;
2. goals for using advanced technology to improve academic achievement;
3. steps to increase accessibility;
4. promotion of curricula and teaching strategies that integrate technology;
5. professional development;
6. technology type and costs;

7. coordination with other resources;
8. integration of technology with curricula and instruction;
9. innovative delivery strategies;
10. parental involvement;
11. collaboration with adult literacy service providers;
12. accountability measures; and
13. supporting resources

The lack of a current long term technology plan which would provide direction for purchases of hardware, software, infrastructure, professional development, and network upgrades, allow purchases to be made that do not meet the long term goals of the district. With the current state funding being cut, a good long term technology planning document will help secure state funding if it follows the 13 rules listed above.

The National Center for Technology Planning recommends five phases for an effective planning model:

- **Phase 1: Recruit and organize the planning team.** It is important that the planning team consists of all stakeholder groups, and members should excel in planning and communication skills. Stakeholders may include technology specialists, district leaders, parents, students, community members, and business leaders.
- **Phase 2: Research.** This phase consists of a needs assessment and an effort to identify the technologies that can be applied to those needs and ascertain how they can be applied.
- **Phase 3: Construct the technology plan.** This phase focuses on applying the research to establish the district’s vision/mission and to define the goals and objectives that will lead to fulfilling that vision and mission.
- **Phase 4: Formalize the planning.** This phase culminates into a comprehensive document that analyzes the present state of the district with respect to technology, articulates specific goals and objectives, incorporates clearly defined strategies and budgetary plans to realize the desired state of technology in the district, and includes a process for evaluation.
- **Phase 5: Continually implement, evaluate, and revise.** This phase deals with the ongoing implementation, evaluation, and revision of the plan to ensure progress is made.

FISCAL IMPACT

This recommendation can be implemented with existing resources.

FINDING 5B-8

Districts lack a written data backup and disaster recovery plan. In the event of a natural disaster or severe power surge, there are no documented procedures to ensure that a district's critical data, systems, and programs can be quickly brought back to pre-disaster status. An example is the loss of the accounting server that required extra staff time to input the accounting data twice after the server was back and working.

RECOMMENDATION

Develop and test a disaster recovery plan that includes the district's critical data, systems, and programs.

Many districts utilize the Municipal Accounting Systems, Inc. (MAS) using both the accounting function and the Student Information System (SIS) where the student data are stored in a cloud on a remote server hosted by the MAS vendor. To restore service it should only require replacement of a computer connected to internet enabled network.

In one district the financial accounting records are entered and processed by an in-house server. The last time the server failed it required about a month of reentry of data to bring the records back on line. This server processes payroll and financial information for the district. The server is now being backed-up to a Network Attached Storage (NAS) device. There is no written documentation available to show procedures for how to restore the database back to a new server if the current server fails. There is no written documentation that shows if the back-up system has ever been tested and is working correctly. Plus both the server and the NAS are in the same room so if a disaster was to occur, all backup would be lost. It was reported that the NAS is backed-up to a remote site across the Wide Area Network (WAN), which could also fail if the network equipment was to fail or be lost.

While several backup systems are in place, districts lack the policies, procedures, and assigned personnel needed to quickly mitigate damage and reestablish critical functionality. By failing to document a backup and recovery plan, system knowledge, recovery information, and responsibility are left to the superintendent or IT director. A disaster recovery plan would aid the district in quickly reloading data, programs, and systems, as well as the recovery of hardware and software, in the event of a loss. **Exhibit 5B-9** provides key elements of a disaster recovery plan.

Exhibit 5B-9
Key Elements of a Technology Disaster Recovery Plan

Steps	Details
Build the disaster recovery team.	Identify a disaster recovery team that includes key policy makers, building management, end-users, key outside contractors, and technical staff.
Obtain and/or approximate key information.	Develop an exhaustive list of critical activities performed within the system.
	Develop an estimate of the minimum space and equipment necessary for restoring essential operations.
	Develop a timeframe for starting initial operations after a security incident.
	Develop a list of key personnel and their responsibilities.
Perform and/or delegate key duties.	Develop an inventory of all computer technology assets, including data, software, hardware, documentation, and supplies.
	Set up a reciprocal agreement with comparable organizations to share each other's equipment or lease backup equipment to allow the system to operate critical functions in the event of a disaster.
	Make plans to procure hardware, software, and other equipment as necessary to ensure that critical operations are resumed as soon as possible.
	Establish procedures for obtaining off-site backup records.
	Locate support resources that might be needed, such as equipment repair, trucking, and cleaning companies.
	Arrange with vendors to provide priority delivery for emergency orders.
	Identify data recovery specialists and establish emergency agreements.
Specify details within the plan.	Identify individual roles and responsibilities by name and job title so that everyone knows exactly what needs to be done.
	Define actions to be taken in advance of an occurrence or undesirable event.
	Define actions to be taken at the onset of an undesirable event to limit damage, loss, and compromised data integrity.
	Identify actions to be taken to restore critical functions.
	Define actions to be taken to re-establish normal operations.
Test the plan.	Test the plan frequently and completely.
	Analyze the results to improve the plan and identify further needs.
Deal with damage appropriately.	If a disaster actually occurs, document all costs and videotape the damage.
	Be prepared to overcome downtime on your own; insurance settlements can take time to resolve.
Give consideration to other significant issues.	Do not make a plan unnecessarily complicated.
	Make one individual responsible for maintaining the plan, but have it structured so that others are authorized and prepared to implement if it is needed.
	Update plan regularly and whenever changes are made to your system.

Source: National Center for Education Statistics, "Safeguarding Your Technology," April 2003

The district should address this problem immediately. The district should develop and test a disaster recovery plan that includes the district's critical data, systems, and programs. The district technology personnel, under the direction of the superintendent, can lead the process of developing a plan adequate to meet the needs of the district. The costs associated with losing vital information, services, and equipment to a disaster could greatly impact the district.

FISCAL IMPACT

This recommendation can be implemented with existing resources.

FINDING 5B-9

Most districts allow staff, teachers, or students to bring cell phones, tablets, iPad, or other personally owned devices into the buildings and use the wireless network to access the internet. Yet most districts do not have a *Bring Your Own Device* (BYOD) policy available to all people using the districts' wireless networks to ensure compliance with all established rules or procedures.

Although the ability to allow staff, students, or teachers the ability to work at anytime from anywhere and on any device provides real benefits; it also brings significant risks. To ensure information does not end up in the wrong hands, or that a network breach is allowed to take down the wireless network. Without a written policy pictures or other personal information could be shared on the network by students, teachers, or staff. Texting in class or using the device to bully another student is possible. Personal information on the network might be assumed as private by the student, staff, or teacher and not owned by district to remove as necessary.

RECOMMENDATION

Develop a written Bring Your Own Device (BYOD) policy and make it available to all students, teachers, parents, staff, and visitors.

BYOD plans that can be used by a school district are easily accessed online. One example is Bayside Middle School's "BYOD at a Glance – Bring Your Own Device Program Key Points" plan.¹⁷ Another example is Tech Learning's K-12 Blueprint.¹⁸

FISCAL IMPACT

This recommendation can be implemented with existing resources.

FINDING 5B-10

There are some districts that do not have an online work order system or may have one, but it is not fully utilized. Addressing support issues in a timely fashion is a challenge for any school district. Using a system to document and assign technology issues increases the efficiency of technical support and communication to users.

¹⁷ http://www.foxbay.k12.wi.us/cms_files/resources/BYOD%20at%20a%20glance%2014-15.pdf

¹⁸ <http://www.k12blueprint.com/toolkits/byod>

An online work order system, hosted by online support systems, maybe implemented to improve help desk functionality and allow staff to enter work orders to be addressed by the district technology director. A work order system enables staff to submit requests online and receive email updates on the status of their request. This system also allows technology staff to analyze data gathered through the help desk system. Technology staff can monitor and assign work order requests, expediting service issues.

According to one district’s staff interviews, an online work order system was in place but was not used. Rather, staff emailed, text, or called the technology director with equipment, troubleshooting, and other technology-related issues. Thus, no documentation existed to track issues or communicate when the issue would be resolved.

RECOMMENDATION

Develop and implement procedures for using the existing online work order system.

Districts should develop and implement a procedure for using the existing online work order system. The technology director/personnel can lead the process of developing a procedure to meet the needs of the Schools and provide issue tracking information. Key instructors can assist in staff training and implementation of the procedure.

FISCAL IMPACT

This recommendation can be implemented with existing resources.

C. INFRASTRUCTURE, SOFTWARE, HARDWARE AND OPERATIONS

FINDING 5B-11

A few districts’ campus buildings have fiber optic wiring that connect them to the central office and out to the internet. Fiber optic wiring allows higher speed network equipment to be installed and faster speeds for interactive video streaming from colleges or on-line resources for world wide access to learning materials.

RECOMMENDATION

Install fiber optic wiring to increase faster internet speed throughout the district and for future growth.

As the need for more digital information is required by school districts to provide a quality education for students, the investment in this technology would advance a district’s technology savvy. Additionally, it would provide many years of quality service to the district.

FISCAL IMPACT

This recommendation can be implemented with existing resources.

FINDING 5B-12

One district is currently using a managed Dell SonicWALL security system for a network firewall and web site filtering. All Oklahoma school districts must provide filtered internet access to all students to ensure the pupils are only able to access safe websites.

RECOMMENDATION

Install a firewall that is managed by both the IT personnel and a support system (e.g. Dell SonicWALL) to allow the district to make changes quickly but also brings to bear a large number of outside resources to ensure safe internet access for students.

This double layered approach where the IT manager and Dell resources are both watching and checking on activity allows the district to provide a working network but also protect the students. A firewall also delivers intrusion prevention, malware protection, application intelligence and control, and real-time traffic monitoring to protect the network from security breaches.

FISCAL IMPACT

This recommendation can be implemented with existing resources.

FINDING 5B-13

Many smaller districts have in place only one server that is used to hold accounting data and manage other district network functions. The server is being backed-up to a local Network Attached Storage (NAS) which is then backed-up to an off-site storage location across a Wide Area Network (internet) connection. Districts do not provide written documentation on the encryption in use for sending information to the off-site location from the NAS. With only one server available to manage the district, it was reported that when the server failed, accounting data was lost and it required staff one month to reenter the lost data.

With a single server that controls all of a district's network infrastructure and it is destroyed by disaster, the district would have several days of downtime while replacing the server. When data is stored at remote locations with no encryption it allows anyone to access or gain control of the information. Accounting data would likely have confidential information that could be captured by unauthorized personnel.

RECOMMENDATION

Review options and address weaknesses in the current system used for data back-up.

The need for data encryption can be addressed by using the free program AxCrypt from Axantum Software and a Quorum Appliance that can be added to the system for up-to-date ready-to-run virtual machine clones of your systems for disaster recovery of the server. The Quorum backup is a hardware and cloud-based service that allows the server to be replaced within five minutes of being interrupted/going offline.

FISCAL IMPACT

One possible backup system is the Quorum Appliance which costs \$3,000 to purchase and requires continuous licensing each year at \$300.

RECOMMENDATION	2019-20	2020-21	2021-22	2022-23	2023-24
Quorum Backup Appliance ¹⁹	(\$3,000)	(\$300)	(\$300)	(\$300)	(\$300)
TOTAL	(\$3,000)	(\$300)	(\$300)	(\$300)	(\$300)

FINDING 5B-14

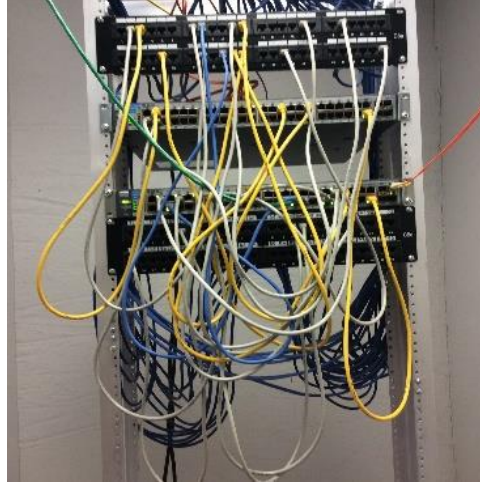
Districts lack Uninterrupted Power Supplies (UPSs) supporting their technology infrastructure. During one onsite visit, staff interviews indicated that power failures are common in the area. While these tend to happen due to problems beyond the district's control, these conditions cause hard drives to stop writing in mid-stream which cause data corruption and eventually an unstable system. Neither the district's server nor the NAS were attached to a battery backup system (**Exhibit 5B-10**).

¹⁹ <http://www.axantum.com/AxCrypt/Default.html>
<https://quorum.net/>

Exhibit 5B-10
Examples of No UPS Available



Elementary



Middle School



High School

RECOMMENDATION

Purchase rack-mounted Uninterrupted Power Supplies for both the server and NAS unit in plus smaller battery backups for network switches and fiber devices located throughout the district's school buildings.

After installing the UPSs and battery backups there should be a written record made for doing maintenance on the battery packs. Often the batteries housed in UPSs are overlooked during maintenance, and it is a best practice to refer to the vendor's documentation for the expected battery life. Once the expected battery life is known, the district should place a label with the expiration date on the unit's outer enclosure where it is clearly visible. This will help ensure that the batteries will be replaced before the recommended expiration date. Most batteries have a 3 year expected life so the record will show the estimated number of replacement batteries needed in 2019 and the associated cost can then be calculated and budgeted.

The district should also ensure that the UPS is not overloaded, and this can be checked by examining the unit's Light-Emitting Diode (LED) indicator, which warns of overload conditions.

FISCAL IMPACT

Estimated cost for Uninterrupted Power Supplies (UPSs) is \$1,700.00.

RECOMMENDATION	2019-20	2020-21	2021-22	2022-23	2023-24
Purchase UPS for Server: CyberPower 750 Watt UPS - Mfr. Part # PR1000LCDRTXL2UA Server Room	(\$550)	\$0	\$0	(\$200)	\$0
Purchase smaller UPS for server: CyberPower 400 Watt UPS - Mfr. Part # PR500LCDRT1U Schools facilities		(\$560)	\$0		(\$400)
TOTAL	(\$550)	(\$560)	\$0	(\$200)	(\$400)

FINDING 5B-15

The physical environment is not optimal in some districts’ data centers. Some are located in a small closet without any climate control for temperature or humidity. Portable fans had been placed in the room to help with cooling (**Exhibit 5B-11**).

**Exhibit 5B-11
Current Server Room Environmental Controls**



RECOMMENDATION

Implement a system of environmental controls to include data center temperature control (cooling), humidity control and environmental alarms.

A data center should be maintained at a temperature between 55° and 75° Fahrenheit. Many Public Schools do not maintain alarm systems in their data centers that can provide notification should the temperature exceed an established threshold. The combination of humidity control, temperature control (cooling) and environmental alarms are all important features and their

absence can jeopardize the entire network. The data centers represent a significant portion of district functionality, as well as a sizeable financial investment. Ensuring that environmental controls provide appropriate protection for all of the district’s network equipment is critical.

Portable air conditioners should be purchased and utilized as backups in case of building system failure or as supplements for areas that do not receive proper air circulation. In order to protect the network equipment throughout the district, temperature alarms should also be purchased and installed to notify key personnel when less than desirable conditions exist in any of the equipment closets. One example is the Temperature @lert Wi-Fi Edition – Wi-Fi Temperature Monitoring Systems.²⁰ This solution will send email alerts when triggered.

FISCAL IMPACT

The consulting team estimates a total one-time cost of \$2,150.00 for the necessary equipment or it can be spread over several years as shown below.

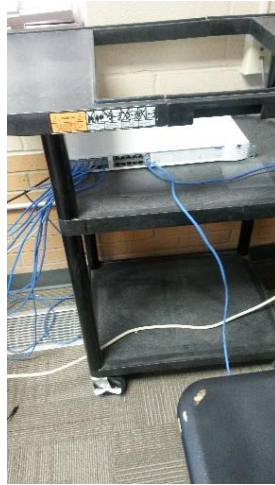
RECOMMENDATION	2019-20	2020-21	2021-22	2022-23	2023-24
Purchase portable air conditioner - HS Server Room	(\$600)	\$0	\$0	\$0	\$0
Purchase portable air conditioner - Upper Elementary	\$0	(\$600)	\$0	\$0	\$0
Purchase portable air conditioner - Middle School	\$0	\$0	(\$650)	\$0	\$0
Purchase environmental alarm system	(\$300)	\$0	\$0	\$0	\$0
TOTAL	(\$900)	(\$600)	(\$650)	\$0	\$0

FINDING 5B-16

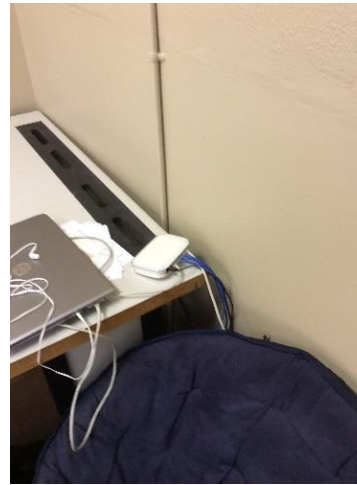
There are unmanaged switches in classrooms with most having a single data line feeding back to the central wiring room connecting with the main infrastructure switch to the district’s fiber backbone. The infrastructure switches are unmanaged, outdated, but most importantly they are potentially insecure. These switches could allow unauthorized access to network resources. Examples can be seen in **Exhibit 5B-12**.

²⁰<http://www.temperaturealert.com/Wireless-Temperature-Store/Temperature-Alert-WiFi-Sensor.aspx>

Exhibit 5B-12 Examples of Unmanaged Switches



Alternative Ed



Study Hall

RECOMMENDATION

Examine network security by conducting a vulnerability scan and address any areas found to be of concern.

Security focuses on protecting servers, computers, programs, and data from unauthorized access, changes, or destruction. The firewall is only one component of the overall network security. Other components include, but are not limited to, content filtering, antivirus, patch management, wireless encryption, and restricting physical access. Many of the devices in the district are more than three years old and the infrastructure and age of the devices can impact the efficiency in which state assessments are administered, as well as the integration of technology into the curriculum. There was no written infrastructure upgrade plan for the current unmanaged switches in classrooms and central back bone.

The district should develop and put in place a written infrastructure upgrade plan which includes replacing unmanaged or outdated infrastructure switches with managed switches that secure the network from unauthorized access. It is critical to assess multiple aspects of network security. While a firewall is already in place, additional security measures should be examined to prevent security breaches and complications due to network vulnerabilities. Completing a network vulnerability scan can help identify these problematic areas. One example of a highly-rated, yet cost-effective vulnerability scanner is the Nessus.

FISCAL IMPACT

The consulting team estimates an annual cost of \$1,300 based upon the cost of one possible solution.

RECOMMENDATION	2019-20	2020-21	2021-22	2022-23	2023-24
Purchase Nessus Vulnerability Scanner.	(\$1,300)	(\$1,300)	(\$1,300)	(\$1,300)	(\$1,300)

FINDING 5B-17

Wireless access is limited in the cafeteria because of building materials, building shape, the number of access points, and the size of the area to be served. One goal in many districts is to provide better wireless coverage to all locations.

RECOMMENDATION

A wireless site survey should be performed to determine the number and location of additional wireless access points.

With wireless systems, it's very difficult to predict the propagation of radio waves and detect the presence of interfering signals without the use of test equipment. Even if the system utilizes omni-directional antennas, radio waves don't necessarily travel the same distance in all directions. Instead walls, doors, elevator shafts, people, and other obstacles offer varying degrees of attenuation, causing the RF (radio frequency) radiation pattern to be irregular and unpredictable. As a result, before installing access points, it's absolutely necessary to perform a wireless site survey (also called an RF site survey) to fully understand the behavior of radio waves within an operating environment.

The ultimate goal of a wireless site survey is to determine the number and placement of access points (or mesh nodes) in order to provide adequate signal coverage throughout a facility or city area. With most implementations, "adequate signal coverage" means the support of a minimum data rate or throughput.

FISCAL IMPACT

Estimated cost for a wireless site survey of the cafeteria is \$2,500.00.

RECOMMENDATION	2019-20	2020-21	2021-22	2022-23	2023-24
Conduct a site survey re: wireless access points.	(\$2,500)	\$0	\$0	\$0	\$0

D. TECHNOLOGY ACQUISITION PRACTICES**FINDING 5B-18**

Districts do not currently have a standard for technology purchases. Because no standard exists, equipment with inadequate memory and specifications has been ordered. Additionally, no framework for equipment replacement or lifecycle exists, resulting in equipment in classrooms that is past its usefulness.

In the district, there are no minimum technology (network, hardware, and software) standards and protocols in place. A lack of coordination and guidelines results in equipment and software that no longer meet user needs or are obsolete and unusable for the designated purpose. This absence of processes and procedures leads to additional costs and an increased backlog of support issues.

RECOMMENDATION

Adopt a district standard that includes an equipment replacement schedule for computers and other technology equipment.

The responsibility and technical expertise needed to meet user demands can no longer be performed in a fragmented fashion. All district technology needs must be prioritized and addressed in a systematic and well-thought-out manner beginning with the development of standards.

The district should develop district standards for all hardware, software and network purchases. The Smarter Balanced Assessment and PARCC technology guidelines should be the starting point of the discussion on district needs and standards.

The next step is to use the current inventory. Using the existing inventory, the technology director should establish a priority list of which types of computers are to be replaced first and with what type of device. The technology director should also establish the expected longevity and scheduled replacement for each computer category.

Once these replacement schedules have been established, the technology director should link district general funds designated for computer replacement to the number of computers to be replaced. The same process can be used for other computer-related equipment, such as printers.

FISCAL IMPACT

This recommendation can be implemented with existing resources.

FINDING 5B-19

Districts do not have a system for tracking computers, Chrome Books, and other technology equipment. It is important to have tracking information available if the equipment is lost, damaged, or assigned to staff who might leave the district.

RECOMMENDATION

Ensure the district develops a system to inventory and track technology-related equipment.

An Access database with copies of the database available to both the superintendent and the IT director is a simple way to ensure that district assets are tracked. The equipment serial numbers are to be used for tracking purposes. The list can also be used to plan future purchases and the retirement of old, outdated assets.

FISCAL IMPACT

This recommendation can be implemented with existing resources.