

1 The Principal as Technology Leader

The effective 21st Century administrator is a hands-on user of technology.

TSSA Collaborative (2001, p. 4).

The principal's diverse roles are part of a long tradition of expectations and responsibilities. Of recent vintage is the role of principal as technology leader. The special challenge for the principal is being a technology leader as well as encouraging the development of teacher and student technology leaders.

The "insider" secret principals know: The technology came first and the principal as technology leader came later. Preparation experiences for the principal's role as technology leader may be absent or fragmented. Often technology knowledge and skills are "learned by doing."

The principal's role as technology leader includes the following 10 tasks:

1. The principal should establish the vision and goals for technology in the school.
2. The principal should carry the technology banner in the school.
3. The principal should model use of technology.
4. The principal should support technology use in the school.
5. The principal should engage in professional development activities that focus on technology and integration of technology in student learning activities.
6. The principal should provide professional development opportunities for teachers and staff that emphasize use of technology and that facilitate integration of technology into student learning.

7. The principal should secure resources to support technology use and integration in the school.
8. The principal should be an advocate for technology use that supports student learning.
9. The principal should be knowledgeable and supportive of national technology standards and promote attainment of the standards in the school. (See “Resources” for Technology Standards for School Administrators and the Draft National Education Technology Plan 2010.)
10. The principal should communicate the uses and importance of technology in enhancing student learning experiences to the school’s stakeholders.

Remember: Technology is nothing more than tools used to complete work.

VISION AND GOALS

The principal must establish the vision and goals for technology in the school. The principal carries the vision “banner” and promotes the vision throughout the school (Grady & LeSourd, 1989–1990; LeSourd & Grady, 1989–1990; LeSourd, Tracz, & Grady, 1992). All who work in the school strive to achieve the vision. “In the visionary role, principals establish a context for technology in the school and understand how technology can be used to restructure learning environments and empower teachers and students to be technologically astute” (Brockmeier, Sermon, & Hope, p. 46). Principals must use their “leadership to step up the pace, and create the sense of urgency, vision and strategic plan” (Technology & Learning, n.d., p. 4).

The vision includes the following:

- The leadership the principal exerts on technology integration into the teaching and learning process
- The role of teachers in integration of technology into teaching and learning activities
- The standards that will guide the technology plan for the school
- The measures that will be applied to assess technology use
- The resources that are necessary to enable effective use of technology by students and teachers
- The communication with families and community members to showcase the use of technology to facilitate student learning and achievement

Trotter (1997) states, “Set your goals first, then consider tools. Otherwise, technology vendors will urge you to adopt goals that fit what they have to sell. . . . You don’t want to buy a technology solution. You want to help design a functional solution” (p. 5).

Model the Use of Technology

Principals who are comfortable with technology become models of technology use in schools. If the goal is to encourage teachers and staff members to use technology, then the principal is the key figure in its adoption and use (Brockmeier, Sermon, & Hope, 2005; Cooley & Reitz, 1997).

Johnson (2005) describes a principal who implemented the six Technology Standards for School Administrators (TSSA). In the example, the high school principal’s actions demonstrate how technology use is modeled by a principal. For instance, the principal demonstrated meeting the Productivity and Professional Practice standard by communicating “regularly and effectively to staff, parents, and community using email, listservs, and websites. . . . His school board reports are illustrated with graphs and photos embedded in multimedia presentations. He uses districtwide calendar programs for facilities scheduling and managing his own schedule” (p. 1).

In another example, the principal demonstrated meeting the Support, Management, and Operations standard:

Using the student information system, [the principal] tracks the day-to-day operations of the school through ready access to schedules, attendance records, health records, discipline incidents, grades, and online teacher grade books. He carries most of this in his personal digital assistant, synchronized with his desktop computer. He manages his building budget using the district’s real-time finance program (Johnson, 2005, p. 1).

In these examples, the principal uses technology to accomplish the management tasks of the school. Through consistent, daily use that touches the academic, behavioral, administrative, and supervisory aspects of the school, teachers, staff, students, and parents have clear evidence of the principal’s use of technology. One principal reported using a Goggle Apps–based calendar so that the staff and teachers could access the calendar and post information on the calendar as well.

Principals need to be knowledgeable of the technology standards and use these as a basis of action in the school. “An underlying assumption in these standards [TSSA] is that administrators should be competent users of

information and technology tools common to information-age professionals” (TSSA Collaborative, 2001, p. 4).

To model technology use, principals must learn to use the technology tools that are available. By adopting the technology and using it at home and at the office, a principal can learn “to think beyond the individual bits of equipment to lessons about how technology can shape and serve an overall system of education” (Trotter, 1997, p. 5).

SUPPORT TECHNOLOGY USE

To be a technology leader involves many of the leadership skills principals display in other aspects of their work. Technology leadership demands attention to technology use throughout the school. The vision for technology use includes a commitment to this focus.

Following are actions principals can take as technology leaders.

Showcase Technology Use

Staff Meetings. As a principal, it is critical to focus on the vision and goals of the school. If the vision calls for technology integration throughout the curriculum, then examples of technology use must be showcased. One precious resource in schools is time. If principals focus attention on technology use during the limited time available for staff meetings, then all in attendance will understand that technology use in the classroom is valued. Provide brief demonstrations of technology integration in different grades or subject areas. Whenever staff meetings are held, a small portion of the meeting should be used for these demonstrations.

These sessions should emphasize both technology integration into student learning activities and how technology enhances student learning. Student projects can be showcased. Specific lessons can be highlighted. Teacher teams or subject-area specialists can feature integrated projects that present technology use. Make these brief demonstrations a regular feature of staff meetings so that all will anticipate this segment of the meeting. By consistency in featuring technology, teachers will be motivated to demonstrate their technology use during this designated time. These opportunities will deliver the message that technology integration is a goal that will be achieved in the school.

Prominent Displays. Photos that feature student and classroom use of technology spread the word that technology is an important aspect of lesson delivery and demonstration. When the photos are displayed throughout the school, families, teachers, community members, and visitors receive the

message that technology is a vibrant part of the school. Students and teachers whose work is featured in the photos take pride in their accomplishments and look forward to being part of the photo displays.

Remember: At the beginning of the school year, secure signed permission or release forms from parents or guardians for the use of student photos in the various media outlets used by the school.

Remember: As principal, you have access to all the learning and activity areas of the school. Use the access you have to capture pictures that reflect all school areas. Keep the camera with you!

Develop a schedule for updating photo displays so that they continue to attract the attention of those who pass through the school. Develop the schedule with the faculty and staff. Enlist their help in contributing photos of students, special events, and classroom activities. Classes can be assigned specific weeks for their displays. The showcase should emphasize standards-based learning completed through the use of technology. The technology can include a variety of the formats accessible to students. Posters, digital pictures, PowerPoints, and digital movies can be featured.

Identify themes for the displays that reflect the academic, athletic, and performance aspects of the school. Use the seasons of the year, as well as national holidays, as additional themes for photo displays.

Feature technology use on the school website. Alert teachers, students, and families to the website. Feature photos and movie clips. Visitors will be drawn to other important information about the school through these visuals. Use technology to improve communication throughout the school community.

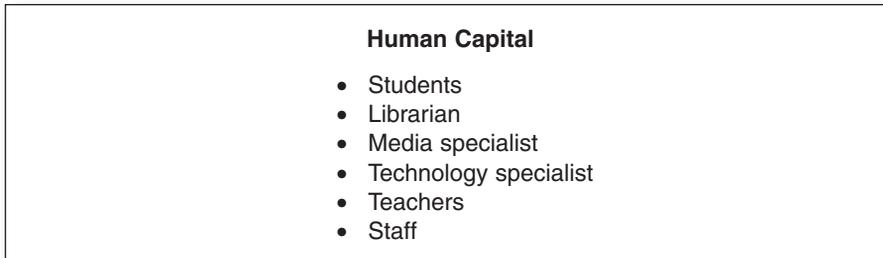
Install a monitor in the entryway to the school and stream photos and movie clips. Students, parents, and teachers take pride in the photos, and all who pass through the entrance will be alerted to school activities and technology's uses in the school.

PROFESSIONAL DEVELOPMENT

Professional Development: Technology

The most important resources in the school are the human resources or human capital (Figure 1.1). These individuals must be a central focus for the principal.

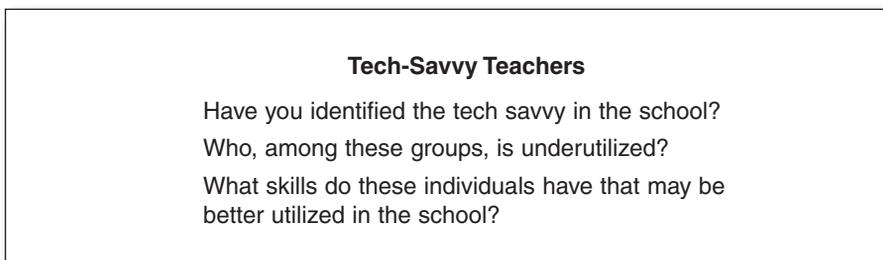
Professional development is essential to enhancing the skills of teachers, staff, and administrators. Principals should use these opportunities to achieve the vision and goals of the school. Often, professional development is left in the hands of outside experts or is expected to occur through conference

Figure 1.1 Human Capital in the School

attendance. Unfortunately, the outside experts and conferences may not provide the knowledge and skills needed to achieve the school's goals. Principals need to use professional development as part of their leadership of the school. These experiences are critical to achieving school goals and should be aligned with the vision and goals of the school. The principal must maintain constant oversight of this critical resource.

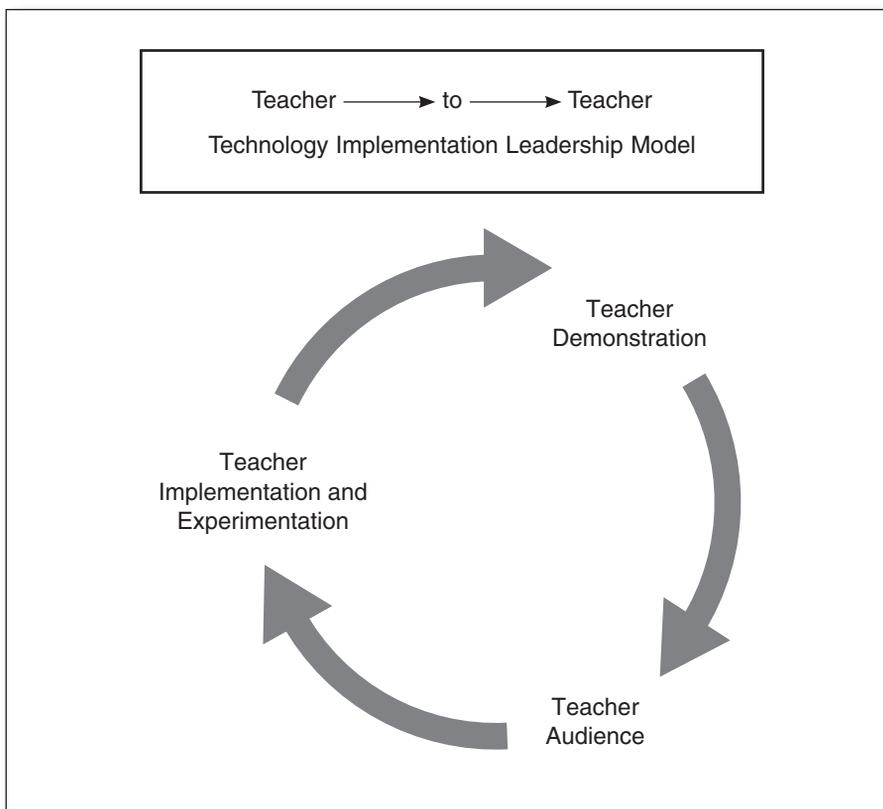
Provide a series of professional development sessions that focus on common and new technologies. Select technology tools that are easily applied to the teaching and learning that occur at each grade level. Whenever possible, ask a teacher to model the technology for the teachers. Focus the experiences on subject areas, teams, interdisciplinary teams, or department-level groupings. Demonstrate the technology as it is applied in a specific subject lesson or activity. Provide examples of students' use of the technology in completing specific classroom activities. Record the sessions so that teachers can review them after the events. Move away from the "one time" approach to demonstrations and adopt the "repeat, repeat, repeat" approach.

Invite different teachers to showcase technology so that all teachers become leaders of technology use. These practices will reduce resistance to technology use and will encourage development of additional technology skills. Identify the tech-savvy teachers in the school (Figure 1.2).

Figure 1.2 Tech-Savvy Teachers in the School

New technology tools appear and change at a rapid pace. The tools that were new at the beginning of the school year may be enhanced, transformed, or replaced by the end of the school year. Teachers need to be in a constant cycle of exposure to and implementation of new technologies. Acceptance of and comfort with these continuous changes will be facilitated by frequent, brief exposure to the new modalities. The teacher-to-teacher model will continue to be the ideal means of reducing resistance to change. Rogers (2003), in *Diffusion of Innovations*, reports on a number of successful change implementations. Essential to the success of these innovations was the person-to-person or peer-to-peer dimension of the changes. As the cycle of teacher demonstrations continues, teachers will refer to the process as “this is the way we do things in this school.”

Figure 1.3 Technology Implementation Leadership Model



Incorporate technology demonstration and implementation as part of the teacher appraisal process. As you engage in teacher observations, note students’ use of technology in class work as well as teachers’ integration of technology

into instruction. Recognize these practices in your observation notes and convey this recognition to the teachers. Establish goals with teachers for their development of technology skills. Encourage implementation of technology in instructional strategies. As you review lesson plans, note teachers' use of technology throughout the lessons. Recognition of technology use will reinforce its inclusion in the instructional process.

Professional Development: Student Learning

As part of professional development activities, provide opportunities for teachers to use technology tools to track student achievement and attainment of learning goals. Use the teacher-to-teacher model of demonstrating these tools. Demonstrate how the technology tools can be used to report student progress to parents and guardians. The progress reports can include students' attainment of instructional goals as well as academic progress in the subject areas. A calendar can be developed as part of a regular plan for communication with parents and guardians. Demonstrate technology tools that present student data through a variety of graphs and models so that students' accomplishments can be routinely reported. Provide opportunities for teachers to learn and practice the use of these tools. Establish timelines for implementation of these tools. Recognize teachers as they gain expertise. Visit with teachers about their plans to develop strategies with students who are not meeting the standards or expectations.

Professional Development: Principals

Make your own professional development a priority. Consider the following professional development activities as a means of enhancing your technology skills and leadership:

- ✓ Attend the annual state technology conference and become familiar with new technology uses and resources. For the annual conference, present a session on administrative uses of technology or on strategies for encouraging technology integration into teaching and learning activities. Become a leader in the state technology association.
- ✓ Present sessions at state and national conferences for teachers and administrators. Through these presentations, you will advance your knowledge of your subject and increase your network of colleagues. You meet more people through your role as presenter than you do through passive attendance at conference sessions. The conversations that emerge from your presentation advance your thinking and can link you to others who share your professional interests.

- ✓ Model and practice the use of technology in your presentations. If you want teachers to use technology, you must model the use of technology. As you become more accomplished in the use and application of technology, you will be better able to understand the reservations and challenges teachers may experience.
- ✓ Attend training sessions on the use and applications of new technologies. Practice the use of these resources so that you are able to discuss them with the technology coordinator as well as teachers. Identify training opportunities for teachers through attendance at these sessions.

Provide Resources

The principal's role is to secure resources to support the use and integration of technology in the school. Resources include examples of technology use and integration as well as hardware, software, and other equipment to support technology use. The principal should provide a steady stream of examples of technology use and innovation. These examples should focus on the various academic areas and should be made available to all of the teachers. Principals receive a constant barrage of email blasts, newsletters, webinar invitations, and journals that report technology innovations in school districts throughout the United States. By sharing or distributing examples of technology innovation and use, individual teachers may find a source of inspiration for their subject area. In the spirit of Rogers' (2003) work on diffusion of innovations, the teacher-to-teacher examples of technology integration may have the greatest valence for motivating reluctant adopters of technology use and integration.

Remember: Cooley and Reitz (1997) concluded that the principal more than any other educator is key to teachers' adoption and use of technology.

National Technology Standards

Principals must be knowledgeable of the national technology standards and use the standards in the school. "The Collaborative for Technology Standards for School Administrators (TSSA Collaborative) has facilitated the development of a national consensus on what P-12 administrators should know and be able to do to optimize the effective use of technology" (p. 3).

The Technology Standards for School Administrators (TSSA Collaborative, 2001) are included in "Resources" for this chapter. In addition, an excerpt from the National Education Technology Plan 2010 (Office of Educational Technology, 2010) is included. These resources provide guidance as schools refine their implementation and integration of technology throughout the school, curriculum, and teaching and learning process.

A Word on Leadership

- Model the use of technology: If you use it, they use it.
- Remember, all eyes are on you: They see everything you do.
- Speak no disparaging words: They hear everything you say.
- Recall that one word from the principal makes all the difference: They are waiting for your encouraging words.
- Conduct one-legged interviews: Check on implementation progress.
- Celebrate successes: Set benchmarks and cheer accomplishments.
- Create a culture of experimentation and risk taking: Small increments of progress matter.
- Practice makes perfect: Hands on, again and again and again.
- Remember: It isn't a one-time purchase.
- Make time and take time to play and learn.
- Provide money and resources: Acquire the necessary hardware, software, and training.

Source: Adapted from Grady (2004).

ACTION AGENDA

- Invite teachers to showcase use of technology at faculty meetings.
- Display examples of student technology use throughout the school.
- Follow the principal's exploration agenda: Explore the technology resources using the 15-minute-a-day approach.

Resources

Principal Self-Assessment

Principal's Exploration Agenda

Technology Standards for School Administrators

Excerpt From the Draft National Education Technology Plan 2010

PRINCIPAL SELF-ASSESSMENT

Figure 1.4 Principal Self-Assessment

Complete the principal self-assessment as an additional tool for professional development:		
Principal Tasks (Check)	YES (✓)	NO (✓)
Are the vision and goals for technology displayed in the school?		
Do you model technology use?		
Do you take actions that demonstrate support for technology use?		
Do you annually attend professional development activities focused on technology?		
Are professional development opportunities focused on technology use and integration offered annually for faculty and staff?		
Do you provide resources for teachers and staff that support technology use and integration throughout the school?		
Do you advocate for technology use in support of student learning?		
Do you support the attainment of national technology standards in the school?		
Do you communicate with stakeholders about the use and importance of technology in enhancing student learning?		

PRINCIPAL'S EXPLORATION AGENDA

Use the 15-minute-a-day approach to explore the vast resources related to technology. This short time frame will provide a valuable professional development experience. The following sites are places to begin the exploration.



RSS Feeds: Rich Site Summary, commonly referred to as *Really Simple Syndication*, is a format for delivering web content such as news sites, blogs, and other online publications. RSS feeds are similar to a subscription only easier to use.

RSS solves a problem for busy people who regularly use the web. It allows you to quickly stay informed by retrieving the latest content from the sites you are interested in. You save time by bringing the news to you rather than searching several sites daily.

The only thing you need to use RSS feeds is a newsreader such as My Yahoo! or Google Reader. When you find a blog or a webpage you want to read regularly, simply click on the RSS feed icon (like the icon in the preceding text) and choose the reader you would like to use.

Blogs

- **Dangerously Irrelevant:** A blog site for sharing thoughts for K–12 educators, highlighting technology and leadership with a vision for the future of education, is led by Scott McLeod, codirector of CASTLE (UCEA Center for the Advanced Study of Technology Leadership in Education):

<http://www.dangerouslyirrelevant.org>

- **Doug Johnson's Blue Skunk Blog:** Blue Skunk Blog was created to provide a convenient way for people to respond to Johnson's writing and presentations:

<http://doug-johnson.squarespace.com>

- **Education Week:** This blog is focused on technology and trends in education:

<http://blogs.edweek.org/edweek/DigitalEducation>

- **Education Week: Leader Talk:** A CASTLE project. This blog is focused on the school leader:

<http://blogs.edweek.org/edweek/LeaderTalk>

- Tech & Learning: This blog features topics for K–12 educators:
<http://www.techlearning.com/section/Blogs>
- Typepad: This blog was created by the Association for Supervision and Curriculum Development for the K–12 educators:
<http://www.ascd.typepad.com/blog>

Resource Sites

- Cybersmart: This site emphasizes 21st Century skills:
<http://www.cybersmart.org>
- Cyber Security for the Digital District: The site provides tools for K–12 technology leaders:
<http://www.cosn.org/cybersecurity>
- Eduweb: This site provides learning games and interactive activities for students:
<http://www.eduweb.com>
- eSchool News: This site provides technology news for educators of K–20:
<http://www.eschoolnews.com>
- International Society for Technology in Education: ISTE provides technology standards for students, teachers, and school administrators:
<http://www.iste.org/standards.aspx>
- iTunes U: This site allows educators to search for digital educational content for students:
<http://www.apple.com/education/itunes-u>
- Launchy: This site offers an open-source keystroke launcher to launch programs and files quickly from your desktop:
<http://www.launchy.net>
- Phrase Express: This site allows you to create abbreviations for short phrases; call up the abbreviations and it will finish typing the phrase for you:
<http://www.phraseexpress.com>
- Renaissance Learning: This site provides advanced technology resources for educators:
<http://www.renlearn.com/neo/NEO2/default.aspx>

- SchoolTube: This site allows students and teachers to share videos online:
<http://www.schooltube.com>
- Tech Smith: This site offers free and paid software downloads for screen capture and voice-over:
<http://www.techsmith.com>
- THE Journal: This site provides K–12 news and resources for educators:
<http://thejournal.com/Home.aspx>

TECHNOLOGY STANDARDS FOR SCHOOL ADMINISTRATORS

I. Leadership and Vision

Educational leaders inspire a shared vision for comprehensive integration of technology and foster an environment and culture conducive to the realization of that vision.

Educational leaders

- A. facilitate the shared development by all stakeholders of a vision for technology use and widely communicate that vision.
- B. maintain an inclusive and cohesive process to develop, implement, and monitor a dynamic, long-range, and systemic technology plan to achieve the vision.
- C. foster and nurture a culture of responsible risk-taking and advocate policies promoting continuous innovation with technology.
- D. use data in making leadership decisions.
- E. advocate for research-based effective practices in use of technology.
- F. advocate, on the state and national levels, for policies, programs, and funding opportunities that support implementation of the district technology plan.

II. Learning and Teaching

Educational leaders ensure that curricular design, instructional strategies, and learning environments integrate appropriate technologies to maximize learning and teaching.

Educational leaders

- A. identify, use, evaluate, and promote appropriate technologies to enhance and support instruction and standards-based curriculum leading to high levels of student achievement.
- B. facilitate and support collaborative technology-enriched learning environments conducive to innovation for improved learning.
- C. provide for learner-centered environments that use technology to meet the individual and diverse needs of learners.

- D. facilitate the use of technologies to support and enhance instructional methods that develop higher-level thinking, decision-making, and problem-solving skills.
- E. provide for and ensure that faculty and staff take advantage of quality professional learning opportunities for improved learning and teaching with technology.

III. Productivity and Professional Practice

Educational leaders apply technology to enhance their professional practice and to increase their own productivity and that of others.

Educational leaders

- A. model the routine, intentional, and effective use of technology.
- B. employ technology for communication and collaboration among colleagues, staff, parents, students, and the larger community.
- C. create and participate in learning communities that stimulate, nurture, and support faculty and staff in using technology for improved productivity.
- D. engage in sustained, job-related professional learning using technology resources.
- E. maintain awareness of emerging technologies and their potential uses in education.
- F. use technology to advance organizational improvement.

FRAMEWORK, STANDARDS, AND PERFORMANCE INDICATORS

IV. Support, Management, and Operations

Educational leaders ensure the integration of technology to support productive systems for learning and administration.

Educational leaders

- A. develop, implement, and monitor policies and guidelines to ensure compatibility of technologies.
- B. implement and use integrated technology-based management and operations systems.

- C. allocate financial and human resources to ensure complete and sustained implementation of the technology plan.
- D. integrate strategic plans, technology plans, and other improvement plans and policies to align efforts and leverage resources.
- E. implement procedures to drive continuous improvements of technology systems and to support technology replacement cycles.

V. Assessment and Evaluation

Educational leaders use technology to plan and implement comprehensive systems of effective assessment and evaluation.

Educational leaders

- A. use multiple methods to assess and evaluate appropriate uses of technology resources for learning, communication, and productivity.
- B. use technology to collect and analyze data, interpret results, and communicate findings to improve instructional practice and student learning.
- C. assess staff knowledge, skills, and performance in using technology and use results to facilitate quality professional development and to inform personnel decisions.
- D. use technology to assess, evaluate, and manage administrative and operational systems.

VI. Social, Legal, and Ethical Issues

Educational leaders understand the social, legal, and ethical issues related to technology and model responsible decision making related to these issues.

Educational leaders

- A. ensure equity of access to technology resources that enable and empower all learners and educators.
- B. identify, communicate, model, and enforce social, legal, and ethical practices to promote responsible use of technology.
- C. promote and enforce privacy, security, and online safety related to the use of technology.

- D. promote and enforce environmentally safe and healthy practices in the use of technology.
- E. participate in the development of policies that clearly enforce copyright law and assign ownership of intellectual property developed with district resources.

Source: This material was originally produced as a project of the Technology Standards for School Administrators Collaborative (2010, pp. 6–7), www.ncrtcc.org/pd/tssa/tssa.pdf. Used with permission, April 2010.

EXCERPT FROM THE DRAFT NATIONAL EDUCATION TECHNOLOGY PLAN 2010

Goals and Recommendations

The NETP presents five goals with recommendations for states, districts, the federal government, and other stakeholders in our education system that address learning, assessment, teaching, infrastructure, and productivity. The plan also identifies far-reaching grand challenge problems that should be funded and coordinated at a national level.

1.0 Learning

All learners will have engaging and empowering learning experiences both in and outside of school that prepare them to be active, creative, knowledgeable, and ethical participants in our globally networked society.

To meet this goal, we recommend the following actions:

- 1.1 Revise, create, and adopt standards and learning objectives for all content areas that reflect 21st century expertise and the power of technology to improve learning.
- 1.2 Develop and adopt learning resources that use technology to embody design principles from the learning sciences.
- 1.3 Develop and adopt learning resources that exploit the flexibility and power of technology to reach all learners anytime and anywhere.
- 1.4 Use advances in the learning sciences and technology to enhance STEM (science, technology, engineering, and mathematics) learning and develop, adopt, and evaluate new methodologies with the potential to enable all learners to excel in STEM.

2.0 Assessment

Our education system at all levels will leverage the power of technology to measure what matters and use assessment data for continuous improvement.

To meet this goal, we recommend the following actions:

- 2.1 Design, develop, and adopt assessments that give students, educators, and other stakeholders timely and actionable feedback about student learning to improve achievement and instructional practices.

- 2.2 Build the capacity of educators and educational institutions to use technology to improve assessment materials and processes for both formative and summative uses.
- 2.3 Conduct research and development that explore how gaming technology, simulations, collaboration environments, and virtual worlds can be used in assessments to engage and motivate learners and to assess complex skills and performances embedded in standards.
- 2.4 Revise practices, policies, and regulations to ensure privacy and information protection while enabling a model of assessment that includes ongoing student learning data gathering and sharing for continuous improvement.

3.0 Teaching

Professional educators will be supported individually and in teams by technology that connects them to data, content, resources, expertise, and learning experiences that enable and inspire more effective teaching for all learners.

To meet this goal, we recommend the following actions:

- 3.1 Design, develop, and adopt technology-based content, resources, and online learning communities that create opportunities for educators to collaborate for more effective teaching, inspire and attract new people into the profession, and encourage our best educators to continue teaching.
- 3.2 Provide pre-service and in-service educators with preparation and professional learning experiences powered by technology that close the gap between students' and educators' fluencies with technology and promote and enable technology use in ways that improve learning, assessment, and instructional practices.
- 3.3 Transform the preparation and professional learning of educators and education leaders by leveraging technology to create career-long personal learning networks within and across schools, pre-service preparation and in-service educational institutions, and professional organizations.
- 3.4 Use technology to provide access to the most effective teaching and learning resources, especially where they are not otherwise available, and to provide more options for all learners at all levels.
- 3.5 Develop a teaching force skilled in online instruction.

4.0 Infrastructure

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

To meet this goal, we recommend the following actions:

- 4.1 Ensure that students and educators have adequate broadband access to the Internet and adequate wireless connectivity both inside and outside school.
- 4.2 Ensure that every student and educator has at least one Internet access device and software and resources for research, communication, multimedia content creation, and collaboration for use in and out of school.
- 4.3 Leverage open educational resources to promote innovative and creative opportunities for all learners and accelerate the development and adoption of new open technology-based learning tools and courses.
- 4.4 Build state and local education agency capacity for evolving an infrastructure for learning.
- 4.5 Support “meaningful use” of educational and information technology in states and districts by establishing definitions, goals, and metrics.

5.0 Productivity

Our education system at all levels will redesign processes and structures to take advantage of the power of technology to improve learning outcomes while making more efficient use of time, money, and staff.

To meet this goal, we recommend the following actions:

- 5.1 Develop and adopt a common definition of productivity in education and more relevant and meaningful measures of learning outcomes and costs.
- 5.2 Improve policies and use technology to manage costs including those for procurement.
- 5.3 Fund the development and use of interoperability standards for content, student learning data, and financial data to enable collecting, sharing, and analyzing data to improve decision making at all levels of our education system.

- 5.4 Rethink basic assumptions in our education system that inhibit leveraging technology to improve learning, starting with our current practice of organizing student and educator learning around seat time instead of the demonstration of competencies.
- 5.5 Design, implement, and evaluate technology-powered programs and interventions to ensure that students progress through our K–16 education system and emerge prepared for the workplace and citizenship.

Source: Office of Educational Technology (2010, pp. 10–12), *Transforming American Education: Learning Powered by Technology: National Education Technology Plan 2010, Executive Summary*, <http://www.ed.gov/technology/netp-2010>.