Maximizing the Impact
The pivotal role of technology in a 21st century education system

Proficiency in 21st Century Skills

Innovative Teaching and Learning

Robust Education Support Systems

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Partnership for 21st Century Skills

SETDA

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Executive Summary

How will we create the schools America needs to remain competitive? For more than a generation, the nation has engaged in a monumental effort to improve student achievement. We've made progress, but we're not even close to where we need to be.

It's time to focus on *what* students need to learn—and on *how* to create a 21st century education system that delivers results. In a digital world, no organization can achieve results without incorporating technology into every aspect of its everyday practices. It's time for schools to maximize the impact of technology as well.

Profound and accelerating changes in the economy make it imperative for the nation to be much more strategic, aggressive and effective in preparing students to succeed and prosper. In an intensely competitive environment, Americans no longer can rest assured that our long run of productivity, prosperity and preeminence will continue unabated or unchallenged. Indeed, international competition from nations with strong education systems and millions of highly educated, skilled workers roils markets—and the U.S. workforce—every day. The rest of the world is catching up in terms of innovation, economic competitiveness and educational achievement.[1]

Yet incredible opportunity remains for Americans who are prepared for the challenges of a dynamic, digital world. Historically, nations that foster knowledge, innovation and creativity—and embrace technological advances—lead the world in prosperity. These qualities of excellence, agility and openness will continue to drive the wealth of nations and reward individuals.

We can—and must—prepare all students with a 21st century education that will position them with the knowledge and skills they need to thrive, whether they continue their formal education or enter the workforce after high school.

The State Educational Technology Directors Association (SETDA), the International Society for Technology in Education (ISTE), and the Partnership for 21st Century Skills are leadership organizations that have come together on this national imperative with a unified vision, agenda and action principles for stakeholders. Together, we represent dozens of leading U.S. companies and organizations, six leadership states, education technology directors in all 50 states, 85,000 education technology professionals and 3.2 million educators throughout the country.

We have different missions. We serve different constituencies. But we speak with one voice on this issue: We must synchronize our efforts to leverage technology to achieve results for every student and, ultimately, for the nation, states and communities as well.

Lagging Indicator: Education Is Dead Last in Technology Use

No industry or organization can remain competitive today without making comprehensive use of technology as a matter of course in all of its operations. Schools are no different. Yet technology—which has transformed business practices and fueled productivity growth since the mid-1990s—is the critical "how" that is largely missing from education improvement efforts.

In fact, education is the *least* technology-intensive enterprise in a ranking of technology use among 55 U.S. industry sectors, according to the U.S. Department of Commerce.[2]

All students need a more robust education—and a refreshingly different kind of education—than most are getting today. The vision of learning we embrace focuses on teaching students to become critical thinkers, problem solvers and innovators; effective communicators and collaborators; and self-directed learners. This vision responds to the demand for citizens who are globally aware, civically engaged, and capable of managing their lives and careers, and for young people who are economically and financially literate and fluent in information, media and technology skills. Employers, educators and the public strongly believe that students need to be proficient in 21st century skills like these to succeed in a world that is constantly in flux.[3]

Creating a 21st century education system requires broad and intensive use of technology—and a strong technology infrastructure. Schools cannot possibly prepare students to participate in a global economy without making intensive use of technology. Two major obstacles are holding schools back in maximizing the impact of technology as a catalyst for improvement:

- The use of technology in education is narrowly conceived. Right now, schools use technology primarily as a tool for developing students' computer and Internet skills. This is important, but technology proficiency is simply the point of entry to the digital world—and it is only a small sliver of the far-reaching utility of technology as a powerful enabling tool for a full range of essential knowledge and skills.

- The assumption that education already is using technology widely is unfounded. Despite federal, state and local investment in technology and Internet connectivity, most schools still use technology sparingly, rather than as a critical component of all educational operations. Right now, 100 million Americans have broadband access, 219 million Americans use cell phones and the personal computer penetration rate is 73 percent.[4] To a wireless nation, which relies on technology for ordinary tasks and extraordinary achievements, it is shocking and inconceivable—but true—that technology is marginalized in the complex and vital affairs of education.

To overcome these obstacles, our nation's education system must join the ranks of competitive U.S. industries that have made technology an indispensable part of their operations and reaped the benefits of their actions. This report is a call to action to integrate technology as a fundamental building block into education in three broad areas:

1. **Use technology comprehensively to develop proficiency in 21st century skills.** Knowledge of core content is necessary, but no longer sufficient, for success in a competitive world. Even if all students mastered core academic subjects, they still would be woefully underprepared to succeed in postsecondary institutions and workplaces, which increasingly value people who can *use* their knowledge to communicate, collaborate, analyze, create, innovate and solve problems. Used comprehensively, technology helps students develop 21st century skills.
2. **Use technology comprehensively to support innovative teaching and learning.** To keep pace with a changing world, schools need to offer more rigorous, relevant and engaging opportunities for students to learn—and to apply their knowledge and skills in meaningful ways. Used comprehensively, technology supports new, research-based approaches and promising practices in teaching and learning.
3. **Use technology comprehensively to create robust education support systems.** To be effective in schools and classrooms, teachers and administrators need training, tools and proficiency in 21st century skills themselves. Used comprehensively, technology transforms standards and assessments, curriculum and instruction, professional development, learning environments, and administration.

This is an agenda around which education advocacy groups—those who advocate 21st century skills, those who advocate more rigor and relevance, and those who advocate technology—can and must rally.

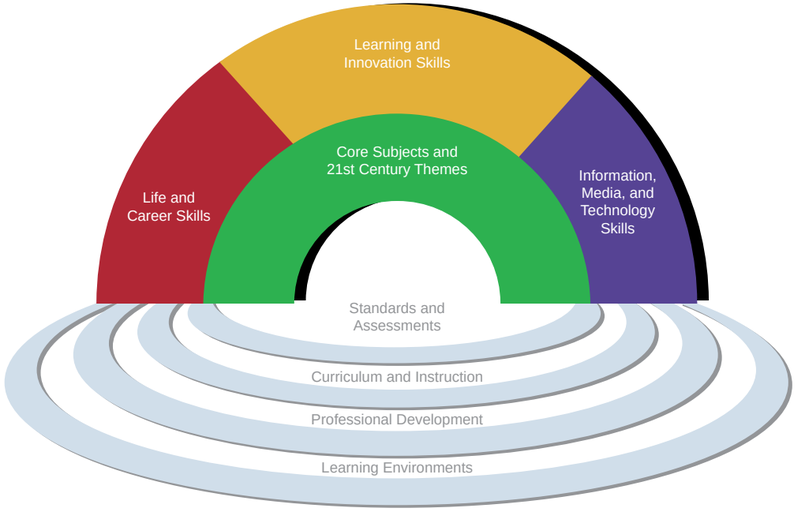
A Shared Vision of a 21st Century Education System

The Partnership for 21st Century Skills has developed a vision for 21st century learning and education support systems that can be used to strengthen education. SETDA and ISTE support this vision. Comprehensive use of technology is instrumental in realizing every aspect of a 21st century education system.

For students, proficiency in 21st century skills—the skills, knowledge and expertise students should master to succeed in college, work and life—should be the outcome of a 21st century education. To be "educated" today, students must master core subjects, 21st century themes and 21st century skills.

To help students achieve proficiency in 21st century skills, teachers and administrators need education support systems that strengthen their instructional, leadership and management capacity. And both students and educators need learning environments that are conducive to results.

Framework for 21st Century Learning



21st Century Student Outcomes

Core Subjects and 21st Century Themes

Core Subjects

- English, reading or language arts
- World languages
- Arts
- Mathematics
- Economics
- Science
- Geography
- History
- Government and civics

21st Century Themes

- Global awareness
- Financial, economic, business and entrepreneurial literacy
- Civic literacy
- Health literacy

Learning and Innovation Skills

- Creativity and innovation skills
- Critical thinking and problem solving skills
- Communication and collaboration skills

Information, Media and Technology Skills

- Information literacy
- Media literacy
- ICT (information and communications technology) literacy

Life and Career Skills

- Flexibility and adaptability
- Initiative and self-direction
- Social and cross-cultural skills
- Productivity and accountability
- Leadership and responsibility

21st Century Education Support Systems

- 21st century standards and assessments
- 21st century curriculum and instruction
- 21st century professional development
- 21st century learning environments

To learn more about the Framework for 21st Century Learning, visit www.21stcenturyskills.org.

1. Use Technology Comprehensively to Develop Proficiency in 21st Century Skills

In a 21st century education system, technology must be used comprehensively and purposefully to support students in mastering the full range of ***what*** they need to learn—core subjects, 21st century themes and 21st century skills.

Most Americans agree that students should learn how to use technology. But technology fluency is just one of many important outcomes that technology makes possible. Now, it's time for students to use technology as a powerful and compelling means to learn core subjects and applied skills.

Technology is "an **enabling force** behind globalization, knowledge work and entrepreneurship."[5] In this sense, technology must empower students to accomplish their own "knowledge work"—work that involves using, processing and creating information and knowledge, which is increasingly prevalent in workplaces and communities. Technology also must enable students to acquire *all* of the 21st century skills they need to participate fully in the global economy and to manage their own destinies.

Students must have rich and ample opportunities to use modern technology for important purposes in schools, outside of classroom walls and beyond the school day, just as individuals in high-performance workplaces and other real-life settings do. Technology enables people to communicate, learn, share, collaborate and create, to think and solve problems, to manage their work, to take ownership of their lives.

Technology can be a means to access content on any topic, a tool for thinking and creating, a connection to peers and experts, and a window into other cultures. Multimedia content can make the curriculum come alive and allow teachers and students to explore content deeply—or in brief, accessible chunks. State-of-the-art scientific instruments can support students' understanding of science, technology, engineering and math content—and help them master the critical thinking skills of these disciplines. Online, collaborative projects with peers or experts in other states or countries can expose them to different cultures and perspectives.

By giving students new means to learn core subjects, 21st century themes and applied skills, technology also can transform teaching and learning experiences in ways that are highlighted beginning on page 9.

Videoconferencing Supports Core Subjects and 21st Century Skills

As part of the **Maine Distance Learning Project,** high school journalism students worked with students in Alabama to create a news magazine television show to highlight the features of each of their regions. Students worked together via videoconferencing on this broadcast journalism project, which helped them build media literacy skills, communication and collaboration skills, and creativity and innovation skills, as well as proficiency in core subjects, such as geography and English language arts.
http://www.mainedistancelearningproject.org/pages/success/gardiner_journalism.html

Competing and Collaborating Online to Build Knowledge and Skills

The Oracle Education Foundation sponsors the **ThinkQuest International** competition, an online, collaborative learning contest in which multinational teams of students create educational Web sites on topics they choose, in categories such as science and technology, health and safety, arts and entertainment, and math.

For one award-winning project, six students from four continents (North America, Africa, Europe and Asia) created a Web site on the SARS (severe acute respiratory syndrome) epidemic. Using a Web discussion forum and instant messaging, the students collaborated across time zones for months to conduct research, interview experts, write content and create a visually dynamic, interactive, multimedia Web site.

In this project, these students used technology to learn core subjects and develop proficiency in 21st century themes; learning and innovation skills; information, media and technology skills; and life and career skills.

ThinkQuest attracts 10,000 participants annually, including coaches, assistant coaches, students and volunteer judges. The ThinkQuest Library now hosts more than 6,500 Web sites, which attract more than 2 million visitors every month, including teachers, students, parents and researchers interested in students' perspectives of the world around them.

The foundation also sponsors Think.com, a free, protected online environment for schools worldwide that provides a suite of tools for e-mail, Web site publishing, discussion and collaboration. ISTE awarded Think.com its National Education Technology Standards (NETS) Seal of Alignment for meeting both technology and subject-area curricular standards. Think.com engages 300,000 students and teachers from 50 countries every year. Since its inception, Think.com has reached more than 1 million people.

Both initiatives provide teachers with tools and professional development, which enable them to support students in developing their 21st century skills.
www.oraclefoundation.org

Instant Messaging Turns Chatting into Learning

Teachers and students are experimenting with instant messaging and chat applications to develop proficiency in core subjects and 21st century skills. At the **Consolidated High School District 230 in Orland Park, Ill.,** for example, teachers are using instant messaging for optional after-school study, such as lab group work and exam preparation in honors biology and review for an online quiz and assignment in Advanced Placement (AP) psychology. Teachers report that even students who are reluctant to participate in classroom discussions are active chatters in the evening sessions, which they can access from the comfort of their homes while multitasking, as students like to do.
https://my.cosn.org/mycosn/resources/CoSNIMminireport.pdf

Laptops Help Students Prepare for 21st Century Challenges

Texas middle school students participating in the **Technology Immersion Pilot** (TIP) are taking charge of their own learning, using wireless laptops that give them access to learning resources beyond the classroom walls and the school day. Students use the laptops in school and at home to communicate; solve problems; and access, manage, integrate, evaluate and create information in all their subject areas. Teachers involved in TIP are finding that the laptops make it easier for them to do their part in preparing students for the challenges of the 21st century. Schools report increased student learning and engagement, increased parental involvement, and decreased discipline issues. In one middle school, for example, standardized math scores increased by five percent for sixth graders, 42 percent for seventh graders and 24 percent for eighth graders.[6]

http://www.txtip.info/
http://www.eschoolnews.com/news/showStory.cfm?ArticleID=6988

Guiding Questions for Stakeholders

- Are schools equipped with state-of-the-art technology that will allow students and educators to develop proficiency in 21st century skills?
- Are schools providing educators with professional development that will enable them to use technology effectively to support learning?
- Are schools taking full advantage of their technology as a critical learning tool for core subjects, 21st century skills and 21st century themes?
- Are schools ensuring that students are mastering rigorous technology skills, such as ISTE's National Educational Technology Standards for Students (NETS•S™)[7]?
- Are schools using technology to extend their ability to reach and support every student?
- Do schools allow, encourage and teach students to use popular personal technologies, such as cell phones, MP3 players and other portable digital devices, as learning tools in school and elsewhere?

2. Use Technology Comprehensively to Support Innovative Teaching and Learning

In a 21st century education system, technology must be used comprehensively and purposefully for supporting ***how*** students learn with innovative teaching and learning practices.

Technology can help engage students in learning, create compelling learning environments and energize classroom teaching. In this sense, technology is "a **learning tool** for more student-centric, relevant, rigorous learning."[8]

Fostering 21st century skills requires new approaches to teaching and learning, all of which can be enhanced with technology, including:

- **Building conceptual understanding of core content.** Mastering content knowledge takes more than rote memorization or drills. Students need to understand the essential underpinnings of mathematics, science, history and literature, for example, to be prepared for higher-level courses and complex subject matter.

- **Addressing misconceptions.** Many students come to school with faulty or incomplete knowledge. Unless educators address these misconceptions explicitly, students are not likely to let them go, which can hinder their progress in school.
- **Fostering inquiry and investigation.** Many students learn more when they study, explore and investigate topics or issues deeply and when they are actively involved in learning.
- **Applying knowledge and skills to interdisciplinary challenges.** Most work in organizations today cannot be categorized into neat silos as a "math problem" or a "science issue," for example. Students need to learn to apply a range of knowledge and skills to complex problems.
- **Creating and transforming knowledge for meaningful purposes.** Students are more engaged in learning—and they learn more—when they have a stake in their work and when they can *do* something important with what they know. In the Internet age, everyone can be a content creator and innovator.
- **Collaborating with others.** There are few places where people work alone to accomplish important tasks. School should be no different. Students are more engaged in learning—and they can tackle bigger, more sophisticated projects—when they can collaborate with others, both inside and beyond their own schools. Further, students learn from one another through these interactions.

- **Apprenticing with experts.** Working with people who are more knowledgeable and skilled is a powerful way of learning. Interaction, guidance and support from experts—both in education and in other professions—is valuable for students. This model works as well when older students mentor younger students; both groups benefit from this experience.

- **Engaging and motivating students.** Many students feel disengaged and disconnected from schoolwork. Schools must find new ways to capture their attention and make learning relevant to their lives.

- **Differentiating instruction to meet individual needs.** Students come to school with a wide range of strengths and weaknesses. It is particularly important in this era of accountability for schools to evaluate and meet individual learning needs, which requires a broader repertoire of teaching and learning strategies.

These approaches to teaching and learning are well grounded in respected research and best practices about how people learn.[9] Further, this is the nature of living and working in the world today. There are few places where people can check their brains—or their technology skills—at the door. Learning the habits of mind and everyday practices that are expected in nimble, technology-intensive organizations should be inherent in a 21st century education.

For all students to acquire 21st century skills, the education system must create learning environments—both for students and for educators—that mirror those of high-performance, knowledge-driven organizations. In these organizations, leaders motivate everyone to contribute, expect people to meet high standards and model effective strategies. They cultivate a culture of knowledge-sharing and collaboration that extends beyond their organizations, engage people in interesting work, challenge them to recognize and solve problems, give them opportunities to learn and grow, and reward them for creative solutions. And they provide people with the technology tools and support they need to succeed.

Technology can be a compelling hook that engages and motivates students to succeed as well. Already, students are among the most enthusiastic and able technology users. And they embrace technology as a tool for learning, communicating, sharing, creating—and even for schoolwork. For example, 50 percent of students with online access say they use social networking services, such as Facebook and MySpace, to talk specifically about schoolwork, according to a recent survey by the National School Boards Association.[10] Students also increasingly report building their own Web sites or online profiles, creating their own content or characters, sharing virtual objects such as images and videos, and participating in collaborative projects online.

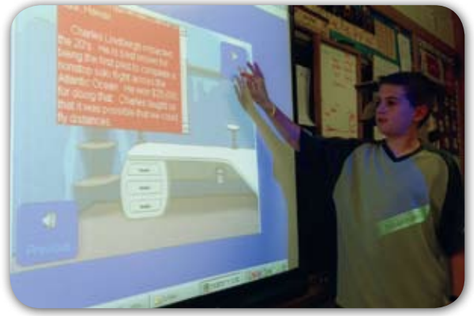
Much of this highly engaging, collaborative and creative activity takes place outside of school, in virtual worlds where geographical boundaries and time zones are no limitation. Now it's time for schools to capture the potential of technology to support innovative teaching and learning in school and in the world.

For example, multimedia applications and Internet resources can help students visualize, explore and master core academic concepts. Students can use technology to dig deeply into research topics, work with others to shape their own projects and present their knowledge creatively. Distance learning opportunities can give students access to courses, experiences and experts that may be unavailable in their schools. Virtual tutoring applications can provide extra support and practice for students who are behind or experiencing difficulties.

Technology also can be an extraordinary support for teachers, who can use it to become more effective in their classrooms. Standards and standards-based lessons and multimedia resources available online can provide teachers with exemplary models, research-based strategies and useful materials. Technology-based classroom assessments can give them an instant read on student performance. Technology can enable teachers to keep all students working productively—and give them time to work with students individually or in small groups.

Technology also can support teachers with professional development. Online training, coaching, collaboration and discussion forums can help teachers implement research-based strategies and promising practices that can improve student achievement. Teachers need more than a stand-alone workshop or a journal article to take ownership of unfamiliar approaches to teaching and learning. They need support that is connected to their work, their classrooms and their students.

One-to-One Computing Engages Students—and Boosts Achievement



Districts from Missouri and eight other states (Arkansas, Illinois, Maine, Minnesota, Nevada, Oklahoma, Texas and Utah) have been using **eMINTS** (enhancing Missouri's Instructional Networked Teaching Strategies) to engage students and improve achievement. The program blends instructional strategies focused on inquiry-based teaching, higher-order thinking skills and cooperative learning; state-of-the-art technology; and up to 200 hours of professional development for teachers so that classroom environments foster new approaches to educating students. Each eMINTS classroom includes:

- Computers (a 1:1 computer-to-student ratio is encouraged for middle and high schools)
- A laptop computer for teachers
- An interactive white board and projector
- Peripherals, such as a printer, camera and scanner
- Office productivity software that helps students organize notes, write and conduct multimedia projects, or applications for specific content areas

In some eMINTS classrooms, students use archived video news clips to learn about U.S. cultural, political and economic issues. They communicate with experts outside their classrooms as they gather perspectives to create solutions to real-world problems related to these issues.

Students in eMINTS classrooms consistently outperform students in the same schools who are not enrolled in these classrooms. For example, in classrooms in the same school, the student achievement in eMINTS classrooms was repeatedly more than 10 percent higher than in control classrooms.[11] And schools report higher attendance rates and fewer discipline referrals in eMINTS classrooms than in other classrooms.

"eMINTS classrooms literally hum with student conversations, research activities involving Internet and library searches, presentations on the interactive white board, and online communications with experts outside the classroom. Teachers plan lessons using far fewer worksheets and relying more on authentic, problem-based learning activities that are directly correlated to state standards and grade-level expectations. Parents access student work via teacher Web sites and online portals."[12]

ISTE awarded the eMINTS program its National Educational Technology Standards for Teachers (NETS•T™) Seal of Alignment for comprehensively addressing guidelines for effective teaching with technology.

Technology Supports Personalized Instruction

Richland School District Two in Columbia, S.C., is enhancing student learning by integrating new instructional methods and modern technologies. For example, the district uses **netTrekker d.i.** from Thinkronize to provide students with an online search engine that gives students the opportunity to use real-world search skills in a safe, controlled environment. This technology is specifically designed to support differentiated instruction, with features such as readability measures based on Lexile® ratings and four other longstanding readability ratings and text-to-speech support for striving readers or English language learners.

Distance Learning Offers Different Kinds of Learning Experiences

The **Alabama Connecting Classrooms, Educators and Students State-wide (ACCESS) program** provides students and teachers with equal access to high-quality instruction to improve student achievement through distance learning opportunities. Teachers and students are provided with a blended approach to online learning, including a multimedia Web portal, real-time videoconferencing, virtual field trips and a management system for assignments, communication and projects.

An external evaluation of the ACCESS program indicates that it provides access to advanced diploma courses, AP or dual enrollment/credit courses, and remediation resources.[13] The majority of teachers, school staff and students rate the course quality as good as or better than traditional courses. **http://accessdl.state.al.us/WebIntroductionPhase3.pdf**

Guiding Questions for Stakeholders

- Are schools equipped with state-of-the-art technology that will allow students and educators to explore sound, research-based ways of teaching and learning?
- Do schools provide time and opportunities for educators to discover how people use technology productively and creatively in settings outside of schools?
- Do schools communicate clear expectations to educators for effectively using technology for student learning and educator professional development?
- Are schools supporting educators with collaborative learning communities that will enable them to learn and share their experiences about innovative teaching and learning?
- Do schools encourage educators to experiment and take risks to transform their pedagogy?

3. Use Technology Comprehensively to Create Robust Education Support Systems

In a 21st century education system, technology must be used comprehensively and purposefully to create robust education support systems for standards and assessments, curriculum and instruction, professional development and professional learning communities, and administration.

Reengineering the front line of the U.S. education system to develop proficiency in 21st century skills and foster innovative teaching and learning cannot happen on a broad scale without a parallel focus throughout the education infrastructure. Educators and staff members need to master 21st century skills themselves to be most effective in their careers. Technology provides educators with instant, on-demand access to resources they can use to transform education.

Technology makes it possible for states and school districts to update their **standards** more frequently to reflect changing demands. Web sites and collaborative tools, for example, make it easy for states and school districts to compare standards and curriculum and to work together to infuse them with 21st century skills. And they make it easy for teachers to access and use standards, rubrics, exemplary student work and classroom lessons, among other resources, to improve teaching and learning.

Technology will be a key instrument in creating 21st century **assessments.** Already, there are online state tests that provide immediate performance results; instructional software programs that incorporate customized, interactive assessments and report results to teachers; and technology-based ICT literacy assessments. And there are strong initiatives under way as well for technology-based assessments of such skills as critical thinking and problem solving.

Technology-based assessments, which typically yield detailed, graphic reports of results, provide educators with timely, useful diagnostic and summative data that can be used to improve instruction.

Technology can support **curriculum and instruction** with classroom, content and learning management systems, for example, that enable teachers to focus on innovative teaching and learning.

Such technologies as videoconferencing, online learning, networking and instant messaging can support **professional development and professional learning communities.** Using technologies like these, educators can learn and collaborate with peers, mentors, experts and community members routinely. They can build ongoing professional relationships, develop capacity in teaching 21st century skills, benefit from just-in-time communications, and reduce the time and expense of travel.

Technology can support **administration** in providing instructional leadership, managing learning environments and professional learning communities, and making decisions that support proficiency in 21st century skills. Networking technologies, for example, can support administrators in communicating with staff members, parents and community members. Data management systems enable states, districts and schools to make sense of the mountains of data they collect, monitor technology and other resources, and track trends in student achievement. In this sense, technology is a "**data tool** for education to better understand and inform educational and instructional decision making."[13]

National Partnership Commits to 21st Century Skills

Six states (Maine, Massachusetts, North Carolina, South Dakota, West Virginia and Wisconsin) have joined the **National Partnership for 21st Century Skills.** These states have committed to reinvigorating learning with seven strategies:

- High-profile leadership
- Broad consensus and a shared vision
- Ongoing professional development in 21st century skills
- Standards and curriculum aligned with 21st century skills
- 21st century assessments
- An effective communications strategy
- An aggressive implementation strategy

West Virginia and North Carolina, the first two states in this initiative, use technology solutions to help teachers incorporate 21st century skills into their teaching. **West Virginia** is partnering with the Intel® Teach program, which features a Web site with professional development resources. Teachers are particularly impressed with online, interactive tools that develop students' thinking skills, including a "visual ranking" tool for organizing ideas, a "seeing reasoning" tool for investigating relationships in complex systems and a "showing evidence" tool for constructing well-reasoned arguments that are supported by evidence.

The state also offers online professional development in 21st century skills through e-learning platforms, such as EdVenture Group, EDC and public television. A graduate-level EdVenture Group course for administrators and teachers, "Implementing 21st Century Skills in a Standards-Based Classroom," focuses on 21st century learning skills and standards from ISTE and national content groups. West Virginia also staffs its schools with technology integration specialists who act as coaches, offering real-time, as-needed professional development to teachers. The technology integration specialists stay on top of their game with a required 40 days of professional development every year.

North Carolina provides all teachers with access to LEARN NC, a statewide network of resources developed by the University of North Carolina at Chapel Hill School of Education. The Web-based program features online courses, standards-based lesson plans and multimedia resources. Teachers also have access to the United Star Distance Learning Consortium, which includes a course on digital literacy, and to eBistro, a Web site developed by the state's department of instructional technology, which provides online, interactive tools for integrating technology into the curriculum.

Using Technology to Make Informed Decisions

Virginia's Educational Information Management System enables stakeholders at all levels of education to make informed educational decisions based on accurate and timely information. Teachers and administrators can access student-level enrollment, demographic, assessment, and program participation information and can match individual student test records from year to year.

Handhelds Help Educators Stay on Top of Student Progress

New Mexico's Reading First schools use handheld technology to assess primary students' reading on a quarterly basis. At the classroom level, this innovative use of handhelds allows teachers to view student progress and modify instruction based on individual and classroom needs. Administrators use the performance data to plan for professional development based on the student progress and teachers' needs. The ease of use and the immediacy of this technology, plus the detailed data reports it provides, enable teachers to review performance data anytime, anywhere.

Networked Education Transforms Teaching and Learning

A new education model—**networked education**—is one of the most effective ways to support 21st century outcomes. In this model, networked communities, networked tools and an education-focused network service provider converge to transform the ways all students learn and teachers teach.

ENA (Education Networks of America) is one technology company that provides this new, more robust and scalable approach to technology infrastructure and services. The expertise necessary to manage all of the technical elements of networked education—connectivity, end-site equipment, a network operations center, content filtering and firewalls, to name a few—increasingly is beyond the capabilities and budgets of most schools. As a result, school systems in states such as **Tennessee** and **Indiana** and in school districts such as **Philadelphia** are using the bundled services, physical infrastructure and expertise to provide technology access and resources to their schools—and to improve student performance and the operational efficiency of school systems.

With networked education, students participate in more personalized, equitable learning opportunities. Teachers rely on a vast array of resources that help make learning more relevant to their students. Administrators depend on reliable access to networked tools to improve their abilities to communicate, collaborate and create interactive, relevant learning experiences for students. Parents are much more connected to their children's education than ever before. There are more opportunities to connect people in schools to each other and to the "outside" world.

In Philadelphia, the Web-based instructional management system provides real-time benchmarking test results so instruction can be immediately targeted to student needs. Teachers can easily access consistent instructional materials that are aligned to state standards. This has contributed to the increase in Adequate Yearly Progress (AYP) schools from 58 to 132 over two years and has helped increase state test scores by 14 percent in math and 10 percent in reading over two years.
http://www.ena.com/files/PDF/NfL-FullWhitepaper.pdf

Guiding Questions for Stakeholders

- Do states, districts and schools have a comprehensive plan for integrating technology into all of their education support systems?
- Do states and districts allocate adequate resources and staffing to provide a robust education support system?
- Do teachers and students have access to resource-rich, online applications and programs that support inquiry-based teaching, higher-order thinking skills and differentiated instruction?
- Do states, districts and schools provide time and opportunities for professional development to learn to use technology—and the data that technology can provide—to make decisions that address student needs?
- Do states make good use of technology to support standards, assessments, curriculum, instruction, professional development, professional learning communities and administration?
- Do state and district networks support networked education tools, applications and education communities?

Action Principles for Stakeholders

Action Principles for Federal and State Policymakers

- Integrate technology as a part of every program and initiative for the effective and efficient implementation of a 21st century education system that includes 21st century skills and core subjects.
- Require standards for educational uses of technology that facilitate school improvement, such as the National Educational Technology Standards (NETS) developed by the International Society of Technology in Education (**http://www.iste.org/NETS-S-2007**).
- Emphasize proficiency in 21st century skills in education policies.
- Develop policies and fund programs that emphasize the critical need for technology to support 21st century skills, innovative teaching and learning, and education support systems.
- Build upon the productivity gains realized in business and other industries through technology.
- Leverage the federal E-rate program to ensure that sufficient infrastructure and connectivity is available to serve all students, especially those in disadvantaged and rural areas.
- Support professional development programs that foster 21st century teaching and learning.

Action Principles for State and Local Education Agencies

- Directly link state and local technology plans into state or district school improvement or 21st century education plans.
- Ensure that the educational technology director is appointed to the 21st century skills task force at the state and district levels.
- Leverage technology to improve teaching and learning with increased engagement and rigor.

- Emphasize proficiency in 21st century skills in state standards.
- Support the development of effective strategies to teach and assess information, media and technology skills.
- Implement ongoing and sustainable professional development in using technology for instruction.
- Provide the networked education infrastructure to support 21st century learning.

Action Principles for Business and Community Leaders

- Advocate proficiency in 21st century skills for all students to compete in a global economy and meet the needs of today's work environments.
- Ensure that technology is a part of every program and initiative for the effective and efficient implementation of a 21st century education system.
- Advocate ongoing professional development programs to support 21st century teaching and learning to improve teacher quality. Support strategies to attract and retain highly qualified teachers.
- Support and encourage policies that fund programs that emphasize the critical need for technology to support 21st century skills, innovative teaching and learning, and education support systems.
- Support the vision of schools as networked learning environments that provide advanced and equitable access to new and enhanced educational opportunities as well as a high level of community involvement in the educational process.

Resources

State Education Technology Directors Association

Evaluating State Educational Technology Programs—SETDA Technical Assistance Program (TAPP)
http://setda.org/web/guest/esetp
http://setdatapp.org

SETDA Toolkits with Case Studies and Programs
http://www.setda.org/web/guest/toolkits

International Society for Technology in Education

ISTE Essential Conditions
http://www.iste.org/NETS-S-2007-Conditions

National Educational Technology Standards for Students (NETS-S™)
http://www.iste.org/NETS-S-2007

National Educational Technology Standards for Teachers (NETS•T™)
http://cnets.iste.org/teachers/t_stands.html

Partnership for 21st Century Skills

Results that Matter: 21st Century Skills and High School Reform
http://www.21stcenturyskills.org/index.php?option=com_content&task=view&id=204&Itemid=114

The Road to 21st Century Learning: A Policymakers' Guide to 21st Century Skills
http://www.21stcenturyskills.org/images/stories/otherdocs/p21up_Policy_Paper.pdf

Conclusion

Creating a 21st century education system is about making sure that all students are prepared to succeed in a competitive world—a world with plenty of opportunities for highly skilled individuals and limited options for everyone else. It's about maximizing the impact of technology to develop proficiency in 21st century skills, support innovative teaching and learning, and create robust education support systems.

We cannot prepare students with the skills they need without making comprehensive use of technology throughout every aspect of education, just as other industry sectors have been doing for years. Technology has a fundamental role to play in creating a 21st century education system.

What will it take to maximize the impact of technology? It will take a clear vision of a 21st century education and an understanding of technology's role. It will require reliable and equitable access to technology and planned, ongoing investments. And it will require substantive and meaningful professional development for educators.

More than anything else, though, it will take inspirational leadership and action from all stakeholders. The action principles and resources in this report provide a starting point for moving forward. The State Educational Technology Directors Association, the International Society for Technology in Education and the Partnership for 21st Century Skills—like employers, educators, parents and students across the nation—believe that there is no time to lose.

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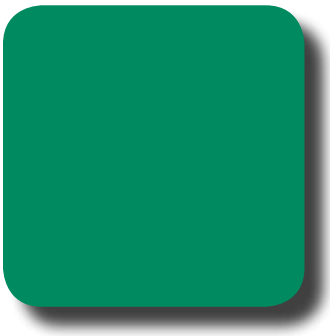


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