IOWA DIGITAL LEARNING PLAN

Iowa's Area Education Agencies

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Letter from the Director

As Director of the Iowa Department of Education, one of my goals is to ensure our students develop the knowledge and skills necessary to be successful in jobs and careers in a rapidly changing world. A foundational component in ensuring this success is digital learning.

Iowa's digital learning plan provides a roadmap for our state. It describes what digital learning looks like and how we can improve it for all students.

I appreciate this plan's focus on learning, teaching, leadership, assessment and infrastructure. The plan takes an aligned approach, ensuring that digital learning is fully integrated into how schools educate students. Digital learning can strengthen the work districts have been doing to improve early literacy results, expand high-quality Career and Technical Education (CTE) offerings, and leverage teacher leadership to improve student achievement.

One of the aspects of this work that I find most energizing and important is the great partnership that has supported the development of this plan and will ensure effective implementation. I appreciate the critical role Iowa's Area Education Agency system plays in this effort along with the support provided by REL Midwest and the feedback provided by many Iowa educators.

Ultimately, digital learning helps personalize learning for all students and ensures they are positioned to achieve their full potential. At the heart of this plan is a commitment to ensure all students are ready for the future. Thank you for being a partner in this effort.

Sincerely,

Ryan M. Wise, Ed.L.D.
Director
Iowa Department of Education

Introduction
Iowa's Digital Learning Plan

Iowa Digital Learning Plan (DLP)

Welcome to the Iowa Digital Learning Plan. This plan is the result of a collaborative effort between the Iowa Department of Education (Department), Iowa Area Education Agencies (AEAs), Local Education Agencies (LEAs), the American Institute for Research (AIR), and many stakeholders. A steering committee made up of AEA staff, Department consultants, and consultants from AIR guided this work and contributed to the development of the different sections of the plan. The steering committee worked with an advisory committee made up of members from local school districts, higher education, Department consultants, and business partners to garner input on the sections of the plan as they were in development. After months of development, a draft version of the plan was taken to a group of stakeholders, including Department staff, AEA staff, LEA staff, higher education, businesses, and others, to solicit their input on the content and direction of the plan. This plan outlines the vision and recommendations for the use of technology to enable learning. From this, further work will be done to identify strategic actions to bring the plan to fruition.

As this plan has been developed, many people have asked what we mean when we say "digital learning." Digital learning is learning that is supported by digital tools and resources. Examples of digital learning include online learning, blended learning, adaptive assessment solutions, and open educational resources. The focus of digital learning begins and ends with the learning experience of the student. That experience starts with the instructional practices a teacher uses in the classroom. Digital tools and resources should be a part of the tools available to teachers to support their instructional practice. As Michael Fullan (2017) eloquently stated, pedagogy is the driver and technology is the accelerator. A teacher's instructional practices are enhanced and learning is transformed when digital learning is used to support, or accelerate, those practices.

Iowa, like other states, has seen a steep growth in 1:1 initiatives (one digital device per student) over the past ten years. Over time, districts have gone from providing computer labs, where students would go at a prescribed time, to 1:1 devices for a certain or all grade levels. This is true in a large majority of Iowa's schools.

In the introduction to the monograph *Islands of Excellence: What Districts Can Do to Improve Instruction and Achievement in All Schools (2003)*[1], the Learning First Alliance said "heroic principals who turn around low-performing schools . . . inspiring teachers who motivate students to excel—those are the familiar prescriptions for improving student achievement in high-poverty schools. While such efforts may mean brighter educational futures for the children involved, they produce isolated islands of excellence," (page 1). In some ways the current approach to digital learning in Iowa has produced islands of excellence. Some districts have deeply embraced digital learning and, as a whole, are beginning to realize the payoff

EQUITY AND ACCESSIBILITY

Equity in education means increasing all students' access to educational opportunities with a focus on closing achievement gaps and removing barriers that students face based on their race, ethnicity, or national origin; sex; sexual orientation or gender identity or expression; disability; English language ability; religion; socioeconomic status; or geographical location.2 Accessibility refers to the design of apps, devices, materials, and environments that support and enable access to content and educational activities for all learners. In addition to enabling students with disabilities to use content and participate in activities, the concepts also apply to accommodating the individual learning needs of students, such as English language learners, students in rural communities, or from economically disadvan-taged homes. Technology can support accessibility through embedded assistance, for example, text-to-speech, audio and digital text formats of instruc-tional materials, programs that differentiate instruction, adaptive testing, built-in accommodations, and assistive technology.

from their investment. In other districts, there is a teacher or teachers who have pushed and are pushing the envelope of digital learning, seeing how it can deepen the learning for their students.

As you will see, the Iowa Digital Learning Plan is built upon the National Ed Tech Plan (NETP)[2]. The NETP plan laid out a national vision for instruction supported by technology, and it did so by providing background, success stories, and resources for educators to draw upon. The framework of the NETP consists of five different aspects of educational technology: *Leadership, Teaching, Learning, Assessment,* and *Infrastructure*. The Iowa plan starts with and builds upon the NETP by providing the Iowa context for digital learning and providing stories from Iowa school districts, demonstrating the different aspects of digital learning and, ultimately, the digital learning vision for Iowa.

Intended to be useful for any group or individual with a stake in education, the NETP assumes as its primary audiences teachers; education leaders; those responsible for preparing teachers; and policymakers at the federal, state, and local levels. The concepts, recommendations, and examples are also applicable to postsecondary institutions, community organizations, and state-level initiatives. The NETP focuses on using technology to transform learning experiences with the goal of providing greater **equity** and accessibility for all learners. *(See Section 3: Learning)*.

In addition to guidance from the NETP and the formulation of a vision for digital learning in Iowa, another goal for this plan is to make clear connections between digital learning and major educational innovations underway in Iowa. Those initiatives include, but are not limited to, Multi-Tier System of Supports (MTSS), Teacher Leadership & Compensation (TLC), Iowa's Differentiated Accountability System (DA), Science Technology Engineering and Mathematics (STEM), and Career and Technical Education (CTE). The link between digital learning and some of these innovations seems more obvious (i.e., STEM). However, other initiatives don't have such a straightforward connection to digital learning, and in this plan we work to make those connections more clear. This is accomplished through some of the stories showing how Iowa schools use aspects of digital learning to support or accelerate the implementation of an initiative.

Through this plan, Iowa will strive to make it possible to bring digital equity to all students. Great progress has been made in making technology available to a majority of students in Iowa. However, as indicated in the NETP, there is a digital divide separating students who are allowed to use technology in ways that transforms or deepens their learning from students who use the same technology as a substitute for worksheets, multiple-choice tests, or other analog learning tools. The digital use divide is present in both formal and informal learning settings and across high- and low-poverty schools and communities. This plan can help districts or individual educators discover ways to use digital learning in more transformative ways, thereby helping to eliminate digital inequities. Showcasing how others are using digital learning tools and resources may be all it takes for a teacher or school to begin to use those same tools and resources transformationally.

Technology can be a powerful tool for transforming learning. It can help affirm and advance relationships between educators and students, reinvent our approaches to learning and collaboration, shrink long-standing equity and accessibility gaps, and adapt learning experiences to meet the needs of all learners.

Schools, community colleges, adult learning centers, and universities should be incubators of exploration and invention. Educators should be collaborators in learning, seeking new knowledge, and constantly acquiring new skills alongside their students. Education leaders should set a vision for creating learning experiences that provide the right tools and supports for all learners to thrive.

However, to realize fully the benefits of technology in our education system and provide authentic learning experiences, educators need to use technology effectively in their practice. Furthermore, education stakeholders should commit to working together to use technology to improve American education. These stakeholders include leaders; teachers, faculty, and other educators; researchers; policymakers; funders; technology developers; community members and organizations; and learners and their families.

Restoring Iowa Schools

As Iowa works to restore our schools to best in the nation and give students a globally competitive education, we must increase academic achievement in elementary and secondary schools, including closing the persistent achievement gap holding back many minority students. Iowa led the nation in fourth-grade reading and eighth-grade mathematics in the early 1990s, but the state's average test scores stagnated over the next two decades. At the same time, Iowa has gaps among low-income students, students from diverse backgrounds, and students with disabilities across several measures of achievement. While there are success stories, these gaps are unacceptable and Iowa is working to address them as an education system.

Reading proficiently by the end of third grade is critical because fourth-graders are expected to progress from learning to read to using their acquired reading skills to solve problems and think critically. Students struggling to read are more likely to eventually drop out of high school because they face difficulty learning most subjects.

In 2017, the National Assessment of Educational Progress (NAEP), also referred to as the nation's report card, showed 37 percent of Iowa fourth-grade students performed at or above the NAEP proficiency level in reading, and 69 percent performed at or above the NAEP basic level. Iowa 8th graders scored 36 percent at or above the NAEP proficiency level in reading, and 79 percent performed at or above the NAEP basic level.

In 2017, in the area of mathematics, 45 percent of Iowa fourth-grade students performed at or above the NAEP proficiency level, and 82 percent performed at or above the NAEP basic level. Iowa 8th graders scored 37 percent at or above the NAEP proficiency level in mathematics, and 76 percent performed at or above the NAEP basic level.

NAEP scores also demonstrate proficiency gaps exist for many minority student groups. Most African-American and Hispanic students and students eligible for free and reduced-price lunch fell below the statewide average score.

Iowa is now seeing progress due to our recent initiative to ensure students read proficiently by the end of third grade. Iowa has made progress on early literacy screening assessments for the third year in a row. The share of kindergarten through third-grade students who met or surpassed benchmarks used to measure statewide progress increased from 69.7 percent to 70.5 percent from fall 2017 to spring 2018 – and has increased nearly 7 percentage points since 2015.

Educators are working extraordinarily hard to help students meet higher expectations, with Iowa's new Teacher Leadership and Compensation System providing more time to collaborate to improve instruction. The Governor's Science, Technology, Engineering and Mathematics Advisory Council is delivering high-quality STEM education programs to students across Iowa and expanding work-based learning to provide students real-world professional experiences to better connect the classroom to future careers. These dedicated efforts are making a difference, but more needs to be done to help students who struggle academically.

Meanwhile, Iowa has a goal of 70 percent of the workforce having education or training beyond high school by 2025 to meet projected workforce needs.

A number of Future Ready actions were taken by Iowa's legislature during the 2018 legislative session. These actions included the appropriation of funds to develop a clearinghouse and for high school students to attend summer programs to develop high-demand job skills, and the adoption of many of the Future Ready Iowa Alliance recommendations.

The Iowa legislature has appropriated $250,000 for the creation of the Iowa Clearinghouse for Work-Based Learning as part of the Future Ready Iowa Initiative. The Clearinghouse was created by Governor Reynolds in Executive Order No. 1 and will be a joint venture of the Department and Iowa Area Education Agencies (AEA) Learning Online. The Clearinghouse will create a virtual space to connect employers who post high-quality work-based learning projects with schools that can select those projects as a starting point for collaboration. It also will include an inventory of work-based learning opportunities and will enable distance kindergarten through grade twelve school-business partnerships when it launches in July 2019.

The legislature also appropriated $600,000, as part of the Future Ready Iowa Initiative, for resident high school students to attend a community college for college-level classes or attend classes taught by community college employed instructors in alignment with high-demand jobs during the summer through a contractual agreements between the community colleges and the school districts. The Department will provide additional guidance prior to the program becoming operational in the summer of 2019.

Other Future Ready Iowa actions taken by the Iowa legislature in 2018 included the expansion of registered apprenticeship opportunities in Iowa, development of a summer youth intern program to help young people at risk of not graduating from high school explore and prepare for high demand careers, and the expansion of Iowa Jobs for America's Graduates (iJAG) to help more middle schools and high schools provide direct services to at-risk students. The Legislature also passed a number of policy actions with the expectation they would be funded in FY20. These included a "Last-Dollar Scholarship Program" to help pay tuition for Iowans who are new high school graduates or adult learners seeking postsecondary credentials, a Future Ready Iowa Skilled Workforce Grant Program to provide an annual stipend for Iowans with at least half the credits toward a bachelor's degree in approved programs of study, a volunteer mentoring program to support students participating in some Future Ready Iowa programs, and the Iowa Employer Innovative Program to expand opportunities for credit and noncredit education and training leading to high-demand jobs by providing state matching funds for innovative proposals to strengthen the regional workforce talent pipeline.

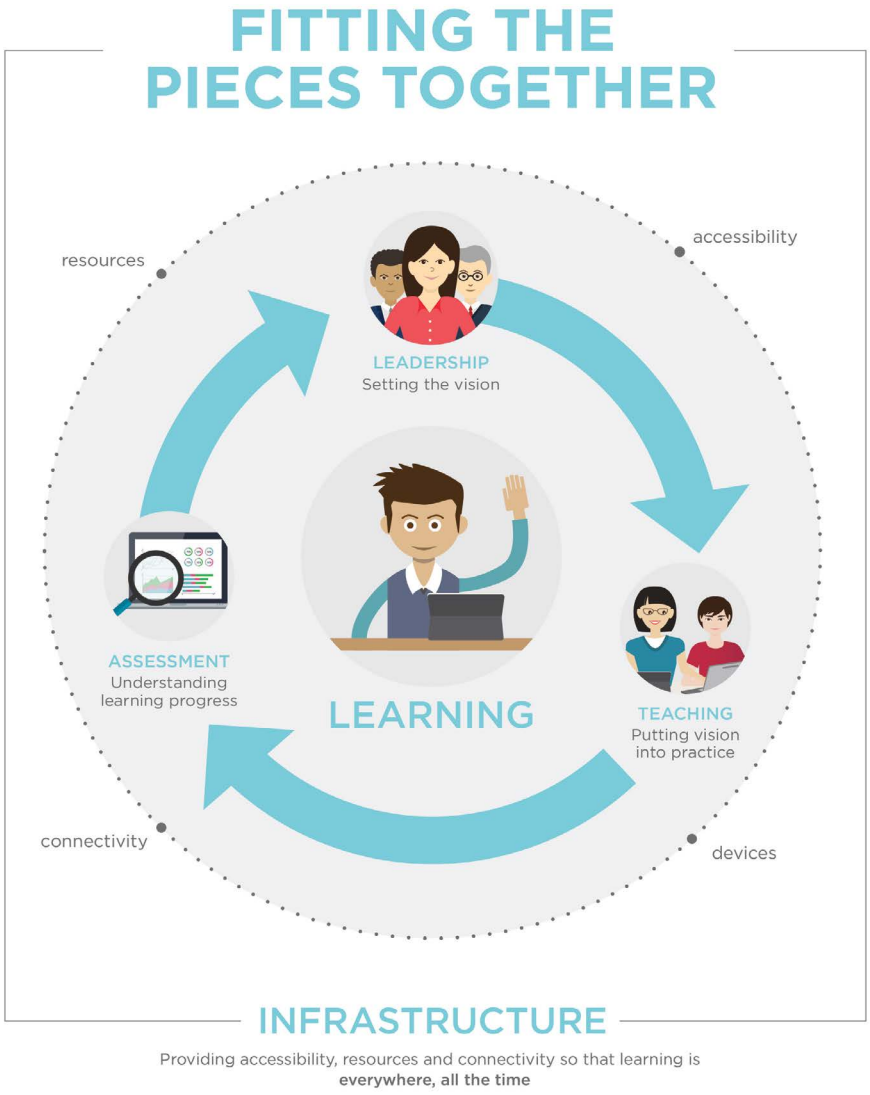
When carefully designed and thoughtfully applied, technology can accelerate, amplify, and expand the impact of effective teaching practices. However, to be transformative, educators need to have the knowledge and skills to take full advantage of technology-rich learning environments (see Section 2: Teaching). In addition, the roles of PK–12 classroom teachers and post-secondary instructors, teacher librarians, families, and learners will need to shift as technology enables new types of learning experiences *(see Section 3: Learning)*.

For these systemic changes in learning and teaching to occur, education leaders need to create a shared vision for how technology can best meet the needs of all learners and to develop a plan that translates the vision into action *(see Section 1: Leadership)*.

Technology-enabled assessments support learning and teaching by communicating evidence of learning progress and providing insights to teachers; administrators; families; and, most importantly, the learners

themselves. These assessments can be embedded within digital learning activities to reduce interruptions to learning time and provide equitable access for all learners. *(See Section 4: Assessment)*.

Learning, teaching, and assessment enabled by technology require a robust infrastructure *(see Section 5: Infrastructure)*. Key elements of this infrastructure include high-speed connectivity and devices that are available to teachers and students when they need them. Aside from wires and devices, a comprehensive learning infrastructure includes digital learning content and other resources, as well as professional development for educators and education leaders.



Recent Progress and the Road Ahead

Since the 2010 NETP, the U.S. has made significant progress in leveraging technology to transform learning in a variety of ways:

- The conversation has shifted from whether technology should be used in learning to how it can improve learning to ensure that all students have access to high-quality educational experiences.
- Technology increasingly is being used to personalize learning and give students more choice over what and how they learn and at what pace, preparing them to organize and direct their own learning for the rest of their lives.
- Advances in the learning sciences have improved our understanding of how people learn and have illuminated which personal and contextual factors most impact their success.

- Advances in web content accessibility standards has allowed all learners to interact with curriculum in the manner that is most effective for the individual learner.
- Research and experience have improved our understanding of what people need to know and the skills and competencies they need to acquire for success in life and work in the 21st century. Through pre-service teacher preparation programs and professional learning, educators are gaining experience and confidence in using technology to achieve learning outcomes.
- Sophisticated software has begun to allow us to adapt assessments and instruction to the needs and abilities of individual learners and provide near real-time results.
- Nationally, significant progress has been made toward ensuring that every school has high-speed classroom connectivity as a foundation for other learning innovations.
- The cost of digital devices has decreased dramatically, while computing power has increased, along with the availability of high-quality interactive educational tools and apps.
- Technology has allowed us to rethink the design of physical learning spaces to accommodate new and expanded relationships among learners, teachers, peers, and mentors.

Although we can be proud of the progress of the last six years, there is still much work to do. Now, a look at the work ahead:

- A **digital use divide** continues to exist between learners who are using technology in active, creative ways to support their learning and those who predominantly use technology for passive content consumption.
- While school and district leaders often leverage data for decision-making, many still need support and better tools so they can get real-time information on how strategies are working through rigorous, quick-turnaround evaluations of technology.
- Many schools do not yet have access to or are not yet using technology in ways that can improve learning on a daily basis, which underscores the need—guided by new research—to accelerate and scale up adoption of effective approaches and technologies.
- Schools and districts that are deciding how to incorporate educational technology in student learning should actively involve and engage families during early development and implementation of their digital transformation.
- Schools, districts and AEAs should consider accessibility when implementing web content procurement procedures.

DIGITAL USE DIVIDE

Traditionally, the digital divide referred to the gap between students who had access to the Internet and devices at school and home and those who did not.[5][6] Significant progress is being made to increase internet access in schools, libraries, and homes across the country. However, a digital use divide separates many students who use technology in ways that transform their learning from those who use the tools to complete the same activities but now with an electronic device (e.g., digital worksheets, online multiple-choice tests). The digital use divide is present in both formal and informal learning settings and across high- and low-poverty schools and communities.[7][8][9]

Few schools have adopted approaches for using technology to support informal learning experiences aligned with formal learning goals.

- Supporting learners in using technology for out-of-school learning experiences is often a missed opportunity.
- Many pre-service teacher education graduates feel unprepared to use technology to support student learning as they transition to teaching and using technology effectively in the classrooms.
- Assessment approaches have evolved but still do not use technology to its full potential to measure a broader range of desired educational outcomes, especially **non-cognitive competencies**.

NON-COGNITIVE COMPETENCIES

Non-cognitive competencies (also referred to as social and emotional learning) include a range of skills, habits, and attitudes that facilitate functioning well in school, work, and life. They include self-awareness, self-management, social aware-ness, and relationship skills as well as perseverance, motivation, and growth mindsets.[10][11][12]

- The focus on providing Internet access and devices for learners should not overshadow the importance of preparing teachers to teach effectively with technology and to select engaging, relevant, and accessible digital content.
- As students use technology to support their learning, schools are faced with a growing need to continuously protect student privacy while allowing the appropriate use of data to personalize learning, advance research, and visualize student progress for families and teachers.
- Network security is a growing concern as internet accessible school data, management, and learning systems become more ubiquitous and as the sophistication of attacks on school networks grows, including the use of ransomware.

The NETP provides a common vision and action plan that responds to an urgent national priority. It describes specific actions the United States should take to ensure learners of all ages have opportunities for personal growth and prosperity and remain competitive in a global economy.

The goal with the Iowa plan is to provide a vision for what digital learning could look like in Iowa. The hope is to bridge the gap that exists between the islands of excellence. Through the stories and resources provided, a vision will be created for what digital learning could look like if fully implemented. Interested educators could draw upon the information contained herein to develop a picture of the desired state for their own classrooms or schools. The effective use of digital learning will help districts address Iowa Core's Universal Constructs and what is often referred to as the 4Cs. The 4Cs, according to the Partnership for 21st Century Learning (2017), include creativity, communication, collaboration, and critical thinking. The Iowa Core's Universal Constructs incorporate these four concepts and include flexibility and adaptability, and productivity and accountability. If used planfully, digital learning can aid districts in ensuring that all students are able to show mastery with each of these constructs. Teachers can plan lessons to address one or more of these constructs and use digital learning devices or resources as tools to allow a student to master the constructs being addressed.

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[1] Islands of Excellence: What Districts Can Do to Improve Instruction and Achievement in All Schools (2003). Learning First Alliance. Downloaded from https://learningfirst.org/sites/learningfirst/files/assets/biebrief.pdf, on November 15, 2017.

[2] Reimagining the Role of Technology in Education: 2017 National Education Technology Plan Update (2018). Downloaded from https://tech.ed.gov/netp/, on November 15, 2017.

Section I

Leadership – Creating a Culture and Conditions for Innovation and Change

GOAL: Embed an understanding of technology-enabled education within the roles and responsibilities of education leaders at all levels and set state, regional, and local visions for technology in learning.

Taking full advantage of technology to transform learning requires strong leadership capable of creating a shared vision of which all members of the community feel a part. Leaders who believe they can delegate the articulation of a vision for how technology can support learning goals to a chief information officer or chief technology officer fundamentally misunderstand how technology can impact learning. Technology alone does not transform learning; rather, technology helps enable transformative learning. The vision begins with a discussion of how and why a community wants to transform learning. Once these goals are clear, technology can be used to open new possibilities for accomplishing the vision that would otherwise be out of reach. Moving to learning enabled by technology can mean a shift in the specific skills and competencies required of leaders. Iowa education leaders— legislators, Department of Education and Area Education Agency personnel, higher education and local district leadership — need personal experience with learning technologies, an understanding of how to deploy these resources effectively, and a community-wide vision for how technology can improve learning.

Leadership through Iowa Legislative Actions

Iowa's legislative policy makers have shown leadership by passing legislation directly supporting or impacting broadband expansion and/or digital learning.

1. Iowa Communications Network: In mid-1989, the Iowa Legislature passed legislation that called for the construction of a shared statewide telecommunications network. The bill was signed into law by then Governor Terry Branstad and within a year, construction began to install one fiber-optic endpoint in every Iowa county. In 1994, a state agency - the Iowa Communications Network (ICN) - was created to manage the network. Today, 311 Iowa education facilities (public and private K-12 schools, Area Education Agencies and community, state and private colleges) utilize the ICN for Internet and Ethernet services. (The network is also utilized by other authorized users, including public libraries, hospitals, National Guard armories, and state and federal government.)

2. The Secure an Advanced Vision for Education (SAVE) Fund was created during the 2003 Regular Legislative Session. In 2008, a statewide one cent sales tax was dedicated to the Secure an Advanced Vision for Education, effective July 1, 2008, and codified in Iowa Code, Chapter 423. The SAVE allows districts the acquisition or installation of information technology infrastructure.

3. Other legislative action supporting digital learning has been taken over a number of legislative sessions. Some actions taken by the Iowa legislature, that advance digital learning for Iowa, have included the development of Iowa Learning Online, approval of Iowa Virtual Academies, allowing districts to develop online learning programs if certain conditions are met, allowing Iowa Learning Online to be used by students in home-school situations, establishment of voluntary computer science standards, and the creation of a computer science professional development incentive fund.

Leadership through Iowa Department of Education

The Department leadership has been instrumental in providing structures and resources that are unique to this state, directly impacting teaching and learning in numerous ways including technology. The

Department directs work through a variety of entities and programs — Area Education Agencies, online learning opportunities, Iowa Teacher Leadership Compensation System — and works collaboratively with School Administrators of Iowa and other agencies to improve teaching and learning.

The Area Education Agency (Iowa's regional intermediate agencies) provide direct support to school districts and also acts as a connection between LEAs and the state-level entities. AEA leadership sets the vision for effective integration of technology, creating Media and Technology director positions — personnel who discuss best practices, provide statewide resources through purchasing agreements, and create structures and processes to provide educator professional development.

Another Department partnership that sets Iowa apart from other states is the Teacher Leadership Compensation (TLC) system. The Iowa Legislature created HF215 in 2013 to build internal capacity within school districts. The Department coordinated the TLC to recruit and retain strong teachers and compensate teacher leaders in the LEAs. (TLC goals and narratives are found in Section II, pps. 36-37.) Many districts have created positions directly aligned to supporting integration of technology in the classroom.

DEPARTMENT CREATION FOR IOWA LEARNING ONLINE

In an effort to expand student educational opportunities through online learning, leadership at the Iowa Department of Education created Iowa Learning Online (ILO) www.iowalearningonline.org. This virtual learning system supports Iowa's districts, schools, and home schoolers at their request, by providing teachers and online high school courses. ILO addresses teacher shortages, particularly in hard-to-fill subject areas, and allows schools to offer a wider variety of courses and/or courses that otherwise would not be available to their students.

Courses are developed and/or licensed based on their adherence to best practices in online instruction and content-area practices, the Iowa Core, and the iNACOL National Standards of Quality for Online Courses. All course selections follow a rigorous evaluation process by ILO's team of educators, content area experts, instructional designers, and educational technologists.

Most schools choose to take advantage of ILO's traditional model of delivering challenging online courses, taught by ILO's Iowa-licensed teachers, through a modern learning management system and desktop or device interactive video. Additionally, schools offering their own online curriculum may do so by enrolling their students in ILO's Branch Out model. In this partnership model, ILO provides the infrastructure and high school courses, and the local school provides the appropriately licensed teachers who work in partnership with ILO's professional development, curriculum and instructional design consultants. The local school is able to retain its focus, while preparing the school for a more globalized future.

SAI AND AEAS PARTNER TO PROMOTE TECH-KNOWLEDGY FOR LEADERS

School Administrators of Iowa (SAI) is a professional association that serves school leaders — principals, curriculum directors, superintendents and other administrators. One of the professional learning opportunities SAI offers is an annual conference. As part of the conference, SAI attendees partner with Area Education Agencies' digital learning consultants to offer supports for educational leaders to hone their technology skills. The Techknowledgy Bar is open during the conference to provide one-on-one support to administrators on questions they may have, ranging from email productivity to using social media communication tools. Mini-lessons on tools and techniques leaders can use to support their work are also offered during the conference. This is a time for administrators to be exposed to new tools and innovations to take back and share within their

district or building. The partnership with the AEAs allows opportunities for administrators to bring in their AEA consultants to follow up and provide ongoing professional learning with their staff throughout the year.

Future Ready K-12 Leaders

To support the unique needs of superintendents and district leaders, the U.S. Department of Education identified and then filmed eight Future Ready districts that exemplified four key focus areas of effective leadership. The resulting collection of 47 research-based, short videos break down specific actions taken by these district leaders to transform teaching and learning and serve essentially as virtual site visits. For more information about the Future Ready Leaders project and access to the survey and videos, visit the U.S. Department of Education Future Ready Leaders website at https://tech.ed.gov/leaders.

Characteristics of Effective Leadership

Selected by synthesizing the best available research and practice knowledge, the following were identified as four key focus areas of effective leadership: collaborative leadership, personalized student learning, personalized professional learning, and robust infrastructure.[1]

Collaborative Leadership

Education leaders develop a shared vision for how technology can support learning and how to secure appropriate resources to sustain technology initiatives. Leaders seek input from a diverse team of stakeholders to adopt and communicate clear goals for teaching, leading, and learning that are facilitated by technology. They model tolerance for risk and experimentation and create a culture of trust and innovation.

Leaders communicate with all stakeholders by using appropriate media and technology tools and establish effective feedback loops. While implementing the vision through a collaboratively developed strategic plan, leaders use technology as a learning tool for both students and teachers. Leaders are creative and forward- thinking in securing sustainable streams of human and capital resources to support their efforts, including appropriate partnerships both within their institutions and beyond.

In order for education research to have the most impact on practice, it is critical for practitioners at the school and district level to use and understand research. The Institute of Education Sciences supports two National Research and Development Centers on Knowledge Utilization, tasked with learning how research is used in schools and districts during decision-making (http://www.ncrpp.org and http://www.research4schools.org). Early results suggest that district leaders value education research and use it to expand their understanding of education issues and when making decisions about professional development and curriculum adoption.

Iowa school districts are moving forward with their technology efforts to impact teaching and learning across the state. One example of systemic change, stakeholder collaboration, and implementation of technology is the Van Meter Consolidated School District.

VAN METER CSD -- PATTERNS OF INNOVATION: A 21ST CENTURY LEARNING P21 EXEMPLAR CASE STUDY

Van Meter is a small K-12 school district located west of Des Moines and includes 650 students. In recent years, the district has implemented a 1:1 computing initiative, standards-based grading, and the beginnings of competency-based instruction through a model chemistry class. Van Meter's size has enabled educators and district leaders to engage stakeholders at every level—including

students themselves—in the development of the district's educational framework. "We involve our students in a lot of the decisions that we make," said Superintendent Deron Durflinger, "because we want it to be about their learning and to create an environment that's most conducive to their overall educational experience."

Through a series of conversations, the district identified collaboration, communication, creativity, and problem solving (the 4Cs) as essential characteristics of successful students.

Van Meter's educational leaders try to use the same collaborative, learner-driven instructional model for teachers that they want to see implemented in the classroom. Teachers set their own goals based on student data and work in smaller groups toward accomplishing those goals in the way they deem appropriate. "The role of the administrator," noted Director of Personalized Learning and Innovation Jen Sigrist, "just like the role of the classroom teacher, is to facilitate and help those groups, either with resources, or in keeping everyone moving toward student achievement improvement."

The 21st Century Learning P21 project is produced by the Partnership for 21st Century Skills with support from the Pearson Foundation, which aims to make a difference by promoting literacy, learning and great teaching. For more resources on teaching 21st century skills, visit p21.org.

Personalized Student Learning

Technology enables personalized pathways for student learning through active and collaborative learning activities. Clearly defined sets of learning outcomes guide instruction. The outcomes, and the aligned curriculum, instruction, and assessment, reflect the multidisciplinary nature of knowledge; prepare students for our participatory culture through attention to digital literacy and citizenship; and attend to general skills and dispositions, such as reflection, critical thinking, persistence, and perseverance.

Administration and school board provide leadership ensuring that policies and resources equip teachers with the right tools and ongoing support to personalize learning in their classrooms. One such decision at Indianola has opened greater opportunities for its students.

INDIANOLA OFFERS ONLINE DIPLOMA

By the 2019-20 school year, students at Indianola High School will have a new way to earn an online core diploma—and in a new setting. District leaders are working toward developing a curriculum unique to Indianola, written by local teachers. Developing this isn't a small undertaking. Teachers receive training through the Heartland Area Education Agency, which partners with Drake University to offer an online certificate. Staff from Indianola High School are at various stages in their coursework, but Superintendent Art Sathoff estimated 24 are involved.

The online learning center will also ensure accessibility for all students. Not all families have the Internet at home, and those in rural areas may have limited or unreliable access. A local online curriculum will also offer opportunities to students seeking a traditional diploma. If a student misses school due to a medical event, for instance, he or she may catch up via online courses. Seniors struggling to get in all their desired classes due to scheduling conflicts may be able to take some of those courses online.

Written by Jenny Fee, Special to the Record-Herald Published 10:50 a.m. CT Feb. 5, 2018 https://www.desmoinesregister.com/story/news/local/indianola/2018/02/05/indianola-high-school-offer-online-diploma/306489002/

Teachers collaborate to make instructional decisions based on a diverse data set, including student and teacher observations and reflections, student work, formative and summative assessment results, and data from analytics embedded within learning activities and software aided by real-time availability of data and visualizations, such as information dashboards. Leadership policy and teacher methods support student voice and choice in the design of learning activities and the means of demonstrating learning. Students frequently complete a series of self-directed, collaborative, multidisciplinary projects and inquiries that are assessed through a profile or portfolio. Technology is integral to most learning designs, used daily within and beyond the classroom for collaboration, inquiry, and composition, as well as for connecting with others around the world. In the classroom, teachers serve as educational designers, coaches, and facilitators, guiding students through their personalized learning experiences.

Personalized Professional Learning

Leaders ensure the availability of ongoing, job-embedded, and relevant professional learning designed and led by teachers with support from other experts. Leaders develop clear outcomes for professional learning aligned with a vision for student learning.

Teachers and leaders engage in collaborative inquiry to build the capacity of both the participating staff and the school as a whole through face-to-face, online, and blended professional learning communities and networks. Leaders ensure that planning for professional learning is participatory and ongoing. Leaders learn alongside teachers and staff members, ensuring that professional learning activities are supported by technology resources and tools, time for collaboration, and appropriate incentives..

MOVING FORWARD WITH PERSONALIZED LEARNING FOR EDUCATORS

Personalized learning has been a focus of the entire Nevada CSD when it comes to students and staff. The district starts each year by organizing the Nevada PhD Conference which allows teachers to select topics that they want to learn more about to improve their practice as educators. K-12 teaching staff choose from over 60 sessions facilitated by 40 presenters, who are mostly the district's own teachers. The goal is to provide educators with the differentiated professional development they need and want by allowing them voice and choice over their learning. From these sessions, teachers look at data from their classrooms and reflect on their teaching practices.

During professional development time, teachers have dedicated time to research, plan, implement, reflect, and share with colleagues the changes to their practice. As the district began personalizing learning experiences for students, they realized the need to provide the same experience for the teachers. The feedback received indicated that staff appreciated having their needs heard and being honored as professionals.

MEDIAPOLIS CSD - IOWA LEARNING ONLINE INSTRUCTION

Being an online teacher (6-12 Student Services Coordinator and Social Studies PLC Lead Teacher) enhanced Kelsey Steffener's teaching in many different ways. Teaching online has given her more confidence and pushed her to problem-solve in new ways. The communication skills she learned as an online teacher made her a stronger classroom teacher, better able to differentiate and personalize instruction to meet the needs of all learners. Being responsible and accountable for a student's online experience takes strong leadership skills. As an online teacher, she has a community of teachers and support from across the state with whom she can share ideas and problem-solve, but successful online teaching relies completely on how she chooses to lead.

This experience and self-reliance has strengthened her leadership skills in her home school district as well. She has been able to apply what she learned teaching online directly to her new position as PLC lead for her department. She has been able to support her fellow teachers in curriculum development and aligning the new standards to classroom instruction. Those are skills she learned being part of the online curriculum development team. Kelsey feels that being an online teacher was one of best decisions she has made as an educator, and she is proud to be part of what she views as the future of education.

Robust Infrastructure

A robust technology infrastructure is essential to transformative digital learning environments, and leaders need to take ownership of infrastructure development and maintenance. The 2016 CoSN Annual E-rate and Infrastructure Survey found that affordability still remains the primary obstacle for robust connectivity even though progress has been made; network speed and capacity pose significant challenges for schools; and, finally, too many school systems report a lack of competition for broadband services in many parts of the United States, particularly in rural areas.2 Leaders are responsible for meeting these challenges and ensuring ubiquitous access among administrators, teachers, and students to connectivity and devices and for supporting personnel to ensure equipment is well maintained.

Iowa's Governor Reynolds wants to improve broadband access for rural Iowans. To address this issue Governor Reynolds is targeting rural, broadband internet to support businesses. More specifically, during her 2018 annual condition of the state address, Reynolds stated, "This new initiative will promote investment and connect rural Iowa by expanding broadband capabilities in every corner of our state." Effective leaders take direct responsibility to ensure infrastructure remains up-to-date (both in terms of security and relevant software, apps, and tools) and open to appropriate Web content and social media tools to enable collaborative learning. Leaders also recognize the importance of building capacity among those responsible for creating and maintaining the technology infrastructure. Effective leaders support these efforts through careful planning and financial stewardship focused on long-term sustainability.

Implementation is Key

Although vision is critical to transforming teaching and learning, a strategic implementation plan is key to success. In some states, districts or schools will develop their own technology implementation plans; in others, state education leaders take the lead and districts follow. The Alliance for Excellent Education's Future Ready website provides one example of free online assessment tools to be completed by district teams. The resulting reports are designed to help district teams create a comprehensive implementation plan that accounts for the four Future Ready focus areas as well as implementation strategies and resources.

In addition to working with teams within educational organizations to create an implementation plan, leaders also should solicit input and feedback from a broad range of influencers: administrators, teacher-leaders experienced in using technology to support learning, professional organizations, boards of education, knowledgeable members of the community, business leaders, cultural institutions, colleagues in other districts, and parents.

Budgeting and Funding for Transition to Digital Learning

Regardless of location, all students should be afforded equitable access to rigorous and quality educational opportunities. Digital resources delivered in blended and/or online settings play an important role in providing this equity. Supported by adequate devices and robust broadband, all students are able to engage with highly-qualified teachers, content-area experts and challenging, standards aligned curriculum.

Unfortunately, districts often are challenged financially when it comes to implementing and sustaining technology initiatives and programs. Once a vision for the use of technology is in place, district superintendents and school leaders first should examine existing budgets to identify areas in which spending can be reduced or eliminated to pay for learning technologies. They also should consider all possibilities for creative funding of these programs. The following approaches are recommended for consideration as districts review their budgets and funding.

Eliminate or Reduce Existing Costs

As technology enables new learning opportunities and experiences, it also can render existing processes and tools obsolete, freeing up funds to pay for technology. Three obvious examples are copy machines (and related supplies and services contracts), dedicated computer labs, and replacing commercially licensed textbooks with openly licensed educational resources. (Openly licensed educational resources are teaching, learning, and research resources that reside in the public domain or have been released under a license that permits their use, modification, and sharing with others. Open resources may be full online courses or digital textbooks or more granular resources such as images, videos, and assessment items.) As part of #GoOpen, the Office of Technology (OET) challenged schools to begin this process by replacing just one textbook with openly licensed educational resources as a first step in appreciating the cost savings and developing an understanding of what would be necessary to implement such a change school- or district-wide. #GoOpen is discussed at length in Section 5.

Partner With Other Organizations

Partnership options for securing resources include local businesses and other organizations, alumni, internal and nearby teacher experts to provide professional development, and curriculum development arrangements with other districts. Some school districts have formed partnerships with local and county governments, sharing technology infrastructure and technical staff to keep costs down by jointly funding chief technology officer roles and taking advantage of the economies of scale when building and purchasing broadband access together. In Iowa, AEA Purchasing facilitates a voluntary purchasing program to help Iowa schools and other eligible entities save time and money. AEA Purchasing is an initiative of the Iowa Association of Area Education Agencies (IAAEA). The goal is to combine the purchasing power of Iowa schools to offer aggressive pricing on materials, goods, and services through a competitive bid process. This includes online applications and technology tools.

WAUKEE'S APEX

Partnering with businesses and getting students into the business world working with professionals is the reality for student-associates in Waukee's APEX program. APEX stands for Aspiring Professional Experience, a name — along with the program's visual branding — created by APEX associates. "Class time" for an APEX associate varies from day to day and from course to course. Associates could spend their two hours in APEX job-shadowing a career they're interested in pursuing. They may be connecting with entrepreneurs to share an idea or learn about the business launch process. They could be hosting a meeting with a client, probing to learn more about the problem the client wants solved and how the APEX associates can help.

The associates take on the full roles of professionals during their time in the program. They schedule the client meetings, ask questions, and take notes. They follow up with a plan on how to get started and set goals. They learn the basics of the Agile methodology and put it to use. After an initial client meeting, they map out how to start their project. Often, that includes meeting with a mentor to get the basics of the skills they will need to complete the project.

The program currently offers fourteen courses — led by ten instructors — from five economic sectors: Financial and Insurance; Business, Technology, and Communication; Engineering; Human Services; and Bioscience and Value-Added Agriculture. The economic sectors and courses are created with guidance from APEX's advisory board, made up of leaders in the business and higher education world.

In the Business, Technology, and Communication sector, APEX offers three courses. Developing Web Based Technologies builds websites for multiple clients including sheplaysnow.com and hyperstream.org. Designing Communication Solutions produces media and designs work such as "day in the life" videos for UnityPoint Health, fliers for the City of Waukee, and marketing materials for the Waukee Public Library.

There is no application process for the APEX program, no GPA requirement, and no prerequisite courses. Removing those barriers, and focusing in on that accessibility when pitching to sophomores and juniors, means that when looking at equity data within the Waukee school district, APEX is able to match ratios for gender and ethnicity to the district-as-a-whole ratios. Additionally, APEX is open to multiple school districts besides Waukee, including Johnston, Van Meter, Adel DeSoto Minburn, Norwalk, Panorama, and others.

Make Full Use of Federal Funds

The E-rate program provides substantial price discounts for infrastructure costs for schools and public libraries and is one source of technology funding. In addition, for funding beyond connectivity, a U.S. Department of Education Dear Colleague letter, published in November 2014 and updated in January 2017, provides guidance and examples for leveraging existing federal funds for technology-related expenditures.

Using Federal Funds: U.S. Department Of Education Dear Colleague Letter On Acceptable Uses Of Federal Funding For Technology

The purpose of the Dear Colleague letter published by the U.S. Department of Education in November 2014 and updated in January 2017 is to help state, district, and eligible partnership grantees better understand how they may be able to use their federal grant funds to support innovative technology-based strategies to personalize learning. The letter includes examples of how funds from the Elementary and Secondary Education Act (Titles I, II, and III) and Individuals with Disabilities Education Act (IDEA) may support the use of technology to improve instruction and student outcomes. Examples were limited to the Elementary and Secondary Education Act and IDEA because of the scale of these programs, but funds from many other formula and competitive grant programs that are administered by the U.S. Department of Education also may be used for this purpose.

The examples do not depart from previous U.S. Department of Education guidance but rather clarify opportunities to use federal grant funds to support digital learning, including improving and personalizing professional learning and other supports for educators, increasing access to high-quality digital content and resources for students, facilitating educator collaboration and communication, and providing devices for students to access digital learning resources. Funding these four areas is important because technology itself is not a panacea.

Student Support and Academic Enrichment (SSAE) Grants

In October 2016 the U.S. Department of Education released Non-Regulatory Guidance: Student Support and Academic Enrichment (SSAE) Grants. This grant program, newly authorized by the ESEA as amended by ESSA, focuses on activities to support well-rounded education, safe and healthy students,

and the effective use of technology. This guidance highlights some of the ways that SSAE funds can be used to meet the following goals for improving the effective use of technology:

1. Supporting high-quality professional development for educators, school leaders, and administrators to personalize learning and improve academic achievement
2. Building technological capacity and infrastructure
3. Carrying out innovative blended learning projects
4. Providing students in rural, remote and underserved areas with the resources to benefit from high quality digital learning opportunities
5. Delivering specialized or rigorous academic courses and curricula using technology, including digital learning technologies and assistive technology

LEAs may use SSAE funds to build technological capacity and infrastructure by purchasing devices, equipment, and software applications to address readiness shortfalls. Districts may not use more than 15% of the funds provided under section 4109(a) for this purpose. ESEA, secs. 4109(a)(2); 4109(b) Please see the non-regulatory guidance on Title IV, Part A for more information.

Rethink Existing Staff Responsibilities

As part of their technology implementation plans, many districts, schools, and higher education institutions are rethinking the roles and responsibilities of existing staff members to support technology in learning. Through Iowa's TLC system, districts have more flexibility with curriculum when staff can collaborate and use technology to expand student learning opportunities. TLC Instructional and Technology Coaches come from the teaching staff, broadening leadership and educational opportunities for staff and students. For example, some are expanding the role of teacher librarians to become evaluators and curators of learning technology resources, an activity that taps into their existing skill sets. Other districts and schools have adopted shared leadership and staffing models, enabling them to expand what they can offer students by sharing expensive resources. Another option for districts and schools is to partner with other organizations to staff specific technology in learning programs. TLC's impact on teaching and technology is further discussed in Section 2.

Whatever approach is adopted, organizations are well served to make sure they are fully staffing to meet needs rather than simply adding additional work to existing positions. MOC-Floyd Valley's use of personnel and technology is a prime example of meeting student needs, while Cedar Falls CSD broadens technology experiences with technology kits created by staff.

RETHINKING STAFF AND TECHNOLOGY TO IMPACT STUDENTS

Intrigued with the maker mentality, Sandy Groom-Meeks, technology instructional coach, and Marlene De Zeeuw, 6th-12th grade teacher librarian, wanted to create an MOC-Floyd Valley Middle School Makerspace (grades 6-8). Starting with borrowed materials from the local area education agency and supplementing with low-cost/no-cost items, the middle school Makerspace was born. Administration and staff supported their efforts and about 150 students each week responded positively. They also received a STEM Scale-Up grant through the Iowa Governor's STEM Advisory Council.

How does Makerspace work in the classroom? For one week each month, Makerspace activities are offered in three back-to-back 25-minute time slots each day during the school's activity and homeroom times. Five to seven different STEAM activities are set up in stations in the middle school library. Students are encouraged to team up and problem solve, create and communicate. They have opportunities to dig into robotics, experiment with circuitry, test an hypothesis, solve engineering challenges, and express themselves artistically. They can create, fail, and retry in order

to explore and build. (To see photos and a description of activities in the makerspace, go to: http://bit.ly/mocfv-makerspace).

TLC TECHNOLOGY COACHES AT CEDAR FALLS

When Cedar Falls began contemplating the TLC grant, they looked at a number of models that would best support teachers and provide opportunities for students. The district identified four instructional technology coaches who specifically work with teachers on integrating technology to achieve their student learning goals.

Like other instructional coaches, the instructional technology coaches facilitate planning, co-teaching, and assessing of student work within the classroom. In addition to that work, the instructional technology coaches organize, plan, deliver, and scaffold instruction with district technology kits. The technology kits have been developed over the past two years in order to provide tools and resources that would not have been available in buildings due to budget constraints. Technology kits (Google Expeditions, OSMO, Code-a-Pillar, green screens, Ozobot, Breakouts, Theta Camera, e.g.) are utilized with all grades and all buildings.

Classroom teachers and students appreciated the additional opportunities to experience learning with these tools. The time the coaches spend in planning and preparing for the lessons helps to ensure that the learning goals are supported and activities are not just isolated, disconnected and fun. Using technology tools and resources began with coaches modeling and working alongside teachers and has now progressed to more teacher independence in technology integration because of the scaffolded support provided by instructional technology coaches.

Ensure Long-Term Sustainability

Technology investments are not one time expenses. Although one-time grants and other supplemental funding sources can serve as catalysts for establishing technology in learning efforts, they are not sustainable as schools and districts build toward a long-term vision and plan. When devices reach the end of life and infrastructure equipment becomes obsolete, districts and schools should have a reliable means to replace or upgrade them. Leaders should consider technology an ongoing, line-item expense from the very beginning of planning technology implementation.

Section I Recommendations

National Recommendations adopted by Iowa

- **Establish clear strategic planning connections among the Iowa Department of Education, Iowa's Area Education Agency system, universities and colleges, and LEAs and how they relate to and are supported by technology to improve learning.**

  State and local authorities are uniquely suited to understand the needs and resources available within their local education ecosystems. Broad, coordinated strategic planning requires a commitment from all parties involved to collaborate consistently across organizational boundaries. These conversations and connections need proactive champions who will invest in working at this level and who can take advantage of existing state and regional conferences to further this work.

- **Explore funding models and plans for sustainable technology purchases and leverage openly licensed content while paying special attention to eliminating those resources and tasks that can be made obsolete by technology.**

Rather than viewing technology as an add-on component to support learning, leaders should take stock of current tools and processes across learning systems and identify those that can be augmented or replaced by existing technologies. During the planning process, they also should identify systems and processes for which no replacement currently exists within the district, school, or college and set goals for developing more efficient solutions.

- **Develop clear communities of practice for education leaders at all levels that act as a hub for setting vision, understanding research, and sharing practices.**

  Building on the model of the education innovation clusters, state, district, university, and community organization leaders should establish cohesive communities of practice—in person and online—to create cycles for sharing the most recent research and effective practices in the use of educational technology.

Iowa-Specific Recommendations

- **Advocate for policy ensuring equitable and affordable access to broadband for students and teachers at all levels of Iowa's education system.**

  Digital learning can only happen if students and educators have fast Internet connections at the classroom level and outside of school. Policies that support affordable access for all educators and students, regardless of where they are located in the state, are imperative if we are to realize the full potential of digital learning for all.

- **When planning statewide initiatives, ensure explicit connections are made to digital learning from the outset and are embedded in actions of developed action plans.**

  Historically, digital learning has been an afterthought when plans are made for major statewide initiatives. Given the role digital learning can play in advancing the work of various initiatives, it is important that those involved with planning include a digital learning component. Infusing digital learning from the outset ensures it is well thought out and aligns with the work to be done.

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[1] The full list of resources and literature reviewed in developing the Characteristics of Future Ready Leadership: Research Synthesis is included in Appendix A.

[2] Consortium for School Networking. CoSN's 2015 annual E-rate and infrastructure survey. (2015). Retrieved from http://cosn.org/sites/default/files/pdf/CoSN_3rd_Annual_Survey_Oct15_FINALV2.pdf.

Section II
Teaching – Teaching with Technology

GOAL: Educators will be supported by technology that connects them to people, data, content, resources, expertise, and learning experiences that can empower and inspire them to provide more effective teaching for all learners.

Technology offers the opportunity for teachers to become more collaborative and extend learning beyond the classroom. Educators can create learning communities composed of students; fellow educators in schools, museums, libraries, and after-school programs; experts in various disciplines around the world; members of community organizations; local businesses and industries; and families. This enhanced collaboration, enabled by technology, offers access to instructional materials as well as the resources and tools to create, manage, and assess their quality and usefulness.

To enact this vision, schools need to support teachers in accessing needed technology and in learning how to use it effectively. Although research indicates that teachers have the biggest impact on student learning out of all other school-level factors, we cannot expect individual educators to assume full responsibility for bringing technology-based learning experiences into schools.[1][2][3][4][5] They need continuous, just-in-time support that includes professional development, mentors, and informal collaborations. In fact, more than two thirds of teachers say they would like more technology in their classrooms,[6] and roughly half say that lack of training is one of the biggest barriers to incorporating technology into their teaching.[7]

Institutions responsible for pre-service and in-service professional development for educators should focus explicitly on ensuring all educators are capable of selecting, evaluating, and using appropriate technologies and resources to create experiences that advance student engagement, interaction and learning. They also should take special care to make certain that educators understand the privacy and security concerns associated with technology. This goal cannot be achieved without incorporating technology-based learning into the programs themselves.

For many teacher preparation institutions, state offices of education, and school districts, the transition to technology-enabled preparation and professional development will entail rethinking instructional approaches and techniques, tools, and the skills and expertise of educators who teach in these programs. This rethinking should be based on a deep understanding of the roles and practices of educators in environments in which learning is supported by technology.

Connecting Teachers and Students to Digital Resources

The Iowa Area Education Agency media directors articulated a bold vision around engaging learners in a unique way to find and choose information and to provide a connection between the school library and its users. After reviewing research on how K-12 and college students look for information and conduct research, the directors engaged in dialogue around new ways to encourage and empower learners to discover information and use digital text to enrich reading opportunities. Technology should add value to the information literacy skills process and experience. If students use Google for convenience and Netflix for “you may also like” recommendations, and if adults use Amazon because of the one-stop shop, the directors believed that same concept could be applied to education.

As a result of that vision, the directors worked with a company to create a new interface to access most of the subscription digital content that Iowa purchases, in addition to creating an interface that can

incorporate accessible digital content from other sources. The new system (AEA Scout) provides unique and innovative user experiences with easier access to multiple sources of digital content, mobile access to digital content, a common interface to read and listen instantly, and tools to learn and share. It is an intelligent system that uses predictive functions (like Netflix and Amazon) that will suggest materials based on usage and interest. The search will become more valuable with use as it will become smarter, similar to technologies like Alexa. This system will further support efforts in the state around personalized learning, blended and flipped classrooms, and online instruction and will be implemented in the state in the fall of 2018.

Roles and Practices of Educators in Technology-Supported Learning

Technology can empower educators to become co-learners with their students by building new experiences for deeper exploration of content. This enhanced learning experience embodies John Dewey's notion of creating "more mature learners." 8 Side-by-side, students and teachers can become engineers of collaboration, designers of learning experiences, leaders, guides, and catalysts of change. 9 10 Following are some descriptions of these educator roles and examples of how technology can play an integral part.

Educators can collaborate far beyond the walls of their schools. Through technology, educators are no longer restricted to collaborating only with other educators in their schools. They now can connect with other educators and experts across their communities or around the world to expand their perspectives and create opportunities for student learning. They can connect with community organizations specializing in real-world concerns to design learning experiences that allow students to explore local needs and priorities. All of these elements make classroom learning more relevant and **authentic**.

AUTHENTIC LEARNING
Authentic learning experiences are those that place learners in the context of real-world experiences and challenges.[11]

By using tools such as video-conferencing, online chats, and social media sites, educators from large urban to small rural districts can connect and collaborate with experts and peers from around the world to form online professional learning communities.

Iowa has many learning opportunities for educators. Some examples are EdCamp Iowa, ITEC (ISTE Affiliate), Iowa 1:1 Institute, STEM, and STEAM. Many of these events and technology opportunities showcase Iowa educators and how they are using technology to move the needle in their classrooms. In addition to actively participating on the Governor's STEM Council, the Bureau of Leading, Teaching, Learning Services provides teacher professional learning opportunities through AEA Online; established a network of Teacher Leaders; supported the resource achievethecore.org featuring Core-aligned resources for teachers in mathematics and English/language arts; connects educators to Open Education Resources in mathematics and science; provides support and resources through iowacore.gov; and provides educators with access to a series of distribution lists and content networks through Gov Delivery.

STEM offers educators the means to increase content knowledge and use technology while gaining real-world experience in problem solving. **STEM** is an acronym for **S**cience, **T**echnology, **E**ngineering, and **M**athematics.

- Science: Study of the nature of the universe (https://iowastem.gov/about)
- Technology: Application of information to the design of goods and services
- Engineering: Application of knowledge for the benefit of humanity
- Mathematics: Study of the universal language of nature

Created with the goal of increasing STEM interest and achievement, the STEM Council is a collaboration of bipartisan Iowa legislators, educators, business nonprofits, students, and family focused on improving STEM opportunities and awareness in Iowa.

The STEM Council follows this definition of STEM:

> ". . . an interdisciplinary approach to learning where rigorous academic concepts are coupled with real-world lessons as students apply science, technology, engineering and mathematics in contexts that make connections between school, community, work and the global enterprise enabling the development of STEM literacy and with it the ability to compete in the new economy." *Tsupros, N., Kohler, R., & Hallinen, J. (2009).*

The Department's Bureau of Career and Technical Education at the Iowa Department of Education provides a variety of leadership opportunities in Career and Technical Education. Career and Technical Education (CTE) is represented six CTE service areas, which include agriculture, food, and natural resources; arts, communications, and information systems; applied sciences, technology, engineering, and manufacturing, including transportation, distribution, logistics, architecture, and construction; health sciences; human services; and business, finance, marketing, and management.

Although STEM is shown as a separate cluster covering careers within each of the four elements - technology, engineering, science and mathematics - all CTE programs in the remaining 15 clusters address many of the STEM elements because of the amount of mathematics and science requirements needed for careers within these 15 clusters. A variety of Career and Technical Student Organizations (CTSOs) provide an opportunity to assist students in developing leadership skills within the clusters.

Research has shown that Career and Technical Student Organizations (CTSOs) develop a student's leadership skills through co-curricular activities in the classroom and online. There are several CTSOs, each focusing on at least one career cluster. STEM is a priority for the Iowa Department of Education. The Bureau of Career and Technical Education at the Iowa Department of Education works with nine different national organizations at the secondary and post-secondary level. These groups are Business Professionals of America (BPA), DECA, Future Business Leaders of America/Phi Beta Lambda (FBLA-PBL), Family, Career and Community Leaders of America (FCCLA), National FFA Organization, HOSA-Future Health Professionals, National Professional Agricultural Students (PAS), SkillsUSA, and Technology Students Association (TSA). Virtual Chapter membership serve students not currently able to participate in person in a local CTSO chapter. Virtual Chapters allow students to learn and participate in a CTSO at their own pace and providing learning opportunities through hands-on experiences at educational conferences.

The goal of increasing STEM interest and achievement is critical to regaining Iowa's historic legacy as a leader in education and workforce development. In fact, STEM is a vital economic development advantage for quality job growth in our state, as STEM graduates are in great demand to meet current and future workforce needs.

Created with the goal of increasing STEM interest and achievement, the STEM Council is a collaboration of bipartisan Iowa legislators, educators, business, nonprofits, students and families focused on improving STEM opportunities and awareness in Iowa.

MIDDLE SCHOOL STEAM: SUPPORTING SKILLS THROUGH THE CREATIVE DESIGN PROCESS

Every student at Clear Creek-Amana Middle School takes a quarter of STEM and a quarter of three other exploratories. The school builds on what the students do each year in terms of autonomy and student choice. Every year the district has learned more about what is possible in that 45-day period.

One example of a STEAM project is sixth graders using 3D design. Although the theme changes each year, the students get the chance to learn about the value and importance of 3D design and printing in many career fields. To increase the real world connection, the Art and STEM teachers work together to create a STEAM experience that covers two quarters of instruction within the exploratories. Through this collaboration, the Action Figure Project was born. The students took art first and created an action figure while learning 3D art techniques and then came to STEM to design, print, and market their action figure.

The students used **Tinkercad** to design their action figure or a part of that figure. Then they 3D printed small figures that get marketed by creating a video using **WeVideo**. Finally, the students designed and created packaging for their figure that was "shelf ready." Rubrics based on the Problem Solving (Creative) Process were created so the students could reach deeper levels of understanding.

Connected Educators

Educators can design highly engaging and relevant learning experiences through technology. Educators have nearly limitless opportunities to select and apply technology in ways that connect with the interests of their students and achieve their learning goals. For example, a classroom teacher beginning a new unit on fractions might choose to have his students play an online learning game such as Conceptual Mathematics, Factor Samurai, Wuzzit Trouble, or Sushi Monster as a way to introduce the concept. Later, the teacher might direct students to practice the concept by using manipulatives so they can start to develop some grounded ideas about equivalence.[11]

To create an engaging and relevant lesson that requires students to use content knowledge and critical thinking skills, an educator might ask students to solve a community problem by using technology. Students may create an online community forum, public presentation, or call to action related to their proposed solution. They can use social networking platforms to gather information and suggestions of resources from their contacts. Students can draft and present their work by using animated presentation software or through multimedia formats such as videos and blogs. This work can be shared in virtual discussions with content experts and stored in online learning portfolios.

A school without access to science labs or equipment can use virtual simulations to offer learners those experiences that are currently unavailable because of limited resources. In addition, these simulations are safe places for students to learn and practice effective processes before they conduct research in the field. Just as technology can enhance science learning for schools lacking equipment, it can enable deep learning once students are in the field as well. Students can collect data for their own use via mobile devices and probes and sync their findings with those of collaborators and researchers anywhere in the world to create large, authentic data sets for study.

Educators can lead the evaluation and implementations of new technologies for learning. Lower price points for learning technologies make it easier for educators to pilot new technologies and approaches before attempting a school-wide adoption. These educators also can lead and model practices

around evaluating new tools for privacy and security risks, as well as compliance with federal privacy regulations. (For more on these regulations, see Section 5: Infrastructure.) Teacher-leaders with a broad understanding of their own educational technology needs, as well as those of students and colleagues, can pilot the chosen technology with a small number of students to quickly and rigorously assess the implementation of an approach and whether the technology delivers the desired outcomes. This allows schools to gain experience with and confidence in these technologies before committing entire schools or districts to purchases and use.

Teacher-leaders and those with experience supporting learning with technology can work with administrators to determine how to share their learning with other teachers. They also can provide support to their peers by answering questions and modeling practical uses of technology to support learning.

Educators can be guides, facilitators, and motivators of learners. The information available to educators through high-speed Internet means teachers do not have to be content experts across all possible subjects. By understanding how to help students access online information, engage in simulations of real-world events, and use technology to document their world, educators can help their students examine problems and think deeply about their learning. Using digital tools, they can help students create spaces to experiment, iterate, and take intellectual risks with all of the information they need at their fingertips.[12] Teachers also can take advantage of these spaces for themselves as they navigate new understandings of teaching that move beyond a focus on what they teach to a much broader menu of how students can learn and show what they know.

#BCEDCAMP: BUILDING AND EMPOWERING EDUCATORS

When implementing teacher leadership in the Benton Community School District, leaders felt they were "still building the plane while flying it." The district was one of the first thirty-nine school districts in the state of Iowa to be part of Teacher Leadership and Compensation. Benton Community quickly realized they could share their teacher leadership journey with others and then in turn learn from others on how they were implementing teacher leadership.

Benton Community collaborated with the Iowa Department of Education Director Ryan Wise to create the first EdCamp focused solely on teacher leadership to the state. The premise of an Edcamp is to bring together educators to promote learning with an organic and dynamic, participant-driven professional development learning experience. EdCamps are designed to be flexible and aim to support student achievement by impacting the instruction students are receiving. By interacting with educators from other districts and educational institutions, EdCamp participants engaged more deeply in their own areas of need or expertise, which lead them to develop a richer understanding of their impact on students. Educators were able to collaborate and learn from each other while expanding their knowledge about how technology could be incorporated within the teacher leadership supports.

Educators can help students make connections across subject areas and decide on the best tools for collecting and showcasing learning through activities such as contributing to online forums, producing webinars, or publishing their findings to relevant websites. These teachers can advise students on how to build online learning portfolios to demonstrate their learning progression. Within these portfolios, students can catalog resources that they can review and share as they move into deeper and more complex thinking about a particular issue. With such portfolios, learners will be able to transition through their education careers with robust examples of their learning histories as well as evidence of what they know and are able to do. These become compelling records of achievement as they apply for entrance into

career and technical education institutions, community colleges, and four-year colleges and universities or for employment.

The availability of technology-based learning tools gives educators a chance to be co-learners alongside their students and peers. Educators should model how to leverage available tools to engage content with curiosity, create mindsets bent on problem solving, and learn how to be co-creators of knowledge. In short, teachers should be the students they hope to inspire in their classrooms.

CREATING AVENUES TO COLLABORATE

Mason City CSD took part in the state-supported Competency Based Education collaborative. As part of this work, teachers from the district worked with other districts in the collaborative to write competencies and proficiency-based rubrics for science, as well as competencies for the universal constructs. Teachers also helped to develop competencies and rubrics in mathematics and ELA.

From the learning gained as part of the collaborative, teachers saw a need to deliver instruction in blended formats to captivate all types of learners within their classrooms. Teachers utilized many different avenues of learning to engage the students. Some of those avenues included Google Classroom, Schoology, instructional videos, Khan Academy, Symbaloo, Screencastify, Seesaw, and collaboration through Google apps. With this blended learning approach, teachers were able to provide direct instruction, small group instruction, and one-on-one help when appropriate. This also allowed for effective feedback opportunities to help students achieve the standards. Not only did teachers utilize technology, lessons also included experiences that were hands-on, interdisciplinary, and created voice and choice in product.

The blended learning approach began in the 5th and 6th grade building. As students progressed into 7th and 8th grade, middle school teachers began to implement those same approaches. As students continued to grow, high school teachers began implementation as well. Data points used to validate blended learning have included both the Iowa Assessment and Problem Based Intervention and Supports (PBIS) data that show self-paced, blended learning has helped students become more self-directed and has given them the opportunity to take ownership of their learning. They are more engaged with the different opportunities teachers are providing within their classroom.

Educators can become catalysts to serve the underserved. Technology provides a new opportunity for traditionally underserved populations to have equitable access to high-quality educational experiences. When connectivity and access are uneven, the digital divide in education is widened, undermining the positive aspects of learning with technology.

All students deserve equal access to (1) the Internet, high-quality content, and devices when they need them and (2) educators skilled at teaching in a technology-enabled learning environment. When this occurs, it increases the likelihood that learners have personalized learning experiences, choice in tools and activities, and access to adaptive assessments that identify their individual abilities, needs, and interests.

USING TECHNOLOGY FOR SPEECH AND LANGUAGE SERVICES

Technology can be used in many ways when providing speech and language services. One way that has helped in rural areas and with the shortage of speech-language pathologists (SLPs) is teletherapy. Teletherapy is when the SLP connects via a video conferencing system with students at school or home to conduct live, face-to-face sessions. Assessments can be completed and a variety of speech and language goals can be practiced on a regular basis through teletherapy.

Teletherapy at Green Hills Area Education Agency began ten years ago when an SLP took part in a pilot program in Iowa. Currently, the SLPs at Green Hills use Zoom for most of their sessions, but they have also used Google Hangout. They are able to share iPad screens with students and use document readers for a variety of instructional uses.

While some SLPs provide teletherapy services exclusively, other SLPs are finding ways to incorporate teletherapy into their regular caseloads. For example, an SLP may physically go to a school once or twice a week, but may be able to see a student more times each week by implementing teletherapy on days he or she is not able drive to the school. Using teletherapy increases flexibility in scheduling, which in turn increases services that SLPs can provide. Teletherapy also provides a way to serve students who attend Iowa Connections Academy, an online school offered through a school district in Green Hills AEA.

Teletherapy has opened new doors for Speech-Language Pathologists and students in Green Hills AEA. It has allowed for increased services and flexibility, as well as encouraged further learning in the digital world. One teletherapist has incorporated digital tools such as Camtasia for making videos and Snagit to alter pdfs in order to enrich students' learning. The teletherapist has also been able to learn about and use a variety of tools offered by Google, ranging from online logs to voice typing and Chrome extensions, to help students who have difficulty communicating. Teletherapists, just like typical speech-language pathologists, continue to look for more effective, efficient, and engaging ways to help their students.

Rethinking Teacher Preparation

Teachers need to leave their teacher preparation programs with a solid understanding of how to use technology to support learning. Effective use of technology is not an optional add-on or a skill that we simply can expect teachers to pick up once they get into the classroom. Teachers need to know how to use technology to realize each state's learning standards from day one. Most states have adopted and are implementing college- and career-ready standards to ensure that their students graduate high school with the knowledge and skills necessary to succeed.

New college and career-ready standards include many mentions of technology expectations. Federal, state, and district leaders nationwide have made significant investments in providing infrastructure as well as devices to schools. Without a well-prepared teaching force, the nation will not experience the full benefits of those investments for transformative learning.13

Based on recommendations from the field, teacher preparation innovators collaborated with the Office of Educational Technology (OET) and developed four guiding principles for the use of technology in pre-service teacher preparation programs that can be found in the Advancing Educational Technology in Teacher Preparation policy brief. These principles are as follows:

- Focus on the active use of technology to enable learning and teaching through creation, production, and problem-solving.
- Build sustainable, program-wide systems of professional learning for higher education instructors to strengthen and continually refresh their capacity to use technological tools to enable transformative learning and teaching.
- Ensure pre-service teachers' experiences with educational technology are program-deep and program-wide, rather than one-off courses separate from their methods courses.
- Align efforts with research-based standards, frameworks, and credentials recognized across the field.

The Area Education Agency system is partnering with the Department of Education to connect the teacher prep programs in the state with the Iowa AEA Online Training System. This will improve the outlet for the Department and AEAs to better deliver professional learning to pre-service teachers. Trainings on topics as diverse as the Individualized Education Program process, the Iowa Core, MTSS, Seclusion/Restraint law, and much more can potentially be available for each pre-service teacher during their program.

THE BAKER TEACHER LEADER CENTER: PRODUCING DIGITAL LITERATE TEACHERS

The Baker Teacher Leader Center in the College of Education at the University of Iowa is a one-of-a-kind professional development center designed to support and expand the required coursework of the Teacher Education Program. Through the Center, students are required to progress through a series of professional development workshops, community engagement experiences, and complete the Level 1 Google Educator Certification.

Through a generous gift of a donor, the Center has been able to purchase a Chromebook for each student who is admitted to the Teacher Education Program. In the students' first semester, they begin the Level 1 Google Educator training and are asked to apply the skills learned through this training to their coursework and field experiences.

The Baker Teacher Leader Center is committed to producing teachers who know how to teach and facilitate learning in technology-rich environments. The Chromebooks and the Level 1 Google Educator Certification are but two tools students are able to add to their "teacher tool box" prior to graduating, helping to ensure #Hawkeyeteachers are the most qualified teachers, leaders, scholars, and innovators.

LEARNING TECHNOLOGIES MINOR AND DISTRICT PARTNERSHIPS PREPARE PRESERVICE TEACHERS FOR 1:1

Iowa State University (ISU) has a long-time tradition of focusing on technology and teacher education. In 2000, the American Association of Colleges for Teacher Education presented Iowa State with the "Best Practice Award" for their innovative use of educational technology within their teacher preparation program. Iowa State continues that tradition of preparing teacher candidates to effectively use technology in transformative ways that leverages technology as a problem-solving tool. Experiences for ISU teacher candidates are designed to have program-deep and system-wide impact in order to prepare future teachers who can confidently and effectively integrate technology to transform PK-12 student learning.

The School of Education at Iowa State University offers an undergraduate minor in Learning Technologies (http://www.education.iastate.edu/undergraduate-studies/learning-technologies-minor/). This minor prepares teacher candidates, who major in early childhood education, elementary education and/or secondary education, to be leaders in the field of educational technology as they enter PreK-12 school districts and classrooms. The Learning Technologies minor requires students to complete five 3-credit courses and a 1-credit school-based field experience. The courses and field experience cover such topics as implementing effective online teaching strategies and design, using emerging technologies for instruction, practicing digital citizenship, and supporting technology use in classrooms including technology coaching. Between 125-150 students at Iowa State are enrolled in the Learning Technologies minor each year, and 40-50 students graduate with the minor each academic year.

A direct result of these technology and teacher preparation efforts is further realized and modeled through a collaborative initiative between the School of Education at Iowa State University and three local K-12 school districts. Roland-Story, Gilbert, and Colo-Nesco schools all maintain 1:1 device programs in their districts and hire ISU teacher candidates enrolled in the Learning Technologies minor to help support these programs. Each semester, administrators from all three school districts arrive on campus to interview and select teacher candidates from the minor to fill 10-15 paid technology internship positions. The technology internships are true extensions of the classroom for teacher candidates because they get hands-on experience with supporting and managing a 1:1 device program. K-12 partner schools are acknowledged for their innovative approach to supporting a 1:1 device program, while at the same time offering professional development opportunities that further develop the ISU teacher candidates' technology expertise and application.

Schools should be able to rely on teacher preparation programs to ensure that new teachers come to them prepared to use technology in meaningful ways. No new teacher exiting a preparation program should require remediation by his or her hiring school or district. Instead, every new teacher should be prepared to model how to select and use the most appropriate apps and tools to support learning and evaluate these tools against basic privacy and security standards. It is inaccurate to assume that because pre-service teachers are tech savvy in their personal lives they will understand how to use technology effectively to support learning without specific training and practice. This expertise does not come through the completion of one educational technology course separate from other methods courses but through the inclusion of experiences with educational technology in all courses modeled by the faculty in teacher preparation programs.

Fostering Ongoing Professional Learning

The same imperatives for teacher preparation apply to ongoing professional learning. Professional learning and development programs should transition to support and develop educators' identities as fluent users of technology; creative and collaborative problem solvers; and adaptive, socially aware experts throughout their careers. Programs also should address challenges when it comes to using technology learning: ongoing professional development should be job embedded and available just in time.[14]

#IAEDCHAT (IOWA EDUCATOR CHAT)

#IAedChat is a real-time, weekly virtual chat created with the purpose of connecting educators to elicit discussion and growth around dynamic topics in education. #IAedChat promotes continuous professional learning and encourages ongoing conversations throughout the week. #IAedChat is also a reliable resource to connect with other passionate educators in Iowa and beyond to share ideas and glean new learning to support improvement at the classroom and the district level. Resources from blogs, websites, podcasts, and other forms of social media are also shared continuously, making #IAedChat not only active on Sunday evenings, but also an active place to share and gather resources throughout the week.

During the eight to nine o'clock hour every Sunday night, #IAedChat moderators Dan Butler (@danpbutler), Andrea Townsley (@townsleyaj), and Colin Wikan (@colinwikan) collaborate to send out seven questions on pressing, educationally relevant topics. Participants use the hashtag #IAedChat to follow along, answer questions, create dialogue, interact, and form relationships with other passionate educators from across Iowa, the nation, and around the world.

On the last Sunday of the month, #IAedChat goes LIVE with a video feed from a Google Hangout with a special guest on hot topics in education. Archives of past virtual chats and videos of the monthly

LIVE chats are included on their Google site https://sites.google.com/site/iowaedchat. A short podcast recap of the chats are available on the podcast channel http://iaedchat.podomatic.com.

EDCAMP IOWA

Edcamp Iowa began in 2012 as a one-day learning event in five different locations across the state for educators. Edcamps are un-conferences that empower educators to network with their peers to expand their professional learning at no cost. EdCamps are about discussion and thinking and problem-solving. The agenda is built by participants first thing in the day, so that topics are relevant and focused on current interests and needs. The rest of the day is spent discussing, sharing, and learning together. "Voting with your feet" also is strongly encouraged, so participants can (and should) quickly leave one session for another if it is not meeting learning needs. Many of the sessions are focused on innovative practices and technology use in the classroom.

TLC in Iowa

The Teacher Leadership and Compensation (TLC) System in Iowa supports ongoing professional learning for teachers. The overriding philosophy of the system is multi-pronged, but boils down to this: Improving student learning requires improving the instruction they receive each day. There is no better way to do this than to empower the best teachers to lead the effort. Through the system, teacher leaders take on extra responsibilities, including helping colleagues analyze data and fine- tune instructional strategies as well as coaching and co-teaching.

The goals of the Teacher Leadership and Compensation System are:

- Attract able and promising new teachers by offering competitive starting salaries and offering short-term and long-term professional development and leadership opportunities.
- Retain effective teachers by providing enhanced career opportunities.
- Promote collaboration by developing and supporting opportunities for teachers in schools and school districts statewide to learn from each other.
- Reward professional growth and effective teaching by providing pathways for career opportunities that come with increased leadership responsibilities and involve increased compensation.
- Improve student achievement by strengthening instruction.

Teachers involved in Iowa's Teacher Leadership and Compensation Program who have training and experience relating to hybrid and/or fully online instruction have additional opportunities to utilize their leadership skills by sharing instructional strategies and appropriate use of digital tools and resources to enhance and transform student learning.

As a result of TLC, professional development is being offered across Iowa's Area Education Agencies to equip teacher leaders with knowledge and skills to effectively coach teachers for technology confidence and competence. Teacher leaders learn how to identify the needs of their district staff utilizing a variety of data points to prioritize needs and develop professional learning experiences for their staff. The coaches also develop Personal Learning Networks (PLNs) to help assist their learning around how to support teachers with technology integration.

COACHING FOR TECHNOLOGY CONFIDENCE AND COMPETENCE

Due to the Teacher Leadership grants, Grant Wood Area Education Agency found there were many districts using these funds to support technology and instructional coaches. In order to build capacity in the districts, the AEA created a course for educators in these roles. Coaches learned

foundations of coaching adults and how to best meet the needs of all the teachers with whom they work, novice to veteran. Additionally, coaches in this cohort developed a Personal Learning Network (PLN) to assist them in learning how to support teachers with technology integration. The course taught them to identify the needs of their district staff utilizing a variety data points, prioritize those needs, and develop professional learning experiences for their staff to meet those needs. The course has evolved from looking at district BrightBytes Technology and Learning data around use of creativity, critical thinking, communication and collaboration using digital tools to sharing new and innovative ways to collect data and connect it to building and district goals.

This opportunity has provided TLC coaches time to collaborate and learn from each other as they support educators in their districts.

TLC, 4C'S, AND INSTRUCTIONAL LEADERSHIP

In rural NW Iowa, Sioux Central's TLC structure includes an instructional leader, five instructional coaches, and seven team leaders who facilitate learning teams. Each team has a goal connected to the 4 C's (Collaboration, Communication, Creativity, and Critical Thinking). Instructional Leader Erin Olson supports team leads as they work with their teams to accomplish their goals. As instructional coaches "grow their coaching muscles," they are utilizing technology that supports the 4 C's. Modeling of technology during professional learning paired with intentional conversation around learning with technology as an avenue to connect and create is affecting technology integration. Each professional learning experience focused on a strategy that connected to one or more of the 4 C's. Technology was included, but was not the focus. For example, Flipgrid was used as a means for reflection. After the whole staff utilized the platform, teachers discussed the platform and possible uses in their classroom.

Sioux Central utilizes learning labs to support continued innovation. After each professional learning, teachers are encouraged to host a lab where teachers can observe students in action implementing a strategy. Participants spend time listening to what students are saying and observing what students are doing. Participants are able to witness learning live.

Opportunities for personal learning are encouraged, as well. Olson devised a "snowday virtual flex" professional learning day that includes teachers engaging in webinars from EdWeb. The design includes connections to the 4 C's with teachers who choose to participate sharing their implementation of an idea inspired from their team learning. While technology components are embedded, the focus is on learning that transfers to meaningful designed learning experiences. This option counts as a professional learning day. Through TLC collaboration, experiences are designed for observation, learning labs are offered as support, and coaches and leads are available to help implement.

Professional Learning for Educators in Iowa

AEA Learning Online offers educators a wide array of facilitated and personalized learning options focused on some of the most pressing professional development areas. Participants are offered a variety of facilitated, online courses that provide learners with the opportunity to interact with an instructor or colleagues from across the state, as well as self-paced modules that allow users to complete mandatory trainings or meet license renewal, sub-authorization, or paraeducator licensing renewal requirements. AEA Learning Online's K-12 online resources include both facilitated and personalized learning options for students.

Section II Recommendations

National Recommendations adopted by Iowa

- **Provide pre-service and in-service educators with professional learning experiences powered by technology to increase their digital literacy and enable them to create compelling learning activities that improve learning and teaching, assessment, and instructional practices.**

  To make this goal a reality, teacher preparation programs, school systems, state and local policymakers, and educators should come together in the interest of designing pre- and in-service professional learning opportunities that are aligned specifically with technology expectations outlined within state standards and that are reflective of the increased connectivity of and access to devices in schools. Technology should not be separate from content area learning but used to transform and expand pre- and in-service learning as an integral part of teacher learning. Continue the partnership between the Department of Education, the Area Education Agency system, and the teacher prep programs in Iowa to craft a vision for implementation.

- **Use technology to provide all learners with online access to effective teaching and better learning opportunities with options in places where they are not otherwise available.**

  This goal will require leveraging partner organizations and building institutional and teacher capacity to take advantage of free and openly licensed educational content such as those indexed through Learning Registry's #GoOpen Node (LearningRegistry.org). Adequate connectivity will increase equitable access to resources, instruction, expertise, and learning pathways regardless of learners' geography, socio-economic status, or other factors that historically may have put them at an educational disadvantage.

- **Develop a teaching force skilled in online and blended instruction.**

  Our education system continues to see a marked increase in online learning opportunities and blended learning models in traditional schools. To meet the demand, institutions of higher education, school districts, classroom educators, and researchers need to come together to ensure practitioners have access to current information regarding research-supported practices and an understanding of the best use of emerging online technologies to support learning in online and blended spaces.

- **Develop a common set of technology competency expectations for university professors and candidates exiting teacher preparation programs for teaching in technologically enabled schools and postsecondary education institutions.**

  There should be no uncertainty of whether a learner entering a PK–12 classroom or college lecture hall will encounter a teacher or instructor fully capable of taking advantage of technology to transform learning. Accrediting institutions, advocacy organizations, state policymakers, administrators, and educators have to collaborate on a set of clear and common expectations and credentialing regarding educators' abilities to design and implement technology-enabled learning environments effectively.

Iowa Specific Recommendations

- **Develop differentiated professional development offerings for educators.**

  By providing a menu of differentiated professional development offerings that include face-to-face, online, and blended options that can be personalized and tailored to educators' needs and assist with understanding the changing role of educators.

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Section III
Learning – Empowering Learning through Technology

GOAL: All learners will have engaging and empowering learning experiences in both formal and informal settings that prepare them to be active, creative, knowledgeable, and ethical participants in our globally connected society.

The vision for education in Iowa is that learners experience high levels of success and develop the capacity to continually grow as successful, healthy, and productive citizens in a global community. Toward that end, a Compact has been established between Iowa's Area Education Agency State System and Iowa's public and non-public accredited schools in collaboration with the Iowa Department of Education pledging co-ownership of student learning goals. The goal is that every child in Iowa who graduates will be fully prepared for success in post-secondary studies, a career, citizenship, and life.

To achieve this, we need to ensure that:

- Every Iowa child is proficient in reading by the end of third grade.
- Every child has the mathematics skills needed to succeed.
- Learning gaps between students with disabilities and those without are reduced by at least half.
- Students enter post-secondary opportunities with the skills and attitude to succeed.

Iowa also implemented a framework for educating all children to high levels of proficiency through a Multi-Tiered System of Supports (MTSS.) MTSS is a process by which schools use data to identify the academic and behavioral supports each and every student needs to be successful in school. The process provides students with evidence-based instruction and interventions matched to their needs and monitors student progress to improve their educational outcomes. Those supports are provided in both small group and individual settings, and progress is monitored to ensure that all learners demonstrate proficiency in the Iowa Core standards and leave school ready for life.

Educational technology is a powerful tool that can be used to enhance teaching and learning to meet the needs of every learner through a multi-tiered system of supports. Effective use of educational technology engages students, accommodates individual learning styles, and allows multiple avenues for knowledge acquisition. Technology can also be used to assess student learning, with the information being used at the classroom level to improve instruction.

To be successful in our daily lives and in a global workforce, we need pathways to acquire expertise and form meaningful connections to peers and mentors. This journey begins with a base of knowledge and abilities that can be augmented and enhanced throughout our lives. Fortunately, advances in learning sciences have provided new insights into how people learn1. Technology can be a powerful tool to reimagine learning experiences on the basis of those insights.

Historically, a learner's educational opportunities have been limited by the resources found within the walls of a school. Technology-enabled learning allows learners to tap resources and expertise anywhere in the world, starting with their own communities. Following are examples:

- With high-speed Internet access, a student can take an Iowa Learning Online (ILO) course if they reside in a school that lacks the budget or a faculty member with the appropriate skills to teach the course. ILO is an Iowa Department of Education initiative designed to help Iowa schools and home-school families expand learning opportunities for their high school students through high quality, rigorous courses delivered online. Students are enrolled in ILO courses through their local school

or directly by their home-school parent/guardian. All courses are taught by Iowa licensed and appropriately endorsed teachers. Find out more about ILO.

- Learners struggling with planning for college and career can access high-quality online mentoring and advising programs where resources or geography present challenges to obtaining sufficient face-to-face mentoring.
- With mobile data collection tools and online collaboration platforms, students in a remote geographic area studying local phenomena can collaborate with peers doing similar work anywhere in the world.
- A school with connectivity but without robust science facilities can offer its students virtual chemistry, biology, anatomy, and physics labs—offering students learning experiences that approach those of peers with better resources.
- Students engaged in creative writing, music, or media production can publish their work to a broad global audience regardless of where they go to school.

BLENDED LEARNING[5]
In a blended learning environment, learning occurs online and in person augmenting and supporting teacher practice. Blended learning often allows students to have some control over time, place, path, or pace of learning. In many blended learning models, students spend some of their face-to-face time with the teacher in a large group, some face-to-face time with a teacher or tutor in a small group, and some time learning with and from peers. Blended learning often benefits from a reconfiguration of the physical learning space to facilitate learning activities, providing a variety of technology-enabled learning zones optimized for collaboration, informal learning, and individual-focused study.

Technology-enabled learning environments allow less experienced learners to access and participate in specialized communities of practice, graduating to more complex activities and deeper participation as they gain the experience needed to become expert members of the community.[2] Examples relevant to early childhood and elementary could include virtual field trips and conferences with authors.

These opportunities expand growth possibilities for all students while affording historically disadvantaged students greater equity of access to high-quality learning materials, expertise, **personalized learning**, and tools for planning for future education.3 4 Such opportunities also can support increased capacity for educators to create **blended learning** opportunities for their students, rethinking when, where, and how students complete different components of a learning experience.

Area Education Agency Personalized Learning System

According to the New School Venture Fund, one essential aspect to establishing personalized learning in schools is developing flexible learning environments. Can districts efficiently allocate staffing and resources, redesign space and time utilization, and connect students to the variety of learning experiences that they need? Traditional classrooms, and even traditional online learning spaces, do not do this sufficiently, providing only a one-size-fits-all approach.

Iowa's AEA Learning Online offers a redesign on the concept of the learning management system, with its Personalized Learning System (http://learning.aeak12online.org). This system emphasizes breaking down curriculum into its elements. When taking individual lessons, assessments, and student learning tasks, and aligning them to the Iowa Core while placing them in the system, a robust catalog of fully flexible e-curriculum can be built. This then allows schools at a local level to recombine those instructional modules into an infinite number of learning opportunities, all to be personalized for the student.

What's more, students themselves can select learning opportunities down to the individual modular level that supports their own learning goals. Interested in obtaining your CPR certification? Looking to complete a mini-course in digital citizenship? Hoping to utilize content-specific instructional modules in a blended learning unit? Or working toward completing a pre-apprenticeship program online? The flexible

Personalized Learning System offers these opportunities and more. And, teachers can also add their own instructional content to the system, benefiting students throughout the state.

An overview of the Personalized Learning System can be found at http://bit.ly/personallearningsystem.

Instructional Practices for Student-Centered, Personalized Learning

These five Competency Based-Education (CBE) principles from the Iowa Department of Education Guidelines for PK-12 Competency-Based Education outline instructional practices to provide student-centered, personalized learning systems through which students of all ages develop ownership of their learning and connect content to their interests and goals. An Innovation Configuration (IC) Map was developed for teachers to self-assess instructional practices related to a competency-based system as they relate to the five CBE Principles.

CBE AND PERSONALIZED LEARNING IN ACTION

As part of the Competency Based Education Collaborative for the past five years, Nevada CSD conducted three community meetings and a district-wide meeting around one question: What are the outcomes wanted for all Nevada graduates? Based on that feedback, the Universal Constructs were the key outcomes. The district had the opportunity to connect with approximately twenty business and industry leaders from Nevada to discuss how to create partnerships with local business and industry leaders that will allow students to demonstrate the district's learner outcomes. The partnerships developed have led to opportunities for students with regard to potential internships and project ideas which allow students to apply their learning to solve real world problems within the community and develop the learner outcomes identified for students.

Nevada CSD started several new programs across the district for students, allowing them more voice and choice over their learning. Multiple programs at the high school provide students new learning opportunities. The LAUNCH program allows students to earn credit in various content areas by demonstrating their learning through projects that they select and design based on their own interests and passions. Essentially, the students go through the same journey as teachers for their individual personalized learning journey. The DMACC SCALE program allows students to work alongside business professionals in Ames on projects in four different career areas. Several student enterprises have developed at the high school: Cub Embroidery offers custom embroidered items for clients, Cub Manufacturing laser engraves several different items upon request, and the FFA Greenhouse offers plants and vegetables for sale in the spring with great success.

The middle school opened up a Makerspace that was created and designed based on student input. Classes use the Design Thinking model where students develop passion projects in which they present to the community. The elementary and middle school staff continue to refine and expand the opportunity for each student to advance at his or her own pace in a self-paced mathematics program through the use of the learning management system. The elementary continues to provide students with opportunities to select projects that are of social interest and have a direct impact on the community. Students in grades 1-4 present passion projects to parents and community members during Demonstration Night. They demonstrate their learning through their research, new learning, challenges faced, and artifacts collected — sharing interactive displays, slideshows, BreakoutEDU games, 3D renderings, wax museums, and more.

Iowa districts work to create multiple learning pathways for students where they have more voice and choice over how they learn the essential content standards we expect all students to learn, and more importantly to develop the universal constructs. Our world is changing rapidly and the ability to access

information anywhere at any time has forced us to look at how we can provide educational opportunities for all students based on their individual needs. The access to technology and what students can do on their devices have allowed their learning to be transformed with personalized learning.

Beyond these essential core academic competencies, there is a growing body of research on the importance of non-cognitive competencies as they relate to academic success.[5][6][7] Non-cognitive competencies include successful navigation through tasks such as forming relationships and solving everyday problems. They also include development of self-awareness, control of impulsivity, executive function, working cooperatively, and caring about oneself and others. In addition, learners should have the opportunity to develop a sense of **agency** in their learning and the belief that they are capable of succeeding in school. Students have voice and choice (also known as student agency) where they have significant and meaningful choices regarding their learning experiences and take increasing responsibility for their learning using strategies for self-regulation.

Increased connectivity also increases the importance of teaching learners how to become responsible digital citizens. We need to guide the development of competencies to use technology in ways that are meaningful, productive, respectful, and safe. For example, helping students learn to use proper online etiquette, recognize how their personal information may be collected and used online, and leverage access to a global community to improve the world around them can help prepare them for successfully navigating through a connected world. Mastering these skills requires a basic understanding of the technology tools and the ability to make increasingly sound judgments about the use of them in learning and daily life. For the development of digital citizenship, educators can turn to resources such as Common Sense Media's **digital citizenship** curriculum or the student technology standards from the International Society for Technology in Education (ISTE).

AGENCY IN LEARNING
Learners with agency can "intentionally make things happen by [their] actions," and "agency enables people to play a part in their self-development, adaptation, and self-renewal with changing times."10 To build this capacity, learners should have the opportunity to make meaningful choices about their learning, and they need practice at doing so effectively. Learners who successfully develop this ability lay the foundation for lifelong, self-directed learning.

DIGITAL CITIZENSHIP
Digital Citizenship can be defined as the safe, ethical, responsible, and informed use of technology. This concept encompasses a range of skills and literacies that can include internet safety, privacy and security, cyberbullying, online reputation management, communication skills, information literacy, and creative credit and copyright.[15]

DIGITAL CITIZENSHIP AND ADVISORY PROGRAM GO HAND IN HAND

As Dallas-Center Grimes Middle School moved to a more tech-centered learning environment, staff members soon realized students needed some training on how to use their computers safely and efficiently. These young "digital natives" had no fear as they zoomed around the Internet, but teachers noted they often were making poor site choices, nor were students being wise and/or kind with what they said. The school's Technology Committee decided to design some much needed digital citizenship lessons to guide the students in making wiser web choices and more efficient searching.

Using the free resource Common Sense Media, members of the committee built lessons to address issues such as digital drama and cyberbullying, keeping personal information private, how to effectively search the internet and much more. Lessons varied in content: some presented ethical scenarios, some included digital activities, and many included videos which led to valuable discussions. The committee placed these lessons on a Google Doc so all staff had easy access to the directions and materials.

Digital Citizenship lessons were a perfect fit for an advisory program, in which students meet in a small group with an advisor to discuss social and academic issues in a safe place. For kids today, the digital world IS a big part of their social and academic life! So at Dallas Center-Grimes Middle School, students and teachers spend two advisory periods a month addressing issues such as how to be safe on the Internet, knowing all about their digital footprints, and realizing just what impact the Internet is having on their lives. DC-G students now navigate the digital world with valuable knowledge, and that is definitely a good thing.

CORE VALUES INCLUDE DIGITAL CITIZENSHIP

Spirit Lake Community School District is continuously looking for ways to empower their students to be future-focused, 21st century learners. The shift began when the school went 1:1 as it quickly offered many blended and online learning opportunities for their students. With the deployment of devices came an online identity and digital footprint for each child beginning at the kindergarten level. The district quickly realized the importance of guiding students in their digital lives.

Every fall at SLCSD, the BrightBytes Technology and Learning Survey is administered to both the staff and the students. During the 2015 school year, the district received an "emerging" score for Digital Citizenship and they knew it was time to empower their students to exhibit the traits of a digital leader. The district's technology integration coach adopted the ISTE standards for students and educators, with a primary focus on the "Digital Citizen" standard. A combination of Common Sense Media and Google's "Be Internet Awesome" curriculum has been used to address topics of digital citizenship at the appropriate grade levels within the district. Parent meetings have taken place and continue to be planned to communicate the current and relevant topics surrounding Internet safety. The district also unveiled a culture playbook, which includes core values such as "encouraging relationships" and "displaying integrity."

Since the initial data collection, Spirit Lake has reached a "proficient" score on their technology integration survey for digital citizenship and will push for continued improvement.

Technology Enabled Learning in Action

Learning principles transcend specific technologies. However, when carefully designed and thoughtfully applied, technology has the potential to accelerate, amplify, and expand the impact of powerful principles of learning. Because the process of learning is not directly observable, the study of learning often produces models and conclusions that evolve across time. The recommendations in this plan are based on current assumptions and theories of how people learn even while education researchers, learning scientists, and educators continue to work toward a deeper understanding.

The NETP focuses on how technology can help learners unlock the power of some of the most potent learning principles discovered to date. For example, we know that technology can help learners think about an idea in more than one way and in more than one context, reflect on what is learned, and adjust understanding accordingly.8 9 Technology also can help capture learners' attention by tapping into their interests and passions.6 It can help us align *how* we learn with *what* we learn.

Following are five ways technology can improve and enhance learning, both in formal and in informal settings. Each is accompanied by examples of learning in action.

1. Technology can enable personalized learning or experiences that are more engaging and relevant. Mindful of the learning objectives, educators might design learning experiences that allow

students in a class to choose from a menu of learning experiences—writing essays, producing media, building websites, collaborating with experts across the globe in data collection—assessed via a common rubric to demonstrate their learning. Such technology-enabled learning experiences can be more engaging and relevant to learners.

BLENDING STUDENT ENGAGEMENT AND RIGOR THROUGH ROTATION STATIONS

Williamsburg Jr/Sr High School is a rural 7-12 1:1 school located in southeast Iowa. The administration and teaching staff are committed to innovative ways for students to learn in a rigorous environment. Blended learning is one avenue Williamsburg is consistently using instructionally in all curricular areas. The district has been ingrained in this process for five years.

The component of blended learning which is readily used at Williamsburg is the rotational station model. This instructional model allows students to work individually or in small groups to complete learning tasks at varying levels and speeds. Teachers use technology, collaboration, independent work time, and heterogenous and homogenous small instructional groups. Teachers work in one of three levels: 1) all students complete the same activities, 2) students complete activities based on their current level, 3) fully personalized learning for students. The building goal is to have all departments working toward the third level.

Data shows students are reaching proficiency levels faster and the number of students reaching proficiency has increased. Other teachers have noticed the number of students reaching advanced levels continues to increase. The ability to provide targeted interventions in small groups is part of the increasing success of students. In addition, classroom referrals have decreased due to an increased level of student engagement.

The district supports teams of teachers receiving both introductory and advanced training with an administrator and instructional coach on an annual basis. The lead learning team also models rotation station instruction during professional development throughout the school year. They emphasize to staff that rotation stations is not the only instructional model to be used, but rather another tool to be used at opportune times.

PHARMACY TECHNICIANS/PRE-PHARMACY CAREER PATHWAY

Marshalltown Learning Academy is using a blended learning approach in its Pre-Pharmacy/ Pharmacy Technician career preparation course. Students spend no more than a year in the pharmacy technician preparation program, including summers and school breaks. This program allows those students with a strong interest in pharmacy and medicine to experience relevant, rigorous, and personalized instruction while still in high school.

Students in the course must meet general education prerequisites, including completion of Algebra I and at least a semester of high school chemistry. Upon completion of a job shadow experience, students can enroll in the Pharmacy Technician program at any time. The program consists of a minimum of four hours a week of field training and coursework at school. Pharmacy Tech coursework is offered in an asynchronous, digital format. Digital content allows maximum flexibility for students in scheduling and accessing the program. Student coursework is monitored by high school mathematics and science teachers, who provide re-teaching of concepts as needed. Student progress in the course is also shared with the community partner pharmacist, who can assist with reinforcing concepts from the coursework. The community partner pharmacist also helps students navigate the process of being a registered intern and accessing practice tests for full certification.

The need for Pharmacy Technicians in the community creates a demand for trained employees from business. Multiple students have entered the Pharmacy Technician program, and at this time, one student has already passed the State Board of Pharmacy test and is a registered Pharmacy Technician.

The Early Learning and Educational Technology Policy Brief released jointly with the U.S. Department of Health and Human Services in October 2016 aligns with the Uses of Technology to Support Early Childhood Practice and the National Education Technology Plan (NETP). It supports a vision that 1) all young children will have adults in their lives who are well-informed on how to use technology to support learning at various ages; and 2) all young children will have opportunities to learn, explore, play, and communicate through a multitude of approaches, including the use of technology. The Department of Education provides guidance, with recognition that technology use should never displace the role of unstructured, unplugged, interactive, and creative play and that these principles may evolve for families and educators in regards to the active use of technology with early learners over time.

2. Technology can help organize learning around real-world challenges and project-based learning using a wide variety of digital learning devices and resources to show competency with complex concepts and content. Rather than writing a research report to be read only by her biology teacher and a small group of classmates, a student might publish her findings online where she receives feedback from researchers and other members of communities of practice around the country. In an attempt to understand the construction of persuasive arguments, another student might draft, produce, and share a public service announcement via online video streaming sites, asking his audience for constructive feedback every step of the way.

PROJECT-BASED LEARNING

Project-based learning takes place in the context of authentic problems, continues over time, and brings in knowledge from many subjects. Project-based learning, if properly implemented and supported, helps students develop 21st century skills including creativity, collaboration, and leadership and engages them in complex, real-world challenges that help them meet expectations for critical thinking.[21]

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PERSONALIZED LEARNING SEED PROGRAM: PROVIDING FIELDWORK OPPORTUNITIES

Roosevelt Creative Corridor Business Academy (RCCBA) operates on a system of a three-dimensional learning path, where students access the standards in a variety of ways that creates their own personalized journey. One major part of that learning at RCCBA is completed through a blended learning format, that the students refer to as “seminar” and “modules”. Seminar is the face-to-face format with teachers; where they front-load new content (and skills) for students, re-teach a skill (or concept), or assess where a student is at on a standard. This looks like a traditional class, but actually holds a much deeper individualized purpose for students. The other half of blended learning is online learning. Students access the learning management system, Canvas, daily to complete work on standards at their own pace and through self-organized methods. Teachers use this format to showcase new information, practice skills/standards, and interact virtually with other students in a variety of different ways. The last area, project based learning, takes the learning from the blended format and applies it to a real-world project. Here students are interacting with community members on a specific project to answer an essential question that

ties everything together. In addition, for each project, students collaborate with "context experts" who provide feedback to students and also engage in "fieldwork" outside of the school to aid in the learning and the success of the project. These three areas use a considerable amount of technology that is used in real-time and includes personalized formats for ALL students.

Students are able to further personalize their learning through elective blocks. Students register for courses that are digitally rich in content and high interest in the areas of exploratory classes. Courses include: Lego Engineering, 3D Printing, Web Design, Gaming, Girls with Ideas, Teens and Social Media, Collaborative Art, iPad GarageBand, and over forty more course choices! Each course last six weeks, and students then shift to other courses within six larger cycles of learning.

3. Technology can help learning move beyond the classroom and take advantage of learning opportunities available in museums, libraries, and other out-of-school settings. Coordinated events such as the Global Read Aloud allow classrooms from all over the world to come together through literacy. One book is chosen, and participating classrooms have six weeks in which teachers read the book aloud to students and then connect their classrooms to other participants across the world. Although the book is the same for each student, the interpretation, thoughts, and connections are different. This setting helps support learners through the shared experience of reading and builds a perception of learners as existing within a world of readers. The shared experience of connecting globally to read can lead to deeper understanding of not only the literature but also of their peers with whom students are learning.

USING INDUSTRY STANDARD TECHNOLOGY IN AN INNOVATIVE SCHOOL MODEL

Iowa BIG is focused on preparing students for life outside of high school by using industry standard technology in community-partnered, student-led projects. Attendance outside of a student's scheduled meeting and seminar times is optional, and some students choose to work offsite. Because of the flexible way students are able to use their time and space, technology plays a big part in how students learn and communicate.

Each day staff and students use apps like Slack to communicate with each other, share work, ask questions, and share resources. Teachers can also use Slack to deliver content and gather feedback for formative assessments. Teams use Agile and Scrum project management methods and an app called Trello to keep track of project flow and to help team members self manage. Teachers manage student assessment and credit by using a custom-made program called BBQ that allows teachers and students to keep track of standards and reflect on growth in important areas such as the universal constructs, as well as joy and community engagement. BBQ also helps teams and teachers communicate with project partners and parents by sending them weekly updates.

Students work alongside professionals from community nonprofits, government agencies, and businesses. Working with adults outside of the educational setting ensures that students learn to use technology in a professional environment. Students learn how to write professional emails, manage their time using a virtual calendar, and communicate using multiple platforms and devices. Depending on their projects, students may learn how to build websites, analyze data, create graphic design, render in 3D, or learn computer programing. Students learn practical applications for tools such as *Google, Chromecast, Microsoft, Adobe, Blender, Unreal Engine 4, HTC Vive, Sketchup, Wordpress*, as well as 3-D printing, laser cutting, *Raspberry Pi, Arduino,* and *Makey-Makey*. Students also have the opportunity to learn and apply programming languages such as *Java, Python, Ruby, CSS Javascript, HTML5, C#, SQL* and *PHP*. Iowa BIG focuses on teaching students to use technology to create, present, respond, and connect.

4. Technology can help learners pursue passions and personal interests. A student who learns Spanish to read the works of Gabriel García Márquez in the original language and a student who collects data and creates visualizations of wind patterns in the San Francisco Bay in anticipation of a sailing trip are learning skills that are of unique interest to them. This ability to learn topics of personal interest teaches students to practice exploration and research that can help instill a mindset of lifelong learning.

ILEAD AUTHENTIC LEARNING PROGRAM ENGAGES STUDENTS BEYOND CLASSROOM WALLS

In order to prepare students for the future, New London CSD, Danville CSD, and Great Prairie AEA (GPAEA) partnered to create an authentic learning program where students engage in real projects put forth by local community members, businesses, and organizations. GPAEA was instrumental in creating a local project pool to give students a variety of projects to engage in for their learning. In this program, students work with businesses virtually and onsite to engage in 21st century skills to complete their projects while providing evidence of learning with the use of an eportfolio. Students and teachers have dialogues about the learning targets, and students attach artifacts that represent their growth and learning in various fields of mathematics, science, social studies, and literacy. Artifacts range from emails, spreadsheets, slides, videos, storyboards, websites, etc. to demonstrate the knowledge and skills they have acquired.

5. Technology access when equitable can help close the digital divide and make transformative learning opportunities available to all learners. An adult learner with limited physical access to continuing education can upskill by taking advantage of online programs to earn new certifications and can accomplish these goals regardless of location.

PROFESSIONALLY DRIVEN MODEL

While schools continue to add and utilize more technology in schools, it has become apparent that a shift in professional development is also necessary. However, this has lead to varying types of professional development strategies that put more of an emphasis on *training*, not necessarily *learning*. This has lead to an awareness to put pedagogy over technology. Therefore, so should professional development.

Several schools across the state of Iowa are shifting toward models of personalized PD, one in particular is the Professionally Driven model. This model started in 2015 at the Oelwein School District and has now spread to other districts such as Dallas Center-Grimes, North Tama, Hudson, Winfield-Mt. Union, Eastern Allamakee, and others. At Nevada, educators (both teachers AND administrators) within the district are empowered to embark on their own learning journey with a focus on *positive effects on learner outcomes*. After identifying an instructional weakness where learners are operating in the lower levels of Bloom's taxonomy consistently, educators then Research, Integrate, Reflect, and Share how they move learners into the upper-levels. In the Reflection Phase, educators at Nevada share their learning journey within the district either through presentations, blog, or video. To complete their journey, the educators are encouraged to then share outside their district by presenting at conferences, guest-blogging, or posting their videos via social media.

The Future of Learning Technologies

Although these examples help provide understanding of the current state of educational technologies, it is also important to note the research being done on early stage educational technology and how this research might be applied more widely in the future to learning.

As part of their work in cyberlearning, the National Science Foundation (NSF) is researching opportunities offered by integrating emerging technologies with advances in the learning sciences.

Following are examples of the projects being funded by the NSF as part of this effort:

In K-12 classrooms across the United States, students are visiting far off places such as Machu Picchu, the Great Barrier Reef, and other locations without ever leaving the classroom. Educators can access programs such as Google Expedition for lessons and additional resources to create virtual field trip experiences. Students can then use Google Cardboard—an inexpensive pair of virtual reality goggles made from a cardboard cutout, magnets, lens and a user-supplied smartphone—to move through an experience that their teacher controls from a tablet. The I-Corps TML project, a program within the National Science Foundation, is currently piloting a similar project for higher education settings. This Virtual Reality Field Experiences (VRFE) application uses an Android smartphone with an accompanying virtual reality viewer such as Google Cardboard.

Increased use of games and simulations give students the experience of working together on a project without leaving their classrooms. Students are involved actively in a situation that feels urgent and must decide what to measure and how to analyze data in order to solve a challenging problem. Examples include RoomQuake, in which an entire classroom becomes a scaled-down simulation of an earthquake. As speakers play the sounds of an earthquake, the students can take readings on simulated seismographs at different locations in the room, inspect an emerging fault line, and stretch twine to identify the epicenter. Another example is Robot-Assisted Language Learning in Education (RALL-E), in which students learning Mandarin converse with a robot that exhibits a range of facial expressions and gestures, coupled with language dialogue software. Such robots will allow students to engage in a social role-playing experience with a new language without the usual anxieties of speaking a new language. The RALL-E also encourages cultural awareness while encouraging good use of language skills and building student confidence through practice.

New ways to connect physical and virtual interaction with learning technologies bridge the tangible and the abstract. For example, the In Touch With Molecules project has students manipulate a physical ball-and-stick model of a molecule such as hemoglobin, while a camera senses the model and visualizes it with related scientific phenomena, such as the energy field around the molecule. Students' tangible engagement with a physical model is connected to more abstract, conceptual models, supporting students' growth of understanding. Toward a similar goal, elementary school students sketch pictures of mathematical situations by using a pen on a tablet surface with representational tools and freehand sketching, much as they would on paper. Unlike with paper, they easily copy, move, group, and transform their pictures and representations in ways that help them to express what they are learning about mathematics. These can be shared with the teacher, and, via artificial intelligence, the computer can help the teacher see patterns in the sketches and support the teacher using student expression as a powerful instructional resource.

Augmented reality (AR) as a new way of investigating our context and history. In the Cyberlearning: Transforming Education EXP project, researchers are addressing how and for what purposes AR technologies can be used to support the learning of critical inquiry strategies and processes. The question is being explored in the context of history education and the Summarizing, Contextualizing, Inferring, Monitoring, and Corroborating (SCIM-C) framework developed for historical inquiry education. A combined hardware and software platform is being built to support SCIM-C pedagogy. Students use a mobile device with AR to augment their "field" experience at a local historical site. In addition to experiencing the site as it exists, AR technology allows students to view and experience the site from several social perspectives and to view its structure and uses across several time periods. Research focuses on the potential of AR technology in inquiry-based fieldwork for disciplines in which analysis

of change across time is important to promote understanding of how very small changes across long periods of time may add up to very large changes.

LET'S GET REAL! AUGMENTED REALITY FOR STUDENTS

Pocahontas Area Community School District, located in rural northwest Iowa, takes pride in bringing purposeful innovative digital experiences to students. Augmented and virtual reality activities are at the top of the list of valuable learning opportunities the district brings to students. These experiences span all grade levels PreK-12. Students engage in several augmented reality apps, but the one that generally excites all students is the Virtuali-Tee augmented reality app by Curiscope, which brings human anatomy to life. The user wears a Virtuali-Tee t-shirt, downloads the free app, and students are taken inside the human body to learn and explore, bringing excitement, authentic learning, and engagement into the room. The district capitalizes on these experiences in science and health classes.

The littlest learners dive into AR Flashcards where the alphabet comes to life with animals popping up that reinforce letter sounds and letter recognition. Teachers are excited to bring the AR Flashcards Addition into the lineup.

Teachers appreciate what augmented reality brings to their classroom environment. The next step is to transition students from consuming the AR experience to actually making their own experiences. Educators have dabbled in Metaverse Studio and are enthusiastic to find curricular segues for students to be creating interactive experiences tied to curricular content.

Let's Get Real! at PAC is making learning engaging, collaborative, and powerful. Teachers are hitting on Iowa Core standards. Students are using higher order thinking skills. Augmented reality allows for individual learning styles and brings technology integration into the classroom in a purposeful fashion.

STUDENTS BUILDING VIRTUAL REALITY TOURS

Mid-Prairie School District was an early adopter in the use of virtual reality with students, using Google Expeditions to immerse students in tours to enhance classroom learning. Currently, a major focus in the Innovation Lab at Mid-Prairie Middle School has been to solve real world problems using innovative solutions. Sixth graders recognized many residents at the local nursing home were unable to enjoy the local Fall Festival Exhibits. Students, with the support of their teacher Terra Huber, used the school's Theta 360 camera to capture photos during the festival. Following the event, students used the online program InstaVR to create a virtual experience for the community's nursing home residents.

This project helped students build empathy for local nursing home residents. Before the event, students spent time researching which exhibits seniors would find most interesting. As they shared their final project, residents shared stories from their own lives, adding meaning to the overall project. The appreciation of the residents was encouraging to the students.

PERSONALIZED LEARNING

Personalized learning refers to learning that is tailored to each student's strengths, needs and interests in order to provide flexibility and supportst o ensure all students reach proficiency of the highest standards/ competencies possible. Personalized learning enables student voice and choice in what, how, when, and where they learn.

In a personalized learning environment:

- **Students advance open demonstrated proficiency**
- **Students' demonstration of competencies requires transfer of knowledge across content areas and/or beyond the classroom**
- **Students engage in assessment as a meaningful and positive learning experience**
- **Students receive rapid, personalized support based on individual learning needs**

The possibilities offered by VR are absolute game-changers in today's classroom. Not only can teachers take their students to intriguing places around the world, but now students can easily create their own VR experience using Google's Tour Creator. The district looks forward to working with students to showcase information from the community with other audiences through a VR experience.

From these examples, we see that learning is not contained within screens or classrooms and that technology can enrich how students engage in the world around them. To see additional examples of cyberlearning, visit The Center for Innovative Research in CyberLearning.[10]

Bringing Equity to Learning Through Technology

Closing the Digital Use Divide

Traditionally, the digital divide in education referred to schools and communities in which access to devices and Internet connectivity were either unavailable or unaffordable.11 Although there is still much work to be done, great progress has been made providing connectivity and device access. The modernization of the federal **E-rate program** has made billions of dollars available to provide high-speed wireless access in schools across the country.

There are currently two categories of E-Rate: Category One services include data transmission services and Internet access, and Category Two services include internal connections (such as switches, wireless access points, and controllers), managed internal broadband services, and basic maintenance of internal connections. Both public and non-public schools are eligible to participate in the E-Rate program. Discounts on eligible products and services range from 20 to 90 percent and is dependent upon student need, usually relying upon the National School Lunch Program eligibility data.

E-RATE: SOURCE OF FUNDING FOR CONNECTIVITY

The Schools and Libraries Universal Service Support Program, commonly known as E-rate, is a source of federal funding for Internet connectivity for U.S. schools and libraries. Created by Congress in 1996, E-rate provides schools and libraries with discounted Internet service based on need. The program was modernized in 2014 to allow schools to prioritize funding high-speed wireless connectivity in schools. For more information about E-rate, visit the website of the Federal Communications Commission (FCC).

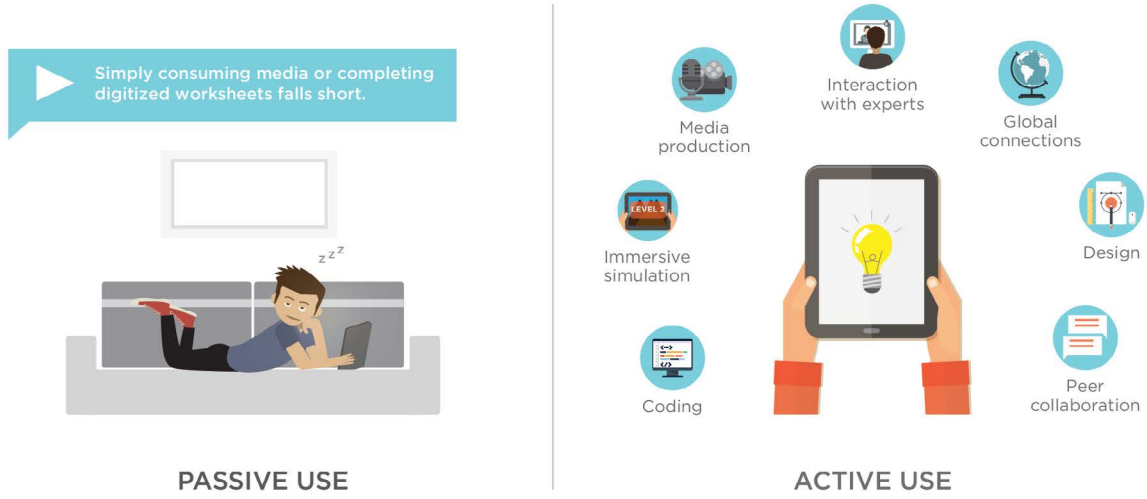
While the Category 1 services have been supported since the program first began in 1998, the widespread support of Category 2 products and services started in 2015. The Category 2 support is currently a five-year program, and action by the Federal Communications Commission is needed to renew and continue the program beyond the 2019-2020 school year. According to data provided by EducationSuperHighway, $75.7 million was made available to Iowa districts in Category 2 for the five-year period, and $28.3 million in funds remain for the five-year cycle.

Source: http://stateofthestates.educationsuperhighway.org/?postalCd=IA

However, we have to be cognizant of a new digital divide—the disparity between students who use technology to create, design, build, explore, and collaborate and those who simply use technology to consume media passively. [12] [13] [14] [15] On its own, access to connectivity and devices does not guarantee access to engaging educational experiences or a quality education.16 Without thoughtful intervention and attention to the way technology is used for learning, the digital use divide could grow even as access to technology in schools increases.[17] [18] [19] [20]

Providing Technology Accessibility for All Learners

Learning experiences enabled by technology should be accessible for all learners, including those with special needs. Supports to make learning accessible should be built into learning software and hardware by default. The approach of including accessibility features from the beginning of the development



public buildings include features such as ramps, automatic doors, or braille on signs to make them accessible by everyone. In the same way, features such as text-to-speech, speech-to-text, enlarged font sizes, color contrast, dictionaries, and glossaries should be built into educational hardware and software to make learning accessible to everyone.

Three main principles drive application of universal design for learning (UDL):[21 22 23 24]

1. **Provide multiple means of representation so that students can approach information in more than one way.** Examples include digital books, specialized software and websites, and screen readers that include features such as text-to-speech, changeable color contrast, alterable text size, selection of different reading levels or materials written in the learner's primary language.
2. **Provide multiple means of expression so that all students can demonstrate and express what they know.** Examples include providing options in how they express their learning, where appropriate, which can include options such as writing, online concept mapping, speech-to-text or translation programs.
3. **Provide multiple means of engagement to stimulate interest in and motivation for learning.** Examples include providing options among several different learning activities or content for a particular competency or skill, providing opportunities for increased collaboration or scaffolding, or providing tools, such as digital storytelling, to ensure grade-appropriate content material is accessible to many learners.

Digital learning tools can offer more flexibility and learning supports than can traditional formats. Using mobile devices, laptops, and networked systems, educators are better able to personalize and customize learning experiences to align with the needs of each student. They also can expand communication with mentors, peers, and colleagues through social media tools. Digital tools also can make it possible to modify content, such as raising or lowering the complexity level of a text or changing the presentation rate.

At a higher level of engagement, digital tools such as games, websites, and digital books can be designed to meet the needs of a range of learners, from novices to experts. Learners with little understanding might approach the experience first as a novice and then move up to an intermediate level as they gain more knowledge and skills. One example is McGill University's The Brain from Top to Bottom. The site includes options to engage with the content as a beginner, intermediate, or advanced learner and adjusts the learning activities accordingly.

To help in the selection of appropriate universally designed products and tools, the National Center on Universal Design for Learning has developed a resource linking each guideline to information about digital supports that can help a teacher put UDL into practice.

ESSENTIAL FOR SOME, GOOD FOR ALL: UDL/AEM

College Community Schools is engaged in a ten-year school improvement plan to build a personalized learning system for each of its students. Giving students "voice and choice" in how they engage and consume instructional content is essential. UDL principles are central to this process. Students at CCSD have 1:1 access to devices (iPads, PK-2; Chromebooks, 3-9; and MacBooks 10-12), and all students 6-12 take a district device home. Given this design philosophy and device saturation, AEM (Accessible Education Materials) is also a district priority.

Providing students with different ways to consume content — i.e., listening to text rather than decoding (assuming decoding is not the main outcome), dictating text rather than manually writing/keyboarding (assuming manual writing or keyboarding is not the central objective) — promotes strength-based learning. This type of design also helps to remove any stigma from students with IEPs who may require such accommodations by providing and encouraging these choices for all learners.

Ensuring all curricular materials meet AEM standards is a daunting task. CCSD is tackling this complex problem by focusing on three areas: procurement of new materials, conversion of existing (non-AEM) materials, and using high-leverage tools to access digital content. The district will not purchase any curriculum that does not meet digital accessibility standards. A curriculum purchasing protocol requires all new curriculum material to meet the NIMAC and the WCAG 2.0 standards for accessibility. Next is converting the existing, non-AEM ready curriculum to a digital format, using tools like Prizmo — an iOS scanning app that easily converts analog text to digital versions that can be accessed by screen readers. Finally, the district purchased Texthelp's Read&Write for Google for all students and staff. This gives students a high-quality screen reader and dictation/prediction writing tool amongst other helpful features. All three of these initiatives are highly-complex, and the journey is just beginning to make learning materials accessible to all.

BUILDING BRIDGES: GWAEA ASSISTIVE TECHNOLOGY CONFERENCE

In response to identified district and Grant Wood AEA staff needs to provide learning around assistive technology, the Grant Wood Area Education Assistive Technology Team hosted the first ever "Building Bridges Assistive Technology Conference" in Cedar Rapids in April 2012. Now, over 200 educators gather annually to explore and learn new ways to utilize a wide range of technology tools in unique ways to enhance access to instructional materials and to design/provide communication supports for students with individual modes of expression. The event features two national Assistive Technology speakers, as well as several AEA/LEA educators with expertise from across the state. As a result of the success of this conference, three other AEAs are now hosting similar events within their own AEA areas.

The Building Bridges Assistive Technology conference has filled a unique need in regards to professional learning for area educators as it has expanded awareness and equipped building teams in the consideration and use of various assistive technology tools and resources. These assistive technology tools and supports are not just "nice to have" tools, but rather technology supports and systems that are critical to providing individualized student expression, learning, and access to instruction in the classroom and beyond.

Physical Spaces and Technology-Enabled Learning

Blended learning and other models of learning enabled by technology require educators to rethink how they organize physical spaces to facilitate best collaborative learning using digital tools. Considerations include the following:

- Are the design and layout of the physical space dynamic and flexible enough to facilitate the technology-enabled learning models and practices selected? Can a space in which an educator delivers whole-class instruction also be shifted to facilitate individual online practice and research?
- Do the physical spaces align in their ability to facilitate individual and collaborative work? When practices such as project-based learning require students to be working together with multiple devices for research and presentation building, is the space as useful as when individual learners need time and space to connect with information and experts online for personalized learning?
- Can the physical spaces and tools be shaped to provide multiple contexts and learning experiences such as Wi-Fi access for outdoor classrooms? Are library spaces able to become laboratories? Can a space used as a history lecture hall for one class become a makerspace for engineering the next period?

For more information and tools for aligning physical spaces, visit the Center for Effective Learning Environments and the Clayton Christensen Institute's Blended Learning Universe.

21ST CENTURY SCHOOL DESIGN

How does a district transform the learning environment to prepare students for their future, not the past? That was a driving question as Charles City CSD school board, staff, and community wrestled with remodeling a 1932 school vs. construction of a new, purpose-built school.

Rather than tweak the style of traditional school buildings with long corridors and a series of same-sized classrooms on either side of the hallway, the district approached the process from square one. Stakeholders shared the types of spaces they wanted to see in a new school, such as individual, small group, and large group areas. They also emphasized that the spaces needed to be flexible to adapt to varying learning activities as well as changing needs. The result is a new school that is filled with natural light and checks the boxes of flexibility and adaptability.

Each of the four learning studios can accommodate up to 150 students. The commons contains the signature space for a 21st century school: a treehouse. It is adjacent to the information commons (library) which makes it a great place to read a book. It also gets used throughout the day for small group instruction and also simply as a place to hang out before and after school.

The new Charles City Middle School aptly embodies the mission of engaging, inspiring, and empowering students and staff in order to maximize learning.

REDESIGNING YOUR CLASSROOM TO FIT THE NEEDS OF ALL STUDENTS

Wilson Elementary school, located in Ottumwa, Iowa, has a very diverse group of students, speaking 16 languages and a poverty rate of over a 60 percent. Fourth grade teacher Mrs. Bryant decided it was necessary to make a change to meet the needs of her students. It began with district and AEA professional development around the 4C's, 21st learning, and 21st century classroom design. While working with tech coaches, she planned days where her students would visit and learn in the 21C room at the Great Prairie AEA. During those days, students experienced learning in a 21C classroom and were immersed in the 4C's. Throughout the year, Mrs. Bryant also attended Blended Learning training with Marsha Kish. She used her learning to begin to change instruction in her classroom.

At the end of the year, Mrs. Bryant got the opportunity to redesign her classroom into a 21C room. In her design, she incorporated the tenants of a 21st century classroom (no front of the room, flexible furniture, and writable surfaces). Couches, gaming chairs, wobble stools, rolling tables and chairs, multiple screens, rolling whiteboards, and Chromebooks were installed in her classroom. The redesign of her classroom greatly supported Blended Learning. During extended literacy time, her students work in Blended Learning centers where they are able to meet with the teacher, and do on- and offline work. Online, her students access digital books and articles, use Seesaw to capture their thinking, and do 4C's activities such as create with the green screen. In mathematics, her students access Prodigy, Coding, ConnectEd, and more. This allows Mrs. Bryant to work with students in small groups and have her other students actively engaged and learning. Students are able to choose the area of the room that works best for the learning they are doing at that time. No matter where they sit in the room, they can see a screen and have a writable surface. Mrs. Bryant's students love learning in her classroom and find it easy to be engaged.

Section III Recommendations

National Recommendations adopted by Iowa

- **States, districts, and postsecondary institutions should develop and implement learning resources that embody the flexibility and power of technology to create equitable and accessible learning ecosystems that make learning possible everywhere and all the time for all students.**

  Whether creating learning resources internally, drawing on collaborative networks, or using traditional procurement procedures, institutions should insist on the use of resources and the design of learning experiences that use UD practices to ensure accessibility and increased equity of learning opportunities.

- **States, districts, and postsecondary institutions should develop and implement learning resources that use technology to embody design principles from the learning sciences.**

  Educational systems have access to cutting-edge learning sciences research. To make better use of the existing body of research literature, however, educators and researchers will need to work together to determine the most useful dissemination methods for easy incorporation and synthesis of research findings into teachers' instructional practices.

- **States, districts, and postsecondary institutions should take inventory of and align all learning technology resources to intended educational outcomes. Using this inventory, they should document all possible learner pathways to expertise, such as combinations of formal and informal learning, blended learning, and distance learning.**

Without thoughtful accounting of the available tools and resources within formal and informal learning spaces within a community, matching learners to high-quality pathways to expertise is left to chance. Such an undertaking will require increased capacity within organizations that have never considered such a mapping of educational pathways. To aid in these efforts, networks such as LRNG, the Hive Learning Networks, and education innovation clusters can serve as models for cross-stakeholder collaboration in the interest of best practices for using existing resources to present learners with pathways to learning and expertise.

- **Education stakeholders should develop a "born accessible" standard of learning resource design to help educators select and evaluate learning resources for accessibility and equity of learning experience.**

  "Born accessible" is a play on the term "born digital" and is used to convey the idea that materials that are "born digital" also can and should be "born accessible." If producers adopt current industry standards for producing educational materials, materials will be accessible out of the box. Using the principles and research-base of UD and UDL, this standard would serve as a commonly accepted framework and language around design for accessibility and offer guidance to vendors and third-party technology developers in interactions with states, districts, and institutions of higher education.

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Section IV
Assessment – Measuring for Learning

GOAL: At all levels, our education system will leverage the power of technology to measure what matters and use assessment data to improve learning.

Measuring learning is a necessary part of every teacher's work. Teachers need to check for student understanding, and parents, students, and leaders need to know how students are doing overall in order to help them successfully prepare for college and work. In addition to supporting learning across content areas, technology-enabled assessments can help reduce the time, resources, and disruption to learning required for the administration of paper assessments.1 Assessments delivered using technology also can provide a more complete and nuanced picture of student needs, interests, and abilities than can traditional assessments, allowing educators to personalize learning. At the heart of any discussion about assessment a common thread that teaching and learning is instinctively intertwined should exist. When you think about the role of assessment, it should be through the lens of impacting student learning. It is one thing to collect data, but how we get the most out of it to improve outcomes for students should be the core of our efforts and of any discussion.

Through embedded assessments, educators can see evidence of students' thinking during the learning process and provide near real-time feedback through learning dashboards so they can take action in the moment.2 Families can be more informed about what and how their children learned during the school day. In the long term, educators, schools, districts, states, and the nation can use the information to support continuous improvement and innovations in learning.

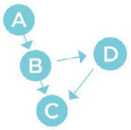
Technology-enabled tools also can support teacher evaluation and coaching. These tools capture video and other evidence of teaching elements such as teamwork and collaboration. They provide new avenues for self-reflection, peer reflection and feedback, and supervisor evaluation.

For those that continue to operate in the past, assessments in their schools and classrooms still rely largely on multiple-choice questions and fill-in-the-bubble answers. Some have taken the step to produce these multiple-choice questions or fill-in-the-bubble answers in digital form with the false belief that they are embracing technology and moving forward. However, although they have made a step, it is insufficient to utilizing technology as a powerful teaching and learning tool. Those that are currently accepting the future in real-time, understand that using assessments methods after learning has occurred with results delivered long-after the lesson, unit or course has ended is like using your autopsy to guide your health program. It is a little late!! Assessments are more instructionally useful when they provide timely feedback.

The present state of assessment will be continually advanced through accessible technology and will expand the use of ongoing, formative, and embedded assessments that are less disruptive and more useful for improving learning. These advances also ensure that all students have the best opportunity to demonstrate their knowledge and skills on a variety of assessments that increasingly focus on real-world skills and complex demonstrations of understanding.

As technology increases our capability to improve long-standing assessment approaches, our public education system has a responsibility to use the information we collect in ways that can have the greatest impact on learning. This means using assessments that ask students to demonstrate what they have learned in meaningful ways. And students and parents know there is more to a sound education than picking the right answer for a multiple-choice question or answering an extended-response question

outside the context of students' daily lives. All learners deserve assessments that better reflect what they know and are able to do with knowledge that has been identified as essential.

	TRADITIONAL	NEXT GENERATION
TIMING	 After learning	 Embedded in learning
ACCESSIBILITY	 Limited	 Universally designed
PATHWAYS	 Fixed	 Adaptive
FEEDBACK	 Delayed	 Real Time
ITEM TYPES	 Generic	 Enhanced

Approaches to Assessment

Various types of assessments are appropriate for different uses and at different times. Summative assessments measure student knowledge and skills at a specific point in time. Summative assessments (i.e. in summary) often are administered in common to a group of students, whether an entire class, grade level at a school, or grade level across a district. These assessment results can help to determine whether students are meeting standards in a given subject and also to evaluate the effectiveness of an instructional curriculum or model.[3]

Many PK–12 schools administer formal summative tests at the end of the year, which they may augment with interim tests earlier in the year. These assessments provide system-wide data on student achievement as well as data by sub-groups of learners.[4] The data can provide valuable insights regarding the achievement and progress of all students, including efforts to promote equitable access to excellent educational opportunities and to narrow achievement gaps.

In contrast, formative assessments are frequent, instructionally embedded checks for understanding that provide quick, continual snapshots of student progress across time. Formative assessments provide information during the instructional process, before summative assessments are administered. Both teachers and students can use the results from formative assessments to determine what actions to take to help promote further learning. In essence, formative assessments inform. These assessments help identify students' understanding, inform and improve the instructional practice of teachers, and help students track their own learning.[5]

Optimally, a comprehensive assessment system balances multiple assessment approaches to ensure that students, families, educators, and policymakers have timely and appropriate information to support individual learners and to make good decisions to strengthen educational systems overall.
In classrooms that truly understand the power of using technology to formatively assess students, you will see opportunities or checks of progress to allow students to demonstrate their learning or understanding. These formative assessment results allow the instructor to adapt instruction based on the needs of students. The modifications and improvements of this targeted instruction will produce benefits for students and their learning.

Evaluating Technology through Rapid-Cycle Technology Evaluations

The emphasis of the role of evidence in the Every Student Succeeds Act (ESSA) provides a unique opportunity to both use and generate evidence to better make education investments. Education technology is an area where this opportunity is particularly rich because these technology tools often make it possible to collect needed data to understand how something is working. Better information about the effectiveness of different technology tools helps educators and administrators make better investments. However, many school and district leaders face barriers in generating meaningful evidence on technology tools and other education investments. They need evaluation tools and processes to conduct low-cost, quick-turnaround evaluations for the types of students they serve.

Using Assessment Data to Support Learning

In almost all aspects of our daily lives, data help us personalize and adapt experiences to our individual needs. However, there is much work remaining to realize the full potential of using assessment data to improve learning in schools. As a result of the lack of understanding among all educators, we are missing out on significant opportunities to use data to improve and personalize learning for the benefit of all students.

For example, with an understanding and desire to reach all students, it is now possible to gather data during formative and summative assessments that can be used to create personalized digital learning experiences for individual students, a task that would be daunting, if not impossible, with traditional assessment methods.

In addition, teachers can use data to inform interventions and decisions about how to engage individual students; personalize learning; and create more engaging, relevant, and accessible learning experiences for all learners.

Iowa's Early Warning System

One of the hallmarks of a well-developed Multi-Tiered Systems of Support (MTSS) process and a balanced assessment system is the utilization of a valid and reliable universal screening and progress monitoring measures. The universal screening of all students, several times a year, enables educators to identify which students are on track to reach end of year outcomes and which students may be at risk. This practice helps to ensure that educators are identifying potential at-risk students as early as

possible so effective preventative practices can be delivered in a timely fashion. Furthermore, data from universal screening can assist educators in evaluating the health and well-being of their system as part of their Continuous Improvement decision-making. The progress monitoring measures enable educators to collect data more frequently on at-risk students in order to make timely decisions regarding the effectiveness of the targeted/intensive instruction.

The state of Iowa has established an early warning system for literacy. The system adopted by the state allows for the use of a common universal screener across Iowa's K-6 system. The system enables educators to not only provide universal screening, but it also allows them to conduct progress monitoring and to make decisions about the effectiveness of a school's MTSS model of service delivery. This system meets the requirements of the Early Literacy Initiative as part of Iowa Code Section 279.68. Data from the system aid in informing the work of Differentiated Accountability.

VAN METER SCHOOL DISTRICT'S SHIFT OF ASSESSMENT PRACTICES

Van Meter School District in an example of one district in Iowa that has adopted an approach to assessment that is shifting their focus from the traditional models of assessment to the next generation of assessments with the student at the center of the assessment process. They have created adaptive district-wide assessments, which allow educators to use data to drive their instructional groups and interventions. They created feedback loops with students and parents using SeeSaw (i.e., Student-Driven Digital portfolios) to help share and reflect upon various samples of student work. Staff members have also implemented formative assessments through their learning platform (i.e., Moodle) to give students immediate feedback to avoid commonly made mistakes and ensure student understanding. The shift in the approach from Van Meter is a good example of how rethinking the approach to assessment can have a positive impact on students and ultimately their learning.

Assessment data can also be made available directly to students. When they have access to their data, students can play a larger role in choosing their own learning pathways.6 The data also can be made available to family members so students' advocates can play a more active role in supporting their children's education. Moreover, data can be used to support teachers' efforts—individually or in teams, departments, or schools—to improve professional practice and learning.7

Although data from technology-based assessments and data systems hold great potential, they are meaningful only when educators use them effectively. Teachers deserve ongoing support to strengthen their skills in how to use data to meet the needs of students better.

Addressing these challenges will take a three-pronged approach: (1) preparing and supporting educators in realizing the full potential of using assessment data, (2) encouraging the development of data assessment tools that are more intuitive and include visualizations that clearly indicate what the data mean for instruction, and (3) ensuring the necessary supports to insure research-based instructional practices are deployed in the classroom.

How Technology Transforms Assessment

Technology can help us imagine and redefine assessment in a variety of ways. These tools can provide unobtrusive measurements for learners who are designing and building products, conducting experiments using mobile devices, and manipulating parameters in simulations. Problems can be situated in real-world environments, where students perform tasks, or include multi-stage scenarios that simulate authentic, progressive engagement with the subject matter. Teachers can access information on student progress and learning throughout the school day, which allows them to adapt instruction to personalize

learning or intervene to address particular learning shortfalls. The unique attributes of technology-based assessments that enable these activities include the following.

Enable enhanced question types

Technology-based assessments allow for a variety of question types beyond the limited multiple-choice, true-or-false, or fill-in-the-blank options that have characterized traditional assessments. Examples of enhanced question types include the following:

- Graphic response, which includes any item to which students respond by drawing, moving, arranging, or selecting graphic regions
- Simulations, in which students take action in immersive and/or roleplaying environments to test their knowledge in contexts that provide high fidelity to real world scenarios
- Equation response, in which students respond by entering an equation
- Performance-based assessments, in which students perform a series of complex tasks

Technology-enhanced questions allow students to demonstrate more complex thinking and share their understanding of material in a way that was previously difficult to assess using traditional means.

In particular, performance-based assessments are designed so that students must complete a series of complex skills that ask them to synthesize information from multiple sources, analyze that information, and justify their conclusions. For example, a performance task in English language arts might include reading passages from primary documents, analyzing the set of passages, and writing an essay in response to a prompt. In a mathematics class, a performance task might ask students to analyze a graph based on actual data and describe the linear relationship between the quantities. Because performance-based assessments allow students to construct an original response rather than selecting the right answer from a list, they can measure students' cognitive thinking skills and their ability to apply their knowledge to solve realistic, meaningful problems.8

Using the technology offered in performance-based assessments, students can enter their responses in the online interface. For tasks that require hand scoring, scores can be merged with machine-scored items in the same system, thus providing complete test results. For example, the Partnership for Assessment of Readiness for College and Careers and the Smarter Balanced Assessment Consortium evaluate students' ability to excel at classroom speaking and listening assignments in addition to more traditional machine-scored prompts.

Provide real-time feedback

Technology-based formative assessments can offer real-time reporting of results, allowing stakeholders to understand students' strengths and weaknesses, while guiding them to make valid, actionable interpretations of the assessment data. Such assessments can enable educators to see, evaluate, and respond to student work more quickly than can traditional assessments. Similarly, learners and their families can access this information almost in real time. Technology-based summative assessments also facilitate faster turnaround of results.

Some of today's technology-based assessments also allow for a richer menu of approaches to feedback than do traditional or even first-generation online assessments. Certain formative assessment platforms allow educators to provide feedback to students via in-line comments (through video, audio, or text), engage in online chats, email feedback directly to families and learners, and connect learners to additional resources for practicing specific skills or developing key understandings.

These technologies also can increase the efficiency of the process of giving feedback, allowing educators more time to focus on areas of greatest need. For example, for giving feedback on areas of

frequent concern, educators can pre-populate a menu of responses to use as comments, allowing them to shift focus to areas of feedback unique to each student. Automated responses can be generated as well when assignments are late or incomplete. Although this is still nascent technology, in recent years, advances have occurred in automated scoring of essays that may make it a more powerful tool to generate timely feedback.

Increase accessibility

Advances in technology grounded in UD and systems that align to UDL have made assessments more accessible and valid for a greater number of students, including those with diverse abilities and language capabilities. These advances have allowed a greater proportion of the population access to assessments. Special features include the ability to increase font sizes and change color contrast, text-to-speech, bilingual dictionaries, glossaries, and more. These features can be embedded in assessments and made available to students, depending on what the assessment is measuring and identified learner needs. Seamless accessibility features embedded in technology-based assessments reduce the need to single out individual students for extra supports, providing an added benefit for students and educators alike.

Similarly, assistive technology, such as text-to-speech, alternate response systems, and refreshable Braille, supports students with disabilities in accessing learning. These technologies continue to advance and can make it possible for students to interact with digital learning resources in ways that would be impossible with standard print-based assessments. When both assistive technologies and assessments effectively interoperate, students are better able to demonstrate what they know and how to apply this knowledge.

Adapt to learner ability and knowledge

Computer adaptive testing has facilitated the ability of assessments to estimate accurately what students know and can do across the curriculum in a shorter testing session than would otherwise be necessary. Computer adaptive testing uses algorithms to adjust the difficulty of questions throughout an assessment on the basis of a student's responses. For example, if the student answers a question correctly, a slightly more challenging item is presented next; if the student answers incorrectly, he or she receives another opportunity to demonstrate knowledge in a different manner.

Because adaptive tests target content and test items aligned with each student's ability level, the adaptation leads to more precise scores for all students across the achievement continuum in a greatly reduced time period. Achieving the same level of precision in a traditional paper-and-pencil test would require students to answer many more questions, potentially impacting instructional time. Moving forward, these assessments can benefit from increased interoperability so that the data from these adaptive measures can be pulled into a centralized dashboard that allows a more integrated understanding of student performance.

Embed with the learning process

Embedded assessments are woven directly into the fabric of learning activities students undertake. Such assessments may be technology driven or simply a part of effective instruction, and they may appear in digital learning tools and games. They are generally invisible to the instructional process because they are embedded in the regular classroom activities. Embedded assessments have the potential to be useful for diagnostic and support purposes in that they provide insights into why students are having difficulties in mastering concepts and provide insights into how to personalize feedback to address these challenges.[9]

Game-based assessment is designed to leverage parallels between video game design and next-generation learning and assessment.[10] Recent research has focused on promising ways that digital

learning can support formative assessment practices[11] [12]—including wraparound features such as annotation tools and dashboards—and ways that games can identify more nuanced conclusions about student learning outcomes.[13]

Assessment for Ongoing Learning

Technology provides students with multiple pathways to create assessable work throughout the year. To demonstrate their understanding, students can create multimedia productions, construct websites to organize and analyze information, and design interactive presentations to serve as products for assessment. These pathways allow teachers to understand how students access and understand information across given categories. For students who need individual accommodations, advances in technology allow for dynamic and personalized presentation and assessment using alternative representations of the same concept or skill. Moving forward, increasingly sophisticated technology-driven assessments will enable more powerful personalized learning, likely accelerating the shift from time-based learning to competency-based learning.

CREATING GOALS USING BRIGHTBYTES DATA - INCREASING THE 4CS IN THE CLASSROOM

Cardinal School District has taken the Bright Bytes Technology and Learning survey for the past four years. It is a survey that gathers information on how we use technology, what hardware/software we need and what type of supports the district is providing for technology. We received our data after the first year and knew we needed to make an action plan. Through the state's TLC initiative the district created a 4C's team to help create and implement an action plan. A team of seven teachers and the technology director worked together to analyze Bright Bytes data, find the areas to improve, and create an action plan. The plan calls for mini tech sessions to give examples of ways to implement more technology into daily lessons, topics to present at PD sessions, explanation of verbage used on survey to staff before the next survey was taken, and the creation of a digital tool box.

Mini tech sessions have provided necessary training. After analyzing the Bright Bytes survey results, four topics were selected. Two groups of teachers, elementary and secondary, came up with examples of technology that would increase technology usage within the daily lessons in the 4C's areas that were lacking. The teachers scheduled two mini tech sessions per month, one in the morning before school and one in the afternoon after school. All staff were expected to attend one of the meetings. For example, a kindergarten and a third grade teacher lead a tech session on how to use Seesaw. A middle school and a high school teacher lead a tech session on the use of google docs and classroom collaboration. The staff feedback has been positive, and the use of technology in the areas of the 4C's has increased.

The Future of Technology-Based Assessment

Although the process is often challenging, in many places, transitioning to technology-based assessment is well under way. Such assessments will continue to improve across time in the following ways.

Continuous improvement of assessments

Traditional paper-and-pencil tests, and even some first-generation technology-based assessments, usually are reviewed and updated only on a designated schedule, often driven by printing and distribution cycles rather than when test items need to be updated. Online delivery of assessments allows for continuous improvement of test items.

Integrated learning and assessment systems

Technology has the potential to move assessment from disjointed separate measures of student progress to an integrated system of assessments and personalized instruction to meet the needs of the learner. Technology can more fully integrate student classroom experiences, homework assignments, and formative and summative assessments, all of which are tied closely to academic standards. Online learning platforms can display effects of missing assignments, progress toward goals, and channels for communication with mentors and teachers.

We also should expect to see integrated systems that make the learning process more seamless for students and educators. As students progress along personalized learning pathways, they will be assessed when they are ready to demonstrate mastery over particular skills and content rather than when the calendar indicates there is a testing date. At the same time, we have a responsibility to ensure that all students are held to high standards and offered excellent educational experiences. Ensuring equity while also providing accelerated personalization is the one of the greatest challenges and opportunities moving forward for technology in assessment.

Using data effectively and appropriately

To realize the vision of sharing data across student information systems, we need to address several challenges. On the technical front, formidable barriers to the development of multi-level assessment systems are created by having several student data systems running side-by-side, coupled with disparate data formats and the lack of interoperability across systems. Student and program data today are collected at various levels and in various amounts to address different needs in the educational system. State data systems generally provide macro solutions, institution-level performance management systems offer micro solutions, and student data generated by embedded assessments create nano solutions. Providing meaningful, actionable information that is collected across all of these systems will require agreement on the technical format for sharing data while attending to student privacy and security.

Learning dashboards that enable visualizations

Although systems that support real-time feedback can increase educator and learner understanding of progress toward learning goals, the feedback is even more valuable if it is available in one easily accessible place. To achieve this, we need to connect information about learning that happens across digital tools and platforms.

Learning dashboards integrate information from assessments, learning tools, educator observations, and other sources to provide compelling, comprehensive visual representations of student progress in real time. A learner's attendance data, feedback from instructors, summative evaluation data, and other useful information all can be made available in formats specific to different stakeholders. Learning dashboards can present this data in easy-to-understand graphic interfaces.

These dashboards also can offer recommendations about resources to help students continue their learning progression as well as help identify students who may be at risk of going off track or even dropping out of school. Across larger education systems, these dashboards can help educators to track learner performance across time as well as monitor groups of students to identify shifts in equity, opportunity, and achievement gaps. Although teacher dashboards are becoming commonplace, student and family dashboards can offer promising opportunities to help students take control of their own learning.

Set of Shared Skill Standards

As we shift toward personalized learning, there is increased need for a shared set of common skill standards. The development of micro-credentials is one approach to address this need by creating a shared language and system for communicating success in developing these competencies.

Micro-credentials, often referred to as badges, focus on mastery of a singular competency and are more focused and granular than diplomas, degrees, or certificates. The earning and awarding of micro-credentials typically is supported by a technology-based system that enables students and evaluators to be located anywhere and for these activities to take place everywhere and all the time. Micro-credentials also allow for the portability of evidence of mastery. Information about the student's work that earned a badge can be embedded in the metadata, as can the standards the work reflects and information about the awarder of the badge.

Analysis of Assessment Content from other Plans from Various States

The education technology plans from Wisconsin, Vermont, Ohio, California, and North Carolina recommend the development and support for assessments that will help teachers adapt or differentiate instruction to the needs of individual learners. This is a consistent theme in digital learning plans, and is a constant theme throughout the Iowa plan as well.

Other areas are consistent throughout the various state plans:

- Data informed decision making.
- Personalized learning --- the need for real-time data access.
- Adoption of platforms and tools that provide online formative assessments and formative data reporting and analysis.
- Competency based models of assessment.
- Redesign of state report cards under ESSA.
- School quality and student success indicators as part of accountability.
- Student portfolios and assessment of project based learning.

Section IV Recommendations

National Recommendations adopted by Iowa

- **Interoperable formative assessment formats offered by major testing consortia for use by educators throughout the year are an important first step.**

  However, work remains to ensure more educators have access to high-quality formative assessment tools and to develop additional capacities to assess both cognitive and non-cognitive skills better. Moving forward, increasing educator capacity for the design and deployment of valid and reliable formative assessments will require the concerted efforts of current assessment developers, teacher preparation programs, school systems, and researchers. Furthermore, colleges and universities will benefit from system-wide reviews of assessment practices and from ensuring all faculty have deep understandings of key principles and practices surrounding the design and implementation of effective learning assessments.

- **Revise practices, policies, and regulations to ensure a model of assessment that includes ongoing gathering and sharing of data for continuous improvement of learning and teaching.**

  This will require not only greater systems interoperability standards but also increased capacity on the part of educators and administrators to understand the types of systems they want to establish within schools and colleges. In addition, they will need to have an understanding of the standards of interoperability they should demand from vendors. A key component of this increased capacity

should ensure educational leaders have a firm understanding of privacy and security concerns, how those concerns are addressed within the school or system, and clear communication of policies and procedures with all stakeholders. Achievement of this recommendation would benefit from the involvement and guidance of organizations, such as CoSN, ISTE, and the State Educational Technology Directors Association (SETDA), that have developed specialized expertise in these areas.

- **States, districts, and others should design, develop, and implement learning dashboards, response systems, and communication pathways that give students, educators, families, and other stakeholders timely and actionable feedback about student learning to improve achievement and instructional practices.**

- **The next generation of such tools should integrate across platforms and tools seamlessly, be designed with a mobile-first mindset, and be guided by UD and UDL principles to ensure accessibility by all stakeholders.**

  Although current products and dashboards include basic functionality and features that improve on those of their predecessors, future iterations should be built on a premise of feedback and conversation, allowing learners and families to discuss learning outcomes and evidence and increasing agency and ownership across stakeholder groups.

- **Create and validate an integrated system for designing and implementing valid, reliable, and cost-effective assessments of complex aspects of 21st-century expertise and competencies across academic disciplines.**

- **Research and development should be conducted that explores how embedded assessment technologies such as simulations, collaboration environments, virtual worlds, games, and cognitive tutors can be used to engage and motivate learners while assessing complex skills.** Although some of this research is in its early stages, the way forward will require close collaboration among organizations—such as GlassLab, Games for Change, and iCivics; colleges, universities, informal learning spaces, and schools; philanthropic organizations; and research institutions—that have a deep understanding of how game mechanics increase learner motivation. This collaboration can increase the likelihood of effective and engaging experiences being built to support learning.

- **Make digital assessment tools an integral part of all instructional projects and initiatives. For example, build upon the success of the literacy screeners part of the FastBridge suite, ensuring similar screeners are available for all content areas and in the area of Social-Emotional, Behavior and Mental Health.**

  Quality digital assessment tools have been shown to contribute to the success of initiatives underway in Iowa's schools. Such tools can assist in screening students to determine their current level of functioning in a particular area and point to their specific needs. Having such tools be digital in nature make the data available in a timely fashion and make the data easily accessible. Learning from the success of current digital assessment tools and applying that information to up and coming initiatives would contribute to the success of each.

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Section V
Infrastructure – Enabling for Use

GOAL: All students and educators will have access to a robust and comprehensive infrastructure when and where they need it for learning.

Preparing students to be successful for the future requires a robust and flexible learning infrastructure capable of supporting new types of engagement and providing ubiquitous access to the technology tools that allow students to create, design, and explore. The essential components of an infrastructure capable of supporting transformational learning experiences include the following:

- Ubiquitous connectivity. Persistent access to high-speed internet in and out of school.
- Powerful learning devices. Access to mobile devices that connect learners and educators to the vast resources of the internet and facilitate communication and collaboration.
- High-quality digital learning content. Digital learning content and tools that can be used to design and deliver engaging and relevant learning experiences.
- Responsible Use Policies (RUPs). Guidelines to safeguard students and ensure that the infrastructure is used to support learning. Web content filters that efficiently work in and out of school to provide a safe and CIPA compliant access to resources.

Building a robust infrastructure for learning begins with an understanding of the goals and desired outcomes that support engaging and empowering learning experiences. When based on learning goals, technology infrastructure decisions become clear.

Setting Future Goals: Guidance on Assessing Your Current Situation

These questions address many of the important considerations for districts as they begin the development of a comprehensive plan for learning with technology. More detailed information and guidance can be found in the U.S. Department of Education's Future Ready Schools: Building Technology Infrastructure for Learning.

- What is your vision for learning that the technology infrastructure will be supporting?
- What digital learning content, tools, and resources will be supported?
- How many and what types of devices will be supported?
- What kind of professional development will teachers need to become proficient with digital learning?
- What is your current network capacity?
- What is the current state of your physical infrastructure?
- What traditional materials and methods are you willing to let go of to ensure financial viability of the digital environment?

THE "FRAME" WORK OF ONE TEACHER LIBRARIAN TO SUPPORT #FUTUREREADY

When students walk into Howard Winneshiek Community School's Discovery Center, previously known as the library, their experience is different from the traditional library experience. Mrs. Denise Shekleton, the teacher librarian at Howard Winn, has used the Future Ready Framework to revamp the opportunities her students have in the Discovery Center. The framework helps build connections within the walls and outside the walls of the buildings of this 1:1 school district. It is not uncommon to walk through the K-8 Discovery Center and see Mrs. Shekleton connecting her students with students and authors from around the country and world, engaged in STEM activities connected to literature, or appreciating a book through an online source.

A large part of her focus in library has revolved around empowering students via 1:1 activities, integrating digital resources and tools to her instruction, and cultivating partnerships. These collaborative activities have showcased her leading beyond the library, one of the Future Ready gears. She empowers students through opportunities to Skype with classrooms and authors around the country and world for Dot Day, Global Read Aloud, World Read Aloud Day, Read Across America, and other nation-wide collaborative initiatives. Her view of being a Future Ready teacher librarian creates these opportunities.

Students have access to her website 24 hours a day. They know how to access it, both at school and at home, using their digital citizenship tools. Students have access to ebooks, audiobooks, credible digital citizenship sites, and links for resources to support classroom curriculum. Mrs. Shekleton empowers students as creators by collaborating with other teachers on classroom projects. Students then have the tools to take with them to apply to multiple real world situations.

Through this change, Shekleton works to support the Howard Winneshiek District mission of preparing and empowering students to "think creatively, serve, contribute, and succeed locally and globally". "It is not possible to do this alone," stated Denise. "Support from the district school board and administrators, as well as collaboration time with teachers, benefits our students at school and outside of school."

Ubiquitous Connectivity

Reliable connectivity, like water and electricity, is foundational to creating an effective learning environment. Students and teachers cannot take advantage of the opportunities to connect and engage globally or leverage high-quality learning resources without consistent and reliable access to the internet. In addition, the U.S. Department of Education's Office for Civil Rights issued a Dear Colleague letter in

October 2014 that included access to technology as an important component of equity of access within U.S. schools.

Connectivity at School

In 2013 the White House set a goal for 99 percent of students in the country to have internet access at a minimum of 100 **megabits** per second per 1,000 students, with a target speed of one gigabit per second by 2018. Efforts by federal, state, and local institutions in recent years have made huge strides toward this goal. The modernization of the E-rate program in 2014 provided billions of additional dollars to help districts improve the speed of and access to Internet connectivity

MEGABITS PER SECOND
Broadband speeds are measured in 'megabits per second,' often shortened to Mb Mbits p/s or Mbps. Bits are tiny units of data, with megabit representing a million of them. The higher the number of Mbps (megabits per second) you have, the speedier your online activity should be. A high number should mean that downloads complete more quickly, webpages load faster, streaming of music or videos begins more rapidly and any video calls or online games played should display smoothly.
***Note from Doresetforyou website, downloaded November 25, 2017.**

Although unprecedented resources are available to reach this goal, still significant work remains for many schools and districts. As mentioned earlier, the 2016 Consortium for School Networking (CoSN) Annual E-rate and Infrastructure Survey found that 81 percent of school systems have met this FCC short-term goal of 100 megabits per second of Internet bandwidth per 1,000 students, which leaves 19% of schools that will need access. Although we still have progress to make, this is a significant improvement from 2013 when only 19 percent reached the goal in 2013.2 Organizations, such as EducationSuperHighway and CoSN, are committed to supporting schools throughout this transition.

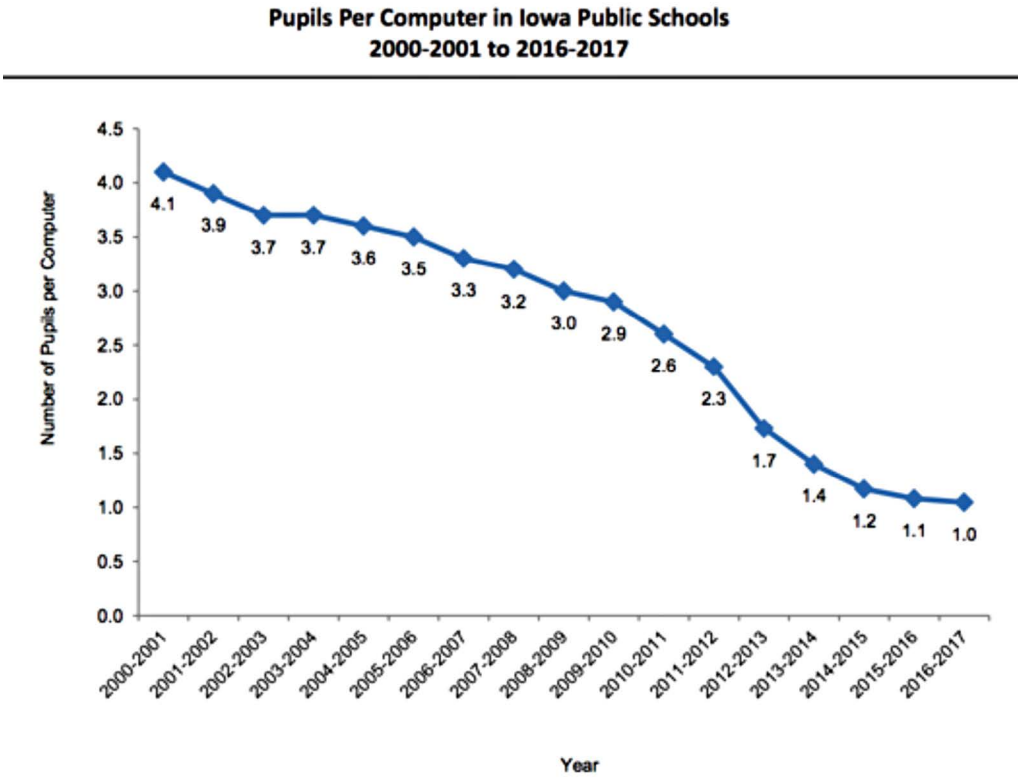
Leadership in technology implementation is needed across all levels of the education system, but the need in PK–12 public schools is acute. The 2016 Consortium for School Networking (CoSN) Annual E-rate and Infrastructure Survey found that 81 percent of school systems have met the FCC's short-term goal of 100 megabits per second of Internet bandwidth per 1,000 students. Although we still have progress to make, this is a significant improvement from 2013 when only 19 percent reached the goal.2 Recent changes to the federal E-rate program make funding available to increase connectivity to the remaining schools; however, these transitions will not happen without strong leadership at state, district, and school levels.

Iowa's Connectivity at School

The Condition of Education Report 2017 (downloaded May 11, 2018)

Each year Iowa's Department of Education develops a condition of education report. The 2017 report included information about student enrollment, number of certified teachers, teacher salaries, student performance on measures such as Iowa Assessments, and measures of technology readiness. In regard to technology readiness, the report's author noted "as of 2016-2017, the statewide pupils per computer has reached 1.0. Districts with enrollments of 7,500 or more are the furthest behind with 1.3 pupils per computer" (page 91).

As shown in the table on the following page, reproduced from the Conditions of Education Report, the ratio of pupils per computer has decreased over time. In 2000-2001 there were 4.1 pupils per computer. This ratio declined by 3.1 pupils per computer to 1.0 pupils per computer in 2016-2017. With such device availability, Iowa's educators are equipped to realize the potential of digital learning.



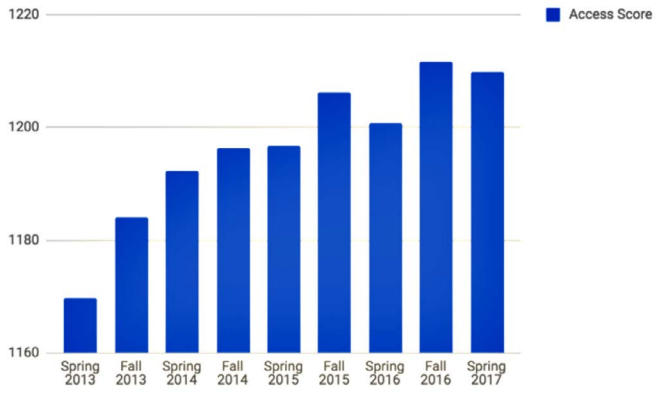
Another data element reported by school districts is the bandwidth available to their buildings. As reported in the Condition of Education Report, bandwidth "ranges have changed from prior years, and now reach into the gigabit (1,000 megabits) realm. All but one of the largest districts have bandwidths greater than 100 megabits, and 76 percent of the largest districts are in the gigabit range. In contrast to computer accessibility, the percentage of schools with gigabit-level bandwidth decreases as the grade levels increase. Thirty percent of elementary schools reported bandwidth of gigabit or more while only 17 percent of high schools have such access" (p. 95).

*According to the BEDS Reference Manual "bandwidth to the building plays a key role in the number of devices that can be made available and the use and functionality of these devices."

BrightBytes Clarity Data

For the past four years, Iowa's Area Education Agency system has made available to schools a tool to help them assess the impact of technology on learning. The tool is the Technology and Learning Module powered by BrightBytes' Clarity data analytics platform. One of the factors the tool allows schools to evaluate is the level of access to the Internet and technology tools at school and home, for both teachers and students alike. The graph below displays access over the past four years, across all districts using the Module.

Graph 5.2
Overall Clarity Access Scores



The scores shown in the graph above indicate that overall access falls in what BrightBytes labeled an "Advanced" range. Through the Technology and Learning Module, Beginning scores are those scores falling in the range of 800-899, Emerging scores fall in the range of 900-999, Proficient scores fall in the range of 1000-1099, Advanced scores fall in the range of 1100-199, and Exemplary scores fall in the 1200-1300 range. In terms of making digital learning possible, these overall scores suggest teachers and students have access to digital tools at home and at school.

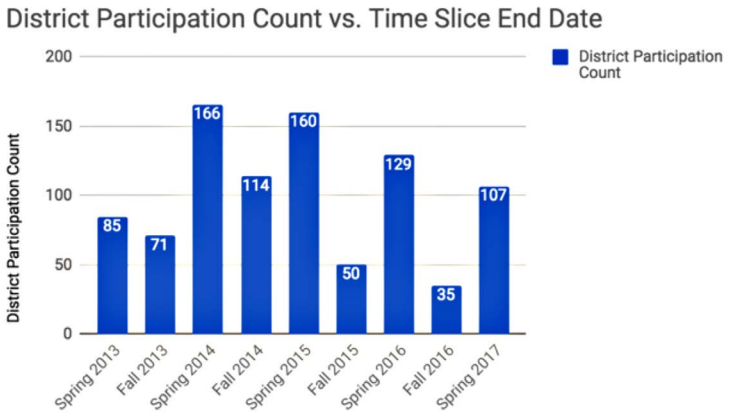
As part of the Technology and Learning Module survey, teachers are asked about the quality of Internet speed at school. Teachers were able to respond with Excellent, Above Average, Average, Below Average, and Poor. Survey results from the most recent statewide data collection are shown below.

Table 5.2
Percentage of teachers reporting about quality Internet speed at school

Excellent	Above Average	Average	Below Average	Poor
19	36	34	8	4

The number of districts participating in the collection of data via the Technology and Learning Module has waxed and waned over time. As can be seen in graph 5.3 below, in the Spring of 2013, 85 school districts participated in data collection. A peak of 166 districts participating was reached in the Spring of 2014. Since that time, the number of districts participating has declined steadily. In the Spring of 2017, 107 districts participated in data collection.

Graph 5.3
Clarity Survey District Participation Rate Over Time



Education SuperHighway Data

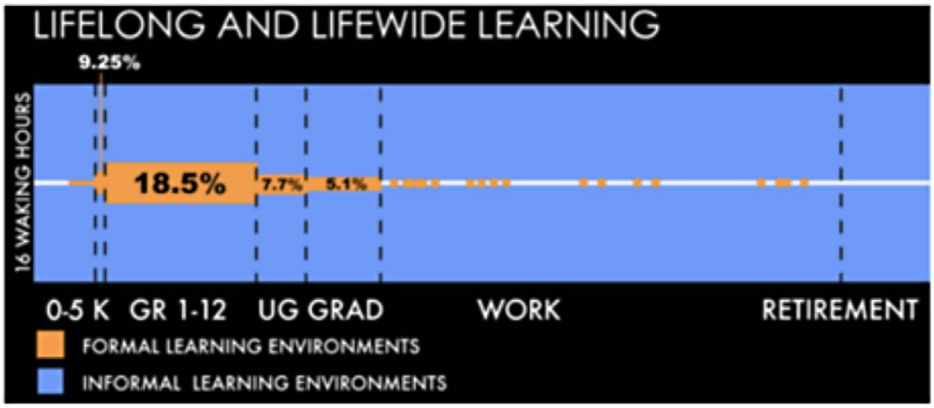
Another data source that may be used in assessing connectivity in Iowa's schools is the "Education SuperHighway." Data presented by this non-profit organization are garnered from district e-rate applications. Given the source of the data and some reported difficulties in ensuring good data hygiene, it is possible the data does not accurately reflect the current reality in Iowa's schools. When submitting their applications, districts were not aware they were going to be used in a national report. Additionally, not all districts filed e-rate applications, meaning we do not know how all of Iowa's districts are doing on the measures being evaluated. Given the amount of reporting in the press these data receive, it was believed to be important to include in the Iowa DLP.

Some highlights from the 2018 Education Super Highway Data set include:

- 97% of Iowa school campuses are connected on fiber
- 99% of districts meet the FCC minimum bandwidth goal (100 kbps/student)
- Bandwidth speeds have nearly tripled over the past three years

- Broadband cost has decreased by 75% during that same time period
- Connectivity at Home

Learning does not stop at the end of the school day, and access to digital learning resources should not either. According to a report from the Council of Economic Advisers, approximately 55 percent of low-income children under the age of 10 in the United States lack internet access at home.



The LIFE Center's Lifelong and Lifewide Diagram by LIFE Center is licensed under a Creative Commons Attribution-NonCommercial-NoDerivs 3.0. (LIFE Center: Stevens, R. Bransford, J. & Stevens, A., 2005)

These statistics along with consideration of the amount of time spent out of school have given rise to concerns about a "homework gap" between students whose internet connections at home are slow or non-existent—a problem disproportionately common in rural and underserved communities—and those who have home connections with adequate speed. They also give credence to the view that connectivity at home for students is an essential component of a 21st century education (not something merely nice to have) if we are to avoid exacerbating pre-existing inequities in unconnected homes.1

Educational leaders should work to ensure learners have access to connectivity and devices when they leave school grounds so that they are not limited in their ability to experience high-quality connected learning fully. To support schools in this effort, organizations such as EveryoneOn focus on providing highly subsidized Internet access to low-income households. In addition, the U.S. Department of Housing and Urban Development launched **ConnectHome** in 2015 to focus on bringing high-speed Internet to low-income communities so everyone can participate in our increasingly connected society.

The FCC has issued an NPRM regarding the 2.5 GHz spectrum. According to the FCC WT Docket No. 18-120, Fact Sheet, "Significant portions of the 2.5 GHz band currently lie fallow across approximately one-half of the United States, primarily in rural areas. Moreover, new access to the Educational Broadband Service (EBS) spectrum in this band has been strictly limited since 1995, and current licensees are subject to a regulatory regime largely left over from the days when educational TV was the only use envisioned for this wide swath of spectrum." This wireless "white space" technology could be used in Iowa to provide targeted Internet access to off-campus use in rural Iowa.

CONNECTHOME

ConnectHome is a U.S. Department of Housing and Urban Development program focused on increasing access to high-speed Internet for low-income households. The pilot program, launched in 27 cities and one tribal nation in the summer of 2015, is aimed at providing thousands of public housing families with high-speed internet access. As part of the program, Internet service provid-ers, nonprofits, and the private sector will offer broadband access, technical training, digital literacy programs, and devices for residents in assisted housing units.5 For more information, visit http://connecthome.hud.gov/.

COMMUNITY WIFI PROJECT CONNECTS STUDENTS

In 2009 the Council Bluffs Community School District implemented a Strategic Plan that included large scale improvements to technology infrastructure and set a goal for students in Grades 3-12 to have personal computing devices. The 1:1 initiative was implemented in the Fall of 2011 and spanned grades 2-12. While the infrastructure improvements and devices were great for students at school, it became apparent that there was a connectivity gap for some students. The device went home, but there was limited access to WiFi in many homes and neighborhoods.

The City of Council Bluffs began offering limited free community Wi-Fi in 2009. The free WiFi was available in some public buildings and outside in very limited areas. In the spring of 2014, the Council Bluffs Community School District approved a Strategic Plan that included a goal to expand its Wi-Fi network for students into the community. At this time, the City of Council Bluffs and the Council Bluffs Community School District formed a 28-E organization focused on providing free community Wi-Fi and expanded WiFi for the district's students. The collaboration between the city, school district, and community partners was unique in that no taxpayer funds were used. Resources already in place at city and school district sites are more readily available throughout the community.

The project was named "BLink - Bluffs Community Wi-Fi". In the fall of 2014, the group announced the first two phases. Fundraising and planning began immediately. Several community partners secured funding, ensuring BLINK as a truly community Wi-Fi initiative. Committees comprising city, school district, and community members were formed to guide the work. As of January 2018, four phases have been fully implemented and a fifth is being planned for the Fall. To see updated coverage area and ongoing project updates, go to the project website: www.BlinkWiFi.org.

TACKLING THE DIGITAL DIVIDE: HOTSPOTS FOR STUDENTS

When the Waterloo Schools began issuing Chromebooks to middle school students, it knew that student internet access outside of the district was a concern which couldn't be ignored. As an urban community, the District recognized that a real digital divide existed amongst students. While issuing devices to students helps tackle technology inequities, it can only magnify those inequities if some students don't have internet access which is necessary for the device to be useful.

To address this issue, the Waterloo Schools partnered with its two local Internet Service Providers to promote programs they offer which heavily discount internet service for those families which qualify based on income requirements. Additionally, the District applied for and received a grant from Sprint through their ConnectED program. This grant allowed the District to purchase hotspot devices through which Sprint provides free internet service. These hotspots are distributed at no charge to students who don't have internet access, allowing them to fully utilize their District provided chromebook at home.

Powerful Learning Devices

Any effort to leverage the power of mobile learning devices and resources is dependent on access to high-speed connectivity. Selecting appropriate devices depends in large measure largely on the age of the students, their individual learning needs and the types of learning activities that will be ongoing in the classroom or after school program. Schools should provide students with appropriate learning devices. The U.S. Department of Education's Office of Educational Technology (OET) published Future Ready

Schools: Building Technology Infrastructure for Learning in November 2014 to help schools and districts consider device purchases as well as other infrastructure concerns when building technology systems to support learning.

Beware of Bring Your Own Device (BYOD) or Bring Your Own Tech (BYOT)

Many institutions have BYOD or BYOT policies that permit students to use their own mobile devices at school. Although it is certainly reasonable to allow students to learn and communicate using their own devices, there are serious digital equity considerations that should be taken into account if schools use BYOD as their primary method for ensuring students have devices, including the following:

- **Economic disparity.** The ability to access digital learning resources is distributed disproportionately to students whose families can afford the devices. This can widen the very gaps that technology is capable of closing. This situation also may raise legal concerns because schools are expected to provide a free education for all students.
- **Instructional burden.** It can be very difficult for teachers to manage learning experiences and activities when they have to support multiple platforms and device types, and some activities may be incompatible with some devices. In this situation, teachers may revert to activities of the lowest common denominator that work on older and less robust devices at the expense of a more effective learning experience.
- **Privacy and security.** Student-owned devices may not have appropriate safeguards in place for storing their learning data. In addition, personal devices likely will not have the security features required to provide valid assessment.

Iowa's Powerful Learning Devices

In an article from the Empowered Learner (October 1, 2017), entitled Change at scale: The 1:1 movement in Iowa, Scott McLeod reported on Iowa's 1:1 movement. In 2007 McLeod moved his center for advanced studies in technology leadership in education (CASTLE) to Iowa State University. That same year McLeod began a collaboration with the School Administrators of Iowa (SAI) focused on 21st century leadership. That collaboration resulted in "approximately 400" administrators attending and learning more about the topic.

According to McLeod, "By October 2009, the number of 1:1 school districts in Iowa had grown from six to 15, and a dozen district superintendents, principals, technology coordinators, and curriculum directors met on campus for a day of role-alike conversations. The attendees that day in October pleaded for an opportunity for their teachers to learn from each other." What resulted from that day-long conversation was what has come to be known as the Iowa 1:1 Institute. Educators from around the state sign up to present a session, resulting in educators learning from one another. Presenters were and are required to focus on the learning, not the tools.

McLeod goes on to report, "The following year (2010), the number of 1:1 districts in Iowa tripled to 45, and every year after the total continued to grow: 90, 135, 180, 22. . . Within six years, we had gone from just a handful of 1:1 districts to two-thirds of the state."

AHSTW — INFRASTRUCTURE AND 1:1

This small rural district has had a 1:1 initiative in place for ten years, going through the common growing pains that technology can cause. The district funds the initiative from PPEL monies and eRate Category 2 dollars, in addition to staffing the tech department with a director, an integrationist, and a tech assistant.

For the first five years of the initiative, the district used airports for its wireless with two SSIDs that were on the same VLan. This created a very flat network that made it difficult to manage bandwidth and changes to the network. Meraki access points, switches, and routers were then implemented to give the network more depth. This allowed for the creation of VLans with multiple SSIDs for PreK-12 students, staff, guests, and others as needed.

Now the district can manage the access points, switches, and router from the same interface. Different SSIDs and VLANs allow for better control of the network traffic and filtering. Because staff are on a different VLAN than students, they can be identified on the network by their IP address as a staff member, which allows for setting different filtering privileges. This also gives the ability to control the bandwidth to each of the SSIDs individually. If bandwidth utilization is extremely high during testing or other activities, identified groups that need less bandwidth can be throttled back to provide bandwidth to those who need it at that time.

While building-wide professional development is provided, the real training comes from the tech team working with staff every day to help achieve what they want in their classrooms. Focus is less on the device and more on integrating technology into the curriculum. Most new curriculum adoptions have an online component that teachers are using. District staff also use some OER from teachers researching curriculum and developing plans. SAMR is used as a common language for how devices were being implemented, while the conversation has changed from "doing a project with technology" to "using technology in purposeful way to enhance instruction."

From providing professional development to identifying cable issues to making long-term purchasing decisions, the district's technical staff keep technology current for learners of all ages. District Tech Director Ryan Smith reminds us, "Without a good infrastructure, all other technology will suffer."

BrightBytes Clarity Data on Device Access

The Teaching and Learning Module includes questions related to teacher and student access to devices at home and school. Teachers were asked how often they were able to obtain computers when they need them. Respondents were able to indicate they were able to obtain them all the time, more than half the time, less than half the time, rarely, or never. Current statewide data (Spring 2018) are listed in Table 5.3 below.

Table 5.3

How often teachers are able to obtain computers when they need them, reported as percentages

All the Time	More than Half the Time	Less than Half the Time	Rarely	Never
61	26	9	3	1

Another question asked as part of the Teaching and Learning Module relates to quality of computers. Specifically, teachers are asked to report about the quality of computers (desktop, mobile, and tablet) at school. Teachers could respond with Excellent, Above Average, Average, Below Average, and Poor. Current statewide data are listed in Table 5.4 on the following page.

Table 5.4

Teacher report, as percentages, of quality of computers at school

Excellent	Above Average	Average	Below Average	Poor
19	32	34	11	5

High-Quality Digital Learning Content

Schools and colleges need to ensure students have access to a variety of high-quality digital learning materials and resources to support their learning. The ability to curate and share digital learning content is an important component of a robust infrastructure for learning. To ensure access to high quality content, the AEAs provide online resources and databases like Britannica Online, TrueFlix and Gale, to accredited public and non-public PreK-12 schools.

Openly Licensed Educational Resources

One effective way to provide high-quality digital learning materials at scale is through the use of openly licensed educational resources. These resources may be used, modified, and shared without paying any licensing fees or requesting permission. Open licenses for this purpose have been created by organizations such as Creative Commons for learning resources. For software, a number of open license types are available, such as the GNU General Public License and others recognized by the Open Source Initiative or the Free Software Foundation. This is significant considering that the United States currently spends approximately $8 billion each year purchasing commercial learning resources.2 Replacing just one textbook for one subject can free up tens of thousands of dollars for other purposes.

There are advantages other than just cost savings. Openly licensed materials can be more accurate than traditional textbooks because they can be updated continually as content changes. Openly licensed materials also allow teachers to exercise their own creativity and expertise so they can tailor learning materials to meet the needs of their students.

Nineteen states have committed to providing a statewide repository to help teachers access, curate, refine, and share openly licensed learning resources. In addition, the U.S. Department of Education's Federal Funding for Technology Dear Colleague letter states that Title II funds can be used to prepare teachers to create, use, and share openly licensed digital learning resources. Student Support and Enrichment (SSAE) funds may also be used for similar purposes as indicated in the guidance released in October 2016 by the U.S. Department of Education .3

Platforms and organizations such as Illinois Open Educational Resources, CK-12.org, SkillsCommons.org, and OER Commons are designed specifically for teachers to locate open content and adapt it, as needed, for their students.

Open Ed Resources via Area Education Agency Learning Online

The Open Educational Resources (OER) movement represents more than the traditional integration of digital resources within the classroom. The movement is focused on the concept of openness. That is, learning is not truly owned by anyone else; we all own our own learning. So, why do we treat curriculum as a whole and digital resources in particular as items that are owned by others? Should they not be owned by us individually and collectively?

Openness is not the same as free. There are resources available on the web that are free. But open curriculum and resources allow us as educators and students to reuse, repurpose, revise, and remix it at

will. The provision of licensing, like Creative Commons, provides the individual the ability to fully control the curriculum.

In addition to *openness*, the OER movement emphasizes collaboration and an ongoing process. When curriculum is "closed", it becomes static and unchanging. It is not easily adaptable and able to be changed at a moment's notice. Teachers often used printed textbooks created by a publisher, a process that stifles the creativity and flexibility within the classroom. It also stifles the opportunities that teachers have to think reflectively about curriculum in general.

Not so with OER. By giving teachers the power once again over the selection, alignment, evaluation, adjustment, *and even the creation* of curricular resources, teachers constantly think reflectively about how to improve the curriculum. It becomes an opportunity to grow as an educator and reflect deeper on the entire educational process. It also provides opportunities for teachers to do the selection, alignment, evaluation, adjustment, and creation in conjunction with other teachers. Whereas education in a closed environment doesn't prompt educators to connect with other educators, the open education movement opens those doors for collaborative processes.

AEA Learning Online, a collaborative of the 9 Area Education Agencies in Iowa, helps support the OER movement in Iowa through many key steps. First, AEA Learning Online maintains a Hub on the OER Commons website (https://www.oercommons.org/hubs/). This hub pulls together national collections of OER content, as well as collections of content created by Iowa educators. The hub also supports a digital space that helps educators select, align, evaluate, adjust, and create educational resources. Districts or schools can create their own hub group space to support work big or small, be it curriculum development or PLC collaboration. AEAs and other statewide entities can support groups of teachers from multiple districts more easily, connecting teachers from across the state.

On the hub, AEA Learning Online supports several collections of OER. This includes our OLLIE e-curriculum for online pedagogy, as well collections of Iowa-teacher generated content for participants in our Blending/Flipping cohorts. In the future, additional collections of e-curriculum will be available through the hub platform.

The most important work AEA Learning Online does with OER, however, is to be an advocate and conduit for districts to become involved. Through professional learning opportunities and online communities of practice, OER helps support the facilitation of groups looking to collaboratively work with OER. AEA Learning Online also serves as a conduit to the national movement, as they lead a national Affinity Group for consultants at educational service agencies supporting OER and participate in the CCSSO national collaboration for OER.

#GOOPEN

In October 2015, the Office of Educational Technology launched #GoOpen, a national movement that encourages states, school districts and educators to use openly licensed educational materials to transform teaching and learning. Openly licensed educational resources have enormous potential to increase access to high-quality educational opportunities in the United States. Use of openly licensed educational materials has enabled school districts to empower teachers and repurpose a portion of funding typically spent on static textbooks for other pressing needs, such as investing in the transition to digital learning. In January 2017, there are over 100 school districts and 19 states that have committed to support the transition to using high-quality, openly licensed educational resources in their schools.

In February 2016, the Department organized the first ever national #GoOpen Exchange where districts shared best practices and several states launched statewide initiatives to support districts in their

transition to openly licensed educational resources. In June 2016, the Department released the #GoOpen District Launch Packet, the first guide for strategically adopting and maintaining openly licensed educational resources as an integral part of the curriculum plan for the district. Finally, in July 2016, OET developed the #GoOpen Regional Summit in a Box for #GoOpen Districts to host and organize regional summits and facilitate sharing best practices and strategies for using openly licensed educational resources. Three Summits were held in 2016, reaching 425 participants representing over 80 districts. Five more are scheduled to take place in the Spring and Summer of 2017.

Iowa's Openly Licensed Educational Resources

#GoOpen Districts in Iowa

A review of the USDOE website, in November 2017, showed four of Iowa's school districts listed as #GoOpen launch districts. Those districts listed included:

- Cedar Rapids Community School District, IA;
- Council Bluffs Community Schools, IA;
- Lewis Central CSD, IA; and
- United Community School District, IA.

As Launch Districts, they each agreed to identify a team to develop an implementation strategy for openly licensed educational materials, replacing at least one textbook with openly licensed educational materials in the next year, and documenting and sharing their implementation process. Lewis Central CSD, one of Iowa's #GoOpen schools, hosted a GoOpen Summit in March 2017.

The day-long GoOpen Summit at Lewis Central CSD began with a keynote speaker and had a number of breakout sessions. The sessions provided attendees an opportunity to learn how to become a GoOpen district, what OER looks like in a classroom, how to get a repository started and more. Attendees could take what they learned that day and go back to their district to begin the process. Handouts and information from that Summit can be found at https://goo.gl/ydvKNQ.

LEWIS CENTRAL — GOOPEN

In October of 2016, Lewis Central CSD took the step of registering as an official GoOpen district, joining other progressive districts across the country in the U.S. Department of Education's (DOE) GoOpen Initiative (http://tech.ed.gov/open). The goal of the initiative is to encourage and highlight districts who are using openly licensed educational resources (OERs) to increase equity among students, keep content relevant and high quality, empower teachers, and save money. For the past few years, the school board and School Improvement Advisory Committee included support of innovative practices in their stated goals, so it made sense to become part of this national initiative. As reported by district personnel, involvement with the national initiative didn't have an immediate impact on the district.

A few years prior to registering as a GoOpen district, elementary mathematics teachers were searching for a textbook that aligned with their mathematics teaching philosophy. For years, teachers would find a textbook to purchase that most closely aligned with their beliefs and then found additional resources to supplement the textbook. In this case, the mathematics teachers couldn't find a textbook to start with. They ended up combining two openly licensed educational resources, Engage NY (https://www.engageny.org/) and the Georgia Standards for Excellence https://goo.gl/tCVY4P, with their own self-created resources to form a loose, flexible "textbook." This was one example of how teachers were already doing GoOpen before the district signed on to being a Launch District.

Becoming a GoOpen district has allowed the district to have better conversations. The district is now connected to hundreds of districts across the country facing the same struggles and looking to find or develop similar instructional resources. When Lewis Central teachers engage in discussions about using OERs, they must have a deeper knowledge of their standards and what instructional strategies work for their grade level and subject matter. There are now greater conversations staff have about copyright and what is available online for "free." The district has not eliminated the purchase of textbooks, but encourages those interested in purchasing new textbooks to research OER options.

Using OERs can be a daunting task. When Lewis Central teachers express interest in creating their own textbook, they begin with websites like Engage NY, Georgia Standards for Excellence, or CK-12.org. Those websites provide free, openly licensed starting points. Teachers can then use websites like Amazon Inspire (https://www.amazoninspire.com/) or OER Commons (https://www.oercommons.org/) to find additional resources and activities to fill the gaps and customize their new "textbook." A district could start from scratch, but that hasn't been the approach taken by Lewis Central.

Lewis Central staff recommend reinvesting money saved, by following GoOpen, in teacher time, professional development, and technology upgrades, as necessary. They have chosen to not making GoOpen a district-wide mandate. Resources aren't currently available for all subject areas. They are committed to finding and using openly licensed resources in those subject areas where they do exist.

Lewis Central has developed resources for those interested in pursuing the use of openly licensed educational materials. They have developed a GoOpen site, http://www.lewiscentral.org/goopen, to share their K-1 mathematics curriculum, a video created to share information with their community on what to expect, and contact information of staff members who can answer questions. As stated by Josh Allen, a point person of their GoOpen work, "If you have questions, I am definitely "Open" to answering them."

Lewis Central's success with GoOpen resulted in a collaborative effort in June 2018 with multi-site #GoOpen Summit in Kearney, Nebraska (ESU10) Cedar Rapids, Iowa (Grant Wood AEA), Calamar, Iowa (Keystone AEA) and Council Bluffs (Lewis Central). Link to resources for the event: https://goo.gl/t6gMCW.

Going Open with Social Studies

Social Studies teachers in Northwest AEA, Prairie Lakes and Green Hills AEA have come together to build a curriculum using Open Education Resources (OER) to teach the Iowa Social Studies Standards. The content is open and available to all teachers. Teachers are using the Iowa Department of Education training on how to create curriculum units which will began with compelling questions. The units are incorporating OER resources, Iowa AEA Online Databases, and appropriate websites. The units contain all of the tools needed such as assessments, project suggestions, and opportunities to differentiate to meet the needs of all learners utilizing the MTSS process. This project is focusing on early elementary grade levels.

The project is a collaborative effort including Northwest AEA, Prairie Lakes AEA, Green Hills AEA, and local school districts. Each AEA sent out a request for participation in the Social Studies-OER Curriculum Project. Districts were invited to send teachers to three days of learning and working at a location in their AEA. Each AEA compensated their respective districts for substitute and transportation costs. The teams of teachers met in January 2017, March 2017 and April 2018.

During the development of the curriculum, participants developed a shared understanding of the project and of the OER movement. Additionally, they gained a deeper knowledge of the Iowa Social Studies guidelines. By combining learning in all of these areas, participants experienced maximal learning, and their time spent collaborating resulted in optimal use of their time. A foundational step in this work was development of a common understanding of projected related vocabulary.

Resources used during this project included:

- OER Commons: AEA Learning Online, a collaborative of Iowa's 9 Area Education Agencies, seeks to spur interest and implementation of OER within the Iowa classroom through a community-based approach leveraging statewide communities of practice, professional development services, and K-12 services
- GoOpen Folder from the GoOpen Summit: On March 3, 2017 Lewis Central CSD, a GoOpen District, hosted a GoOpen Summit. This folder contains supporting files for pursuing a GoOpen curriculum.
- Iowa Social Studies Standards: The state's academic standards in social studies are premised upon a rigorous and relevant K-12 social studies program within each district in the state. Engaging students in the pursuit of active informed citizenship will require a broad range of understandings and skills. It will also require an articulated district curriculum which connects students to the social world through informed instructional experiences led by teachers who are committed to active civic participation. This represents a bold step toward a vision of social studies for all of Iowa's students.

At the end of the sessions, each participant had at least one curricular unit available in a shared Google Team Drive Folder to teach in 2018-19.

MIDDLE SCHOOL MATHEMATICS: CHANGING TEACHING WITH OER CHANGES STUDENTS

Mount Pleasant CSD was studying and reviewing mathematics curriculum at the elementary level when staff was introduced to Open Up Resources by Illustrative Mathematics. They learned that the program was rigorous, aligned, digital, and free — something that is difficult to comprehend in the curriculum world!

The program was introduced to the MS mathematics team, and after a series of conversations with Open Up Resources, the mathematics team decided to jump in. With the support of Instructional Coaches and Principals, they have been on a comprehensive path that is making a difference in engagement, achievement, and success. Teachers had two full days of PD in August and met through video conferencing monthly with Open Up Resources trainers. Teachers had homework and dug into practice and reflection for two hours per session at grade level teams (grades 6, 7, 8). The digital part of this process is that the curriculum is easily connected to the district's Canvas LMS environment through a cartridge that Illustrative Mathematics/OUR provided to the district. With minimal clean-up, the staff has been integrating Middle School mathematics curriculum seamlessly through their 1:1 initiative for students.

One highlight for the year was that teachers wanted more time with colleagues across the area who were also implementing this curriculum. With Instructional Coaches, they set up a regional reflection day where eight other districts joined the Mount Pleasant team for a day of idea sharing. This involved all levels of teaching and learning—from classroom teacher and instructional coaches to principals and curriculum directors. While data collection is still in the beginning stages, Mount Pleasant saw an impact in Measures of Academic Progress (MAP) scores from Fall to Winter and looks forward to seeing reportable growth! Teachers and principals report success in engagement and enthusiasm for the learning, applying, and implementing of Illustrative Mathematics.

Responsible Use Policies (RUP)

Districts with internet connectivity and device access also should have policies in place to promote responsible use and protect student privacy. A RUP is a written agreement among parents, students, and school personnel that outlines the terms of responsible use and consequences for misuse. Effective RUPs create an opportunity to teach students, while in school, to become responsible digital citizens, which will help them thrive in a connected world.

RUPs traditionally cover topics such as expectations for how students will interact with one another in digital spaces, what resources students may or may not access with district-provided devices and over a school network, as well as standards for academic integrity when using technology for learning. These policies also can outline school and system agreements as to the use of student data and information. Typically, parents acknowledge that their child agrees to basic care and responsibility guidelines, and students sign a contract agreeing to follow rules governing use of the Internet and online conduct.

RUPs should be written in plain language that is easily accessible to students, parents, and district personnel. Technology also can assist in the easy translation of these policies into other languages, providing a bridge to communication that otherwise might leave some families disconnected. If policies and procedures for the use of devices are too strict, they often have unintended negative consequences, such as preventing access to legitimate educational resources. For additional information on questions to consider when drafting a RUP, see the U.S. Department of Education's Policies for Users of Student Data: A Checklist or the CoSN publication Rethinking Acceptable Use Policies to Enable Learning: A Guide for School Districts.

Policies and procedures for device management, teaching responsible use, and safeguarding student privacy should be in place and understood by all members of the community prior to providing internet access or devices. Future Ready Schools: Building Technology Infrastructure for Learning, offers extensive guidance on how to prepare students to use the Internet, a school-provided or personal device at school, or a school-provided device at home appropriately.

In addition to internet access and device use, with the growing popularity of social media in learning, districts also should consider policies and guidelines for their safe and productive use in schools

Furthermore, as students become more exposed to numerous cyber-settings and cybertools, districts and schools should take steps to raise awareness and inform students, staff, and families about the variety of cyber-dangers that exist. And, take steps to teach students about responsible behavior and respectful treatment of others as part of a cyber safety training that also addresses cyberbullying.

Protections for Student Data and Privacy

The use of student data is crucial for personalized learning and continuous improvement (see Section 4: Assessment). Acting as the stewards of student data presents educators with several responsibilities. School officials, families, and software developers have to be mindful of how data privacy, confidentiality, and security practices affect students. Schools and districts have an obligation to tell students and families what kind of student data the school or third parties (e.g., online educational service providers) are collecting and how the data can be used. As they plan, schools and other educational institutions should be certain that policies are in place regarding who has access to student data and that students and families understand their rights and responsibilities concerning data collection.

These policies should include not only formal adoption processes for online educational services but also informal adoptions such as the downloading of an application to a mobile device and agreeing

to clickwraps. A user encounters a clickwrap when asked to click on a button to accept the provider's terms of service before using an app or software. With clickwrap agreements, the act of accepting the terms of service enters the developer and the user (in this case, the school or district) into a contractual relationship akin to signing a contract. The U.S. Department of Education offers schools and families examples, training, and other assistance in navigating privacy concerns through the Privacy Technical Assistance Center. This information includes Protecting Student Privacy While Using Online Educational Services: Requirements and Best Practices, Protecting Student Privacy While Using Online Educational Services: Model Terms of Service, and Checklist for Developing School District Privacy Programs.

Key Federal Laws Protecting Student Data and Privacy

The Family Educational Rights and Privacy Act (FERPA) (20 U.S.C. § 1232g; 34 CFR Part 99) is a Federal law that affords parents the right to inspect and review their children's education records, the right to seek to have the education records amended, and the right to have some control over the disclosure of personally identifiable information from the education records. When a student turns 18 years of age or attends a postsecondary education institution at any age, thereby becoming an "eligible student," the parent's rights under FERPA transfer to the student.

FERPA generally requires that parents or eligible students provide prior written consent before schools and school districts can disclose personally identifiable information from a student's education records, unless an exception to FERPA's general consent requirement applies. For example, when schools and school districts use online educational services, they must ensure that FERPA requirements are met. The U.S. Department of Education issued best practice guidance to address questions related to student privacy and the use of online educational technology in the classroom, available at https://studentprivacy.ed.gov/resources/protecting-student-privacy-while-using-online-educational-services-requirements-and-best.

The Protection of Pupil Rights Amendment (PPRA) (20 U.S.C. § 1232h; 34 CFR Part 98) is a Federal law that governs what information can be collected from students in certain surveys, analyses, and evaluations as part of programs administered by the U.S. Department of Education. For instance, students may not be required, as part of an applicable program and without prior written consent, to take any survey, analysis, or evaluation that reveals information concerning one or more of eight protected areas, including, but not limited to, behaviors and attitudes, and illegal, anti-social, self-incriminating, or demeaning behavior. PPRA also sets forth requirements for Local Educational Agencies to develop and adopt policies, in consultation with parents, concerning, for example, the collection, disclosure, and use of personal information from students for the purpose of marketing, parental notification, and the administration of certain physical examinations to students.

For more information about FERPA and PPRA, visit https://www2.ed.gov/policy/gen/guid/fpco/ferpa/index.html or https://www2.ed.gov/policy/gen/guid/fpco/ppra/parents.html. General questions about FERPA or PPRA may be submitted to the Family Policy Compliance Office by using the Contact Us tab on that website or directly at https://www2.ed.gov/about/contacts/gen/index.html.

The Children's Online Privacy Protection Act (COPPA) (15 U.S.C. § 6501–6505) governs online collection of personal information from children under age 13. For example, before a developer can collect any information from a student under 13, verifiable parental consent is required. The FTC, which enforces COPPA, has said that school officials can act in the capacity of a parent to provide consent to sign students up for online educational programs at school for the use and benefit of the school, and for no other commercial purpose. The general guidance is that software companies are allowed to track students within their program, but COPPA prevents them from tracking those students across the internet.

The U.S. Department of Education issued best practice guidance to address questions related to student privacy and the use of online educational technology in the classroom, available at https://studentprivacy.ed.gov/resources/protecting-student-privacy-while-using-online-educational-services-requirements-and-best.

The Children's Internet Protection Act (CIPA) (47 U.S.C. § 254) imposes several requirements on schools or libraries that receive E-rate discounts for Internet access. Schools and libraries must certify that they have an Internet safety policy that includes technology protection measures. These protection measures must block or filter Internet access to pictures that are obscene, pornographic, or harmful to minors, and schools also must monitor the online activities of minors. Because most schools receive E-rate funds, they are required to educate their students about appropriate online behavior, including on social networking websites and in chat rooms, and to build cyberbullying awareness. Particularly if a digital learning resource requires networking among students, schools must comply with CIPA.

The Individuals with Disabilities Education Act (IDEA) also contains confidentiality of information provisions that protect personally identifiable information in education records collected, maintained, or used by participating agencies under Part B of IDEA. In general and consistent with FERPA, IDEA's confidentiality provisions require prior written consent for disclosures of personally identifiable information contained in education records unless a specific exception applies. Note that the IDEA Part B confidentiality of information provisions incorporate some of the FERPA requirements but also include several provisions that are specifically related to children with disabilities. For more information, see ED's additional guidance regarding IDEA and FERPA Confidentiality Provisions released in June 2014, available at: www.ed.gov/policy/gen/ guid/ptac/pdf/idea-ferpa.pdf.

Device and Network Management

Many schools underestimate the importance of a plan for staffing and resources for ongoing monitoring, management, and maintenance of network infrastructure. We must ensure that student data are maintained in secure systems that meet all applicable federal and state requirements concerning the protection of personally identifiable information. Key elements of an infrastructure plan should include the following:

- Network management and monitoring
- User help desk and technical support
- Maintenance and upgrade of devices and equipment
- Insurance for devices
- Estimates of future demand and network capacity planning
- Licensing fees for digital learning content
- Firewall protection
- Content filtering
- Anti-virus and Anti-malware protection
- Security filtering
- Network redundancy
- Back-up recovery plans
- User cybersecurity education
- Use of open standards to ensure interoperability with other learning network.

Interoperability. As teachers and students go online for more of their teaching and learning needs, the number of systems they rely on increases. This makes it very difficult for teachers and students to see a comprehensive picture of their learning progress or to know where students are struggling so that teachers can give them effective support. There are some approaches in place to address these challenges. For example, the Guide to EdTech Procurement from Digital Learning Now! recommends leveraging industry standards for single sign-on and data interoperability.

Single sign-on. Apps and tools can be built to enable single sign-on, allowing teachers and students to log in to all their applications with a single password. A teacher teaching six classes of students a day with multiple apps and tools needs a way to manage learning content, attendance, student progress, and grades. Students and teachers having to keep track of a different username and password to log in to each system wastes time and creates frustration. In addition, if all the different learning systems do not recognize who a student is, they cannot help schools create a complete picture of that student's learning. For all these reasons, solutions involving single sign-on are needed for teachers and students to access all their applications through a single login credential. Many districts are even moving from preferring single sign-on to requiring it.

Interoperable systems. No one app or tool can provide all the functionality that every teacher, student, or parent may need. Enabling teachers and students to use more than one app seamlessly goes beyond just having a common log-in. Basic information, such as student schedules or courses completed, may need to be shared from one system to another to provide the best learning experience. For example, if a student demonstrates the mastery of a new concept in an online learning platform, that might be reflected in an app that the teacher or families use to track student progress.

One common format for Web services in education is the Learning Tools Interoperability standard. The IMS Global Learning Consortium developed this standard, and information about the specification can be found on its website. This standard allows learning management systems to exchange data with other learning tools and applications approved for use by the school so that students can have a seamless learning experience even if they are using apps created by different developers.

Data interoperability and standards. Regardless of whether you enable data sharing through an existing or custom application program interface or through a data export option, in order to be useful, the data need to be in a common format. For example, when transferring student data between systems, should a system indicate gender as M or F or as male or female? Should the name of the field be student name or first name? These are essential items to define if we are going to allow students to move seamlessly between learning apps. Fortunately, data interoperability frameworks have been established to ensure data are presented in usable formats. In addition to the CEDS mentioned earlier, the following are examples of existing frameworks, resources, and organizational alliances that address the issue of data interoperability:

- The Schools Interoperability Framework (SIF) is an open data sharing specification that includes Extensible Markup Language XML for modeling educational data and service-oriented architecture for sharing the data between institutions.
- The Interoperability Standards for Education: Working Together to Strategically Connect the K–12 Enterprise, developed by CoSN, is a primer for education leaders to better understand issues related to building technology infrastructures that support learning.
- The Postsecondary Electronic Standards Council is a nonprofit umbrella organization that promotes the implementation and usage of data exchange standards.
- The Ed-Fi Alliance supports the creation of common data standards for communication among educational tools. Ed-Fi focuses on providing educators with dashboard starter kits showing real-time data displays.

Section V Recommendations

National Recommendations adopted by Iowa

- **Ensure students and educators have broadband access to the internet and adequate wireless connectivity, with a special focus on equity of access outside of school.**

Although connectivity itself does not ensure transformational use of technology to enable learning, lack of connectivity almost certainly precludes it. Working with federal programs such as E-rate through the FCC, as well as with nonprofit partners such as CoSN, EducationSuperHighway, EveryoneOn, and others, states, districts, and postsecondary institutions should make sure technology-enabled learning is available for all students, everywhere, all the time.

- **Ensure that every student and educator has at least one internet access device and appropriate software and resources for research, communication, multimedia content creation, and collaboration for use in and out of school.**

  Only when learners have the tools necessary to complete these activities are they able to realize the potential of education technologies fully. States and districts should make sure such device purchases are funded sustainably with a plan for device refresh.

- **Support the development and use of openly licensed educational materials to promote innovative and creative opportunities for all learners and accelerate the development and adoption of new open technology–based learning tools and courses.**

  Similar to those leading state and local efforts under way in California, Illinois, and Washington state, administrators and policymakers at all levels and in formal and informal spaces should consider the diversified learning paths and potential cost savings inherent in the use of such openly licensed resources.

- **Draft sustainability plans for infrastructure concerns that include upgrades of wired and wireless access as well as device refresh plans and sustainable funding sources while ensuring the safety and protection of student data.**

  As state and local education institutions work to bridge the existing digital divide, they concurrently should be drafting plans for the upgrade of infrastructure necessary to meet the needs of increased user demand as well as speeds necessary for the use of evolving technologies. These plans should include specific systems and strategies for protecting student data, be drafted with cross-stakeholder groups, and include special consideration of funding sustainability and possible partners.

- **Create a comprehensive map and database of connectivity, device access, use of openly licensed educational resources, and their uses across the country.**

  To understand the digital divide better and progress toward bridging it, researchers, state and local officials, and district administrators should work in concert with one another to test connectivity speeds in schools and homes and to identify the kinds of devices to which educators and students have access and the ratios of devices to users within education institutions. The building of such a map and database would allow for the visualization of inequities of access and targeted interventions to alleviate them. In addition, the level of engagement with openly licensed learning materials should be made transparent as an indicator of progress toward equitable access and effective allocation of resources.

- **Include cybersafety and cybersecurity training for students, teachers and parents as part of district and school "Responsible Use Policy" training.**

  Crimes against children and youth and the tactics to ensnare them are becoming more sophisticated. Because children often use devices both in and outside of school, cybersafety and cybersecurity should be incorporated into Responsible Use policies and trainings. The Department of Education provides several resources to support states, schools and districts: Readiness and Emergency Management for Schools (REMS) Technical Assistance (TA) Center, The National Center for Safe and Supportive Learning Environment, StopBullying.gov.

- **Determine the current reality of Instructional Technology Infrastructure support across school districts, develop a desired state and action plan for that desired state, to ensure quality IT support is available to all schools.**

  The support of IT professionals is crucial for digital learning to be successful. Without such support, digital infrastructure (instructional technology infrastructure) is left to those who do not have the background to make and implement the best decisions for digital learning success. Ensuring that quality support is available across all schools helps ensure the success of digital learning in all schools and across the state.

- **Develop a robust and sophisticated data collection system to assess more directly the different aspects of digital infrastructure (e.g., connectivity at home and school, devices in a school building, and use of open educational resources).**

  Currently, data on infrastructure are gathered via general education reporting documents or through means that were not intended for the purposes for which they have been used. Finding and/or designing data collection tools that have a specific focus of clearly delineating the current reality of infrastructure in each school building will assist in identifying what work needs to be done to ensure the success of digital learning.

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Appendix B

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2016 NETP Technical Working Group

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Interviews

Public Policymakers

- Claudine Brown, Assistant Secretary for Education & Access, Smithsonian Institution
- Nadya Chinoy Dabby, Assistant Deputy Secretary, U.S. Department of Education, Office of Innovation and Improvement
- Seth Galanter, Deputy Assistant Secretary, U.S. Department of Education, Office for Civil Rights
- Dipayan Ghosh, National Economic Council, White House Office of Science and Technology Policy
- Roosevelt Johnson, Deputy Associate Administrator, NASA, Office of Education
- Patrick Martin, Instructional Systems Specialist for Educational Technology, U.S. Department of Defense, Education Activity
- Ruth Neild, Director, U.S. Department of Education, Institute of Education Sciences
- Jim Shelton, Deputy Secretary, U.S. Department of Education
- Adrian Talley, Principal Deputy Director & Associate Director for Education, U.S. Department of Defense, Education Activity
- Bob Wise, Director, Alliance for Education
- Michael Yudin, Former Assistant Secretary, U.S. Department of Education, Office of Special Education & Rehabilitative Services

Leaders of National Organizations

- Sharon Robinson, President and Chief Executive Officer, AACTE
- Bob Wise, President, Alliance for Excellent Education
- Dan Domenech, Executive Director, American Association of School Administrators
- Sylvia Knight Norton, Executive Director, American Association of School Librarians
- Deb Delisle, Chief Executive Officer, ASCD
- Veronica Rivera, Executive Director, Association of Latino Administrators and Superintendents
- Shelley Pasnik, Director and Vice President, Center for Children and Technology
- Barnett Barry, Chief Executive Officer, Center for Teaching Quality
- Tim Cherubini, Executive Director, Chief Officers of State Library Agencies
- Ann Christensen, President, Clayton Christensen Institute
- Jim Steyer, Chief Executive Officer, Common Sense Education
- Keith Krueger, Chief Executive Officer, Consortium for School Networking
- Chris Minnich, Executive Director, Council of Chief State School Officers
- Mike Lawrence, Executive Director, CUE
- Aimee Guidera, President and CEO, Data Quality Campaign
- Karen Cator, President & Chief Executive Officer, Digital Promise
- Hadley Ferguson, Executive Director, EdCamp Foundation
- Betsy Corcoran, Chief Executive Officer & Co-founder, EdSurge
- Jose Vilson and Rafranz Davis, Co-founders, EduColor
- John O'Brien, Chief Executive Officer, EDUCAUSE
- Evan Marwell, Chief Executive Officer and Founder, EducationSuperHighway
- Chike Aguh, Chief Executive Officer, EveryoneOn
- Shawn Rubin, Director, Technology Integration, Highlander Institute
- Susan Patrick, President and Chief Executive Officer, iNACOL
- Kecia Ray, Board President Chief Executive Officer, International Society for Technology in Education
- Beth Rabbit, Chief Executive Officer, Learning Accelerator
- Stephanie Hirsch, Executive Director, Learning Forward
- Kristen Amundson, President and CEO, National State Boards of Education
- John Hill, Executive Director, National Rural Education Association
- Stacey Childress, Chief Executive Officer, New Schools Venture Fund

- Gail Connelly, Executive Director, National Association of Elementary School Principals
- JoAnn Bartoletti, National Association of Secondary School Principals
- Elyse Eidman-Aadahl, Executive Director, National Writing Project
- Ann Flynn, Director of Education Technology, National School Boards Association
- Margaret Honey, President and CEO, New York Hall of Science
- Barbara Means, Director, Technology in Learning, SRI International
- Tracy Weeks, Executive Director, State Educational Technology Directors Association

Outreach Events

- SETDA October 29, 2014
- iNACOL Conference November 4, 2014
- Higher Education Experts November 9, 2014
- ConnectED to the Future Superintendent Summit November 18, 2014
- Open Education Experts November 20, 2014
- ISTE Conference December 5, 2014
- Silicon Valley — Innovators February 24, 2015
- Silicon Valley — Developers and Investors February 24, 2015
- PDX — Portland State University Conference February 25, 2015
- SETDA and CoSN Washington Education Technology Policy Summit April 6-7, 2016
- SETDA Emerging Technologies Leadership Forum June 24-27, 2016
- SETDA Leadership Summit October 16-19, 2016

Target Virtual Outreach

- Classroom Teachers: February 9, 2015
- Assessment Experts: February 11, 2015
- Adult Education Experts: February 18, 2015
- Librarians: February 18, 2015
- Teacher Preparation Experts: February 18, 2015
- District Administrators: February 19, 2015
- Informal Learning Experts: February 20, 2015
- Researchers: February 20, 2015

External Reviewers

- Frederick Brown, Deputy Executive Director, Learning Forward
- Stevie Chepko, Council for the Accreditation of Educator Preparation
- Elyse Eidman-Aadahl, Executive Director, National Writing Project
- Keith Krueger, Chief Executive Officer, Consortium for School Networking
- Evan Marwell, Chief Executive Officer, EducationSuperHighway
- Diana Oblinger, President Emeritus, EDUCAUSE
- Desiree Pointer-Mace, Associate Professor and Associate Dean for Graduate Programs in the School of Education, Alvemo College

Appendix C

The Development of the 2016 NETP

The 2016 NETP builds on the foundation of the 2010 Plan, Transforming American Education: Learning Powered by Technology. The 2016 NETP explores the exciting advances, opportunities, and research that illustrate how teaching and learning can be enhanced with the innovative use of technology and openly licensed content and resources. The 2016 NETP offers a vision of how technology can transform formal and informal learning, the critical elements such as qualified teachers and staff, high-quality curriculum and resources, strong leadership, robust infrastructure, and aligned assessments.

The development of the 2016 NETP began with a series of meetings with the TWG, which consisted of 13 leading educators, technology innovators, and researchers. The first meeting was a one-day gathering to develop the vision and overarching themes. On the basis of expertise and interest, each of the TWG members was assigned to a sub-group to focus on one of the five key topic areas: Learning, Teaching, Leadership, Assessment, and Infrastructure. TWG members provided feedback that informed the development of the 2016 NETP outline and working drafts, including the identification of relevant research and exemplary programs. The TWG reviewed two drafts and offered their comments and recommendations, which were incorporated into the final document. In addition, a group of national content experts and members of key stakeholder groups reviewed and provided feedback on an early draft, which was also incorporated into the document.

The 2016 NETP also was informed by a series of interviews conducted by the AIR team with 31 leaders from the U.S. Department of Education; the White House Office of Science and Technology Policy; and other government agencies, technology innovators, and nonprofit organizations. These interviews provided valuable insight into the priorities and practices being implemented to further the goals of ensuring equity and accessibility to high-quality instruction enabled by technology for all students. In addition, the AIR team convened a series of nine face-to-face and eight virtual focus groups to gather further insights and recommendations for the 2016 NETP. The participants represented a broad cross section of key stakeholders, including practitioners, state and local administrators, technology innovators, experts, and developers. The focus groups also provided the opportunity for participants to identify exemplars of the innovative use of technology in formal and informal educational settings.

Throughout the development process for the 2016 NETP, attention was focused on the compilation and review of proposed examples to illustrate the innovative use of technology across the five areas of Learning, Teaching, Leadership, Assessment, and Infrastructure. Suggestions were collected from the TWG members, interviewees, focus group participants, and AIR and OET staff. In addition, the AIR team conducted a review of the literature, a survey of national education technology initiatives (for example, Future Ready, CoSN, ISTE, and Digital Promise), and Internet searches to identify these exemplary programs and initiatives. More than 235 examples were identified during the course of the project. In an effort to identify those examples that best aligned with the 2016 NETP, the AIR and OET teams used the following screening criteria to make the final selection: quality of the user experience, evidence of success, and clear use of technology (where appropriate). A total of 53 examples are included in the 2016 NETP to deepen an understanding of the innovative use of technology to enhance teaching and learning in formal and informal settings.

For more information, visit:
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Iowa's Area Education Agencies