Washington State Educational Technology Plan:

A Blueprint for Washington's K-12 Common Schools and Learning Communities






Dr. Terry Bergeson
State Superintendent of
Public Instruction

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Washington State Educational Technology Plan

A Blueprint for Washington's K-12 Common Schools and Learning Communities

Prepared by
Dennis Small, Educational Technology Program Manager

Education Technology and K-20
Office of Superintendent of Public Instruction

Dr. Terry Bergeson
Superintendent of Public Instruction

Marty Daybell
Chief Information Officer/Deputy Superintendent,
Administration & Operations

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Office of Superintendent of Public Instruction
Old Capitol Building
P.O. Box 47200
Olympia, WA 98504-7200

For more information about the contents
of this document, please contact:
Dennis Small, OSPI
E-mail: dsmall@ospi.wednet.edu
Phone: 360.725.6384

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Executive Summary

In 1994, Washington State issued its first educational technology plan. Since then tremendous changes have occurred in how educational technology—*"the combination of human imagination, inventiveness and electronic tools that transform ideas into reality to meet a need or solve a problem"*—is applied to Washington's learning and teaching needs.

In September 2002, the Superintendent of Public Instruction, Dr. Terry Bergeson, assisted by the Educational Technology Advisory Committee (ETAC), updated the educational technology plan and the vision for the use of educational technology in Washington schools.

Beginning in late 2004, the Office of Superintendent of Public Instruction (OSPI) again began to work with the ETAC to review and update the plan to address new federal requirements created by the No Child Left Behind (NCLB) legislation. The ETAC and its working groups completed their work in December, 2005, which is reflected in this update to the 2002 Washington State Educational Technology Plan: A Blueprint for Washington's K-12 Common Schools and Learning Communities.

Both the 1994 and 2002 plans contained twelve comprehensive recommendations, addressing a wide variety of educational technology issues. The 2005 ETAC recommended that this year's plan focus on only **one** new key initiative:
Establish a holistic technology professional development grant program supported by state or federal funding that ensures that technology essential conditions are in place and provides funding for intensive peer coaching/mentoring support for a minimum of three years (see pages 53-54).

Additional new elements in this updated plan include:

- Washington State's definitions of technology literacy and fluency (pages 18-20), and Indicators of Technology Literacy Tiers (see Appendix F or http://www.k12.wa.us/EdTech/TechLitTiers.aspx);
- Washington State's definitions of technology integration into the curriculum (pages 20-22), and Indicators of Technology Integration Tiers (see Appendix G or http://www.k12.wa.us/EdTech/TechIntTiers.aspx);
- A definition of Technology Essential Conditions which are necessary to support technology integration and literacy (page 22 or http://www.k12.wa.us/EdTech/TechEssCondDef.aspx);
- The relationship between educational technology and Washington's newly-developed Grade Level Expectations (GLEs) (see Appendix C or http://www.k12.wa.us/EdTech/EALR-GLE-Tech.aspx); and

- Ten key strategies identified by the ETAC to support technology integration and literacy (pages 54-56):
  1. *Highlight professional development initiatives that are already underway through the state-funded Educational Technology Support Center (ETSC) Program.*
  2. *Highlight existing connections to statewide curricular initiatives and make new connections.*
  3. *Strengthen existing connections to Professional Growth Plans for educators.*
  4. *Strengthen existing connections to Pre-Service Training of new teachers.*
  5. *Identify and highlight districts that have required technology competencies for educators or use technology integration as an element of teacher observations by administrators.*
  6. *Identify and highlight districts that have required technology literacy courses for students or have aligned their curriculum to NETS Standards.*
  7. *Identify and highlight districts that include technological resources as part of their curriculum adoption cycle.*
  8. *Require districts to address Technology Essential Conditions as part of the 2007-2010 school district technology planning process.*
  9. *Make connections to the Microsoft Partners in Learning "Learning Transformed" Grant awarded to EWU and Cheney School District.*
  10. *Strengthen existing connections to National Board Certification for educators.*

Beginning with the 2006-07 school year, districts will be required to report to OSPI the technology literacy of their 8th grade students and the integration of technology by teachers. Resources to assist districts are under development by OSPI and will be posted online at http://www.k12.wa.us/EdTech/TechRequirements.aspx.

A strong planning process is not a one-time event. Looking to the future, the Educational Technology Advisory Committee will continue developing and evaluating these and related recommendations. The advisory committee will also measure success over time and report to schools, the Legislature, the Superintendent of Public Instruction, and other stakeholders on the continuing technological achievements and challenges in Washington's educational system.

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1.0 Introduction

This section discusses the purpose, background, and organization of the educational technology plan.

1.1 PURPOSE

The purpose of this update to the 2002 educational technology plan is to:

- Meet state and federal educational technology planning requirements.
- Provide a current snapshot on current educational technology progress.
- Identify best practices, resources, and current issues in educational technology.
- Provide guidance to key stakeholders on educational technology implementation.

1.2 BACKGROUND

The Superintendent of Public Instruction must develop and periodically update a statewide educational technology plan with the assistance of an Educational Technology Advisory Committee (ETAC). The planning process evaluates:

- School and school district planning, implementation, and staff training in the use of technology in curriculum, instruction, assessment, and administration.
- The status of electronically connecting school districts, institutions of higher learning, and other sources of online information.
- Equitable methods to increase educational technology use by students and school staff statewide.
- Funding recommendations and requirements for educational technology.

The Superintendent of Public Instruction published the first educational technology plan in 1994, with addenda in 1996 and 2000, and minor draft revisions in 1998. A major reworking of the plan occurred in 2002.

Today the educational technology opportunities and challenges are even greater than they were when Washington's education reform movement was conceived in 1993. Schools have access to a broader and richer variety of educational technology hardware, software, and media resources. However, teachers and students face new teaching and learning standards that demand increasingly effective and appropriate use of educational technology. Providing more hardware is necessary but insufficient. Teachers and their students need the human element as well to make educational technology work effectively—professional development and adequate resources must accompany technology infusion in the classroom.

Educational Technology Planning Process

Several requirements and initiatives drive the need for a state educational technology plan. First, state education reform legislation requires periodically updating the state educational technology plan. In accordance with RCW 28A.650.015, the Superintendent of Public Instruction must "develop and implement a Washington State K-12 education technology plan" that must be updated "on at least a biennial basis" and should be developed "to coordinate and expand the use of education technology in the common schools of the state."

Second, recently enacted legislation under the federal Elementary and Secondary Education Act (ESEA or "No Child Left Behind Act") requires state technology planning in order to receive federal funding under the act. The federal legislation requires Washington to undertake state and district-level technology planning, articulate "technology literacy" for students, and focus educational technology efforts on children in poverty and at-risk of academic failure.

Finally, rapid increases in educational technology development, dissemination, and practice requires a new statewide perspective on how technology is furthering educational goals under Washington's education reform efforts and what issues need to be addressed.

The Superintendent of Public Instruction is required by RCW 28A.650.105 to appoint an Educational Technology Advisory Committee (ETAC) to "assist in the development and implementation of the technology plan" with representatives from a wide range of educational stakeholders. The ETAC met a number of times during 2005, and also established Working Groups to assist in developing recommendations on:

- Student Technology Literacy.
- Technology Integration into the Classroom.
- Technology Essential Conditions.

This report is the result of the sustained dedication of the advisory committee members and its supporting Working Groups. ETAC volunteers have come together on multiple occasions—frequently using videoconferencing technology, electronic mail, and the Internet—to discuss and define how educational technology can and should be used appropriately to improve achievement and lifelong outcomes for students in Washington's public schools. This report is the product of their work.

Appendix A provides additional information on the ETAC membership and the Working Group participants.[1]

1.3 ORGANIZATION OF THIS REPORT

This report will be provided in two alternative formats: a paper report and a companion website.

Paper Report

This paper report describes the findings and conclusions of the Educational Technology Advisory Committee. Specifically, the report describes:

- *Legislative charge*—state and federal requirements that drive the educational technology planning process.
- *Vision*—the Educational Technology Advisory Committee's vision for educational technology.
- *Key Concepts*—the conceptual framework for educational technology in Washington's schools; namely, how educational technology contributes to high performing schools and the interdependent nature of multiple stakeholders in educational technology.
- *State of the State*—district, regional, statewide educational technology initiatives, funding, and policy issues.
- *Gap Analysis*—what the research says and how Washington State compares.
- *Recommendations*—for policy makers, schools, communities, and others.
- *Appendices*—the educational technology planning process, bibliography, relationship of educational technology to education reform standards, 1994 and 2002 technology plan recommendations, current educational technology initiatives, indicators of technology literacy tiers, and indicators of technology integration tiers.

Several conventions are used in the educational technology plan. Most information sources may be found online. Rather than citing Internet addresses repeatedly throughout the document or citing multiple Internet addresses on one page, the endnotes provide an Internet source or a reference source. Additional information is provided in a companion bibliography (Appendix B). The bibliography allows the reader to obtain additional reference information, including Internet address, sponsoring organization, and a brief abstract, and review selected programs and organizations. In limited cases, Internet addresses are provided in the text of the report when an example or information resource may be particularly useful to pursue directly online.

Companion Website

In addition to publishing the paper report, OSPI will also provide a web-based version of the educational technology plan. Besides providing the contents of the paper report of the Educational Technology Advisory Committee, the companion website will provide:

- Links to additional resources.
- Rubrics and assessment tools for the Tiers of Technology Literacy and the Tiers of Technology Integration, along with suggestions on how districts can customize the examples in the tiers to align with district initiatives.
- A rubric of Technology Essential Conditions.
- Links to tools to help guide education leaders, teachers, and administrators through their technology planning process.

2.0 Legislative Charge

This section describes state and federal legislative requirements and associated educational technology resources, including education reform legislation and the federal Elementary and Secondary Education Act (ESEA).

2.1 STATE LEGISLATIVE CHARGE

Educational technology requirements are infused throughout Washington's education reform effort.

Education Reform Legislation [2]

In 1990, with the establishment of the Governor's Council for Education Reform and Funding (GCERF), education reform became a focus for all stakeholders in Washington State. As the Council's subgroups focused on specific topics ranging from learning outcomes to governance, there was an emerging recognition of the critical role technology must play in shaping the system. At the request of the Council, Judith A. Billings, then State Superintendent of Public Instruction, convened an Ad Hoc Technology Task Force to provide the Council with recommendations regarding the role technology should play in education reform.

The Council incorporated many of the ad hoc task force's recommendations into their report to the legislature. The GCERF recommendations to the legislature included initial recommendations for $50 million during the 1993-95 biennium to build technology infrastructure and support local district efforts in technology.

During the 1993 legislative process, the GCERF report evolved into Engrossed Substitute House Bill (ESHB) 1209, which was enacted by the Washington State Legislature. Washington's 1993 Education Reform Act required the development of academic content standards for all students in eight core content areas which included: reading, writing, communications, mathematics, science, social studies, the arts, and health and fitness. The Commission on Student Learning developed the process for developing these content standards and the system for assessing student progress towards meeting these requirements. The 1993 law required the establishment of timelines for the development of the academic content standards (Essential Academic Learning Requirements—EALRs) and an aligned assessment system. As required by this legislation, the full implementation of the statewide standards and assessment system was effective in 2000.

As required by the state's education reform legislation, the Commission created eight subject advisory committees to develop the EALRs in the eight core content areas. Each group was composed of public and private school educators, parents, community members, business people, and high school students. More than 400 people participated in the development of these academic content standards.

After their initial development, the EALRs were presented in a number of public forums for review, discussion and revision. The outcome of these thoughtful public debates and research reviews was the 1995 formal adoption of the reading, writing, communication, and mathematics EALRs. By 1998 the remaining four content area Essential Academic Learning Requirements were adopted. During the last seven years, minor edits have been made in all of the academic content standards. Like the initial development phase, these have occurred through a process where a representative group reviewed and implemented changes. These changes were then reviewed by the greater public and put into place.

Since 1995, Washington has had in place academic content standards (EALRs) in reading, writing, communications, and mathematics. The standards were developed for all children at three grade spans (elementary, middle/junior high, and high school). Specific benchmark and component level requirements on what children should know and be able to do are defined in each subject area. The standards are rigorous and require higher level thinking on the part of all students. The Washington Assessment of Student Learning is administered annually to students in grades four, seven, and ten to assess student achievement in relation to these benchmarks. In the past few years, Grade Level Expectations (GLEs) for implementing these EALRs have also been developed.

The Washington State Legislature, through the 1993 Education Reform Act (ESHB 1209), also directed the Superintendent of Public Instruction to develop a state technology plan for K-12 schools with the assistance of a statewide Educational Technology Advisory Committee (ETAC).[3] Past efforts have included integrating technology into the EALRs and identifying statewide technology development requirements in support of education reform efforts. The link between the EALRs, GLEs and educational technology are shown in Appendix C.

The 1994 state educational technology plan described a number of initiatives underway at that time in support of education reform efforts, including:

- Technology support to school districts through the Educational Technology Support Centers in each of the nine educational service districts (ESDs).
- Enhancement of the statewide data network.
- Networking consultants for districts.
- Interactive videoconferencing services.
- Online curriculum projects.
- Fiscal allocations to schools for educational technology investments.

The 1994 state plan provided 12 recommendations pertaining to educational technology policies, resources, and implementation. These 12 recommendations (see Appendix D) addressed leadership, resource, and implementation issues. The 12 recommendations from the 2002 state plan (also in Appendix D) addressed standards and professional development, fiscal policy and strategic funding, and learning and teaching support. Section 6 provides a progress review and examines the status both the 1994 and 2002 recommendations.

2.2 Elementary and Secondary Education Act (ESEA)

H.R. 1, the "No Child Left Behind (NCLB) Act," passed by Congress in late 2001 and also known as the re-authorized Elementary and Secondary Education Act (ESEA),[4] has significant policy and fiscal implications for educational technology planning. The major focus of the ESEA is to provide all children with a fair, equal, and significant opportunity to obtain a high quality education. The act is based on four conceptual "pillars:"

1. Accountability
2. Flexibility
3. Research-based Education
4. Parent Options

The following section provides a brief overview of the section of the federal legislation that provides direct funding for educational technology.[5] Additional funding information is provided in Section 5.2, Funding.

Title II, Part D: Enhanced Education Through Technology

Title II, Part D—preparing, training, and recruiting high-quality teachers and principals—provides funding for Enhancing Education Through Technology (EETT).[6] Technology funding is provided through a state formula, as well as through competitive grants. Funds may be used for promoting state and local technology initiatives to increase student achievement, increasing access to technology, and improving and expanding teacher professional development in technology.

Fifty percent of the available local education agency (LEA) technology funds are distributed to eligible applicants on a formula basis, and a minimum of 25 percent of these funds must be spent on professional development. The remaining 50 percent are used for a competitive grants program. During the 2005-2006 school year, these funds are supporting schools' participation in the "NO LIMIT" Project (New Outcomes and Learning Improvement in Mathematics, Integrating Technology). The project goal is to improve proficiency for middle school mathematics students in high poverty, high need schools.

The NO LIMIT project develops classroom models where middle school students are using technology-infused, project-based learning to improve their achievement in mathematics. Performance indicators of successful implementation have been developed and are being evaluated by the Woodring Applied Research and Development Center at Western Washington University (WWU).

Washington's goal for the allocation portion of the grant is for more teachers to be trained in the integration of technology into the curriculum, increase their use of research-based project models, and increase student technology literacy. However, with an average allocation of about $3 per student, OSPI's expectations are modest.

3.0 A Vision for Educational Technology

Although meeting state and federal educational technology planning requirements is essential, the 2002 ETAC adopted a broader vision for Washington's continuing educational technology development, which the 2005 ETAC also endorsed. This section describes the advisory committee's vision statements and the singularly important definition of "educational technology."

3.1 VISION AND BELIEF STATEMENTS

Expanded Version

In a society increasingly dependent on information and knowledge, equitable and universal access to technology, media and information resources is essential to the learning process. With access to and proficiency in the use of these tools, and with the guidance of skilled educators and community members, all students have the opportunity to become actively engaged and take responsible roles in their learning as they think, create, conduct inquiries, solve problems and communicate in individual, collaborative and interdisciplinary settings.

As a result, students emerge as lifelong learners, productive members of the workforce, and citizens that can effectively contribute to our democratic way of life.

Short Version

Education today requires the knowledge and skills to utilize technology, and equitable and universal access to it.

3.2 EDUCATIONAL TECHNOLOGY DEFINED

While technology*, in its broadest sense, can be defined as "the practical application of knowledge" (from Webster's online dictionary), in this document we define* educational technology *to be "the combination of human imagination, inventiveness and electronic tools that transform ideas into reality to meet a need or solve a problem."*

Educational technology includes hardware (computers, handheld devices, printers, digital cameras), software and content applications (programming classes, productivity software), and media (the Internet and videoconferencing).

Educational technology may be applied in several ways:

- For learning and academic achievement in the classroom—curriculum and instruction.
- For sharing information and best practices—professional development through regional, statewide, and federal initiatives and funding sources.
- For monitoring and diagnosing student achievement and professional development—assessment and reporting of results, interactive (online) information resources on school characteristics, and analytic tools.
- To facilitate school administration and organizational effectiveness—grade checkers, productivity software, attendance monitoring, compiling information, and communicating with students, peers, administrators, parents, and others.

Stated simply, educational technology is not computers, software, and the Internet. Educational technology is, ultimately, "*the combination of human imagination, inventiveness and electronic tools that transform ideas into reality to meet a need or solve a problem."*

4.0 Key Concepts for Educational Technology

This section discusses the conceptual relationship between educational technology and high performing schools, OSPI's strategic planning goals, the interdependent nature of key stakeholders involved in educational technology, and related key concepts that have guided the ETAC throughout the educational technology planning process. Overall, this section of the educational technology plan emphasizes:

- Relating educational technology goals to the characteristics of high performing schools and to OSPI's strategic planning objectives.
- Underscoring the interdependent nature of stakeholders involved in educational technology planning, including policy makers, school educational leaders, educators, other staff, and the local teaching and learning communities.
- Endorsing learning and teaching philosophies that support the appropriate and effective integration of educational technology into curriculum, instruction, and assessment practices.
- Defining technology literacy and fluency, technology integration, and technology essential conditions.

4.1 EDUCATIONAL TECHNOLOGY AND HIGH PERFORMING SCHOOLS

The 2002 ETAC reviewed several conceptual frameworks and examined their applicability to Washington State's technology planning process. Such frameworks help policy makers and educators evaluate educational technology in general and the progress of schools and district educational technology efforts in particular. The advisory committee reviewed several frameworks for their potential applicability to Washington's efforts. Key frameworks included:[7]

- The Milken Foundation's "7 Dimensions for Gauging Progress" (Lemke and Coughlin, 1998).
- The North Central Regional Educational Laboratory's enGauge framework that outlines "Six Essential Conditions for the Effective Use of Technology in Learning."[8]
- OSPI's "Nine Characteristics of High Performing Schools."
- The CEO Forum's interactive "School Technology and Readiness (StaR) Chart."[9]

For instance, the Milken Foundation's "7 Dimensions for Gauging Progress" considers the role of educational technology in terms of:

1) Learners;
2) Learning Environments;
3) Professional Capacity;

4) System Capacity;
5) Community Connections;
6) Technology Capacity; and
7) Accountability.

A conceptually strong framework should be based on empirical research that clearly identifies critical factors related to the successful application of educational technology. It should allow policy makers, educators, and other stakeholders to examine the key dimensions of educational technology, for instance, "Professional Capacity," and then provide specific measures to assess Washington State's particular strengths or limitations in this area.

The advisory committee focused on OSPI's "Nine Characteristics of High Performing Schools" due to its unique application to Washington's education reform efforts, the complementary relationship of educational technology and the nine characteristics, and the advisory committee's explicit goal to link educational technology to student achievement, i.e., high performing schools within the context of Washington's education reform efforts. High performing schools have:

1. *A clear and shared vision and purpose.*
2. *High standards and expectations for all their students.*
3. *Effective leadership in both instructional and administrative areas.*
4. *High levels of teamwork.*
5. *Aligned their curriculum and instruction with the state standards and assessments.*
6. *Closely monitored teaching and student progress.*
7. *Emphasized professional development.*
8. *A supporting learning environment.*
9. *A high level of community involvement.*[10]

The "Nine Characteristics of High Performing Schools" is based on OSPI's evaluation of 20 recent research studies that examined the common characteristics of high performing schools. Several studies were reviews of other research that has taken place over many years on the same topic, while others examined these schools in specific settings and locations, such as high performing elementary schools in a large urban setting. This body of research represents findings from both Washington State and around the nation.

OSPI staff analyzed the studies to determine what characteristics were found most often among high performing schools. Performance was usually measured in terms of high or dramatically improving scores on standardized tests, often in difficult circumstances such as high levels of poverty. In every case, there was no single factor

that accounted for the success or improvement. Instead, the research found that high performing schools tend to have a combination of common characteristics. Some reports found as few as five characteristics, while others found many more. OSPI's analysis of these characteristics narrowed these lists into nine areas.

By focusing educational technology on the dimensions of high performing schools, the ETAC addresses a recurring issue that has faced educational technology throughout Washington's education reform efforts, namely, *"How does educational technology contribute to a successful school, and under what conditions?"*

4.2 EDUCATIONAL TECHNOLOGY AND OSPI STRATEGIC GOALS

Another key concept is the linkage of the educational technology planning process with OSPI's strategic goals. OSPI, through its strategic planning process, has developed several overarching goals that provide a state-level perspective on Washington's educational strategy. The four goals are:

1. *All students demonstrate high levels of achievement in the four state learning goals,*[11] *and successfully graduate from high school.*
2. *All students in Washington have high quality educators, staff and educational leaders supporting their success.*
3. *All students learn in a safe, civil, healthy, and engaging environment.*
4. *All Office of Superintendent of Public Instruction (OSPI) staff use integrated, sound management and operational practices to ensure excellence in internal and external customer services.*

The educational technology planning process takes these goals into consideration. In summary, Table 4.1 shows the relationship between OSPI's strategic planning goals, the nine characteristics of high performing schools, and educational technology.

Table 4.1. Educational Technology's Contribution to Nine Characteristics of High Performing Schools and OSPI Strategic Goals

Strategic Goal	Characteristics of High Performing Schools	Educational Technology Contribution
Goal 1—All students demonstrate high levels of achievement in the four state learning goals and successfully graduate from high school.	Clear and Shared Focus	• Provide effective media to communicate expectations to students and to promote student "buy-in" to clear and shared focus
	High standards and expectations for all students.	• Support achievement of Essential Academic Learning Requirements • Provide "technology literacy" for 21st century citizens
	Curriculum, instruction, and assessment aligned with standards	• Support content delivery and enhancements • Facilitate gathering, analyzing, and synthesizing assessment data in meaningful ways
	Frequent monitoring of learning and teaching	• Make monitoring less burdensome and more focused • Provide diagnostic tools for learners
Goal 2—All students in Washington have high quality educators, staff and educational leaders supporting their success	Clear and Shared Focus	• Communicate expectations to educators, staff, and educational leaders • Support "buy-in" to clear and shared focus
	Effective school leadership	• Define the critical role of technology literacy for successful 21st century educators and educational leaders
	High levels of collaboration and communication	• Make collaboration and communication more effective and efficient
	Curriculum, instruction, and assessment aligned with standards	• Support content delivery and enhancements • Facilitate gathering, analyzing, and synthesizing assessment data to inform instructional practice
	Frequent monitoring of learning and teaching	• Provide diagnostic recommendations for instructional strategies
	Focused professional development	• Facilitate gathering, analyzing, and synthesizing assessment data to inform professional development • Enhance professional development delivery
Goal 3—All students learn in a safe, civil, healthy, and engaging environment	High levels of collaboration and communication	• Enhance collaboration and communication for students with special needs students and multiple learning styles
	Supportive learning environment	Provide appropriate: • Delivery of learning resources • Delivery of support resources
	High level of family and community involvement	• Enhance family and community outreach strategies to facilitate interaction and meaningful participation

Strategic Goal	Characteristics of High Performing Schools	Educational Technology Contribution
Goal 4—All OSPI staff use integrated, sound management and operational practices to ensure excellence in internal and external customer services	Clear and shared focus	Provide: • School Improvement Planning Web Tool • Report Card Web Site • Possible statewide educational portal
	High levels of collaboration and communication	Provide: • Core Student Record System/Electronic Data System/Assessment Information • Certification Project/Professional Growth Plans • OSPI electronic communications and updates
	Curriculum, Instruction and Assessment Aligned with Standards	Provide: • Online Curricular, Instruction, and Assessment Resources • Sharing of exemplary materials developed by fellow educators, peer review opportunities
	Focused Professional Development	Provide: • Technical support and responses to frequently asked questions • Research for educators and educational stakeholders on effective practices • Clearinghouse of professional development opportunities

4.3 INTERDEPENDENT STAKEHOLDERS AND SYSTEMS

Multiple stakeholders are involved in educational technology. The primary stakeholders are:

- *Policy makers*, including state and federal legislators and other policy makers.
- *Funders*, including state and federal legislators, philanthropic organizations, and the business community.
- *Certification and professional development providers*, including schools of education and in-service and continuing education providers.
- *School educational leaders*, including school boards, superintendents, principals, curriculum, instruction, and assessment specialists, and other administrative professionals.
- *Teachers.*
- *Students*, including special need populations such as special education, bilingual, low income, migrant, and Native American students.
- *Network administrators.*

- *Parents and community members.*
- *Lifelong learning providers*, including community and technical colleges, and universities.

Each stakeholder brings a unique perspective. The educational technology plan recognizes the unique perspectives of multiple stakeholders and their interdependence. For each stakeholder group, the ETAC seeks to convey three fundamental objectives: *Engage, enable, and empower:*

- *Engage* stakeholders in educational technology.
- *Enable* stakeholders to adopt appropriate technology suited to their particular needs and strengths.
- *Empower* stakeholders with the essential leadership, resources, and encouragement to succeed.

4.4 Teaching Philosophy Matters When it Comes to Educational Technology

Another key concept is teaching philosophy. Teaching philosophy matters when it comes to effective and appropriate educational technology use. The two philosophical poles are “instruction” versus “construction,” or, in the case of educational technology, “learning ‘from’ computers” versus “learning ‘with’ technology” (Ringstaff and Kelley, 2002). Table 4.2 shows some of the principal differences between a transmission pedagogy (instruction) versus a constructivist (construction) pedagogy.

Table 4.2. Teaching Philosophies

Activity and Roles	Teaching Philosophies	
	Instruction	**Construction**
Classroom activity	Teacher-centered, didactic	Learner-centered, interactive
Teacher role	Fact teller, always expert	Collaborative, sometimes learner
Student role	Listener, always learner	Collaborator, sometimes expert
Instructional emphasis	Facts, memorization	Relationships, inquiry and investigation
Concept of knowledge	Accumulation of facts	Transformation of facts
Demonstration of success	Quantity	Quality of understanding
Assessment	Norm-referenced	Criterion-referenced, portfolios and performance
Technology use	Drill and practice	Communication, collaboration, information access, expression

Source: Sandholtz, Ringstaff, and Dwyer (1997): cited in Ringstaff and Kelley (2002)

Constructivism is a learning theory that claims that understanding "comes from a person's effortful activity to integrate newly communicated claims and ideas with his own prior beliefs and understandings" (Becker, 2000: 11). The two pedagogical underpinnings for a constructivist approach are 1) attending to the "meaningfulness" of instructional support for each student that matches the student's personal experience, and 2) developing a student's capacity to understand a subject deeply enough so the student knows when and how to apply knowledge to a particular circumstance.

Henry Jay Becker's review of the 1998 Teaching, Learning, and Computing (TLC) survey, administered to 4,000 teachers in over 1,100 schools nationwide, showed that there is a strong relationship between teachers' general philosophical viewpoint about what constitutes good teaching and the particular objectives they view as most important in using computers with students. Specifically, Becker's (2000) analysis of the TLC survey found statistical relationships in teachers' responses between philosophical preference (transmission-oriented teaching versus constructivist compatible teaching), objectives for computer use, and the types of software used frequently with students.[12] Computer-using teachers are more likely to have a constructivist philosophy than non-using teachers (Becker, 2000).

While recognizing that no "one size fits all," especially when it comes to teaching philosophy, certain teaching philosophies may enable a more appropriate and effective teaching strategy (or set of strategies) with educational technology. Some researchers express their preference for a constructivist or student-centered approach as "better suited to fully realizing the potential of computer-based technology" (Ringstaff and Kelley, 2002: 2; see also Becker, 2000; Becker, 1999).

Other researchers take a more embracing perspective. The Metiri Group developed a "range of use" chart to "help educators 'see' that:

- instructional approach, level of challenge, and authenticity matter;
- low performing students don't have to be relegated to drill and practice, or integrated learning systems, but can learn the basics as they engage across a range of uses; and
- all uses are valide [sic] provided they truly meet learners' needs."[13]

Certain instructional approaches to learning may better lend themselves to educational technology applications than others. On one end of the spectrum, a didactic learning approach may favor drill and practice so elementary students can learn computer basics. A middle ground approach may entail coaching students through appropriate computer-based applications. Finally, a constructivist learning approach may emphasize higher order thinking skills at the high school level, for instance, problem solving with real data sets on the Internet.

To summarize, instead of asking what kind of educational technology a teacher requires, the question might be more appropriately framed as, *"What is the school's teaching philosophy and how can educational technology most effectively address students' needs within that philosophical framework?"*

4.5 DEFINITIONS OF TECHNOLOGY LITERACY AND FLUENCY

One of the goals of Title II, Part D of the No Child Left Behind Act of 2001 (NCLB) is to assist every student in crossing the digital divide by ensuring that every student is technologically literate by the time the student finishes the eighth grade, regardless of the student's race, ethnicity, gender, family income, geographic location, or disability. Defining technology literacy, though, was left up to each state.

In 2002, the State Educational Technology Directors Association (SETDA) convened a Technology Literacy Assessment (TLA) Work Group at its 2002 National Leadership Institute (NLI) to establish a shared definition of technology literacy for states to use as a starting place for their state-specific definition and guidelines. The 2005 Washington State Technology Literacy for Students Working Group used this common definition as a starting place for its work:

> ***"****Technology literacy is the ability to responsibly use appropriate technology to communicate, solve problems, and access, manage, integrate, evaluate, and create information to improve learning in all subject areas and to acquire lifelong knowledge and skills in the 21st century."*[14]

The Technology Literacy Working Group also re-visited the Seven Essential Learnings for Technology from the 1994 Washington State Technology Plan[15] and the Technology Foundation Standards for Students adopted in the 2002 Washington State Educational Technology Plan[16] from the National Educational Technology Standards (NETS) for Students[17]. In addition, they reviewed the work of the Partnership for 21st Century Skills (2003)[18], the "Digital Transformation: A Framework for ICT Literacy" report by the Information and Communication Technologies (ICT) Panel (2002)[19], and a number of resources from school districts in Washington and other states and countries.

As a result, the Working Group concluded that technology literacy should not be limited to primarily the mastery of technical skills, but needed to be broadened to include general literacy skills, as well as critical thinking and problem solving. As a result, they expanded the definition to include "technology fluency", drawing upon the work of the National Resource Council in the publication Being Fluent with Information Technology:

> *"People fluent with information technology are able to express themselves creatively, to reformulate knowledge, and to synthesize new information. Fluency with information technology entails a process of lifelong learning in which individuals continually apply what they know to adapt to change and acquire more knowledge to be more effective at applying information technology to their work and personal lives."*[20]

Definitions of Technology Literacy and Fluency

Technology literacy is the ability to responsibly, creatively, and effectively use appropriate technology to:

- communicate;
- access, collect, manage, integrate, and evaluate information;
- solve problems and create solutions;
- build and share knowledge; and
- improve and enhance learning in all subject areas and experiences.

Technology fluency builds upon technology literacy and is demonstrated when students:

- apply technology to real-world experiences;
- adapt to changing technologies;
- modify current and create new technologies; and
- personalize technology to meet personal needs, interests, and learning styles.

4.6 Definition of Technology Integration

One of the challenges in the effective use of educational technology is the lack of a common understanding of what it "looks like" when it is integrated in the curriculum. For example, when school principals in one state were surveyed to determine the extent of technology integration in the curriculum in their schools, the following responses were cited as examples of integration:

- use of an integrated learning system in a subject;
- allowing, encouraging, or requiring students to use word processing and presentation software in reports and displays;
- requiring papers to be done on a word processor;
- using presentation software and projection technology for teacher presentations; and
- using computers for on-line testing and analysis of test results[21].

Although requiring students to use word processors or other software can increase their literacy and technology skills, it is only a part of technology integration. Similarly, although access to online information sources can assist students in enriching their projects, it also is only one step toward integration. Teaching students how to use electronic presentation tools can be a powerful aid to improving students' communication skills, yet this too is only partial integration. The use of computer

programs **alone** is not the full definition of integration, and the use of it does not mean that technology integration has fully occurred. Technology integration is occurring if:

- teachers are trained in a full range of technology uses and in the determination of their appropriate roles and applications;
- teachers and students routinely turn to technology when needed; and
- teachers and students are empowered and supported in carrying out those choices.

Under these conditions, the potential of digital technologies to improve teaching and learning is likely to be realized.[22]

In an overview of the status of the integration of instructional technology in public education, Earle writes: "[Technology] Integration is defined not by the amount or type of technology used, but by how and why it is used." (Rodney Earle, 2002) [23] Thus, as educators in the state of Washington met to define technology integration, they chose to do in the context of describing the "Elements of Powerful 21st Century Learning Environments."

Elements of Powerful 21st Century Learning Environments[24]

- Educators use technology to create rich environments where student work shows evidence of conceptual understanding beyond recall.
- Educators use technology to encourage students to engage in activities that develop understanding and create personal meaning through reflection.
- Educators use technology to provide opportunities for students to apply knowledge in real world contexts.
- Educators and students incorporate suitable technology to engage in active participation, exploration, and research.
- Educators use technology to provide diverse and culturally relevant experiences to help students develop an understanding of our world.
- Educators use technology to enhance and differentiate instruction in order to present students with a challenging curriculum designed to help each individual student develop a depth of understanding and critical thinking skills.
- Educators use technology for meaningful assessment data that informs their practice and allows students to exhibit higher order thinking and to demonstrate knowledge.
- Educators use and facilitate student use of technology to communicate, collaborate, and create communities with educators, parents, students, and additional stakeholders.

The phrase “use technology” should be seen as a continuum of constantly increasing skills that employs the appropriate cognitive demand as defined in Bloom’s Taxonomy and includes concepts such as: incorporate, exploit, leverage, employ, etc.

All of the above components are in support of Washington State’s learning goals and the state Essential Academic Learning Requirements and Grade Level Expectations.

4.7 Definition of Technology Essential Conditions

The powerful teaching and learning activities described above depend on more than just the technology. Certain conditions are necessary for schools to effectively use technology for learning, teaching, and educational management. Physical, human, financial, and policy dimensions greatly affect the success of technology use in schools.

A combination of **Technology Essential Conditions**[25] are required to create equitable learning environments conducive to powerful uses of technology[26], including:

- Forward-Thinking, Shared Vision
    - Vision, Planning, and Policy
    - Student Technology Literacy Standards
    - Technology Standards for Teachers
    - Technology Standards for Education Leaders & Staff
    - Community Connections
- Technology Administration and Support Focused on Teaching and Learning
    - Technology Support
    - Instructional Technology Staffing
    - Adequate Ongoing Funding
    - Electronic Data Support Systems
- Technology Capacity, Equity, & Access to Support Teaching and Learning
    - Student Access to Technology
    - Teacher/Education Leader/Staff Access to Technology
    - Aligned Curriculum-based Tools & Online Resources
    - Network Capability/Internet Access/Video Capacity
- Leadership and Professional Development to Improve Teaching and Learning
    - Leadership/Learning Community
    - Technology Professional Development Plan & Funding
    - Models & Content of Professional Development
- Student-Centered 21st Century Learning Environment
    - Student Use of Technology
    - Technology Integration

5.0 State of the State

This section discusses the state of educational technology in Washington State, including statewide technology dissemination since education reform was initiated in Washington State, district initiatives, regional and statewide initiatives, and activities underway at the state level by OSPI and the Governor. Funding is derived from a variety of local, state, federal, and private sources.

5.1 WASHINGTON HAS MULTIPLE EDUCATIONAL TECHNOLOGY INITIATIVES UNDERWAY

Multiple educational technology activities are underway and under development throughout Washington State at the school building, district, regional, state, and federal levels. Many of these efforts involve public and private partnerships.

Multiple stakeholders are involved in various educational technology initiatives. Although an exhaustive program listing is beyond the scope of the educational technology plan, the initiatives described here provide a sense of the depth, breadth, and heterogeneous nature of educational technology initiatives currently underway in Washington State. Appendix E, Educational Technology Initiatives, provides an overview of the initiatives. Appendix B, Bibliography, provides additional information on program sponsorship and specific activities. Individual initiatives vary greatly in terms of:

- Program scope.
- Program content, e.g., math skills development versus assistive technology applications for disabled students.
- Targeted populations (primarily teachers and students, but also involving network administrators, school educational leaders, policy makers, and researchers).
- Overall funding, funding methods, and funding support over time.
- Implementation timeframe.
- Specific technology applications.

This high degree of variability highlights the need for a dynamic statewide process to align current educational technology initiatives so that schools, policy makers, and other stakeholders can assess progress effectively.

Another issue is the degree of overlap and unique features of individual initiatives. As shown in Table 5.1, four categories are used to disaggregate somewhat the various program initiatives:

1. *Learning and Teaching Initiatives*—these initiatives include teacher and student applications, Internet and other educational technology resources, and program content and delivery strategies.
2. *Professional Development to Support Technology Integration into Curriculum and Instruction*—a particular focus is on teacher professional development strategies to infuse educational technology into curriculum and instructional practice.
3. *Networking and Connectivity*—primarily focuses on describing the current status of the K-20 Educational Telecommunications Network.
4. *Technology Support for Education Reform*—describes not so much the application of educational technology *per se*, but instead focuses on how technology is being applied to address education reform objectives statewide through classroom, district, regional, and statewide school improvement planning tools, assessment tools, and Web-based information relating to Washington's education reform efforts.

Generally, the initiatives described have statewide applicability, are supported through dedicated funding at the state, federal, or foundation level, and have been implemented for a minimum of two years.

Table 5.1. Educational Technology Initiatives in Washington State

Initiative	Short Description	Sponsors				
		School Districts, ESDs	State	Federal	Private	Other Partnerships
LEARNING AND TEACHING INITIATIVES						
Assistive Technology Projects	Includes the SRVOP Project for deaf children, their families and educators; the Technology and Learning Disabilities Project; and the Washington Assistive Technology Alliance	✓		✓		✓
Digital Learning Commons	Web-based portal where students and teachers have access to high quality digital resources, teaching and learning tools, and online courses	✓	✓		✓	
Generation YES Project	Students collaborate with teachers in restructuring education through educational technology	✓			✓	
High Tech Learning Centers	Information technology (IT) education leading to industry certification and/or higher education	✓				
MarcoPolo Online Resources	Internet content developed by experts for K-12 classroom applications	✓	✓		✓	
NO LIMIT Project	Improve math skills through technology integration	✓		✓		
Online Buying Cooperatives	Product purchases through ETSC program	✓	✓			
Online Courses	Online courses offered through districts	✓				
ProQuest Online Database	Access to over 3,000 magazine titles and various newspapers and databases	✓			✓	✓
SHARE Project	Multiple schools involved in providing online communication, newsletters, research, web-page development, publication of student work, project-based curriculum	✓				

Initiative	Short Description	Sponsors				
		School Districts, ESDs	State	Federal	Private	Other Partnerships
UW Distance Learning Courses	Distance education to provide college-level courses for K-12 students, and related online course development		✓			✓
Washington State LASER	K-8 science education reform initiative	✓	✓	✓		✓
PROFESSIONAL DEVELOPMENT TO SUPPORT TECHNOLOGY INTEGRATION						
ETSC Program	Support OSPI-directed technology initiatives; Collaboration; Professional development; Information dissemination; Support regional technology leadership and district technology planning.	✓	✓			
PILOT Tool	Professional development, assessment, information sharing	✓	✓			
NETWORKING AND CONNECTIVITY						
The K-20 Network	High-speed educational telecommunications network	✓	✓			
Internet 2 ("Abilene")	Next generation Internet					✓
TECHNOLOGY SUPPORT FOR EDUCATION REFORM						
Online Statewide Educational Standards	Essential Academic Learning Standards (EALRs) and GLEs online		✓			
Report Card Web Site	Online application for researching and evaluating education data, including demographic and test score information		✓			
School Improvement Planning Web Tool	Collect and analyze data to determine the effectiveness of school programs and services		✓			

Note: Initiatives listed in alphabetical order.

5.2 EDUCATIONAL TECHNOLOGY FUNDING IS DERIVED FROM MULTIPLE SOURCES

This section provides a review of funding for educational technology along with recent state and federal allocations earmarked specifically for educational technology purposes. Although there are no comprehensive statewide data on funding sources and total expenditures for educational technology in Washington State, survey findings from the Technology Alliance and OSPI provide some data on funding practices and overall expenditures.

Overview of Educational Technology Funding

The tremendous advancement in educational technology from 1994 to present is no doubt due to funding from a variety of public and private resources.

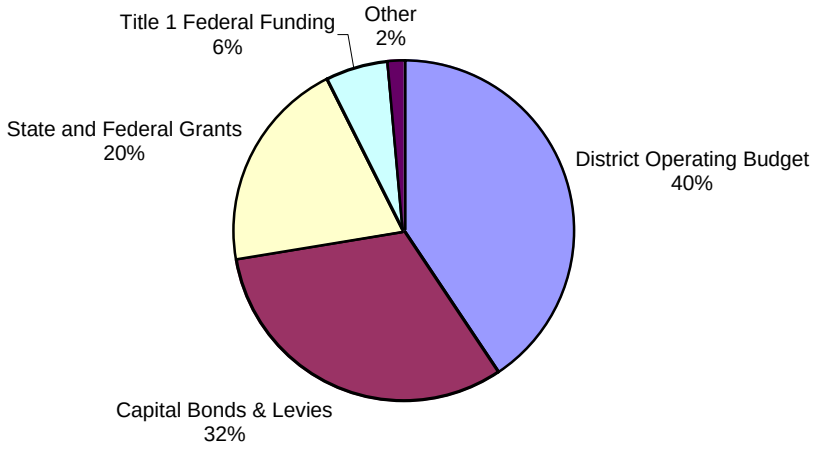
In a survey conducted by the Technology Alliance (1998), districts reported that educational technology funding was derived from several local, state, and federal sources (*Figure 5.1*).

In 2000, per-pupil spending on educational technology in Washington State averaged $120, down slightly from $133 in 1998. There is a very wide range in the per-pupil amount, from $8 per pupil to $667 per pupil. District operating budgets provide the largest single source of funding for educational technology, followed by bonds and levies. Districts with higher per-pupil property assessments continue to be more likely to spend more per student than those with lower per-pupil property assessments (Friedman and Erickson, 2000).

Overall, about one in four districts (28 percent) considered less than half of their funding to be secure. On the other hand, 32 percent of districts considered most of their funding to be secure, a significant improvement since 1998 (Friedman and Erickson, 2000).

In terms of district spending priorities, national data suggest that funding for professional development should be a priority yet most funding is devoted to hardware (67 percent) and software (20 percent), with about 14 percent going to staff development (Education Week, 2002). Educational technology experts suggest the opposite: “Organizations should spend 30 percent of their technology budget on equipment and 70 percent on the ‘human infrastructure’ to support ongoing training and technical assistance” (White, Ringstaff, and Kelley, 2002: 5).

Figure 5.1. School Educational Technology Funding Sources



Source: Technology Alliance (1998). Based on a fax-back survey to Washington's 296 school districts. 227 districts responded, a response rate of 78 percent representing 82 percent of total state enrollment.

Local Funding for Educational Technology

Local funding, including capital bonds and levies, is the second largest source of educational technology funding.

Bonds and Levies

Article 7 of the State Constitution and chapter 84.52 RCW give school districts authority to levy property taxes. There are four types of levies:

1) Excess general fund levies
2) Debt service fund levies
3) Transportation vehicle fund levies
4) Capital project fund levies

The voters of the school district must approve such levies by a 60 percent "Yes" vote in a district-wide election. School districts may run a levy for a particular fund only two times in a calendar year. Unsuccessful levies may be resubmitted in subsequent years (Bigelow, Jones, and Stead, 2002).

Excess general fund levies are used for day-to-day operations of the schools, commonly known as school district maintenance and operation (M&O) levies. M&O levies can be used to pay for training, to finance the purchase of instructional materials including software and other computer-related materials, and to replace equipment including hardware (Technology Alliance, 1998). The majority of local funding for school district

maintenance and operations (M&O) is derived from local tax levies. Statewide, local sources provided over 19 percent of school district revenues in the 2000-01 school year, with levy proceeds comprising most of this funding (Bigelow, Jones, and Stead, 2002).

The major source of support for acquiring educational technology for the classroom, besides reprioritizing within general apportionment, has been the local special property tax levy (special levy). School districts are authorized to propose to local voters special levies for maintenance and operations purposes, capital projects, or other more specific purposes. Both maintenance and operations and capital projects special levies may be used by a school district to meet its needs for digital technology. In fact, a number of school districts have gone to their voters and received permission to collect additional revenues solely to support additional technology. This practice has led to a disparity among school districts in acquiring digital technology based on the willingness of the local taxpayers to approve special levies and the availability of private funds.

In addition to M&O levies, districts have the authority to raise levies for debt service, capital projects, and transportation needs. Other local revenue is derived from timber excise tax, school lunches, investment earnings, various fees, interdistrict cooperatives, grants, and donations.

Capital levies can be used to pay for school construction or remodeling. Computers are considered to be a type of equipment and computer acquisition is permissible. However, such bond proceeds may not be used to replace equipment. Two to six-year capital levies may be used to buy computers apart from a construction project if the acquisition is part of a system upgrade. Library, text, and reference books in digital format may be purchased as part of a construction project. Capital levies may also be used to finance the modernization of a computer system or facility (Technology Alliance, 1998).

The supermajority requirement of 60 percent further limits the ability of districts to raise revenues for educational technology initiatives. In 2001, 275 of the state's 296 school districts passed General Fund M&O levies. The average revenue per Full Time Equivalent (FTE) student statewide was $1,105. Seventeen districts did not submit a levy. Four districts attempted levies for 2001 but failed to gain voter approval (Bigelow, Jones, and Stead, 2002).

Capital bonds and levies provide a significant source of funding for school district educational technology efforts; however, capital bonds and levy funding may be regarded as unstable and limited in terms of what type of educational technology efforts may be pursued.

Capital bonds and levies have other major limitations as funding sources, because legal opinions and school district interpretations of state laws have tended to limit these expenditures to initial hardware purchases, or to hardware bundled with pre-installed software. This often means that important needs such as staff development, maintenance and technical support are inadequately funded, leading to ineffective use of the technology or computers sitting unused. Many school districts in economically

depressed regions are not able to get voter approval for local bonds and levies. Therefore, there tends to be educational technology inequities between districts in technology expenditures, and consequently in the quality and quantity of technology programs available for instructional purposes.

At the policy level, persistent differences between high valuation and low valuation districts may create educational technology adequacy and equity issues, especially as poorer districts try to play “catch-up” with their more affluent counterparts. The Technology Alliance 1998 survey and a follow-up survey in 2000 found a positive correlation between district property values and technology spending per pupil and a negative correlation between student participation in the free and reduced-price lunch program and technology spending. That is, wealthier districts and those with fewer children in the free and reduced-price lunch program tend to make higher per-pupil expenditures on educational technology (Technology Alliance, 1998; Friedman and Erickson, 2000).

State Funding for Educational Technology

Washington State has a long history of supporting educational technology, including:

- In-service training for educational technology instruction.
- Ongoing support for Educational Service District educational technology programs through the Educational Technology Support Center Program.
- Equipment purchases.
- Educational technology grants to improve educator professional development and student achievement.

During the 2005-2007 biennium, the state continued to provide funding to support educational technology in K-12 schools. The Legislature provided monies for the on-going support of the K-20 Network, which connects school districts, educational service districts (ESDs), community colleges, and the four-year colleges and universities to one another and the Internet. All nine ESDs, 294 school districts, the schools for the deaf and blind students, and OSPI are connected to the network. Currently over 98 percent of K-12 classrooms in Washington State have access to the Internet via the K-20 Network.

The monies provided for the on-going support of the K-20 Network included $3.9 million biennially to fund the Regional Institutional Technical Units at the nine ESDs, which provide technical support specifically for K-12 schools. It also included funding for K-12 transport and maintenance costs not covered by participant co-payments, as well as funding for the KOCO network operations that jointly support all of the K-20 Network.

The Legislature also provided $3.9 million during the 2005-07 biennium for the Educational Technology Support Center (ETSC) Program and OSPI staff to provide statewide leadership in technology.

Currently there is no dedicated funding source for educational technology, i.e., through a state revolving fund dedicated to educational technology or through a formula-driven apportionment process. Consequently, continued funding for educational technology at the state level relies on biennial and supplemental appropriations, creating challenges for effective long-range planning.

Federal Funding for Educational Technology

The federal government's share of seven percent of overall education funding is relatively small. Enhancing Education Through Technology is the primary source of federal educational technology funding under the Elementary and Secondary Education Act (ESEA). As shown in Table 5.2, a total of just over $6.54 million was allocated to Washington State for fiscal year 2005-06, with 5 percent ($325,000) allocated to OSPI for program administration and technical assistance. The remainder was divided evenly between competitive grants and flow-through funds to districts (as required by the legislation), with $3,018,238 each in competitive grants and flow-through dollars.

Table 5.2. Title II, Part D - Enhancing Education Through Technology (EETT) Funding for Washington State 2005-2006

Item	Amount	Notes
Administration	$325,000	
Flow-Through to School Districts (formula driven)	$3,108,238	Distributed via iGrants grant system; based on Title I allocation percentages for each district; average of about $3.00 per student. Districts may transfer up to 50 percent of funds to Title I or other programs as long as funding is used to improve learning with educational technology. Requirements: • For improving student achievement through the use of technology. • For improving student achievement through use of technology. • Must spend at least 25 percent on professional development on integrating technology into curriculum. Deliverables: • Improved student technology literacy. • Improved teacher quality in infusing technology into curriculum.
Competitive Grants to School Districts	$3,018,238	All devoted to Year 1 of "No LIMIT" Project, in partnership with all nine ESDs and the Special Education Technology Center in Ellensburg (Appendix E provides additional information on the No LIMIT Project). Awarded in 2005-06 to 298 grade 5-9 math classrooms in 76 school buildings to improve learning through infusion of technology in mathematics. Evaluation over 2 years by Western Washington University for all participants in a statewide, comprehensive approach.
TOTAL	**$6,450,000**	

Other Funding Sources

Funding provided by other sources is small (estimated at less than two percent of total educational technology funding). However, these resources provide essential services and they perform roles that might not otherwise be supported.

Other funding sources include philanthropic sources (private organizations), public-private partnerships, and individual donations or in-kind community support. The support can include direct financial assistance to individual school districts or hosting a technical assistance website or professional development training venue. Appendix E provides a review of such initiatives. Many of these initiatives highlight innovative and targeted approaches to infusing educational technology into curriculum, instruction, and assessment practices, professional development, network support, and educational leadership. Standard-setting bodies such as the International Society for Technology in Education (ISTE) have taken on a leadership role in developing educational technology standards for teachers, students, and administrators. Private and non-profit foundations supported by the Bill & Melinda Gates Foundation, Intel, Apple, and others have provided targeted support to high-need schools and have identified policy issues for legislative consideration.

6.0 Gap Analysis

The gap analysis presented in this section provides several comparisons of Washington's educational technology efforts:

- How Washington compares nationally.
- What the significant shortfalls are based on the national literature and concurrent trends in Washington State.
- Specific issue areas such as students with special needs and educational technology equity between districts.
- Summary of major trend lines and projections.

The analysis provides strong support for the recommendations and priority action items developed by the Educational Technology Advisory Committee and described in Section 7.

6.1 Overview of Washington's Educational Technology Progress

How does educational technology contribute to, strengthen, and refine Washington's educational reform efforts? This was the genesis for the educational technology plan in 1994 and is the same question that policy makers and educators are asking today. By some accounts, the achievements are significant.

Computers are better, faster, cheaper, and more plentiful. Educational software is more robust and plentiful. The Internet—a tool used mainly by researchers and government agencies in 1994—today hosts a variety of curriculum, instruction, and assessment offerings for educators and students at school and at home. Educational technology provides professional development, administrative, and distance learning opportunities. Alternative media—including videoconferencing, personal digital assistants, and telecommunications devices—are a reality for many schools. And the K-20 network provides a reliable network for providing high-speed telecommunications to 475 public education sites statewide.

Educational technology has increased substantially since 1994, when Washington's first educational technology plan was adopted. Nationally, there has been significant progress on almost every measure of educational technology, including technology availability at schools, use of educational technology in instructional settings, ratio of computers to students, and availability of educational technology outside of the schools at students' homes and in the broader community. Washington State tends to reflect these trends, as described below.

However, persistent issues remain nationally and in Washington State, including:

- Gaps in access and use of educational technology between minority and poor students and their counterparts.
- Limited infusion of educational technology into curriculum, instruction, and assessment practices.
- Lack of consolidated, sustained funding to support educational technology applications.
- Lack of research on the most efficient ways to infuse educational technology into specific programs.
- Policies and practices that hinder students in making full use of educational technology, even when it is available and accessible.
- Too much reliance on hardware allocations at the cost of professional development and network staffing support.

National trends in educational technology are described below, followed by a closer examination of educational technology in Washington's schools.

6.2 Significant Growth in Rise & Use of Educational Technology 1994 to 2005

Across schools in the United States the availability of technology for instructional purposes has increased tremendously. In 2000, four in five students (about 80 percent) reported using computers at school (Newberger, 2001). Although gaps persist between those who have access to educational technology, the period between the first educational technology plan in 1994 and today is striking in many respects, most notably in the widespread dissemination of educational technology networks, hardware, and increasing computing speed and diverse applications. At the same time, the ability to harness educational technology effectively, efficiently, and appropriately in classroom and other instructional settings raises continuing challenges and unresolved issues.

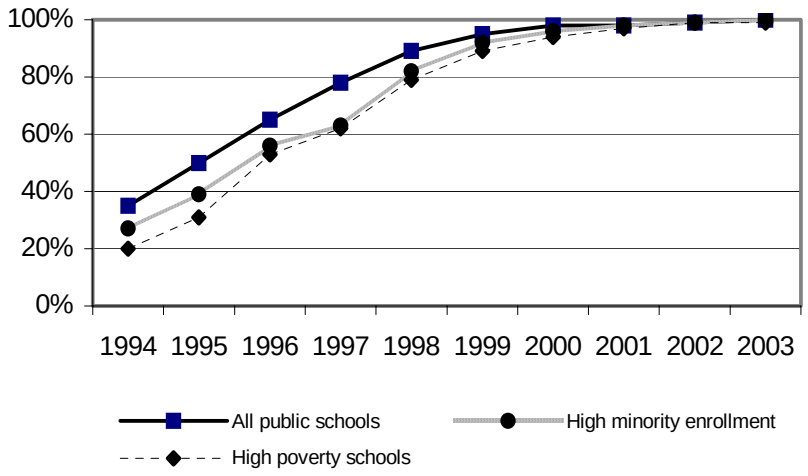
There are many discrete types of educational technology and associated applications such as the Internet, handheld devices, computers and associated software systems. This section first discusses Internet access due to its widespread adoption and application in multiple learning activities and its incorporation of a wide variety of educational technologies, such as electronic mail, videoconferencing, and distance learning.

Internet Access at School is Widespread

By 2003, nearly all K-12 public schools were connected to the Internet, compared with 35 percent in 1994 (*Figure 6.1*), with "some sort of access to the Internet, someplace in their building."[27] The significant increase in Internet access may have been aided by the federal Education rate (E-rate) program. The E-rate program was established in 1996 to make discounted telecommunications services, Internet access, and internal connections available to schools and libraries, based on student income and rural or urban location (Cattagni and Farris, 2001). In 2001, 59 percent of all students reported using the Internet at school, with over 70 percent of high school students using the Internet at school.

Changes have also taken place in the types of network connections and the speed at which they are connected to the Internet. Not surprisingly, connections are more frequently dedicated-line Internet connections and they provide faster and more reliable access (Cattagni and Farris, 2001).

Figure 6.1. Percent of Public Schools with Internet Access, by School Characteristics: 1994-2003



Note:

High minority enrollment = 50 percent of more of student population.

High poverty schools = 75 percent or more of students eligible for free or reduced-price school lunch

Source: Internet Access in U.S. Public Schools and Classrooms, 1994-2003, NCES

Internet Access After Class and At Home

In 2003, 48 percent of public schools offered computers with Internet access to students outside of regular school hours. Secondary schools were more likely to make the Internet available to students outside or regular school hours than elementary schools (69 percent compared to 41 percent), as were larger schools. Large, secondary schools are thus most likely to offer the use of after-school computers with Internet access. Of the schools making the Internet available to students outside of regular schools hours, almost all (98 percent) made it available after school, 17 percent made it available before school, and 9 percent made it available on weekends (NCES, 2003).

More children have access to a computer or use the Internet at home. By August 2000, 54 million households in the United States, about one out of every two households (51 percent), had one or more computers. Of these, 44 million households (42 percent of all households) had Internet access. In comparison, about one in four households had a computer in 1993. In 1997, the first year in which the Census Bureau collected information on Internet use, one in five households had Internet access (18 percent) (Newberger, 2001).

Nearly two out of every three children has access to a computer at home. Older children are more likely to use the computer at home. White non-Hispanics and Asians and Pacific Islanders are most likely to have a computer at home. Not surprisingly, high-income households are more likely to have computers or Internet access. About 90 percent of children in high-income households earning $75,000 or more per year had a computer at home. Only one in three children in low-income households earning $15,000 or less per year had a computer at home. Furthermore, compared to their wealthier counterparts, low-income children are more likely to use computers for games rather than for schoolwork, word processing, and other software applications (Becker, H., cited in Wilhelm, Carmen, and Reynolds, 2001).

School has the potential to be the great equalizer in terms of computer and Internet access. For children 6 to 17 years old, computer use at school is more nearly equal across income, race, and ethnicity than computer access at home (Newberger, 2001). Yet although the gap in access both at home and at school has declined, high poverty and high minority school children are less likely to have dedicated Internet access at home or at school (Newberger, 2001; Cattagni and Harris, 2001). Continuing disparities in educational technology access raises concerns about disproportionate access for children at risk who have the highest need for educational technology. For instance, Project TELL – a long-running demonstration project in New York City – found that at-risk youth with access to home computers and network availability in an online learning community scored substantially higher than their control group peers on standardized reading and math tests (Kornblum, W., 1998; cited in Wilhelm, Carmen, and Reynolds, 2002). Consequently, while the gap is narrowing, a gap nevertheless remains in access to educational technology.

Internet Applications

How the Internet is used, rather than simply having access, is of interest to policy makers and to educators alike.

Student Use of the Internet

The most frequently cited uses of the Internet by children at home are e-mail, school research or courses, information searches, and checking news, weather, and sports (Newberger, 2001). Students rely on the Internet to help them do their schoolwork and use the Internet for multiple education-related activities. Five metaphors of Internet use have been identified through student focus groups (Levin and Arafeh, 2002):

- "Virtual textbook and reference library"—a place to find primary and secondary source material.
- "Virtual tutor and study shortcut"—a place to receive instruction about material that is interesting or confusing, or as a way to complete schoolwork as quickly and painlessly as possible, and for some, using the Internet to plagiarize material or otherwise cheat.
- "Virtual study group"—a collaboration tool with other students.
- "Virtual guidance counselor"—a place to seek guidance relating to school, careers, and post-secondary education.
- "Virtual locker, backpack, and notebook"—a place to store important school-related materials and to transport books and papers, and a place to keep track of class schedules, syllabi, assignments, notes, and papers.

Teacher and Professional Use of the Internet

Most teachers (68 percent) report making some use of the Internet in their professional activities. Almost half of teachers use the Internet weekly or more frequently. (Becker, 1999). Teachers most frequently use the Internet for information searches, teacher research, lesson planning, demonstrations and presentations (National School Boards Foundation, 2002). Teachers use information from the Internet at home and at school on an equal basis. Overall, the three most important variables in predicting teachers' Internet use is (Becker, 1999):

- The teacher's level of classroom connectivity—high speed Internet classroom connectivity is one of the strongest predictors of teacher's Internet use.
- Teacher computer expertise—"Although the Internet is often presented as a novice-friendly area of computer use…relevant prior computer knowledge may be an important pre-requisite for a teacher to make the Internet a valued resource in their classroom, and valuable in their lesson preparation activities in particular." (Becker, 1999: 29)

- Teacher pedagogical beliefs and practices—Teachers who regard education as primarily the distribution of facts and skills to students are much less likely than their "constructivist" counterparts to use the Internet.

Internet Use Policies

A major concern of parents, school educational leaders, and policy makers is student access to inappropriate Internet material. All public schools with Internet access in Washington have "acceptable use policies" (AUPs) and use various technologies or procedures to limit inappropriate use of the Internet. These technologies or procedures include blocking or filtering software, an intranet system, honor codes for students, or teacher and staff monitoring to control student access to inappropriate material on the Internet (Cattagni and Farris, 2001).

The federal Children's Internet Protection Act (CIPA) requires districts that use E-rate funds to put "technology protection measures" into place that guard against student access to obscene materials, child pornography, and other online content that is harmful to minors. However, several issues have been raised concerning Internet use policies (Willard, 2002, Borja, 2002):

- Over-reliance on blocking technologies and other AUPs may fail to ensure that the Internet is used for high-quality educational purposes; students may simply use the Internet instead for music, games, chat rooms, and other non-instructional uses.
- Relying on third-party vendors to establish blocking protocols may relegate key acceptable use policymaking to private vendors rather than school officials, potentially creating biased or inappropriate restrictions.
- Failing to instruct students and inform parents on acceptable uses of the Internet or overly relying on blocking and filtering software to the exclusion of teaching responsible use and supervising students appropriately may lead to a "false sense of security" concerning Internet use.

6.3 EDUCATIONAL TECHNOLOGY ISSUES

In critical respects educational technology use is surprisingly limited. Data from *Technology Counts*, Education Week's annual review of educational technology, suggests that, "apart from the increased use of the Internet, general use of computers in the classroom appears to be stagnant" (Education Week, 2002: 56). Over a five-year period, the level of computer use in fourth and eighth grade remained unchanged.[28] The Education Week survey also indicates that teachers who did use computers in class used them most often for traditional drill-and-practice activities or math games. Tasks promoting higher thinking skills were used much less frequently.

Barriers to Teacher Use of Educational Technology

Despite significant gains in the overall amount of educational technology, barriers to educational technology present significant challenges. Teachers report several issues that present barriers to their use of educational technology, including (Smerdon, et al., 2000):

- Lack of release time for professional development on how to use computers and the Internet.
- Lack of time set aside in the school schedule for students to use computers in class.
- Insufficient numbers of computers.
- Lack of good instructional software.
- Difficult Internet access.

Related problems include obsolete or poorly equipped machines (some over ten years old), wide discrepancies in educational technology accessibility from state to state and from school to school, and persistent gaps in educational technology accessibility in high poverty and high minority schools (Ringstaff and Kelley, 2002; Wilhelm, Carmen, and Reynolds, 2002).

How instructional computers are deployed within a school is another consideration. Class scheduling, pressure of curriculum coverage, classroom access to computer clusters, teacher skill and expertise in using computers, and teacher philosophy and objectives for computer use have been correlated with the successful application of instructional computers. Barriers to using computers include classes that are too large, accountability for teaching a specific curriculum that inhibits use of educational technology, unreliable and complicated computer systems and unwanted technology or technology that a teacher did not request (Becker, 2000).

Educational Leadership Makes a Difference

In addition to teacher attitudes about and use of educational technology, educational leaders and the policies they adopt can affect the ways in which students and teachers apply educational technology. In a qualitative survey of student perceptions about the Internet, students reported that administrative decisions affected levels of access to the Internet, requirements for technology literacy skills, and the amount of restrictions on student Internet access. Students also reported that, even in well connected schools, wide variation in teaching policies about Internet use in class frequently inhibits engaging curriculum and instruction with online resources. In fact, as the researchers noted, "Students repeatedly told us that the quality of their Internet-based assignments was poor and uninspiring. They want to be assigned more—and more engaging—Internet activities that are relevant to their lives. Indeed, many students assert that this would significantly improve their attitude toward school and learning" (Levin and Arafeh, 2002: iv). Other roadblocks cited by students include (Levin and Arafeh, 2002):

- Poor quality of Internet access, often limited to certain places or certain times in school with restrictive use policies.
- Blocking and filtering software creates barriers to legitimate educational use of the Internet.
- Teachers do not assign homework requiring the use of the Internet out of concern for students without access at home.

In the Apple Classrooms of Tomorrow Project (ACOT), professional development allowed participants to see expert teachers modeling instructional use of technology as they worked with students. Evaluation of the program found that principal and administrative support was critical to project success. Specifically, principals needed to provide time for participating teachers to plan and reflect together on their practices, recognize teacher efforts, and ensure that teachers had the authority and flexibility to adjust their instructional schedule and develop curriculum objectives promoting team teaching and interdisciplinary instruction (Ringstaff and Kelley, 2002).

6.4 Snapshot of Educational Technology in Washington Schools 1993-2005

State trends in educational technology match those at the national level in many respects. Based on surveys and inventories that OSPI has conducted since 1992, there has been tremendous change in both the amount of technology and its use in K-12 schools in Washington State. These changes have often accompanied by an increase in complexity, leading to greater support and training requirements. In addition, networked technology has shifted from a supplemental resource to a "mission-critical" role in a number of districts, both instructionally and administratively.

In several important respects, the barriers to effective educational technology found in national studies are also evident in Washington State.

Connectivity and Internet Access in Washington Schools

Virtually all instructional buildings in Washington State can now access the Internet, compared to 32 percent in 1994 (the earliest survey data for Washington State on this item). In addition, 98.7 percent of K-12 instructional classrooms in Washington State can now access the Internet from one or more computers in their classroom, a tremendous increase from only four percent in 1994.

Experts have suggested that a 1:4 computer-to-student ratio would provide a sufficient level of access. However, there are significant variations in the ways in which computers are disseminated in schools, whether computer labs are used, and which grade levels have access to computers. Classroom-based computers with Internet access have been associated with whether teachers use the Internet for student research (Becker, 2000; Ringstaff and Kelley, 2002). Consequently, this is a singularly important indicator of educational technology adoption in Washington's schools.

Based on this and related measures, *overall* Washington appears to closely meet the general standard of one computer for four students (*Figure 6.4*). Many classrooms, however, may fail to reach this desired ratio.

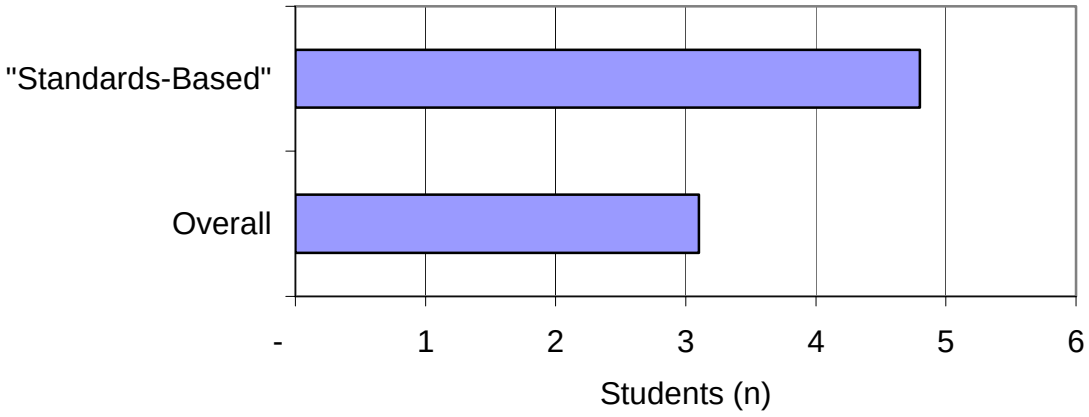
OSPI reported in its 2004 technology survey that over 71 percent of the instructional computers in use met the minimum statewide standards recommended by OSPI. The student to computer ratio for "standards-based computers" is less than 5:1, higher than the average recommended ratio of four students per computer.

Communication and Connectivity

Nearly all of the approximately 55,000 K-12 certified staff in Washington State had e-mail accounts provided by their school district in 2004. Over 52,000 students (about 5 percent) have district-provided e-mail accounts. In 1993, less than one-third of teachers had e-mail accounts and student accounts were largely non-existent.

Based on United States census data, Washington State ranks fourth nationwide in the percent of children having home Internet access. More than half (60 percent) of Washington households with children ages 3-17 have Internet access at home. Nationwide, the percent of school-age children with home Internet access ranges from 69 percent (New Hampshire) to 31 percent (Mississippi) (Wilhelm, Carmen, and Reynolds, 2002).

Figure 6.2. Selected Student-Computer Ratios



Note:
"Standards-based" computer defined as Intel or AMD based Pentium III 500 MHz or higher desktop, or Pentium II 400 MHz or higher laptop, or Mac G4/G5 450 MHz or higher desktop, or Mac G3/G4/G5 laptop.

Source: Office of Superintendent of Public Instruction (2004).

Network Support

Related to the issue of older or obsolescent technology is lack of network support. Teachers report that a major barrier to effective integration of educational technology into their instructional practices is due to lack of adequate support, unreliable networks and computers, or insufficient skill to operate a computer (Becker, 2000; Smerdon, et al., 2001). In the Technology Alliance survey, almost one out of five schools (18 percent) reported that they used ad hoc support (including teachers working on their own time) to install and operate computers and other technologies. In many schools, small technology departments struggle to assist multiple schools, and no schools reported a level of 1 Full Time Equivalent (FTE) technology coordinator per school (Friedman and Erickson, 2000). OSPI's 2004 survey found that 84 percent of Washington's school buildings have some level of paid technology support, averaging 4.1 hours per day.

This continued lack of adequate technology support is due to very high computer-to-technician staffing ratios in schools, periodic shortages of network administrators due to market competition, and restrictive salary requirements that preclude hiring additional staff when needed. Because of this, network staffing ratios in schools are significantly higher than within industry. OSPI estimates that in 2004 a typical network administrator in Washington's public schools supported over 320 personal computers in a school district, while her private industry counterpart supported about 40 personal computers.

The Technology Support Index, an educational technology assessment tool developed by Dr. Chip Kimball of the Lake Washington School District, describes several domains of technology support. The domains are: equipment standards, staffing and processes, professional development, and intelligent systems. Each domain is described in terms of the status of the school's technology support: "emergent," "islands," "integrated," or "exemplary" technology support. For instance, an "emergent" computer-to-technician ratio is over 250:1. An "exemplary" computer-to-technician ratio is 75:1. By this definition, Washington State school district network support overall would be considered "emergent," or "A strategy or domain that has a need for attention and improvement… in the beginning states on a developmental continuum, and if the issues aren't addressed, on-going support challenges will likely be found."[29]

Educational Technology Uses

Washington teachers and students increasingly use educational technology for learning and teaching support. Certificated staff predominantly use computers for word processing, e-mail and communications, online grading and attendance, and to a lesser degree, web research, while in 1993 word processing and stand-alone grade book programs were mainly used.

Students predominantly use computers for word processing and web research, and to a lesser degree, instructional software and drill and practice, while drill and practice was the main use of computers by students in 1993.

A small but growing number of K-12 students (10,164 in 2004) are currently enrolled in online courses, which were virtually non-existent in 1993. New initiatives, particularly the Digital Learning Commons, are promoting online learning opportunities for Washington's students.

A 2002 survey conducted by the University of Washington of 6th-12th grade students reported that non-home locations for computer use were mostly at school and school computer labs, followed by the local library. Students in upper grade levels are more likely to use computers for schoolwork in high school. Almost sixty percent of 11th and 12th graders reported that they used a computer for schoolwork four or more hours weekly. Almost half (45 percent) of early high school students (9th and 10th grade) and 30 percent of middle school students reported that they used a computer more than four hours or more weekly.

Online Learning: Digital Learning Commons Task Force Findings

In February 2002, then Governor Gary Locke convened a task force of leaders from education, business, and government to consider how to deliver a statewide digital education initiative quickly, effectively and equitably. The task force focused on determining a vision for the future and workable first steps to achieving it. The task force identified implementation challenges and explored relevant policy issues. The task force also learned that online coursework already plays a role in Washington schools. The task force's telephone survey determined that 13 percent of the students surveyed had taken an online class at some time during their educational life, and that over half (53 percent) of these children received credit for online courses from their school or district. Several Washington-based online schools and programs discussed in Appendix E are among the providers that students used for online coursework.

An analysis of digital education efforts in other states conducted for the task force revealed mixed success in many of these early efforts. Notably, the initial funding for several statewide, online course programs was from a one-time state government appropriation, with ongoing funding expected to come from the state entirely as a general fund line item. This lack of a self-sustaining model has left these states vulnerable during periods of state budget constraints.

Progress Compared to the 1994 Technology Plan Recommendations

The 1994 technology plan recommendations were spirited and ambitious, reflecting the newly enacted education reform legislation and Washington State's newly created plans for the education reform initiatives.

Table 6.1 provides a summary of the 1994 technology plan recommendations (see Appendix D for the full text summary of each recommendation). Several recommendations have been successfully adopted, including:

- The development of partnerships, alliances, and public awareness (Recommendation 2).
- Affordable communications (Recommendation 3).
- Regional support for educational professionals (Recommendation 7).
- The K-20 Network (Recommendation 8).
- Electronic (online) resources (Recommendation 9).
- Educational technology policies (Recommendation 12).

Table 6.1. 1994 Technology Plan Recommendations and Current Status

1994 Technology Plan Recommendation	Current Status
1. Integration of Technology into Educational Initiatives	Difficult to say to what extent "technological implications and opportunities" were considered by education initiatives at that time. The ETAC has periodically served in an advisory capacity for educational technology policy.
2. Partnerships, Alliances, and Public Awareness	The recommendation largely focused on OSPI-based initiatives. OSPI has sponsored multiple educational technology initiatives since 1994. Additionally, Section 5, State of the State, describes current status of multiple initiatives that have directly and indirectly involved OSPI.
3. Affordable Telecommunications Access for Schools	The Legislature supported the development and continued support for the K-20 Network. The K-20 Network and E-rate program significantly address this recommendation.
4. State Policies and Funding Strategies Which Reflect Schools' Technology Requirements	This recommendation was very broad, which makes it difficult to gauge progress. Recommendation 4 states, "It is recommended that all development, adoption and/or revision of policies and procedures for the common school system by the State Legislature, the State Board of Education, the Commission on Student Learning, and OSPI reflect current technological requirements for learning."
5. Levy and Bond Regulations Which Reflect Schools' Technology Requirements	SSB 6515 (2002 c 275) clarifies that capital projects funds may be used by school districts to pay the costs of implementing technology systems, facilities, and projects. Limited primarily to hardware system upgrades, not curriculum, instruction, assessment, or professional development practices.
6. State Allocation to Districts for Technology	Various grant programs have been established through a mix of federal and state sources. No dedicated grant program for educational technology in place.
7. Regional Support for Educational Professionals	$3.9 million provided biennially supports the Educational Technology Support Center Program, the Educational Technology Development Center, and OSPI staff to provide statewide leadership in technology.
8. Enhancing K-12 Education's Statewide Electronic Network	By December 1999, all ESDs, 294 school districts, the schools for the deaf and blind students, and OSPI were connected to the network. Over 98 percent of K-12 classrooms in Washington State now have access to the Internet via the K-20 Network.
9. Providing Electronic Destinations	Multiple program initiatives are underway, directly or indirectly involving OSPI. These include online buying cooperatives, online courses, professional development support, and online databases. See Appendix E, Educational Technology Initiatives.

1994 Technology Plan Recommendation	Current Status
10. Integrating Technology into the Curriculum	No comprehensive state-funded initiative to date. Primarily limited to course development and professional development opportunities provided through a variety of public and private resources.
11. Technology in Teacher Preparation Programs	No comprehensive statewide initiative to date. Multiple public and private initiatives underway for professional development in pre-service and in-service programs. The ETAC has adopted the ISTE National Educational Technology Standards (NETS) framework for teachers.
12. Information Policies	294 of 296 districts have formulated educational technology plans and have adopted educational technology policies.

Source: *Report to the Legislature on the Washington State Technology Plan for the K-12 Common School System* (1994). Olympia, WA: Office of Superintendent of Public Instruction.

Other recommendations have been implemented partially or, based on the current state of the state and gap analysis, reflect continuing needs. In particular, although many individual efforts are underway, there have been no comprehensive state-funded and sustained initiatives in support of integrating technology into curriculum (Recommendation 10) and technology into teacher preparation programs (Recommendation 11).

Progress Compared to the 2002 Technology Plan Recommendations

Table 6.2 provides a summary of the 2002 technology plan recommendations (see Appendix D for the full text summary of each recommendation). Significant progress has been made on several recommendations, including:

- Teacher, Paraprofessional, and Educational Leader Technology Standards (Recommendation 1).
- Student “Technology Literacy” Standards (Recommendation 3).
- Digital Educational Content (Recommendation 9).
- Best Practices in Educational Technology (Recommendation 10).
- Statewide Data-Driven Decision Making System (Recommendation 12).

Minor progress has been noted on three other recommendations from the plan.

Table 6.2. 2002 Technology Plan Recommendations and Current Status

2002 Recommendation	Current Status
STANDARDS AND PROFESSIONAL DEVELOPMENT	
Teacher, Paraprofessional, and Educational Leader Technology Standards and Professional Development	128 of 296 districts have technology standards for teachers, 74 districts have technology standards for paraprofessionals, and 98 districts have technology standards for educational leaders.
Pre-Service Educational Technology Training	Although progress has been minimal, the Performance-Based Pedagogy Assessment of Teacher Candidates document (June, 2004) includes technology.
Student "Technology Literacy" Standards	185 school districts have technology standards for students.
FISCAL POLICY AND STRATEGIC FUNDING	
Flexibility in Bonds and Levies	No progress. However, a proposal to lower school bonds and levies passage requirement to 50% passed the Senate (but not the House) in 2005.
State Educational Technology Funding/ Revolving Fund	No progress.
Enhanced Educational Technology Support	No progress.
LEARNING AND TEACHING SUPPORT	
Enhanced K-20 Educational Telecommunications Network	No progress. However, 98.7% of public K-12 classrooms now have networked Internet connectivity.
Targeted Support for Needy Schools	No progress.
Digital Educational Content	The Digital Learning Commons is promoting online learning opportunities for Washington's students.
Best Practices in Educational Technology	The Educational Technology Support Center (ETSC) Program is assisting districts with Microsoft Peer Coaching, MarcoPolo resources aligned to state standards, and Metiri "Technology That Works" database.
Community Engagement Through Educational Technology	No progress.
Statewide Data-Driven Decision Making System	OSPI has established the Core Student Record System (CSRS) and Electronic Data System (EDS).

Progress Compared to Other States

Washington compares favorably to other states on several measures in student access to educational technology and applications, though not as well on others.

The K-20 Educational Telecommunications Network was one of the first statewide network backbones in the country providing access to almost all school districts statewide. The Legislature's continuing support of the network has extended its use beyond K-12 to universities, community and technical colleges, and libraries. As noted previously, today almost all instructional classrooms statewide (98.5 percent) can access the Internet from one or more classroom computers. This compares favorably with many other states.

The *2002 State New Economy Index* (Progressive Policy Institute)[30] measures, among other items, the amount of technology in schools based on:

- Students per multimedia computer.
- Students per Internet connected computer.
- Percentage of schools with Internet access through a T1 or cable modem.
- Percentage of schools where at least 50 percent of teachers use the Internet in class.
- Percentage of schools where at least 50 percent of teachers have school-based email addresses.

Based on this aggregate measure, Washington ranked 27th nationwide. According to the Progressive Policy Institute, states that ranked highest in integrating information technology into schools are the less populated and more geographically dispersed states, perhaps suggesting a need for rural and remote areas to seek higher levels of access and connectivity.

On other measures described in *Technology Counts*, Washington does not compare as favorably on several educational technology measures (Education Week, 2002):

- Washington does not provide any incentives for teachers to use technology (compared with, for instance, Wyoming, which provided 20 days of state-financed training in 2001-02 to more than 600 teachers and 100 administrators to develop standards-based classrooms using technology).
- Washington does not have online testing available for the Washington Assessment of Student Learning or other statewide tests (compared with, for instance, South Dakota's online assessment system).

- Although Washington requires technology training in educational technology for teacher certification, the requirements are broadly defined, are not specific to required knowledge, skills, or abilities (KSAs), and may be highly variable across the schools of education (compared with, for instance, Idaho's teacher performance standards).

Summary of Current Barriers and Issues

Similar to barriers cited in national studies of educational technology, Washington schools encounter barriers such as:[31]

- The lack of equitable and universal access to up-to-date equipment; teachers are reluctant or altogether unwilling to use equipment that is severely limited instructionally, performs unreliably, or requires extensive support to access.
- Inadequate or outdated technology-based instructional materials and online information; districts with poor website design or access may make teachers and students reluctant to use technology at school.
- Shortage of information technology (IT) workers due to funding constraints or private sector competition for highly qualified network administrators at salaries that are higher than what schools can support.
- Buildings not "ready" to use technology and telecommunications.
- Lack of budgeting and funding for support, maintenance and upgrading of equipment.
- Lack of funding for planning, staff development, and curriculum development.
- State fiscal policies that restrict the use of bonds and levies mainly to hardware expenditures.

6.5 THE BOTTOM LINE: EDUCATIONAL TECHNOLOGY AND STUDENT ACHIEVEMENT

Several studies point to the promise and difficulty in gauging the effect of educational technology on student achievement (Ringstaff and Kelley, 2002; Schacter, 1999; Smerdon, et al., 2000; Becker, 2000). Reviews of studies on educational technology highlight the variability in terms of the technology used (and the speed at which it is changing), the population of interest (general classroom environment, teachers, poor students), and the dependent variables or measures of interest.

Measuring the impact of technology use on student achievement is "fraught with difficulties" since classrooms "are not experimental laboratories where scientists can compare the effectiveness of technology to traditional instructional methods while holding all other variables constant" (Ringstaff and Kelley, 2002: 23). Despite this caution, an emerging body of research provides optimism that, when applied appropriately and judiciously, educational technology can improve student achievement for students in general, as well as for those who are at-risk or have special needs.

Conditions that favor desirable educational outcomes acknowledge that technology is not a panacea for difficult decisions and hard work to improve student achievement. Technology is merely “one piece of the puzzle.”

Teachers, in order to use technology effectively, need adequate and appropriate training and they need to hold certain pedagogical beliefs in order to use technology effectively. Educators and their students need sufficient and accessible equipment and the technology needs to be put into the right instructional environment. Students also need to be supported at home in how they use educational technology. Educational leaders need to develop appropriate policies that encourage rather than unnecessarily hinder, block, or filter material that is relevant to a student’s educational goals. To make all this happen, network administrators need to be on hand (i.e., staffed) in order to provide teachers, administrators, and students with sufficient technical and instructional support.

Educational technology is not simply a matter of providing a stand-alone computer laboratory accessible only at a certain time of day. Technology, in order to be effective in raising student achievement, must be integrated within the instructional and curricular framework. It must complement an instructional objective rather than be regarded by teachers and administrators as an unnecessary intrusion into a pre-established curriculum (Ringstaff and Kelley, 2002; Becker, 2000, Smerdon, et al., 2000; Becker, 1999; Schacter, 1999; National School Boards Foundation, 2002; Levin and Arafeh, 2002; Byrom, 1998).

In the following section, the Educational Technology Advisory Committee articulates how the educational technology gaps identified in this report can be addressed.

7.0 Recommendations

This section describes the recommendations developed by the Educational Technology Advisory Committee, which focus on Professional Development to Support Technology Literacy and Integration. The ETAC strongly emphasizes the holistic relationship between these recommendations and the primary outcome of interest, improved student learning.

PROFESSIONAL DEVELOPMENT TO SUPPORT TECHNOLOGY LITERACY & INTEGRATION

Description of New Technology Professional Development Initiative

OSPI should pursue state or federal funding to establish a holistic technology professional development grant program that ensures that technology essential conditions are in place in addition to the professional development program. It is recommended that this program would provide buildings selected for participation with flexible matching funds to establish these essential conditions, followed by funding for intensive peer coaching/mentoring support for a minimum of three years. A rigorous external formative and summative evaluation of the program will be conducted.

The professional development provided should embody these principles of effective technology professional development:

- Involve staff in the development of a long-term school improvement plan constructed from an analysis of school and individual assessment identifying academic strengths and needs, which aligns and integrates technology with the curriculum.
- Allow staff to choose from a range of professional development options that meet their professional needs and delivery preferences, with expectations and incentives clearly defined.
- Model the infusion of technology to create schools as learner-centered environments that foster in students the mastery of concepts and learning strategies that promote the application of understandings to real-world problems.
- Focus on the development of school-based, collaborative learning communities of educators sustained through daily job-embedded practice, ongoing coaching and follow-up.
- Seek to understand and appropriately support the development of rich curriculum-based, technology-infused learning environments.
- Use formative and summative assessment to measure the impact of professional development on both classroom instructional practice and student achievement, and use this data to continuously improve the professional development.

Connections and Potential Leverage with Current or Emerging Initiatives

Two promising programs are already in place which could be leveraged for such a program. The "Peer Coaching Program", part of Microsoft's Partners in Learning initiative, is designed to help schools implement a professional development model that enhances standards-based instruction by supporting teachers to provide engaging, technology rich, learning activities to students. The Program trains teacher leaders to serve as peer coaches for colleagues. As coaches, these teachers assist their peers in identifying ways that technology can strengthen classroom curriculum and enhance their students' academic achievement. They also help their colleagues to develop the necessary technology skills and instructional strategies needed to integrate technology into teaching and learning. In Washington State, the Microsoft Peer Coaching Program is provided primarily through the Educational Technology Support Center Program.

The eMINTS instructional model, initially developed in Missouri**,** is a set of research based strategies grounded in constructivist theory. The model supports educators in integrating technology and best teaching practices to create a learning community where teachers and students explore and create knowledge together using a variety of resources. Teachers facilitate student learning through the use of essential questions that stimulate thinking; build curiosity, create connections, and generate long lasting knowledge through issues that matter to students. The eMINTS instructional model requires conscious alignment of curriculum, professional development initiatives, technology acquisitions and school vision. Collaborative leadership practices and school structures that support the school's professional learning community in the implementation of the eMINTS instructional model are required for success.

Critical elements of the eMINTS instructional model include:

- A carefully selected suite of hardware and software;
- Constructivist, inquiry-based teaching practices;
- Sustained, intensive professional development and classroom visits;
- Implementation by school-based teams; and
- Rigorous external formative and summative evaluation.

Ten Key Strategies to Support Technology Literacy & Integration

In addition to the Technology Professional Development Initiative, the ETAC recommended ten key strategies to support statewide efforts in technology literacy and integration:

1. Highlight professional development initiatives that are already underway through the state-funded Educational Technology Support Center (ETSC) Program. Besides the Microsoft Peer Coaching Program, these also include the Sustainable Classroom Model, the SHARE Project, Leadership Institutes in partnership with NCCE, the Teacher Leadership Project (TLP), and training in the use of MarcoPolo resources.

2. Highlight existing connections to statewide curricular initiatives and make new connections. In mathematics, these already include the NO LIMIT Project, MarcoPolo resources aligned to state standards, and the Metiri "Technology That Works" database. In reading, this also includes MarcoPolo resources aligned to state standards, and the Metiri "Technology That Works" database. In science and social studies, it includes MarcoPolo resources aligned to state standards, and the opportunity to integrate technology into newly-developed Classroom-Based Assessments. In writing, the ETAC recommends that OSPI explore piloting the use of technology to take the Writing WASL.

3. Strengthen existing connections to Professional Growth Plans for educators. The Washington State Professional Development Planning Guide in Action (September, 2005) includes technology as a key element impacting the learning environment, and the ETAC recommends that the newly-developed Tiers of Technology Integration be used as part of this "Needs Assessment Rubric".

4. Strengthen existing connections to Pre-Service Training of new teachers. The Performance-Based Pedagogy Assessment of Teacher Candidates document (June, 2004) also includes technology as a key element, and the ETAC recommends that the newly-developed Tiers of Technology Integration be used as part of their "Performance-Based Pedagogy Assessment".

5. Identify and highlight districts that have required technology competencies for educators or use technology integration as an element of teacher observations by administrators. For example, Lake Washington School District expects all educators who use computers in the course of their duties to demonstrate proficiency in at least four required software applications.

6. Identify and highlight districts that have required technology literacy courses for students or have aligned their curriculum to NETS Standards. For example, Bellingham School District has developed "Technology Connections", a semester-long course designed to equip all 9th grade students with organizational skills and technology tools needed to accomplish high level learning goals. The course works in conjunction with other required freshman classes (e.g., English and Science), and elements of school and career planning are incorporated as well.

7. Identify and highlight districts that include technological resources as part of their curriculum adoption cycle. For example, Kent School District includes software and technological tools as part of their "Adopted Materials and Supplemental Support Materials for elementary schools".

8. Require districts to address Technology Essential Conditions as part of the 2007-2010 school district technology planning process. In order to receive E-rate or Title II, Part D (EETT) funds, districts are required to have an approved 3-year technology plan, and most districts will be going through the planning process during 2006-07. Because these Essential Conditions are necessary for schools to effectively use technology for learning, teaching, and educational management, the ETAC recommends that these physical, human, financial, and policy dimensions should be assessed and addressed in future 3-year technology plans, beginning with the 2007-2010 cycle. This will help ensure that funding decisions and professional development plans developed to support these plans take into account "the whole picture", and increase the likelihood of success in improving technology integration and technology literacy, and ultimately improving student achievement.

9. Make connections to the Microsoft Partners in Learning "Learning Transformed" Grant awarded to EWU and Cheney School District. The ETAC recommends that the newly-developed Tiers of Technology Integration and some of the self-assessment and observation tools being developed should be used as part of evaluation of the grant over time.

10. Strengthen existing connections to National Board Certification for educators. A key part of the certification process is the portfolio, in which teachers videotape their teaching, gather student learning products and other teaching artifacts, and provide detailed analyses of their practice. The ETAC recommends that technology should be integrated throughout this process, and best practices shared with new candidates pursuing certification.

Endnotes

[1] Additional information on the ETAC planning process is online at: http://www.k12.wa.us/EdTech/techplan.aspx

[2] This description of the education reform process was adapted in part from the draft Washington State Technology Plan for K-12 Common Schools (November 15, 1993), and the federal ESEA application submitted by OSPI to the U.S. Department of Education June 12, 2002. Retrieved August 26, 2002 from the OSPI website: http://www.k12.wa.us/ESEA/

[3] See, RCW 28A.650.015.

[4] Additional information on ESEA, Washington State's application for ESEA funding, and related links is online at: http://www.k12.wa.us/ESEA/

[5] The ESEA information is derived primarily from *Washington State Consolidated Application For Federal Funds Under the Elementary and Secondary Education Act "No Child Left Behind"* (OSPI, 2002). The application is online at: http://www.k12.wa.us/ESEA/

[6] With the passage of the ESEA, in federal fiscal year 2003 the Technology Literacy Challenge Fund (TLCF) is consolidated with several other technology programs under *Title II, Part D—Enhancing Education Through Technology.* The TLCF provided funds to obtain computer equipment, Internet connections, content, and staff training.

[7] Please see Appendix B, Bibliography, for additional information on these conceptual frameworks.

[8] The Six Essential Conditions for the Effective use of Technology in Learning are: 1) Vision; 2) Practice; 3) Proficiency; 4) Equity; 5) Access; 6) Systems. Retrieved September 16, 2002 from the North Central Regional Educational Laboratory website: http://www.ncrel.org/engauge/framewk/index.htm

[9] "The STaR Chart identifies and defines four school profiles ranging from the "Early Tech" school with little or no technology to the "Target Tech" school that provides a model for the integration and innovative use of education technology. The STaR Chart is not intended to be a measure of any particular school's technology and readiness, but rather to serve a benchmark against which every school can assess and track its own progress." Retrieved September 16, 2002 from the International Society for Technology in Education website: http://ww2.iste.org/starchart/

[10] Retrieved September 16, 2002 from the OSPI website: http://www.k12.wa.us/SchoolImprovement/success.aspx

[11] **RCW 28A.150.210**
Basic Education Act -- Goal.
The goal of the Basic Education Act for the schools of the state of Washington set forth in this chapter shall be to provide students with the opportunity to become responsible citizens, to contribute to their own economic well-being and to that of their families and communities, and to enjoy productive and satisfying lives. To these ends, the goals of each school district, with the involvement of parents and community members, shall be to provide opportunities for all students to develop the knowledge and skills essential to:

> (1) Read with comprehension, write with skill, and communicate effectively and responsibly in a variety of ways and settings;

(2) Know and apply the core concepts and principles of mathematics; social, physical, and life sciences; civics and history; geography; arts; and health and fitness;

(3) Think analytically, logically, and creatively, and to integrate experience and knowledge to form reasoned judgments and solve problems; and

(4) Understand the importance of work and how performance, effort, and decisions directly affect future career and educational opportunities.

[1993 c 336 § 101; (1992 c 141 § 501 repealed by 1993 c 336 § 1203); 1977 ex.s. c 359 § 2. Formerly RCW 28A.58.752.]

[12] See also Becker (1999): 22. In the review of Internet use by teachers, Becker sought to examine teacher attitudes about what constitutes good teaching and how that relates to Internet use. His survey analysis distinguished several factors related to constructivist versus traditional pedagogy, including disagreement with traditional pedagogy and learning theory, frequent use of projects and demonstrations, and frequent practices requiring heavier student responsibility.

[13]The Metiri Group (n.d.). "Range of Use." Retrieved August 12, 2002 from The Metiri Group website: http://www.metiri.com/WebInvestigation/RangeOfUse.htm

[14] State Educational Technology Directors Association (SETDA), "2002 National Leadership InstituteToolkit." Retrieved December 21, 2005 from the SETDA website: http://www.setda.org/NLItoolkit/tla/tla02.htm

[15] Washington State Technology Plan for K-12 Common Schools (1994), "Seven Essential Learnings for Technology." Retrieved December 21, 2005 from the OSPI website: http://www.k12.wa.us/EdTech/p11-22.aspx

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[21] Northwest Educational Technology Consortium (NETC), "Overview of Technology Integration." Retrieved December 21, 2005 from the NETC website: http://www.netc.org/images/pdf/tech.integration.pdf

[22] Ibid

[23] Ibid

[24] Fouts & Associates, "Classroom Instruction in Gates Grantee Schools: A Baseline Report." Retrieved December 21, 2005 from the Gates Foundation website: http://gatesfoundation.org/nr/downloads/ed/researchevaluation/ClassroomInstruction.pdf

[25] International Society for Technology in Education, "Essential Conditions for Implementing NETS for Administrators." Retrieved December 21, 2005 from the ISTE website: http://cnets.iste.org/administrators/a_esscond.html

[26] Nebraska Department of Education, "Rubric Of Essential Technology Conditions (RETC) for Nebraska PreK-12 Schools." Retrieved December 21, 2005 from the Nebraska DOE website: http://www.nde.state.ne.us/TECHCEN/documents/NERETC.pdf

[27] Becker, H., 1999: 3. Becker's qualification brings up an important point, namely, that merely measuring the ratio of computers to students in a building does not provide the finer grain detail of how appropriately and effectively computers are deployed within a building.

[28] "In 1996, a third of 4th graders and about a quarter of 8th graders reported that they used computers at least once or twice a week. Four years later, the reported levels of use were unchanged" (Education Week, 2002: 56).

[29] The Technology Support Index was developed by Dr. Chip Kimball in conjunction with ISTE and the Bill & Melinda Gates Foundation. Retrieved September 6, 2002 from the ISTE website: http://tsi.iste.org/techsupport/

[30] Retrieved August 30, 2002 from the Progressive Policy Institute website: http://www.neweconomyindex.org/states/2002/endnotes.html#23

[31] "Funding, Maintenance, and Hardware: Dilemmas and Some Proposed Solutions for Washington State Schools." Unpublished document from the Technology Alliance.

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