



# **California ICT Digital Literacy Policy**

**And**

# **California Basic Elements of ICT Digital Literacy – Continuum of Assessment Skills**

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for  
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## Introduction

Policy leaders in California, in order to improve the quality of life and prepare a competitive workforce for the 21<sup>st</sup> Century, must consider how to create and support an Information and Communications Technologies (ICT) Digital Literacy policy that will:

- **Promote** a commitment to ICT digital literacy as a basic skill required for all residents.
- **Encourage** institutional support of ICT digital literacy strategies in education, workforce preparation and government services.
- **Enhance** ICT digital literacy opportunities in technological innovation and workforce readiness.
- **Support** benchmarking and adoption of metrics that reflect globally-accepted standards.
- **Develop** timetables and milestones to ensure appropriate accountability for assessing timely progress and ultimate success.

A California policy that considers the above factors will assist in capturing the full opportunity for California and all of its citizens to fully and competitively participate in a 21<sup>st</sup> Century global economy with equal access to, and use of, advanced technologies. Fundamental to the success of such a policy strategy is acknowledgment that *ICT digital literacy is the new 21<sup>st</sup> Century basic literacy*, and that every citizen must be competent in these new basic skills.

Section I of this document, in consideration of the need for a state policy, discusses a policy framework based on supporting research and rationale for enacting a California ICT Digital Literacy Policy. CETF recommends an Executive Order by the Governor of California and a Joint Concurrent Legislative Resolution. (Appendix A and Appendix B).

Section II of this document presents the *California Basic Elements of ICT Digital Literacy – Continuum of Assessment Skills*. Its purpose is to provide a standardized approach for digital literacy assessment and certification, along with diagnosis, and continuous improvement of basic information and communications (ICT) digital literacy skills for students and the workforce. The framework builds upon:

- The definition of digital literacy in the proposed *California Policy for ICT Digital Literacy*;
- A recognition that all residents of the state benefit from being ICT digitally literate in school, the workplace and 21<sup>st</sup> Century life; and
- The adoption of global standards and performance indicators for ICT digital literacy.

*California Basic Elements of ICT Digital Literacy – Continuum of Assessment Skills* reflects a collaborative effort of research of global ICT policy initiatives, best practices, standards, performance indicators and digital literacy assessments meeting global standards. (Appendix C).

## Section 1: ICT Digital Literacy Policy Rationale, Research and Best Practices

In November 2006, Governor Schwarzenegger established the California Broadband Task Force (CBTF) as part of Executive Order S-23-06. In initiating this activity, the Governor provided leadership in moving California forward to join forces with numerous countries around the world in acknowledging that information and communications technologies (ICT), specifically enhanced by deployment of broadband infrastructure, are critical to economic development and global competitiveness.

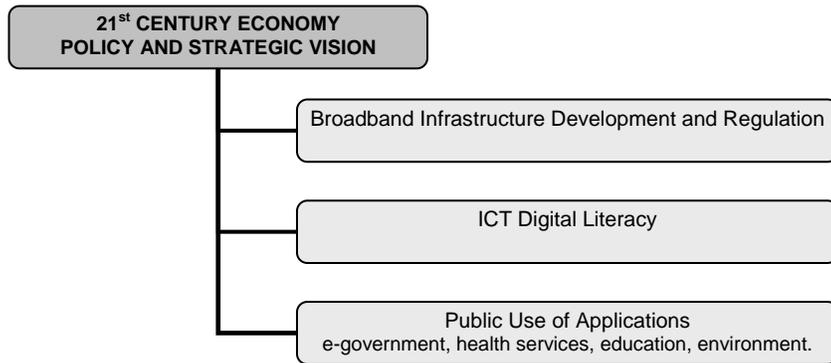
Following extensive research, analysis and stakeholder input, the Task Force released its findings in January 2008 on California's status in broadband deployment, accompanied by recommendations to ensure the State's role as a world leader.

Concurrent with the release of the CBTF Report, the California Emerging Technology Fund (CETF), a non-profit organization dedicated to closing the Digital Divide and making California a global leader in the deployment and adoption of broadband technology, released a consensus report from the ICT Digital Literacy Leadership Roundtable held in November 2007. The report sets forth a "call to action" for policymakers, employers, educators, and other stakeholders to endorse an ICT Digital Literacy Policy for California to ensure that students and workers are prepared for a 21st Century economy. The ICT Leadership Roundtable declared that it is imperative that California take immediate steps toward addressing the need for a digitally literate citizenry.

Both the CBTF and the CETF efforts agree on the need for addressing requirements for a 21<sup>st</sup> Century skilled workforce if California is to remain globally competitive and maintain a leadership role in innovation of information and communications technologies. Furthermore, its residents will be able to enjoy the benefits of a technologically enriched society. ***Both reports acknowledge the importance for State policymakers to develop a shared vision and to provide leadership*** to reach a goal of a digitally literate society able to function successfully in the 21st Century.

These reports, along with numerous existing initiatives and policy statements, reinforce that best practices have common components of a successful ICT policy initiative. Most policies, at a minimum, acknowledge that an ICT policy framework must address broadband infrastructure development, effective regulatory policies, digital literacy in education and human capacity building, and effective applications for public use of services such as e-government, e-health, and improving the environment, among others. The following chart illustrates this relationship.

## Components of ICT Best Practices



Global bodies, such as the World Summit on the Information Society (WSIS), UNESCO, and other sovereign nations recognize these components as necessary to the achievement of broader 21st Century policy goals and strategic objectives in sectors such as health, education, e-commerce, and e-government. Information literacy or digital literacy is, per se, integral to achievement of all these broader objectives. Furthermore, existing global ICT policy initiatives recognize the need and potential of ICT literacy as a catalyst for socio-economic development and global competitiveness.

The matrix below, extrapolating from numerous international policy documents and strategic initiatives, further delineates key policies and strategies common in each of the above components. They are necessary to achievement of the broader ICT vision:

Infrastructure	Regulation	Digital Literacy	Public Services
<p>Government leadership fosters the development and deployment of broadband infrastructures by:</p> <ul style="list-style-type: none"> <li>• Formulating a Vision and Policies.</li> <li>• Promoting competition in the supply of ICT infrastructure and services.</li> <li>• Supporting ICT broadband initiatives.</li> <li>• Supporting policies that advance standardized certification and assessment.</li> </ul>	<p>The regulatory framework is supportive of ICT by:</p> <ul style="list-style-type: none"> <li>• Promoting competition in ICT infrastructure and services.</li> <li>• Stimulating universal access to ICT services.</li> <li>• Developing a single regulatory framework for convergent multi-media technologies.</li> </ul>	<p>Education and workforce development policies encourage ICT digital literacy by:</p> <ul style="list-style-type: none"> <li>• Adopting 21<sup>st</sup> Century learning skills.</li> <li>• Supporting teacher training in ICT skills.</li> <li>• Seeding programs to increase digital literacy and workforce skills.</li> <li>• Benchmarking progress with standardized assessments and certification to global standards.</li> </ul>	<p>The government embraces ICT by:</p> <ul style="list-style-type: none"> <li>• Optimizing ICT deployment in government operations.</li> <li>• Using ICT to deliver a wide range of government services.</li> <li>• Advancing applications for citizens through public-private partnerships.</li> </ul>

In further analysis of exemplary ICT digital literacy policies and strategies from other states and countries, additional factors emerge that are relevant to implementation of a successful digital literacy policy. They are:

1. Establishing a visionary public policy environment that asserts a Digital Divide is unacceptable and embraces a goal of digital literacy for all residents.
2. Adopting global standards and benchmarking for ICT digital literacy skills and certification.
3. Initiating sustainable ICT projects to expand digital literacy skills and build workforce capacity.
4. Providing universal and affordable access to information technology for all residents, with a particular commitment to ensuring equal opportunities to economically disadvantaged communities and vulnerable populations.

It is illustrative how other countries and regions have approached ICT strategies and policies, and specifically how they have addressed the digital literacy needs within those initiatives. For example, the European Union, considered a leader in digital literacy, describes its intent relating to workforce needs and digital literacy in the following way:

*The main policy objective is to contribute to improve framework conditions in Europe for the provision of a world-class e-skilled workforce to achieve stronger productivity, economic and social benefits and for the reduction of the digital divide.*

The EU recognized a need to:

1. *Develop optimal policies to prepare new workers and support current ones as they face the challenges of ICT led change and globalization;*
2. *Reduce the digital divide and ensure that its citizens are digitally literate; and*
3. *Provide a coordinated and timely response to implement change successfully.*

The private sector has also advanced this mindset by leading collaborative efforts in digital literacy. For example, the Asian Development Bank (ADB), in its Long Term Strategic Framework, has embarked on corporate partnerships to advance regional digital leadership. According to the ADB a skilled 21<sup>st</sup> Century workforce is a priority for governments across the region, and is seen as an important factor in encouraging foreign investment. Simply stated, the framework acknowledges:

*Those countries which have a clear policy objective to develop local ICT expertise and know-how and which align programs such as education, skills and digital literacy in support are most likely to achieve that objective with resulting benefits to their communities, businesses and public administration. (Source: Asian Development Bank- Long Term Strategic Framework)*

At a nation level, Singapore, in an effort to support development of ICT skills, started with a levy on the use of low-paid labor that “encouraged” its citizens and companies to improve ICT skills. The levy was part of an initiative on Integrated Workforce Development. A program called CREST (Critical Enabling Skills Training) called for the training of workers in companies by a network of private providers on “critical skills” to acquire knowledge: learning to learn, literacy, listening and oral communication skills, problem solving and personal effectiveness, organizational effectiveness and leadership. The government, through a Productivity Standards Board, set the standards and desired outcomes. While not realistic for the United States, the approach, however, demonstrates the priority and creativity given to ICT skills acquisition in developing countries.

Among many countries, whether considered developed or developing, there is substantial acknowledgement of the importance of digital literacy as it relates to economic development, productivity, cultural advancement, or social cohesion. Singapore, Korea, Jordan, Finland all have policies and efforts underway to increase the training and upgrading of digital literacy skills. Jordan, for example, created a program of economic and social transformation in 2001 to develop high value-added sectors and to establish a knowledge economy. The top priority in this program has been the development of the nation’s human resources skilled in digital literacy, among other considerations.

As previously discussed, there are numerous successful ICT digital literacy policies and strategies already being implemented around the globe. California does not need to reinvent the wheel in developing its own policy or strategy. However, because there are only a few states across the United States with policy initiatives in place to address the issue of ICT digital literacy, this research suggests strongly that best examples for California, in light of its global competitiveness and economic development needs for the future, are primarily models in other countries.

Almost every country studied, including those that are considered to be “advanced,” e.g. the European Union, Japan, Korea, Finland, is concerned about the lack of ICT skilled human resources, the need for widespread teacher training in ICT, and increased efforts to increase the ICT digital literacy of the young as well as those in the workforce. (See Appendix D for key global policies and initiatives).

Within the United States, Kentucky is probably the most referenced state in advancing ICT strategies for economic development and education. Kentucky's 2004 *Prescription for Innovation* is a comprehensive plan to accelerate technology growth, particularly in the areas of broadband deployment and technology literacy and usage. The initiative maintains four key goals for affecting statewide economic development:

- Full broadband deployment by the end of 2007.
- Improved use of computers and the Internet.
- A meaningful online presence for all Kentucky communities, to improve citizen services and promote economic development through e-government, virtual education, online healthcare.
- E-Community Leadership Teams in every county focused on growth strategies for local government, business and industry, education, healthcare, agriculture, libraries, tourism, and community-based organizations.

These goals are consistent with the common attributes for success previously discussed in global best practice models.

In their broader efforts to improve social welfare and bring about economic opportunity for the people, many regions of the world have advanced some form of ICT policy, some comprehensive and others less so. For example, in the East African nations many have initiated broad-based ICT policies and master plans; some influenced by development agencies, and others like Mauritius inspired by Asian countries such as Singapore and India. Mauritius has an advanced ICT policy, being less dependent on external assistance both in policy development and in implementation of ICT programs. Rwanda, on the other hand, has a detailed ICT strategy developed through external assistance. However, the plan is inconsistent with the country's political reality, the level of infrastructure deployment, and the resources and the capacity of institutions to implement them.

Experience shows that developing ICT policies by building upon a shared vision, relying on local expertise and focusing on building blocks such as telecommunication policies and human resource development leads to better results than ambitious lists of projects lacking in alignment to an overarching mission.

In summary, the ultimate success of ICT and digital literacy policy efforts appears to be directly linked to a vision, leadership commitment, broadband infrastructure deployment and a favorable policy climate.

### **Role of Multiple Stakeholders**

An analysis of best practices indicates that the implementation of the most successful strategies must also include the "buy-in" and participation of multiple stakeholders with distinct roles.

It will take a collaborative effort to reach the goal of an ICT digitally literate population and workforce in California. Specifically, the K-20 education segments and the business community must work in tandem to achieve success. Many projects and initiatives are already underway throughout the State. The challenge will be to bring them together with a shared vision, common definition of ICT digital literacy, and with "buy-in" for the proposed continuum for digital literacy aligned to assessments, standards, and certification.

To illustrate this important aspect, the following matrix of stakeholder roles, based on review of global best practices, is presented for consideration in formulating and successfully implementing a successful policy and digital literacy strategy for California.

## California ICT Digital Literacy Policy and Strategy – Matrix of Global Best Practices – Stakeholder Roles

	State Level	Local Entities	K-12, Colleges and Universities	Business and Other Key Stakeholders	Individuals
<b>21st Century Economy</b>	Adopt Policies in support of an <b>ICT Digital Literacy Roadmap for Success</b> that meet globally recognized standards.	Adopt ICT digital literacy skills framework for education and workforce.	Develop a <b>California Performance Skills Framework</b> for K-20 Education.	Lead strategic alliances to support economic policies based on an ICT digital literacy foundation.	Demonstrate a willingness to seek training for employment in ICT related jobs.
	Provide an ICT literacy vision and needed leadership.	Initiate local projects based on existing best ICT practices.	Work with government, K-12 and industry to develop ICT skills competencies needed for the work force and high school exit.	Provide up to date meaningful statistics and benchmarks to track and reduce the skills gap.	Be flexible in employment opportunities.
	Conduct ICT literacy census.				
	Require standardized skills, certifications and assessments.	Build public-private sector partnerships.	Infuse digital literacy into teacher education curriculum and professional development.	Seed models of innovation.	Use technology in the home.
<b>21st Century Learning and Workforce</b>	Adopt an ICT Digital Literacy definition and elements based on global standards.	Add ICT literacy to school board education exit requirements based on ISTE-NETS standards.	Align assessments and certifications to global standards with supporting diagnostics and curriculum.	Increase decentralized workforce training by initiating pilot projects in digital literacy with local entities.	Be willing to engage in digital literacy skills acquisition and lifelong learning.
	Encourage a citizenry mindset of lifelong learning.	Develop teacher qualifications for mastery of ICT digital literacy.	Require digital literacy competencies for teacher credentials.	Promote the job training in ICT digital literacy skills.	Show ambition to learn new methods and ICT related skills.
	Enhance understanding of statewide qualification structures to facilitate workforce opportunity and mobility.	Increase ICT training and certification opportunities for workforce development.	Incorporate digital literacy competencies into vocational training.	Seed pilot projects.	Recognize the need for continuous improvement and self-assessment in digital literacy capabilities.
			Adopt ICT digital literacy requirements for high school exit requirements.		
<b>21st Century Citizenry</b>	Promote a digitally literate 21st century citizenry.	Recognize ICT skills for professional and vocational training.	Promote lifelong learning and e learning.	Foster dialogue with diverse stakeholders.	Foster the use of ICT in social environments and family groups.
	Advance e-government and ICT applications for health, environment and e learning.	Provide incentives for retraining employees.	Require ADA compliance for assistive devices, software design and curriculum.	Collaborate with Government on a Public Awareness Effort.	Participate in e learning at home, libraries, community centers.
	Provide equal opportunities by supporting policies that eliminate the digital divide.	Encourage under-represented groups to acquire digital literacy skills (women, long-term unemployed, the disabled).		Work with local entities to train the long term unemployed and other target groups in key e-skills for business.	Apply digital literacy skills to access health, e-government, banking, and to support healthy environment.
	Support universal access to broadband technologies.			Establish statewide pool of ICT digitally literate workers.	

## Role of K-20 Education Stakeholders

The role of ICT digital literacy in formal education has long been acknowledged. A decade ago the International Society for Technology in Education (ISTE) released recommendations that supported incorporating K-12 digital literacy – or educational technology - skills into the academic standards. ISTE’s recommendations, known as National Educational Technology Standards (NETS) are endorsed by a majority of states as fundamental to K-12 standards and high school graduation requirements. These standards are now used by school districts in every state and in many countries, and are credited with significantly influencing expectations for students and creating a target of excellence relating to technology use and skills development.

In 2007, ISTE released the next generation of NETS for Students, focusing more on skills and expertise and less on tools. The updated NETS standards further acknowledge the importance of the digital literacy role K-12 curricula. Specifically, they address:

- Creativity and innovation.
- Communication and collaboration.
- Research and information fluency.
- Critical thinking, problem solving, and decision-making.
- Digital citizenship; and technology operations and concepts.

Many local school districts in California are already incorporating these new ISTE NETS standards into their technology plans. California state educational policy makers have yet to endorse the NETS. The Governor’s Broadband Task Force and the CETF Leadership Roundtable both reference the relevance of the ISTE standards as integral to the California ICT Digital Literacy Policy.

As California advances into the 21<sup>st</sup> Century, current and future teachers, and teacher librarians must be prepared to meet the needs of technologically literate students. Teachers and teacher librarians must be certified in digital literacy so that they can assist the process and enable the students of today and tomorrow to acquire the prerequisite skills needed to compete in their chosen academic, career, cultural, and social pursuits. Embedding digital literacy training and certification programs in pre-service and professional development will advance digital literacy throughout California.

In addressing ICT digital literacy requirements, school districts must also take into consideration their policies for how students and teachers are able to use online tools to access applications and resources. For example, access to Web 2.0 tools, such as blogs and podcasts, are often blocked by districts, suggesting a need to revise current policies to keep abreast of technology developments and new applications.

Teacher librarians have enthusiastically embraced online web 2.0 courses offered by the California School Librarians Association (CSLA), thus adding hundreds of online curriculum resources to already available curriculum. Yet, many teachers and students are unable to access these resources due to district blocking frequently based on outdated policies.

Districts do require signing of Acceptable Use Policies (AUP) for parents, students and district employees to use Internet workstations. However, communications technology ethics, Internet safety, copyright, piracy, plagiarism, peer-to-peer file sharing, and other topics are words and subjects not uniformly understood. AUPs protect districts from liability but do little or nothing to inform and educate users (teachers and students) or parents about what they are signing. A prerequisite tutorial would be an appropriate requirement prior to signing an annual AUP. Tutorials should be required (for students and employees) or made available (for parents) before signing an AUP as a basic digital literacy online course similar to what businesses require in annual policy coverage for employees. Each district could then further contribute to the advancement of digital literacy by providing an online tutorial to meet this informational need.

### **Role of Community Colleges Redefined**

The California Community Colleges (CCC) has a key role to play in ensuring a digitally literate citizenry. The CCC is a vital link between K-12 education, academic and professional degrees and the workforce. Therefore, the CCC represents a significant stakeholder constituency in efforts to ensure the achievement of 21<sup>st</sup> Century skills for all residents of California. The CCC must play a leadership role in collaborating with business and educators on the incorporation of a seamless continuum of skills into academic study and vocational education requirements, and in offering opportunities for student assessment, acquisition, and certification of ICT digital literacy.

### **Role for Business Leaders**

The business community has been most vocal in expressing the need for an ICT digitally literate workforce. Business leaders have long recognized that in a competitive global economy a growing proportion of jobs now require at least a basic level of digital literacy, with many of the best jobs demanding even stronger digital skills. A paper issued by the National Policy Association's Digital Economic Opportunity Committee (DEOC) in 2006 acknowledged an American workforce crisis of workers lacking adequate 21<sup>st</sup> Century skills needed to fuel the information age economy. Importing foreign workers to address the IT worker shortage was viewed as only a stopgap measure.

The paper specifically focused on the following scenarios should the nation not effectively address skills building in information technologies:

- *Businesses will be less able to hire sufficient numbers of skilled workers at the wage levels needed to be productive and competitive. Although companies can compensate for this IT skills gap in a growing economy through higher productivity, such a solution cannot be sustained in the long run.*
- *Schools at all levels will be less able to hire enough instructors with the skills that are needed to train the workers of today and those of tomorrow.*
- *Government will be less able to hire enough skilled workers to carry out the increasingly ICT dependent functions of providing for the health, welfare, and protection of the country.*
- *Workers will have fewer opportunities to obtain good jobs, better pay and benefits, and a better quality of life.*

Many countries, through public-private sector collaborations, have already developed national "frameworks" and "roadmaps" for education and training, and strong national policies to support workforce training for the jobs of the future.

The U.S. Chamber of Commerce's Institute for a Competitive Workforce in 2007 launched a new *Digital Skills Working Group* intended to seek to equip American workers with the skills they need to operate computers and the rapidly evolving software applications and programs businesses commonly use. The Working Group focuses the importance of "digital skills" in the U.S. economy; to work toward a clearer consensus across industry sectors on the definitions of the necessary skill sets; and to identify the major opportunities available to U.S. workers to receive effective training in the use of digital skills on the job.

ACT, a well known U.S. assessment company, is promoting a *National Career Readiness Certificate* as a standard of work readiness to address the ICT skills crisis and is working in collaboration with educational institutions around the country. The certificate is earned when students demonstrate workforce skills preparedness based on international standards and competencies. Collaborative initiatives between business, government, community colleges, and other stakeholders in Iowa, Kentucky, and Michigan, just to name a few, are also exploring benchmarking, standardized certificates of skills readiness. Other global assessment providers such as Educational Testing Service (ETS), Certiport, and ICDL-US are engaged with the California State University and other California institutions and stakeholders to address benchmarking, assessment and curriculum development for implementing a statewide digital literacy effort.

Unlike many other countries, in the United States there are no national or statewide assessments in place for digital literacy certification for a 21st Century workforce. The European Union, for example, has standardized certification requirements in ICT skills supported by the business sector as a fundamental component of the applicant's competency for employment, an approach replicated in countries such as Singapore, North Korea, the Middle East such as Jordan, Australia, New Zealand, among many others.

## **Call to Action**

The California Emerging Technology Fund ICT Digital Literacy Leadership Roundtable recommends policy action in the form of an Executive Order of the Governor and a Concurrent Resolution of the Legislature in support of an ICT Digital Literacy Policy. (Appendix A and Appendix B).

California has a limited timeframe for the policy “window of opportunity” in order to retain leadership in technological innovation, ICT economic development and workforce readiness in order to keep pace with many global competitors. California – as indicated by the CBTF Report - while competitive with deployment of broadband technology nevertheless lags behind much of the world in implementing an ICT Digital Literacy Policy.

California policy makers now have the opportunity to take a national leadership role in implementing policies and strategies that align multiple efforts already underway. This can be accomplished by enacting a California ICT digital literacy policy built upon a basic definition of ICT digital literacy and requiring that the California Basic Elements of ICT Digital Literacy-Continuum of Assessment Skills be adopted. (Appendix C).

Such actions will be giant steps toward bridging the Digital Divide and meeting the 21<sup>st</sup> Century skills requirements of students and workers to ensure California is globally competitive.

## Section II:

### Background for California Basic Elements of ICT Digital Literacy – Continuum of Assessment Skills

#### Purpose:

The purpose of the California Basic Elements of ICT Digital Literacy-Continuum of Assessment Skills is to provide a standardized approach for assessment and certification, along with diagnosis, and continuous improvement of basic information and communications technologies (ICT) digital literacy skills for students and the workforce. It builds upon:

- The definition of digital literacy in the *California Policy for ICT Digital Literacy*.
- A recognition that all residents of the state benefit from being ICT digitally literate in school, the workplace and 21<sup>st</sup> Century life.
- Adoption of global standards and performance indicators for ICT digital literacy.

The Continuum of Assessment Skills has been developed to address basic digital literacy skills assessment and certification requirements for both K-20 and workforce skills.

#### Definition, Elements and Competencies:

ICT digital literacy, as defined in the California Basic Elements of Digital Literacy – Continuum of Assessment Skills, is ability to use digital technology and communications tools, and/or networks to access, manage, integrate, evaluate, create and communicate information in order to function in a knowledge society. Specifically, the elements, definitions and competencies are:

BASIC ELEMENTS OF DIGITAL LITERACY		
Elements	Definitions	Competencies
Access	Knowing about and knowing how to collect and/or retrieve information.	Search, find, and retrieve information in digital environments.
Manage	Applying an existing organizational or classification scheme.	Conduct a rudimentary and preliminary organization of accessed information for retrieval and future application.
Integrate	Interpreting and representing information - summarizing, comparing, and contrasting.	Interpret and represent information by using ICT tools to synthesize, summarize, compare, and contrast information from multiple sources.
Evaluate	Making judgments about the quality, relevance, usefulness, or efficiency of information.	Judge the currency, appropriateness, and adequacy of information and information sources for a specific purpose (including determining authority, bias, and timelines of materials).
Create	Generating information by adapting, applying, designing, inventing, or authoring information.	Adapt, apply, design, or invent information in ICT environments (to describe an event, express an opinion, or support a basic argument, viewpoint or position).
Communicate	Communicate information persuasively to meet needs of various audiences through use of an appropriate medium.	Communicate, adapt, and present information properly in its context (audience, media) in ICT environments and for a peer audience.
<b>Note:</b> Existing international and national digital literacy frameworks and assessment instruments share these common elements.		

## **Standards, Performance Indicators and Outcomes:**

The standards, performance indicators and outcomes presented on the Continuum of Assessment Skills were mapped to the above ICT literacy elements, definitions, and competencies in order to:

- Provide a seamless continuum of ICT digital literacy skills.
- Ensure statewide standardized assessments of competencies.
- Assist in identifying digital literacy skills gaps for advancement to full proficiency.
- Provide a reliable performance guide to school administrators, educators, and employers for use in diagnosis and continuous improvement of students and workers.
- Guide curriculum choices and curriculum development.
- Validate that certification of competency in basic ICT digital literacy skills achievement is based on globally acceptable standards and performance indicators.

The Association of College and Research Libraries (ACRL), a division of the American Library Association (ALA) is considered a premier source for standards, performance indicators, and outcomes for assessment of ICT digital literacy competencies at the Post-Secondary Level. Multiple academic institutions and commercial assessment developers have adopted the ACRL framework. Additionally, the National ICT Literacy Policy Council, a collaboration of business and education organizations has endorsed them. In February 2007, the National ICT Literacy Policy Council met in Washington, D.C. to draft definitions of expected ICT literacy standards for students entering college and for college students beginning advanced course work. The resulting standards are the 'foundational' level of ICT literacy for minimally expected performance of first and third-year college students, and are incorporated into ICT literacy assessment instruments of the Educational Testing Service Assessment. ETS is already using the assessment in pilot programs in the California State University System and with multiple four-year institutions nationwide. Pilot projects related to these standards and performance indicators are already underway in California State University (CSU) four-year post-secondary institutions – with national assessment developers such as Educational Testing Service (ETS), among others. CSU is considering incorporating ICT digital literacy performance indicators and outcomes into academic requirements.

These existing *Post secondary standards and performance indicators* and outcomes relating to the ICT digital literacy skills necessary for completion of academic and professional degrees as recommended by the National ICT Literacy Policy Council were considered in the development of the CETF Continuum of Assessment Skills. (Appendix E).

There are five standards and twenty-two performance indicators which focus upon the needs of students in higher education at all levels and which identify a range of outcomes for assessing student progress toward information literacy. These outcomes serve as guidelines for faculty, librarians, and others in developing methods for measuring a student's ICT digital literacy competency.

It is recommended that all California post-secondary systems adopt these standards, performance indicators and outcomes. The five specific standards identified by ACRL and the National ICT Literacy Policy Council are:

**Standard One**

**The information literate student determines the nature and extent of the information needed.**

**Standard Two**

**The information literate student accesses needed information effectively and efficiently.**

**Standard Three**

**The information literate student evaluates information and its sources critically and incorporates selected information into his or her knowledge base and value system.**

**Standard Four**

**The information literate student, individually or as a member of a group, uses information effectively to accomplish a specific purpose.**

**Standard Five**

**The information literate student understands many of the economic, legal, and social issues surrounding the use of information and accesses and uses information ethically and legally.**

The need for *Community Colleges, vocational programs, schools and institutions and the industry* entry level digital literacy assessment requirements were addressed as a unique consideration in the development of the California Basic Elements of ICT Digital Literacy - Continuum of Assessment Skills. This rationale rested on the assumption that in general vocational education students and entry-level workers seeking certification in work force preparation may require a higher level of remediation and concentration on the basic literacy skills than students in four-year academic and professional programs. Test developers, such as ICDL-US and Certiport, are working with the California Community Colleges and employers on a number of pilot projects that use a variety of ICT skills assessment instruments for certification of work force competencies in students.

There are no national or statewide recognized standards, performance indicators or outcomes for certification at this time for ICT digital literacy competency in the community colleges, vocational programs, or for entry level workforce. Existing standards, performance indicators and outcomes for ICT digital literacy skills for work force preparation, advancing of employees already in the workforce, benchmarking, and certification are varied and lack standardization. There has been no parallel standardization effort at Community Colleges to that of the National ICT Literacy Policy Council for the four-year institutions. To date, the assessments and curricula have been primarily driven by competitive vendors with a primary interest in marketing tests for industry related computer skills standards or technical competencies for jobs related to information technology. For example, Companies such as Microsoft and Cisco, Novell, Linux, among many others, have wide-ranging testing materials with support curriculum that relate directly to their products. Their skills tests, known generally as IT assessments, are available either directly from the company or through numerous re-sellers.

Most of these basic computer skills certifications and training programs are costly for the test taker and focus on identifying and validating use of vendor specific software programs or the operating systems and application programs for computers.

IT assessments seem to adequately measure and provide certification of higher-level candidates on primarily the technical skills. However, it is possible that over half of the students in community colleges today are lacking in basic ICT literacy skills required to even effectively operate a computer and navigate typical application suites because of deficiencies in basic literacy skills.

Internationally, two leading companies have dominated the work force for basic digital literacy assessment areas – Certiporth with its Internet and Computing Core Certification (IC3) and *International Computer Driver's License (ICDL)* with a work skills assessment (CSP/iLit), and known for the *Computer Drivers License Certification*. Both companies reference multiple countries using their assessments for both standardized benchmarking and regional and national levels, and for individual digital literacy work force assessments. Additionally, the Computing Industry Association (CompTIA) has a technology certification called CompTIA A+ certification. This assessment falls into the IT category and proves a candidate has a broad base entry-level knowledge and competency in core hardware and operating system technologies, including installation, configuration, diagnosing, preventive maintenance and basic networking. These assessment providers all collaborate to one degree or another with community colleges, training providers, institutions and employers throughout California.

## **Standards and Performance Indicators for K-12 Students**

In the *K-12 education* segment, ICT digital literacy competencies and assessment present an even more complex paradigm. Digital literacy is broadly co-mingled with technology planning, professional development, the incorporation of skills into existing curriculum, administrative support, and access to technology. The International Society for Technology in Education (ISTE) and the Partnership for the 21<sup>st</sup> Century Skills, a national collaboration of education associations and businesses, are the two leading organizations in identifying K-12 digital literacy skills and assessment approaches. While there is no national standard at K-12, many states have already adopted and aligned the recommendations of these organizations into their locally approved curriculum and assessment standards. Many school districts in California are incorporating the ISTE National Education Technology Standards (NETS) and performance indicators into their curriculum and technology planning processes. It is for this reason that the California Basic Elements of ICT Digital Literacy – Continuum of Assessment Skills incorporates the ISTE NET\*S Standards for K-12 education and the Partnership for the 21<sup>st</sup> Century performance standards.

Educational professionals regard eighth grade as a good benchmarking grade for assessing digital literacy. The *NET\*S Online Technology Assessment* developed jointly by the International Society for Technology in Education (ISTE) and Microsoft focuses on this population and uses ICT to demonstrate achievement in analytic, production and communication skills.

The assessment's twelve 30-minute activities require students to use a variety of Microsoft's most commonly used Office applications Word, Excel, PowerPoint, Internet Explorer, Outlook, Access and FrontPage - to complete real world tasks such as writing a business letter or constructing a slide presentation on "The Nine Planets." The assessments offer formative information about students' skills and have been offered as an online tool for teachers and administrators to gauge their students' progress towards No Child Left Behind (NCLB) 8th grade technology-literacy requirement. However, to date no similar standardized evaluation instrument for high school exit proficiency is available.

### **Performance Indicators for Teachers and Teacher Librarians**

Building on the ISTE NETS for Students, the ISTE NETS for Teachers (NETS•T) standards focus on pre-service teacher education, and define the fundamental concepts, knowledge, skills, and attitudes for applying technology in educational settings. All candidates seeking certification or endorsements in teacher preparation should meet these educational technology standards. It is the responsibility of faculty across the university and at cooperating schools to provide opportunities for teacher candidates to meet these standards. Teacher Librarians also need to meet these standards because they are frequently the key professionals at a school site that have responsibility for teaching multimedia, ICT and information literacy skills.

### **ICT Development in a K-12 School Environment**

In addition to the student performance standards in ICT digital literacy, it is important that the K-12 school environment promote a mindset of ICT development. This includes recognizing that Teacher Librarians, along with classroom teachers, have a significant role in teaching ICT digital literacy skills. It is this partnership that contributes to successful integration of digital literacy into the curriculum. The following framework provides a guide for consideration as educators incorporate ICT digital literacy requirements into the pedagogy, curriculum and assessment.

The chart on the following page displays the indicators of ICT development in a K-12 school environment.

**Chart: Indicators of ICT Development in a K-12 School Environment**

Stages of ICT Development and Approaches to ICT Teaching and Learning	Indicators of ICT Development in a K-12 School Environment		
	Learning and Teaching Pedagogy	Understanding of Curriculum	Assessment
<b>Emerging</b> Discovering ICT tools.	Teacher-centered pedagogy: Focus is on knowledge and skills of ICT.	Students' ICT literacy is developed during special ICT lessons. Target: to teach students to understand and use hardware and software.	ICT capabilities are assessed separately from students' capacities in other domains. Assessment is a responsibility of the ICT subject teacher. Mainly knowledge and technical skills are assessed. Multiple-choice questions and other standard test techniques are used.
<b>Applying</b> Learning how to use ICT.	Teacher-centered pedagogy: Focus is on fundamental knowledge and skills to apply ICT in discrete areas.	ICT is applied within discrete subjects in artificial isolated subject contexts.	Assessment focuses on skills and abilities to perform tasks. ICT literacy is assessed separately and as a part of other subjects. Assessment is a responsibility of isolated teachers.
<b>Infusing</b> Understanding how and when to use ICT to achieve particular purposes.	Student-centered pedagogy: Focus is on collaboration and communication, use of different information sources and application of ICT for various standard purposes.	Curriculum is organized on a problem-based authentic basis. ICT and different subjects are integrated. ICT (and ICT literacy) is a tool used for accomplishment of various authentic tasks. Projects and other resource-based learning methods are dominant.	Evaluation is integrated and moderated across subject areas. Assessment focuses on attainments in subject domains. Portfolios and multiple media are used to demonstrate attainments. ICT literacy includes technical, cognitive, social and ethical aspects. Evaluation is the responsibility of the student.
<b>Transforming</b> Specializing in the use of ICT tools.	Student-centered pedagogy: Focus is on active experimental learning, critical thinking and decision-making capabilities. ICT is applied for individualization of learning and a range of other purposes.	Curriculum is tailored to each student's individual needs. Blended learning environments and learning management systems are used in the teaching and learning process. ICT literacy is enhanced and applied while accomplishing various learning tasks.	Evaluation is continuous and holistic. Learner-oriented, open-ended, project-based, peer-mediated evaluation approaches are used. ICT literacy is a part of basic literacy. Various communities are involved in the assessment.
<b>Progress in implementing ICT at a school and indicators that describe ICT literacy.</b>			
Anderson, J. & Weert, T. (2002). <i>Information and communication technology in education. A curriculum for schools and programme of teacher development.</i>			

## SUMMARY AND NEXT STEPS

From the outset of this research and development activity, CETF required clarity and a shared vision for success and insisted that the California Basic Elements of ICT Digital Literacy - Continuum of Assessment Skills meet the following basic requirements:

- Be able to attract multi-stakeholder “buy-in” during development process.
- Be able to assess both basic literacy and ICT digital literacy skills.
- Be cost effective.
- Be delivered in a short time at many locations with online security.
- Be accessible to special needs groups and multilingual.
- Be endorsed by employers and business associations as essential in getting a job.
- Be endorsed by assessment providers as the basic ICT digital literacy continuum.
- Be validated to global standards and performance levels and accepted in California.
- Be aligned to syllabi, curriculum and diagnostics.

The California Basic Elements of ICT Digital Literacy – Continuum of Assessment Skills will help to guide assessment and certification of students both academically and in the workforce in achievement of basic ICT digital literacy skills. Furthermore, individuals will be better informed and self-empowered to acquire the necessary skills needed for educational attainment and reaching career goals. The matrix for the California Basic Elements of ICT Digital Literacy - Continuum of Assessment Skills is presented in Appendix C.

Validation of the Continuum of Skills is an important next step in the process. Assessment providers have indicated a willingness to dedicate resources (most likely human resources and in-kind services) to the development of a “roadmap for action” and design of a large-scale benchmarking project – perhaps leveraging the existing CETF projects and including other pilot sites. According to the assessment providers, to yield scientifically validated information the planning and implementation process for this phase will require a 12-18 month effort.

The development of the Continuum of skills was a challenging effort made possible by the collaboration and cooperation of major assessment providers and standards developers. California is now the only state that has reached this mark in developing a framework for ICT digital literacy basic skills assessment.

The CETF effort in ICT Digital Literacy has been successful in securing stakeholder buy-in from the Governor, Legislators, key education and business stakeholders, and assessment providers.

The next milestone will be successfully implementing the benchmarking pilots in 2009-2010. There is strong support for promptly designing and implementing this phase of the initiative. CETF has built momentum and high expectations for the effort, and needs to keep stakeholders engaged in the process by continuing the momentum. Therefore, it is important to reach agreement on the pilot design and launch this phase in early 2009.

# Appendix A

## **Information and Communications Technologies (ICT) Digital Literacy Policy**

**Executive Order # \_\_\_\_\_**

**By the Governor of California**

WHEREAS, Information and Communications Technologies (ICT) Digital Literacy is a defining component of California's competitiveness for a knowledge-based economy and is growing in importance to attract capital investment that will generate higher quality jobs;

WHEREAS, ICT Digital Literacy skills are critical to a California's ability to compete successfully in a global information and knowledge economy;

WHEREAS, ICT Digital Literacy is defined as using digital technology, communications tools and/or networks to access, manage, integrate, evaluate, create and communicate information in order to function in a knowledge-based economy and society;

WHEREAS, there is widespread recognition documented in numerous national and international reports by entities such as the World Summit on the Information Society (WSIS) that ICT Digital Literacy is increasingly critical for increasing productivity, improving quality of life, and enhancing global competitiveness;

WHEREAS, the first inaugural annual survey by the Public Policy Institute of California in partnership with the California Emerging Technology Fund and ZeroDivide (titled *Californians and Information Technology*) found that nearly seven in ten Californians and strong majorities across demographic groups believe it is very important to have Internet access;

WHEREAS, to ensure continued global competitiveness in today's knowledge-based economy, it is increasingly important for workers to be able to cope with changes in the nature of work, shifts in the labor demand, and changes in required ICT skills for the jobs being generated;

WHEREAS, at the individual level, the ability to read, write, do math, problem solve, work in a team, think critically and use ICT is essential to education and workforce preparation, employment success, civic participation, health care and accessing entertainment;

WHEREAS, the State of California supports information and communication technologies for applications in government, education, workforce, health care, business and other areas;

WHEREAS, it is recognized that all residents must have the opportunity for full participation in the educational, civic, cultural, and economic sectors of California society and must have accessibility to and appropriate skills for fully utilizing government, education, workforce, health care, business, and other services;

WHEREAS, a California ICT Digital Literacy Policy will support a framework and continuum of digital literacy skills, benchmarking and metrics consistent with globally accepted standards, and will ensure accountability for assessing progress and success;

AND WHEREAS, an ICT Digital Literacy policy is consistent with the Administration's goal to strengthen the economy, expand the skilled workforce, and increase competitiveness in sciences, technology, engineering and math (STEM) industries and careers;

NOW, THEREFORE, I, ARNOLD SCHWARZENEGGER, Governor of the State of California, by virtue of the power vested in me by the Constitution and statutes of the State of California, do hereby order effective immediately that a goal be established to ensure that California residents are digitally literate, and in so doing recognize the importance of:

1. (1) access to information and communications technologies by our people regardless of income, geographic location or advantage; (2) the provision of ubiquitous broadband service in a competitive marketplace at affordable cost; (3) opportunities for our people to acquire ICT digital literacy skills in order to benefit academically, economically and socially; and (4) a California ICT Digital Literacy Policy that declares that all residents of California will be digitally literate.
  
2. A seamless continuum of Digital Literacy competencies with benchmarks, metrics, assessments and certifications endorsed by the State to identify the ICT digital literacy proficiencies of residents, students, and workers.

**Furthermore, I declare that:**

The Chief Information Officer for the Administration in collaboration with the Secretaries of Education, Labor and Workforce Development, and Business, Transportation and Housing shall coordinate oversight of the efforts necessary to meet this goal of digital literacy.

It shall be the policy of the State of California, and of all of the Agencies and Departments within the Administration, to pursue and achieve the goal of globally-competitive Information and Communication Technologies (ICT) Digital Literacy for all students, workers and residents.

The Legislature and Superintendent of Public Instruction shall consider adopting a similar policy and to join in issuing a "Call to Action" to schools, higher education institutions, employers, workforce training agencies, local governments, community organizations, and civic leaders to advance California as a global leader in ICT Digital Literacy by:

- a. Incorporating ICT Digital Literacy into workforce training programs and curricula.
- b. Supporting and promoting ICT Digital Literacy by encouraging all public agencies to optimize e-government and the availability of public services online.
- c. Requiring employers and employer organizations to identify requisite ICT Digital Literacy skills for 21<sup>st</sup> century jobs and to articulate appropriate training and assessment standards to local, regional and state agencies responsible for workforce training.

- d. Encouraging public and private sectors to join forces and form public-private partnerships to promote ICT Digital Literacy.

I further declare that a *California ICT Digital Literacy Leadership Council* shall be established within the Administration to be chaired by the Chief Information Officer and to consist of the Secretary of Education, Secretary of Labor and Workforce Development and Secretary of Business, Transportation and Housing, and Secretary of State and Consumer Affairs. *The California ICT Digital Literacy Leadership Council* shall invite the Superintendent of Public Instruction to participate as a member of the Council.

Authority is delegated to the Council to establish an *ICT Digital Literacy Advisory Committee* consisting of representatives of related State entities, such as the California Economic Strategy Panel, California Workforce Investment Board, Community College Board of Trustees, State Board of Education, California Community Colleges, California State University, University of California, public-purpose private-sector organizations such as the California Emerging Technology Fund, California Business Roundtable, California Chamber of Commerce, American Electronics Association, TechNet, and leaders from the private sector to assist in preparing an Action Plan. The Majority and Minority Leaders of the Senate and Assembly shall be invited to each appoint a Legislator to serve on the *ICT Digital Literacy Advisory Committee*. The Council in consultation with the Advisory Committee shall be responsible for developing *The California Action Plan for ICT Digital Literacy* which shall include:

- a. Definition of the basic elements of Digital Literacy.
- b. Description and articulation of a “continuum” of skills required for Digital Literacy.
- c. Strategies and actions for incorporating Digital Literacy into workforce training statewide.
- d. Strategies and actions for incorporating Digital Literacy into K-12 and higher education.
- e. Acceptable framework(s) for assessment and certification.
- f. Recommended curricula consistent with the assessment framework(s).
- g. A timeline for implementation of the Action Plan.
- h. Identification of metrics to ascertain the achievement of ICT Digital Literacy.

The *California Action Plan for ICT Digital Literacy* shall be consistent with the recommendations of the California Broadband Task Report – January 2008: *The State of Connectivity Building Innovation Through Broadband*. Thus, the California Workforce Investment Board (WIB) shall develop an explicit technology literacy component for its five-year Strategic State Plan to:

1. Raise the level of Digital Literacy in California by supporting technology training and integrating Digital Literacy skills into workforce development activities;
2. Expand Career Technical Education (CTE) opportunities and Digital Literacy programs in community colleges;
3. Build consensus at the State and local community levels by identifying Digital Literacy ecosystems to drive models of excellence, benchmarking, and reliable metrics for measuring success;
4. Initiate benchmarking and appropriate tracking of large populations and providing appropriate diagnostics for citizens to self empower in order to acquire 21<sup>st</sup> Century skills;

5. Provide workforce examples of skills training and job-placement community-value projects for e-government, e-health or other conveniences;
6. Engage the ICT industry and entertainment mega-industry along with large employers to promote applications;
7. Highlight collaborative models in underserved communities and culturally diverse populations;
8. Build and resource a strong coalition empowered with achieving near term action and results oriented outcomes;
9. Reward success to reinforce best practices, individual champions, economic results, and public awareness and support;
10. Recommend to the Legislature ways of providing tax incentives to technology-based businesses offering technology training and technical support to at-risk communities, particularly disabled and low-literacy populations.

These activities are to be accomplished through realignment of existing personnel and resources to address this priority without additional state funding. However, the California ICT Digital Literacy Leadership Council is authorized to identify and deploy non-state resources that can work in collaboration with State agencies to help build a public-private sector alliance for the purpose of assisting in implementation of the goals of the ICT Digital Literacy Policy.

The California ICT Digital Literacy Leadership Council is hereby required to submit the *California Action Plan for ICT Digital Literacy* to the Governor by October 31, 2009.

**Furthermore,**

**I FURTHER DIRECT** that as soon as hereafter possible, this Order be filed in the Office of the Secretary of State and that widespread publicity and notice be given to this Order.

IN WITNESS WHEREOF I have here unto set my hand and caused the Great Seal of the State of California to be affixed this \_\_\_\_\_ of 2008.

# Appendix B

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Senate Concurrent Resolution No. \_\_\_\_\_

Relative to information and communication technologies digital literacy

WHEREAS, Information and communication technologies (ICT) digital literacy is a defining component of California's competitiveness in a knowledge-based economy, and is becoming more important to attracting capital investment that will generate higher quality jobs; and

WHEREAS, ICT digital literacy skills are critical to the ability of California to compete successfully in a global information and knowledge economy; and

WHEREAS, ICT digital literacy is defined as using digital technology, communications tools, networks, or any combination thereof, to access, manage, integrate, evaluate, create, and communicate information in order to function in a knowledge-based economy and society; and

WHEREAS, There is widespread recognition documented in numerous national and international reports by entities and conferences, such as the World Summit on the Information Society (WSIS), that ICT digital literacy is increasingly critical for increasing productivity, improving quality of life, and enhancing global competitiveness; and

WHEREAS, Even though the first annual Californians and Information Technology survey by the Public Policy Institute of California, in partnership with the California Emerging Technology Fund and ZeroDivide, found that "[n]early seven in 10 Californians and strong majorities across demographic groups say it is very important for Californians to have Internet access," there is a persistent digital divide in California as evidenced by the following survey findings:

(a) Less than one-half of Latinos (48 percent) have home computers, while 86 percent of Whites, 84 percent of Asians, and 79 percent of Blacks have them;

(b) Only 40 percent of Latinos have Internet access and 34 percent have broadband connections at home, while the majorities of other racial and ethnic groups have both Internet access and broadband connections at home;

(c) Only 32 percent of Californians are very confident about their abilities to keep viruses, s p a r e , and adware off their home computers;

(d) Fifty six percent of parents indicate that they visit the Internet Web sites of their children's schools; however, only 30 percent of those with household incomes under \$40,000 visit the schools' Internet Web sites, while 84 percent of those with incomes of \$80,000 or more visit them;

(e) A majority of Californians express concern that residents in lower income areas and rural areas have less access to broadband Internet technology than others (62 percent and 51 percent, respectively);

(f) Disparity exists among ethnic and racial groups, income levels, and regions when comparing rates of computer ownership, Internet access, and broadband connections at home; for example:

(1) Since 2000, computer use among Whites has grown from 79 percent to 85 percent and among Blacks has increased from 76 percent to 83 percent, as has Internet use (from 70 percent to 81 percent for Whites and from 60 percent to 82 percent for Blacks);

(2) Among Latinos, computer use has declined since 2000 from 64 percent to 58 percent and Internet use is almost unchanged (47 percent compared to 48 percent). Asians also have seen declines during the same period in both their use of computers

(from 91 percent to 81 percent) and of the Internet (from 84 percent to 80 percent);  
and

WHEREAS, To ensure continued global competitiveness in today's knowledge--based economy, it is increasingly important for workers to be able to cope with changes in the nature of work, shifts in the labor demand, and changes in required ICT skills for the jobs being created; and

WHEREAS, At the individual level, the ability to read, write, perform proficiently in mathematics, solve problems, work in a team, think critically, and use ICT is essential to education and workforce preparation, employment success, civic participation, health care, and accessing entertainment; and

WHEREAS, California supports ICT for applications in government, education, the workforce, health care, business, and other areas; and

WHEREAS, It is recognized that all residents must have the opportunity for full participation in the educational, civic, cultural, and economic sectors of California society, and must have access, and appropriate skills for, fully utilizing government, education, workforce, health care, business, and other services; and

WHEREAS, A California ICT digital literacy policy should support a framework and continuum of digital literacy skills, benchmarking, and metrics consistent with globally accepted standards, and should ensure accountability for assessing progress and success; and

WHEREAS, Having an ICT digital literacy policy is consistent with the Governor's goals of strengthening the economy, expanding the skilled workforce, and

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increasing competitiveness in sciences, technology, engineering, and mathematics industries and careers; now, therefore, be it

*Resolved by the Senate of the State of California, the Assembly thereof concurring,*  
That the Legislature finds and declares that it is the goal of the state to accomplish all of the following:

(a) Ensure that California residents are digitally literate, and in so doing, recognize the importance of the following:

(1) Access to ICT by Californians regardless of geographic location, income, or any particular advantage.

(2) The provision of ubiquitous broadband service in a competitive marketplace at affordable cost.

(3) Opportunities for Californians to acquire ICT digital literacy skills in order to benefit academically, economically, and socially.

(4) A California ICT digital literacy policy that furthers the goal of all residents of California achieving digital literacy.

(b) Create a seamless continuum of digital literacy competencies with benchmarks, metrics, assessments, and certifications endorsed by the state to identify the ICT digital literacy proficiencies of students, workers, and California residents overall.

(c) Establish a goal of pursuing and achieving ICT digital literacy for students, workers, and California residents overall; and be it further

*Resolved*, That the Legislature further finds and declares that is important to maintain and advance California as a global leader in ICT digital literacy by doing all of the following:

(a) Incorporate ICT digital literacy into workforce training programs and Curricula.

(b) Supporte and promote ICT digital literacy by encouraging all public agencies to optimize e-government and the availability of public services online.

(c) Require employers and employer organizations to identify requisite ICT digital literacy skills for 21<sup>st</sup> century jobs and to articulate appropriate training and assessment standards to local, regional, and state agencies responsible for workforce training.

(d) Encourage public and private sectors to join forces and form public-private partnerships to promote ICT digital literacy; and be it further

*Resolved*, That the Legislature requests that the Governor create the California Information and Communication Technologies (ICT) Digital Literacy Leadership Council to provide leadership regarding ICT digital literacy; and be it further

*Resolved*, That the council should be composed of the Secretary for Education, the Secretary of Labor and Workforce Development, the Secretary of Business, Transportation and Housing, and the State Chief Information Officer, who should be the chairperson of the council; and be it further

*Resolved*, That the council should invite the Superintendent of Public Instruction and one representative each from the California State Senate and the California State Assembly to participate as members of the council; and be it further

*Resolved*, That the Secretary of the Senate transmit copies of this resolution to the author for appropriate distribution.

## Appendix C

<b>CALIFORNIA BASIC ELEMENTS OF ICT DIGITAL LITERACY – Continuum of Assessment Skills</b>							
<b>Elements</b>	<b>Definitions</b>	<b>Competencies</b>	<b>Standards and Performance Indicators</b>		<b>Assessments</b>		
			<b>ISTE</b>	<b>P21</b>	<b>ETS ICT Literacy</b>	<b>Certiport IC3 Standard</b>	<b>CSP/iLit</b>
<u>Access</u>	Knowing about and knowing how to collect and/or retrieve information.	Search, find, and retrieve information in digital environments.	<p>Plan strategies to guide inquiry (3a).</p> <p>Locate, organize, analyze, evaluate, synthesize, and ethically use information from a variety of sources and media. (3b)</p> <p>Collect and analyze data to identify solutions and/or make informed decisions. (4c)</p> <p>Understand and use technology systems. (6a).</p> <p>Advocate and practice safe, legal, and responsible use of information and technology. (5a)</p>	<p>ICT Literacy.</p> <p>Information Literacy.</p>	<p>Collect and/or retrieve information in digital environments. Information sources might be web pages, databases, discussion groups, email, or on-line descriptions of print media. Sample tasks include:</p> <p style="padding-left: 20px;">Generating and combining search terms (keywords) to satisfy the requirements of a particular research task.</p> <p style="padding-left: 20px;">Efficiently browsing one or more resources to locate pertinent information.</p> <p style="padding-left: 20px;">Deciding what types of resources might yield the most useful information for a particular need.</p>	<p>IC3 Living Online:</p> <p>Identify network fundamentals and the benefits and risks of network computing.</p> <p>Identify the risks of using computer hardware and software and how to use computers and the Internet safely, ethically and legally.</p>	<p>Select a specific search engine.</p> <p>Carry out a search for specific information using a keyword, phrase.</p> <p>Combine selection criteria in a search.</p> <p>Duplicate text, image, URL from a Web page to a document.</p> <p>Save a Web page to a location on a drive as a txt file, html file.</p> <p>Download text file, image file, sound file, video file, software, from a Web page to a location on a drive.</p>
<u>Manage</u>	Applying an existing organizational or classification scheme.	Conduct a rudimentary and preliminary organization of accessed information for retrieval and future application.	<p>Plan strategies to guide inquiry (3a-repeat).</p> <p>Locate, organize, analyze, evaluate, synthesize, and ethically use information from a variety of sources and media (3b-repeat).</p> <p>Plan and manage activities to develop a solution or complete a project. (4b)</p> <p>Select and use applications effectively and productively. (6b)</p> <p>Use multiple processes and diverse perspectives to explore alternative solutions. (4d)</p>	<p>Information Literacy.</p> <p>ICT Literacy.</p>	<p>Organize information to help you or others find it later, such as by:</p> <p style="padding-left: 20px;">Categorizing emails into appropriate folders based on a critical view of the emails' contents.</p> <p style="padding-left: 20px;">Arranging personnel information into an organizational chart.</p> <p style="padding-left: 20px;">Sorting files, emails, or database returns to clarify clusters of related information.</p>	<p>IC3 Key Applications:</p> <p>Common Program Functions</p> <p>Common word processing functions</p> <p>Common spreadsheet functions</p> <p>Common presentation functions</p>	<p>Understand how an operating system shows drives, folders, files in a hierarchical structure.</p> <p>Recognize common file types: word processing files, spreadsheet files, database files, presentation files, image files, audio files, video files, compressed files, temporary files.</p> <p>Select a file, directory/folder individually or as a group of adjacent, non-adjacent files, directories/folders.</p>

## CALIFORNIA BASIC ELEMENTS OF ICT DIGITAL LITERACY – Continuum of Assessment Skills

Elements	Definitions	Competencies	Standards and Performance Indicators		Assessments		
			ISTE	P21	ETS ICT Literacy	Certiport IC3 Standard	CSP/iLit
<u>Integrate</u>	Interpreting and representing information - summarizing, comparing, and contrasting.	Interpret and represent information by using ICT tools to synthesize, summarize, compare, and contrast information from multiple sources.	<p><b>Research and Information Fluency:</b> Students apply digital tools to gather, evaluate, and use information. (3)</p> <p>Locate, organize, analyze, evaluate, synthesize, and ethically use information from a variety of sources and media. (3b-repeat)</p> <p>Use models and simulations to explore complex systems and issues. (1c)</p> <p>Troubleshoot systems and applications. (6c)</p> <p>Transfer current knowledge to learning of new technologies. (6d)</p> <p><b>Technology Operations and Concepts:</b> Students demonstrate a sound understanding of technology concepts, systems, and operations. (6)</p>	<p>Information Literacy.</p> <p>Media Literacy.</p> <p>ICT Literacy.</p>	<p>Interpret and represent information, such as by using digital tools to synthesize, summarize, compare, and contrast information from multiple sources. Sample tasks include:</p> <p>Comparing advertisements, emails, or web sites from competing vendors by summarizing information into a table.</p> <p>Summarizing and synthesizing information from a variety of types of sources according to specific criteria in order to compare information and make a decision.</p> <p>Re-representing results from an academic or sports tournament into a spreadsheet to clarify standings and decide the need for playoffs.</p>	<p>IC3 Living Online 3.2 Understand how content is created, located and evaluated on the World Wide Web.</p>	<p>Determine the extent of information needed.</p> <p>Access the needed information and its sources critically.</p> <p>Incorporate selected information into one's knowledge base.</p>

## CALIFORNIA BASIC ELEMENTS OF ICT DIGITAL LITERACY – Continuum of Assessment Skills

Elements	Definitions	Competencies	Standards and Performance Indicators		Assessments		
			ISTE	P21	ETS ICT Literacy	Certiport IC3 Standard	CSP/iLit
<u>Evaluate</u>	Making judgments about the quality, relevance, usefulness, or efficiency of information.	Judge the currency, appropriateness, and adequacy of information and information sources for a specific purpose (including determining authority, bias, and timelines of materials).	<p>Locate, organize, analyze, evaluate, synthesize, and ethically use information from a variety of sources and media. (3b-repeat)</p> <p>Evaluate and select information sources and digital tools based on the appropriateness to specific tasks. (3c)</p> <p><b>Critical Thinking, Problem Solving, and Decision Making:</b> Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources. (4)</p> <p>Collect and analyze data to identify solutions and/or make informed decisions. (4c-repeat)</p>	<p>Information Literacy.</p> <p>Media Literacy.</p> <p>Critical Thinking and Problem Solving.</p> <p>ICT Literacy.</p>	<p><b>Evaluate:</b> Judge whether information satisfies an information problem by determining authority, bias, timeliness, relevance, and other aspects of materials. Sample tasks include:</p> <p>Judging the relative usefulness of provided Web pages and on-line journal articles.</p> <p>Evaluating whether a database contains appropriately current and pertinent information.</p> <p>Deciding the extent to which a collection of resources sufficiently covers a research area.</p>	<p>IC3 Computing Fundamentals.</p> <p>Identify different types of application software and general concept relating to application software categories.</p>	<p>Evaluate information and its sources critically.</p> <p>Understand the economic, legal, and social issues surrounding the use of information, and access and use the information ethically and legally.</p>
<u>Create</u>	Generating information by adapting, applying, designing, inventing, or authoring information.	Adapt, apply, design, or invent information in ICT environments (to describe an event, express an opinion, or support a basic argument, viewpoint or position).	<p><b>Creativity and Innovation.</b> Students demonstrate creative thinking, construct knowledge, and develop innovative products and processes using technology. (1)</p> <p>Apply existing knowledge to generate new ideas, products, or processes. (1a)</p> <p>Process data and report results. (3d)</p> <p>Identify trends and forecast possibilities. (1d)</p> <p>Contribute to project teams to produce original works or solve problems. (2d)</p>	<p>Creativity and Innovation.</p> <p>Critical Thinking and Problem Solving.</p> <p>Communication and Collaboration.</p> <p>Media Literacy.</p>	<p>Adapt, apply, design, or construct information in digital environments, such as by:</p> <p>Editing and formatting a document according to a set of editorial specifications.</p> <p>Creating a presentation slide to support a position on a controversial topic.</p> <p>Creating a data display to clarify the relationship between academic and economic variables.</p>	<p>IC3 Key Applications 1.0, 2.0, 3.0, 4.0 and Living Online 3.2. Common Program Functions. Common word processing functions. Common spreadsheet functions. Common presentation functions. Understand how content is created, located and evaluated on the World Wide Web.</p>	<p>Recognize what information is needed and have the ability to locate, evaluate, incorporate and integrate the needed information effectively.</p>

## CALIFORNIA BASIC ELEMENTS OF ICT DIGITAL LITERACY – Continuum of Assessment Skills

Elements	Definitions	Competencies	Standards and Performance Indicators		Assessments		
			ISTE	P21	ETS ICT Literacy	Certiport IC3 Standard	CSP/iLit
<u>Communicate</u>	Communicate information persuasively to meet needs of various audiences through use of an appropriate medium.	Communicate, adapt, and present information properly in its context (audience, media) in ICT environments and for a peer audience.	<p><b>Communication and Collaboration.</b> Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others. (2)</p> <p>Create original works as a means of personal or group expression. (1b)</p> <p>Interact, collaborate, and publish with peers, experts, or others employing a variety of digital environments and media. (2a)</p> <p>Communicate information and ideas effectively to multiple audiences using a variety of media and formats. (2b)</p>	<p>Communication and Collaboration.</p> <p>Creativity and Innovation.</p> <p>Media Literacy.</p>	<p>Disseminate information tailored to a particular audience in an effective digital format, such as by:</p> <p>    Formatting a document to make it more useful to a particular group.</p> <p>    Transforming an email into a succinct presentation to meet an audience's needs.</p> <p>    Selecting and organizing slides for distinct presentations to different audiences.</p> <p>    Designing a flyer to advertise to a distinct group of users.</p>	<p>IC3 Living Online 2.1 and 2.3. Electronic communication and collaboration.</p> <p>Identify the appropriate use of different types of communication/collaborations tools and the "rules of the road" regarding online communication.</p>	<p>CSP Knowledge Areas. Basic skills required to effectively create communications types are contained in key areas:</p> <ul style="list-style-type: none"> <li>File Management</li> <li>Word Processing</li> <li>Spreadsheets</li> <li>Databases</li> <li>Presentations</li> <li>Internet and email</li> </ul>
<u>Other:</u>  Global understanding.			Develop cultural understanding and global awareness by engaging with learners of other cultures.(2c)	Social and Cross-Cultural Skills.		n/a	<p>Identify some situations where a computer might be more appropriate than a person for carrying out a task and where not.</p> <p>Know some of the uses of computer applications in education such as: student registration and timetabling systems, computer-based training (CBT), distance learning, homework using the Internet.</p> <p>Know some of the uses of large-scale computer applications in government such as: public records systems (census, vehicle registration), revenue collection, electronic voting.</p>

**CALIFORNIA BASIC ELEMENTS OF ICT DIGITAL LITERACY – Continuum of Assessment Skills**

Elements	Definitions	Competencies	Standards and Performance Indicators		Assessments		
			ISTE	P21	ETS ICT Literacy	Certiport IC3 Standard	CSP/iLit
<p><u>ther:</u></p> <p>Identify subject of investigation.</p>			<p>Identify and define authentic problems and significant questions for investigation. (4a)</p>	<p>Critical Thinking and Problem Solving</p>	<p>Understand and articulate the scope of an information problem in order to facilitate the electronic search for information, such as by:</p> <p>Distinguishing a clear, concise, and topical research question from poorly framed questions, such as ones that are overly broad or do not otherwise fulfill the information need.</p> <p>Asking questions of a “professor” that help disambiguate a vague research assignment.</p> <p>Conducting effective preliminary information searches to help frame a research statement.</p>	<p>IC3 Computing Fundamentals 1.1, 1.2, 2.2, 3.1, 3.2,3.3.</p> <p>IC3 Living Online 3.2</p> <p>Identify types of computers, how they process information, and the purpose and function of different hardware components.</p> <p>Identify how to maintain computer equipment and solve common problems relating to computer hardware.</p> <p>Identify what an operating system is and how it works, and solve common problems related.</p> <p>Use an operating system to manipulate a computer.</p> <p>Identify how to change system settings, install and remove software, desktop, files and disks to operating systems.</p>	<p>Define scope of investigation.</p> <p>Recognize what information is needed and have the ability to locate, evaluate, incorporate and integrate the needed information effectively.</p> <p>Determine information authenticity, validity, and reliability.</p>

## CALIFORNIA BASIC ELEMENTS OF ICT DIGITAL LITERACY – Continuum of Assessment Skills

Elements	Definitions	Competencies	Standards and Performance Indicators		Assessments		
			ISTE	P21	ETS ICT Literacy	Certiport IC3 Standard	CSP/iLit
<p><u>Other:</u></p> <p>Personal qualities.</p>			<p><b>Digital Citizenship:</b> Students understand human, cultural, and societal issues related to technology and practice legal and ethical behavior. (5)</p> <p>Exhibit a positive attitude toward using technology that supports collaboration, learning, and productivity. (5b)</p> <p>Demonstrate personal responsibility for lifelong learning. (5c)</p> <p>Exhibit leadership for digital citizenship. (5d)</p> <p>Advocate and practice safe, legal, and responsible use of information and technology. (5a-repeat)</p>	<p>ICT Literacy.</p> <p>Information Literacy.</p> <p>Media Literacy.</p> <p>Leadership and Responsibility.</p>	<p>ICT Literacy is the ability to appropriately use digital technology, communication tools, and/or networks to solve information problems in order to function in a knowledge society. This includes the ability to use technology as a tool to research, organize, and communicate information and <b>an awareness of the ethical/legal issues surrounding accessing and using information.</b></p>	<p>IC3 Living Online 1.0, 2.0, 3.0, 4.0</p> <p>Communication networks and the Internet.</p> <p>Electronic communication and collaboration.</p> <p>Using the Internet and the Worldwide Web.</p> <p>The impact of computing and Internet on society.</p>	<p>Be aware that recycling printed outputs, recycling printer toner cartridges, using a monitor that consumes less power while the computer is inactive can help the environment.</p> <p>Understand that using electronic documents can help reduce the need for printed materials.</p> <p>Understand the concept of copyright when applied to software, and also to files such as: graphics, text, audio, video.</p> <p>Understand copyright issues involved in downloading information from the Internet.</p>

## Appendix D

### ICT Digital Literacy Policies Reviewed and Referenced

In the preparation for this report and recommendations, the World Summit on Information Society (WSIS) statement of 2005, the European Union Policy and the following country policies were researched and analyzed by KEMPSTER GROUP either in whole or as a component of a larger regional effort in digital literacy:

Angola	Australia	Austria
Azerbaijan	Bangladesh	Belgium
Benin	Bhutan	Botswana
Brunei	Burkina Faso	Burundi
Cameroon	Canada	Cape Verde
Central African Republic	Chad	Cote d'Ivoire
Comoros	Democratic Republic of Congo	Denmark
Djibouti	Equatorial Republic of Congo	Eritrea
Ethiopia	Finland	Gabon
Gambia	Germany	Ghana
Greece	Guinea	Guinea Bissou
India	Indonesia	Ireland
Italy	Japan	Jordan
Kenya	Republic of Korea	Lesotho
Madagascar	Malawi	Malaysia
Maldives	Mali	Mauritania
Mauritius	Mongolia	Mozambique
Nepal	The Netherlands	New Zealand
Niger	Nigeria	Norway
Pakistan	Philippines	Portugal
Rwanda	Saudi Arabia	Senegal
Samoa	Seychelles	Singapore
Slovenia	South Africa	Spain
Sri Lanka	Sudan	Swaziland
Sweden	Tanzania	Thailand
Togo	Uganda	United Kingdom
United States	Uzbekistan	Viet Nam
Zambia		

The following key resources were used for this report, and are referenced in order to provide a detailed illustration of national initiatives and policy approaches.

World Summit on Information Society (WSIS) International ICT Digital Literacy Policies:

[http://portal.unesco.org/ci/en/files/20891/11364818989/Beacons\\_of\\_the\\_Information\\_Society\\_The\\_Alexandria\\_Proclamation\\_on\\_Information\\_Literacy\\_and\\_Lifelong\\_Learning.doc/Beacons%20of%20the%20Information%20Society%20The%20Alexandria%20Proclamation%20on%20Information%20Literacy%20and%20Lifelong%20Learning.doc](http://portal.unesco.org/ci/en/files/20891/11364818989/Beacons_of_the_Information_Society_The_Alexandria_Proclamation_on_Information_Literacy_and_Lifelong_Learning.doc/Beacons%20of%20the%20Information%20Society%20The%20Alexandria%20Proclamation%20on%20Information%20Literacy%20and%20Lifelong%20Learning.doc)

(Adopted in Alexandria, Egypt at the Bibliotheca Alexandrina on 9 November 2005).

**NOTE:** The **European Union** and its specific focus on ICT Digital Literacy are separately referenced. It is considered by many observers and experts to have the most comprehensive strategies for addressing ICT Digital Literacy. It can serve as a model of best practices for California in efforts to address the need for ICT skills and literacy benchmarking and assessment.

<http://ec.europa.eu/enterprise/ict/policy/ict-skills/es-br.pdf>

(Adopted December 18, 2002; Continuing Implementation and Ongoing)

**Australia:**

[http://www.dbcde.gov.au/\\_data/assets/pdf\\_file/20457/New\\_SFIE\\_July\\_2004\\_final.pdf](http://www.dbcde.gov.au/_data/assets/pdf_file/20457/New_SFIE_July_2004_final.pdf)

(Adopted by the Australian Government in July 2004; Continuing Implementation and Ongoing planning for sector focus, e.g., education, government, etc.)

**Bangladesh:**

(Source: <http://www.sdnbd.org/sdi/issues/IT-computer/itpolicy-bd-2002.htm>)

(Adopted by the Ministry of Science and Information & Communication Technology and Government of the People's Republic of Bangladesh in October 2002; Continuing Implementation as part of the National Development Plan.)

**Finland:**

[http://www.vnk.fi/julkaisukansio/2006/tietoyhteiskuntaneuvosto/A\\_Renewing\\_Human-centric\\_and\\_Competitive\\_Finland\\_net.pdf](http://www.vnk.fi/julkaisukansio/2006/tietoyhteiskuntaneuvosto/A_Renewing_Human-centric_and_Competitive_Finland_net.pdf)

(Adopted by the Finnish Government as part of the implementation of Finnish Government's Information Society Programme. September 2006; Continuing Implementation.)

**Japan:**

Sources: [http://www.cicc.org.sg/Seminar/Japan's\\_IT\\_Strategy.pdf](http://www.cicc.org.sg/Seminar/Japan's_IT_Strategy.pdf)

[http://www.kantei.go.jp/foreign/it/network/0122full\\_e.html](http://www.kantei.go.jp/foreign/it/network/0122full_e.html)

<http://unpan1.un.org/intradoc/groups/public/documents/apcity/unpan002771.pdf>

[http://www.apricot.net/apricot2005/slides/C3-4\\_3.pdf](http://www.apricot.net/apricot2005/slides/C3-4_3.pdf)

**e-Japan Strategy II**

(Adopted July 2003)

**e-Japan Strategy II Acceleration Package**

(Adopted February 2004)

**IT Policy Package-2005**

**The Clarification of Important Measures**

(Adopted February 2005)

**Jordan:**

<http://www.reach.com.jo/Downloads/R4/REACH%204.0.pdf>

**REACH 4.0**

Strategies for Jordan's ICT Development

*(Final Report adopted January 2004; Continuing Implementation)*

**Korea:**

<http://siteresources.worldbank.org/INTEGOVERNMENT/Resources/NoteKoreaICT.doc>

**Informatization Promotion Act**

*(Adopted in 1995)*

**First Master Plan for Informatization Promotion**

*(Adopted in 1996)*

**CYBER KOREA 21**

*(Adopted in 1998)*

**e-KOREA VISION 2007**

*(Adopted in 2003)*

**New Zealand:**

[http://www.minedu.govt.nz/web/downloadable/dl11734\\_v1/web-version---ict-strategic-framework-for-educatio.pdf](http://www.minedu.govt.nz/web/downloadable/dl11734_v1/web-version---ict-strategic-framework-for-educatio.pdf)

[http://www.tki.org.nz/r/literacy\\_numeracy/litnum\\_stra\\_e.php](http://www.tki.org.nz/r/literacy_numeracy/litnum_stra_e.php)

**Report of the Literacy Taskforce**

*(Adopted in 1999; Continuing Implementation)*

**ICT Strategic Framework for Education 2006–07**

**SUPPORTING LEARNING IN A CONNECTED SECTOR THROUGH THE SMART USE OF ICT**

*(Adopted November 2006; Continuing Implementation)*

**Saudi Arabia:**

<http://css.escwa.org.lb/ICTpolicymaking/5.pdf>

**INFORMATION AND COMMUNICATIONS TECHNOLOGY (ICT) POLICY STATEMENT**

*(Adopted for Implementation in 2006; Continuing Implementation)*

**Kentucky Department of Education:**

<http://www.education.ky.gov/KDE/Instructional+Resources/Curriculum+Documents+and+Resources/Academic+Expectations/Academic+Expectation+116.htm>

**Kentucky Technology Standards Academic Expectation 1.16**

*(Adopted June 2001; Updated as of October 23, 2007; Continuing Implementation)*

**Iowa Department of Education:**

<http://www.iowa.gov/educate/content/view/263/404/>

**Career & Technical Education Standards and Benchmarks**

*(Adopted 1992; Continuing Implementation)*

**Iowa CONTENT STANDARDS and BENCHMARKS Information Technology**

*(Adopted in 2001; Continuing Implementation)*

**New Hampshire Department of Educational Technology:**

<http://www.nheon.org/oet/standards/ICTLiteracy.htm>

**New Hampshire ICT Literacy Standards for K-12 Students**

*(Adopted and Effective on July 1, 2005 Continuing Implementation)*

# World Summit on Information Society Policy Statement

## INTERNATIONAL ICT DIGITAL LITERACY POLICIES



### BEACONS OF THE INFORMATION SOCIETY

#### THE ALEXANDRIA PROCLAMATION ON INFORMATION LITERACY AND LIFELONG LEARNING

Celebrating this week's confirmation of the site of the Pharos of Alexandria, one of the ancient wonders of the world, the participants in the High Level Colloquium on Information Literacy and Lifelong Learning held at the Bibliotheca Alexandrina on 6-9 November 2005 proclaim that information literacy and lifelong learning are the beacons of the Information Society, illuminating the courses to development, prosperity and freedom.

Information Literacy lies at the core of lifelong learning. It empowers people in all walks of life to seek, evaluate, use and create information effectively to achieve their personal, social, occupational and educational goals. It is a basic human right in a digital world and promotes social inclusion of all nations.

Lifelong learning enables individuals, communities and nations to attain their goals and to take advantage of emerging opportunities in the evolving global environment for shared benefit. It assists them and their institutions to meet technological, economic and social challenges, to redress disadvantage and to advance the well being of all.

#### Information literacy

- comprises the competencies to recognize information needs and to locate, evaluate, apply and create information within cultural and social contexts;
- is crucial to the competitive advantage of individuals, enterprises (especially small and medium enterprises), regions and nations;
- provides the key to effective access, use and creation of content to support economic development, education, health and human services, and all other aspects of contemporary societies, and thereby provides the vital foundation for fulfilling the goals of the Millennium Declaration and the World Summit on the Information Society; and
- extends beyond current technologies to encompass learning, critical thinking and interpretative skills across professional boundaries and empowers individuals and communities.

Within the context of the developing Information Society, we urge governments and intergovernmental organizations to pursue policies and programs to promote information literacy and lifelong learning. In particular, we ask them to support

- regional and thematic meetings which will facilitate the adoption of information literacy and lifelong learning strategies within specific regions and socioeconomic sectors;
- professional development of personnel in education, library, information, archive, and health and human services in the principles and practices of information literacy and lifelong learning;
- inclusion of information literacy into initial and continuing education for key economic sectors and government policy making and administration, and into the practice of advisors to the business, industry and agriculture sectors;
- programs to increase the employability and entrepreneurial capabilities of women and the disadvantaged, including immigrants, the underemployed and the unemployed; and
- recognition of lifelong learning and information literacy as key elements for the development of generic capabilities which must be required for the accreditation of all education and training programs.

We affirm that vigorous investment in information literacy and lifelong learning strategies creates public value and is essential to the development of the Information Society.

*This was adopted in Alexandria, Egypt at the Bibliotheca Alexandrina on 9 November 2005.*

[http://portal.unesco.org/ci/en/files/20891/11364818989Beacons\\_of\\_the\\_Information\\_Society\\_The\\_Alexandria\\_Proclamation\\_on\\_Information\\_Literacy\\_and\\_Lifelong\\_Learning.doc/Beacons%20of%20the%20Information%20Society%20The%20Alexandria%20Proclamation%20on%20Information%20Literacy%20and%20Lifelong%20Learning.doc](http://portal.unesco.org/ci/en/files/20891/11364818989Beacons_of_the_Information_Society_The_Alexandria_Proclamation_on_Information_Literacy_and_Lifelong_Learning.doc/Beacons%20of%20the%20Information%20Society%20The%20Alexandria%20Proclamation%20on%20Information%20Literacy%20and%20Lifelong%20Learning.doc)

## The European Union: A Best Practices Model for California

Putting Europe at the forefront of international competitiveness is one of the greatest and most urgent challenges for the European Union. To reach this goal, information and communication technologies and their productive usage will have to play an important role, as an enabler of innovation and to streamline business processes. This calls for well-trained people. IT digital literacy needs to be strengthened across all sectors and professional qualifications in order to use information and communication technologies effectively to enhance productivity and thus stimulating growth and employment.

The political challenge of an “Information Society for ALL” can not be tackled in isolation. There is not only competition for talented people between different business sectors but also between different regions and countries. Europe, according to planning documents and reports, must be as a whole an attractive place to work and to live, in order to attract people who can drive the European Union’s economies.

The 2002 report, **E-BUSINESS AND ICT SKILLS IN EUROPE**, set out to show that numerous initiatives already existed at the national, regional or industrial level. However, the report strongly suggested that new forms of co-operation between the different stakeholders are needed. Schools and universities will have to adapt their curricula but at the same time more efforts have to be undertaken to train people and to upgrade their skills on a continuous basis.

The message was stark - Europe will be held back because it did not have enough skilled people. But they not just talking about the ICT professionals – people in all sectors of employment are expected to acquire ICT skills (with less than a third of them having received any ICT training at all). Yet at the same time there was identified a growing “ICT poverty gap”, with women, the unemployed and low income groups tending to miss out even further on ICT training and access, and therefore on the chance to improve their lot. The question posed by the European Union was, “Can we afford not to equip everyone with the skills needed to operate in the knowledge society?”

Fewer and fewer jobs can be filled with only a basic education. Skills to operate computers are vital, and yet the providers of literacy and skills – of reading, writing and arithmetic capabilities – are struggling to keep pace.

Four main challenges in the ICT field must be faced if the EU is to achieve its objective of becoming the world's leading knowledge economy by 2010:

### *Closing the skills gap*

To close the skills gap, we need to respond to the needs of industry. Manpower is needed at all levels: from IT support staff, to sales staff, project leaders, engineers, educators, managers. People who combine technical know-how with business acumen; matching qualifications and skills profiles with the needs of e-Europe – that is the challenge.

### *Demographic shifts and life long learning*

Newly skilled young people entering the labor market will *not be enough* to provide the skills that e-Europe needs. Hence businesses must focus on motivating, retaining and re-equipping current staff, and ensure that today's and tomorrow's workers are capable of remaining in the labor market throughout a full working life, and not drift away in their 50's. Europe must also show itself to be more open to the outside world, using the skills of immigrants to plug some of the ICT gaps.

### *Investing in children – tomorrow's workforce*

We must invest in our labor force of the future: young people. Full access for schoolchildren to computers, multimedia tools and to the Internet is paramount.

Achieving an interconnection of PCs in schools of one for every fifteen pupils by the end of 2003 (as called for by the Barcelona European Council) is a step along this road. But providing hardware is only half the battle. We must also encourage the use of ICTs as a tool and a resource across all subject areas and make sure that teachers are equipped with the right skills.

### *Strengthening gender equality in the ICT sector*

Even though men and women use computers to more or less the same degree at work, the differences arise when it comes to jobs demanding higher levels of ICT education. Especially when it comes to ICT specialists and jobs that are traditionally seen as a male preserve, such as engineering and technical support. We need to step up action to boost the number of women in these areas, from the shop floor to senior management, and encourage more girls and young women into ICT training. At the moment only around 1 in 5 ICT students are women. Until this changes, companies and society are losing out on a valuable resource.

Meeting these challenges means a substantial shift in our priorities to provide the right incentives to people and focus to invest in education, skills and competencies. It also involves a review of how public expenditure is being used to best effect. The EU's resources in terms of Structural Funds have a major role to play here, and it will be important that the focus of these funds in the coming years (particularly with an enlarged EU in prospect) takes sufficient account of the need to invest more substantially in human resources.

At the European Council in March 2000 in Lisbon, the Heads of State and Government of the European Union set the ambitious target for the EU to become, by 2010, *"the most competitive and dynamic knowledge-based economy in the world, capable of sustainable economic growth with more and better jobs and greater social cohesion"*. The intelligent use of ICT and of e-business skills ("e-skills") is a major enabler to increase productivity and competitiveness, which are at the heart of the Lisbon strategy. This requires a skilled and adaptable labor force.

The EITO 2001 Yearbook and several studies commissioned by the ICT industry highlighted the fact that the European industry is suffering from a significant e-skills gap. This has initiated, at different levels, a policy debate about how to better promote e-skills in Europe, in order to fully reap the potential benefits of modern information and communication technologies. As a follow-up of the informal meeting of the Council of Ministers responsible for telecommunications and for employment in Luleå in February 2001, a specific Task Force on skills and mobility was set-up in June 2001. Based on their report of December 2001, the Commission adopted in February 2002 an Action Plan for skills and mobility".

In this Action Plan, the European Commission acknowledges the evidence of a *"shortage in ICT occupations and sectors"* as *"one of the biggest concerns of enterprises"*. Although the current business cycle and the economic downturn have somewhat alleviated this problem, the lack of skilled professionals in the e-business and ICT area seems to be a pertinent issue. The e-skills gap may no longer be as threatening as perceived two years ago, however, there is undoubtedly still an ICT skills mismatch as well as the risk that the current situation may result in future problems. This would be the case if the current slowdown of growth in the ICT sector were to result in less effort to further improve the e-skills base. It should be recognized that the use of ICT and e-business is still growing, in particular in user industries that will in future need more ICT experts than ever.

The challenge is to develop, nurture and attract talents as well as to strengthen human capital investment. The current main issues encompass, on the demand side, clearly defining what e-business and ICT skills are needed, thereafter enabling forecasting and scenarios exercises.

On the supply side, the challenges lie in the provision of a sufficient volume of skilled labor, with accurate and up-to-date knowledge that matches the demand requirements. Last but not least, the supply of talented and skilled people needs to be scalable and sustainable over-time.

In the scope of the eEurope GoDigital initiative, the Commission has established an ICT Skills Monitoring Group<sup>2</sup> with representatives of Member States to better understand the nature of the proclaimed e-skills gap and to identify good policy responses to improve the availability of ICT skills.

### The problem of e-skills: An area of mixed responsibilities

Industry has a clear role in the provision of training and educating the workforce to address the e-skills gap. However, the responsibility does not just fall on industry, and there are already a number of joint initiatives taking place between government, education and the private sector reinforcing the importance of collaboration and coordination of approach in order to improve sustainability at national and European levels. The public sector also has its own policy schemes underway across Europe indicating that the public and the private sector understand that the responsibility lies with a number of stakeholders: industry, government, academia and the social partners.

### Key challenges in overcoming the e-skills gap

	ICT Industry	Key User Industries	All Business Sectors
<b>Funding</b>	<ul style="list-style-type: none"> <li>R&amp;D</li> <li>New Product development</li> </ul>	<ul style="list-style-type: none"> <li>Training</li> <li>Awareness</li> <li>Demonstration</li> <li>Adopting new applications</li> </ul>	<ul style="list-style-type: none"> <li>Training</li> <li>Awareness</li> </ul>
<b>Education</b>	<ul style="list-style-type: none"> <li>New Degree Courses</li> <li>New Curriculum Development</li> </ul>	<ul style="list-style-type: none"> <li>Targeted vocational education and training curricula</li> <li>Certification</li> <li>On the job training schemes</li> </ul>	<ul style="list-style-type: none"> <li>Basic work-related education</li> <li>Lower level certification, e.g., European Computer Driving License (ECDL)</li> </ul>
<b>Skills</b>	<ul style="list-style-type: none"> <li>High science and technology skills</li> <li>Ability to constantly update on new technological developments</li> <li>New people, new skills</li> </ul>	<ul style="list-style-type: none"> <li>Applications skills</li> <li>More advanced ICT skills</li> </ul>	<ul style="list-style-type: none"> <li>On the job training schemes to deliver general ICT skills</li> <li>Digitally literate school leavers</li> </ul>
<b>Social needs</b>	<ul style="list-style-type: none"> <li>Social curricula</li> <li>Information society implications</li> </ul>	<ul style="list-style-type: none"> <li>Information Society implications</li> <li>Global markets</li> </ul>	<ul style="list-style-type: none"> <li>New target groups</li> </ul>
<b>Forecasting</b>	<ul style="list-style-type: none"> <li>Forecasting of ICT professional skills market</li> </ul>	<ul style="list-style-type: none"> <li>Forecasting of ICT professional skills market</li> <li>Forecasting of ICT user skills</li> </ul>	<ul style="list-style-type: none"> <li>Forecasting of ICT user skills needs</li> </ul>

Only if all of the different priorities of the 'industry groups' were properly addressed would the e-skills gap no longer be a major issue. The breadth of coverage of the programmes identified as a result of the research indicates that this is a complex domain with many different actors involved: the EU, Member States, industry, the social partners and individuals. There are also issues of social development, culture and private versus public financing to consider. Finally there are numerous tools which are being used such as education and training, incentives, immigration and forecasting.

Although there are many differences between the Member States, a set of common principles can be identified:

- Policies aim to establish an "enabling" environment that encourages investment in human resources development and training by all stakeholders;
- Policies aim to develop a framework for human resources development and training that is relevant to countries' social and economic context;
- Member States are keen to ensure equal access to human resources development of training for all, irrespective of socio-economic and income status, ethnic origin, sex, age, income level etc.;
- There is a drive to develop partnerships between various stakeholders in the delivery of learning, education and training programmes.

A thread that runs through these common principles is that the policies are mainly economic, educational, or social in origin and therefore a matrix can be drawn up with one dimension being the actors and the other being the types of tools that are employed.

### EU Matrix of Tools and Actors

	<b>Economic</b>	<b>Educational</b>	<b>Social</b>
<b>EU</b>	<ul style="list-style-type: none"> <li>• The creation of common skills, profiles and occupational frameworks.</li> </ul>	<ul style="list-style-type: none"> <li>• Encourage lifelong learning</li> <li>• Enhance understanding of national qualification structures across Europe to facilitate mobility.</li> </ul>	<ul style="list-style-type: none"> <li>• Promote social cohesion.</li> <li>• Equal opportunities.</li> </ul>
<b>Member States</b>	<ul style="list-style-type: none"> <li>• Work with the EU to develop a common skills framework based on existing best practice in Member States.</li> </ul>	<ul style="list-style-type: none"> <li>• Add ICT to school education.</li> <li>• Improve qualifications for ICTs.</li> <li>• Increased training provision for workforce development.</li> </ul>	<ul style="list-style-type: none"> <li>• Better recognition of professional experience and vocational training.</li> <li>• Provide incentives for retraining employees.</li> <li>• Encourage under-represented groups to acquire e-skills (women, long-term unemployed, the disabled).</li> </ul>
<b>Industry</b>	<ul style="list-style-type: none"> <li>• Work with government to provide up to date meaningful statistics on the skills gap.</li> </ul>	<ul style="list-style-type: none"> <li>• On the job training schemes.</li> </ul>	<ul style="list-style-type: none"> <li>• Work with Member States and Social partners to train the long term unemployed and other target groups in key e-skills for business.</li> </ul>
<b>Colleges and Universities</b>	<ul style="list-style-type: none"> <li>• Work with government and industry to provide skills profiles needed for the work force in Europe.</li> </ul>	<ul style="list-style-type: none"> <li>• Provision of e-learning.</li> <li>• Provision of new qualifications.</li> </ul>	<ul style="list-style-type: none"> <li>• Foundation courses and conversion courses.</li> <li>• Promotion of the concept of lifelong learning.</li> </ul>
<b>Social Partners</b>	<ul style="list-style-type: none"> <li>• Work with the EC and Member States to support economic policies.</li> </ul>	<ul style="list-style-type: none"> <li>• Increased decentralized workforce training provision.</li> </ul>	<ul style="list-style-type: none"> <li>• Social dialogue between Member States, industry and the EC to encourage new ways of working.</li> </ul>
<b>Individuals</b>	<ul style="list-style-type: none"> <li>• Willingness to seek employment in ICT related jobs.</li> <li>• Flexibility in employment.</li> </ul>	<ul style="list-style-type: none"> <li>• Willingness to engage with lifelong learning.</li> <li>• Ambition to learn new methods and ICT related skills.</li> </ul>	<ul style="list-style-type: none"> <li>• Acceptance of ICT and use of ICT in social environments and family groups.</li> </ul>

(Source: <http://ec.europa.eu/enterprise/ict/policy/ict-skills/es-br.pdf>)

## Samples of ICT Policy Initiatives from Other Countries

### AUSTRALIA

Australia has already made significant strides towards an open, adaptable economy and society in recent years, but continued success cannot be taken for granted. Further economic growth and community development are required to meet future challenges. Increasingly, we will need to create and mobilize new capabilities and bring them to bear in a focused way. This will be an innovative, problem-solving society: in other words, an 'information' economy and society.

Australia's broad objectives for the information economy are:

- to promote social cohesion by ensuring that particular sectors, groups of Australians and regions are not left behind
- to secure Australia's information economy against external and internal threats and to promote Australia's interests in the emerging global information economy
- to remove barriers to information economy development
- to make government an exemplar in the use of ICT to improve citizen engagement, efficiency and effectiveness of service delivery.

These objectives translate into the Australian Government's **four strategic priorities and sixteen associated strategies for the information economy**. (Note: The latter are not included herein.)

1. Ensure that all Australians have the capabilities networks and tools to participate in the benefits of the information economy.
2. Ensure the security and interoperability of Australia's information infrastructure and support confidence in digital services.
3. Develop Australia's innovation system as a platform for productivity growth and industry transformation.
4. Raise Australian public sector productivity, collaboration and accessibility through the effective use of information, knowledge and ICT.

(Source: [http://www.dbcde.gov.au/\\_data/assets/pdf\\_file/20457/New\\_SFIE\\_July\\_2004\\_final.pdf](http://www.dbcde.gov.au/_data/assets/pdf_file/20457/New_SFIE_July_2004_final.pdf))

# BANGLADESH

## National Information and Communication Technology (ICT) Policy

### Vision

This Policy aims at building an ICT-driven nation comprising of knowledge-based society by the year 2006 [Policy articulated in 2002.] In view of this, a country-wide ICT-infrastructure will be developed to ensure access to information by every citizen to facilitate empowerment of people and enhance democratic values and norms for sustainable economic development by using the infrastructure for human resources development, governance, e-commerce, banking, public utility services and all sorts of on-line ICT-enabled services.

### Objectives

- In order to give a thrust to the ICT sector and expeditious development of Software industry and its export required infrastructural facilities and legal framework will be created.
- Provide effective incentives for development of ICT sector to both local and foreign entrepreneurs;
- Develop an efficient ICT infrastructure that provides open access to international and national network;
- Promote and facilitate use of ICT in all sectors of the economy for transparency, good governance and efficiency improvement;
- Establish legislative and regulatory framework for ICT issues like IPR, data security and protection, digital signature, e-Commerce, ICT education etc. as well as to ensure quality ICT education provided by different private organizations
- Set up national databases that are reliable and easily accessible to all the people of the country;
- Promote use of ICT by providing special allocations for ICT project implementation in the public sector. Train the decision makers in ICT use and promote an ICT culture.
- Develop a large pool of world class ICT professionals to meet the needs of local and global markets
- Set up a very high quality ICT institution to continuously promote and foster ICT Industry;
- Enact Laws and Regulations for uninterrupted growth of ICT, in conformity with World Trade Organization (WTO) stipulations.

### POLICY PREAMBLE – Excerpt on Training and Human Resources Development

Information Communication Technology (ICT) encompasses the broad fields of data/information processing, transmission and communications by means of computer and telecommunication techniques and these modern tools are being increasingly used for organizational/personal information processing in all sectors of economy and society. This document presents the policy guidelines for the development of the ICT sector in Bangladesh.

A dependable information system is essential for efficient management and operation of the public and private sectors. But there is a shortage of locally generated information needed for efficient performance of these sectors. In order to meet this objective, ICT use in every sector shall have to be accelerated in terms of information generation, utilization and applications. Considering the gravity and importance of ICT Hon'ble Prime Minister has already declared ICT as the thrust sector.

Many nations have taken advantage of the opportunities afforded by ICT within a policy framework, laid down guidelines and proceeded with the formulation of a national ICT strategy as a part of the overall

national development plan. Bangladesh intends to use ICT as the key-driving element for socio-economic development.

### **Training and Human Resources Development**

Bangladesh must prepare itself to compete effectively in the global ICT market. As the demand for skilled manpower in ICT is growing world-wide, the country needs to produce a large number of ICT professionals. The specific policy statements are:

- Widespread introduction of ICT education in public and private educational institutions is a prerequisite for producing skilled ICT manpower. Facilities shall be built to promote ICT training and computer aided training at all levels of education including Primary Schools and Madrasahs. Donor agencies, non-government organizations and other development partners of the country shall be encouraged to help build the necessary capacity in this area.
- Universities, Bangladesh Institutes of Technology and colleges, both in the public and private sectors, shall be strengthened to produce ICT graduates in four-year Computer Science and/or Engineering courses. Necessary resources will be allocated to these institutions.
- Out of the three Science and Technology universities proposed in the Fifth Five-Year Plan, one will be established as center of excellence in ICT by giving higher allocation of resources.
- Establish multimedia institutes up to district level to start with to produce skilled human resources to exploit the opportunity offered by the growing multimedia-market.
- Diploma and Trade Certificate in ICT will be offered in both public and private institutes including Polytechnics. The continual skill upgrading of existing professionals working in public and private sectors shall be ensured by in-service training programmes.
- The shortage of trained and qualified teachers and trainers for ICT training is a bottleneck to the HRD plan. To address the issue, IT-Capacity-Building of the Teachers Training Institutes (TTI) including TTCs, NAPE, PTI will be taken up. To teach the teachers and trainers, intensive post-graduate diploma courses will be introduced in TTIs. Training programmes to train and retrain them periodically to keep them up-to-date with the technological progress in the area of ICT will be introduced. ICT literacy will be a desirable requirement in the recruitment and selection of teachers. Divisional training centers of BCC will provide TOT (Training for the Trainers) to build up sufficient number of skilled trainers.
- As it would be difficult to train teachers in ICT in large number using the present infrastructure, deploy virtual ICT trainers wherever possible. CD and web based courseware development and use shall be encouraged to promote computer-aided education at all level of education.
- To address the issue of deficiency in English and mathematics education, a crash programme shall be taken up to train teachers. To ensure standard and quality of ICT education, a national certification and accreditation system shall be developed and implemented.
- Take up programmes to develop quality ICT professionals and skilled personnel to ensure success in the global software and ICT-enabled services market. Encourage and support formal and informal sector to adopt internationally accepted standards in training programs and to introduce globally acceptable standards.
- Use the potential of ICT for delivery of distance education to help stretch the country's limited teaching resources and ensure quality education to all.
- Qualified and skilled teachers will be brought in from abroad in the fields where local teachers are not available.
- Syllabus and Course Curricula for all levels of Computer Science training will be updated continuously

(Source: <http://www.sdnbd.org/sdi/issues/IT-computer/itpolicy-bd-2002.htm>)

# FINLAND

## The National Knowledge Society Strategy 2007–2015

During 2006, a National Knowledge Society Strategy for 2007-2015 has been drafted as part of the implementation of Finnish Government's Information Society Programme.

The Strategy has been drafted to support the emergence of a Finland phenomenon, in other words, the transformation of Finland into an internationally attractive, human-centric and competitive knowledge and service society. Development of skills and creativity, bold renewal of structures and operating models, and efficient utilization of technology will make this possible, even under conditions of increasing global competition.

Technology has matured as a facilitator of broad societal changes, the realization of which requires the reform of structures and operating models in conjunction with the implementation of technology.

Knowledge is an even more important resource in our society, which, with the help of technology, can be utilized more effectively than ever before. The strategic priority has shifted from being a society that utilizes ICT to one that generates knowledge-based growth. The broad utilization of information provides Finland with the opportunity to function as a global reformer and develop new skills and business. This will require seamless cooperation between different stakeholders and the development of ideas into products and services.

## Strategic Guidelines

In order to achieve the set targets, the strategic work defined the main projects for 2007- 2011, through which the Finland phenomenon will be created. In addition to the main projects, the Strategy includes 72 proposals for measures intended to ensure Finland's transformation from an industrial society to an internationally attractive, human-centric and competitive knowledge and service society. The Strategy also includes a concrete implementation programme.

- Initiation of a policy programme for reforming public sector service structures
- Increasing connection speeds for information networks and ensuring the interoperability of the information society infrastructure
- Ensuring the prerequisites for lifelong learning
- Reforming the rules for working life and developing leadership and supervisory work
- Reforming the innovation system
- Further development of the copyright system
- Promotion of digitalization of business in SME's
- Influencing internationally, especially at the EU level, and close cooperation with Asian countries and neighboring regions

## A VISION FOR 2015

### A renewing, human-centric and competitive Finland will:

- successfully reform its structures, operating models, services and product offering
- utilize throughout society the product, process and service innovations made possible by digitalization, the resulting changes of which will be reflected in society as competitiveness, success, high service quality and well-being
- encourage creativity and innovativeness as well as personal growth throughout society
- promote social and regional equality
- cooperate with the private and public sector and boldly cross over traditional sector borders
- do interactive and target-oriented international cooperation
- implement a strategy-oriented operating model in innovation activities, in which education, research and product development and the utilization of their results form a balanced approach
- support innovative and market-oriented research and development activities
- invest in everyday innovations and content and services that make daily life easier for people and organizations
- export successfully technology, product, service and process innovations to global markets
- effectively apply international technology, product, service and process innovations in the private and public sectors
- create opportunities for all members of society to utilize their own potential as fully as possible and appreciate various types of expertise
- offer citizens opportunities to influence the development of society and express themselves
- promote tolerance and interaction between cultures

### Strategic intent 2015

ICT will be inseparably linked to citizens' and organizations' daily life in 2015. Knowledge, expertise and technology will be seen as strategic resources. They will be broadly utilized in business and public administration with the target of continuous reform, improving services, increasing success, and maintaining and developing competitiveness. Knowledge is a key production factor for the national economy, and production of intangible capital is one of the foundations of Finland's economy. With the development of productivity and competitiveness, individuals' well-being has improved and exclusion decreased.

### Responsibilities of the actors in information society development

#### ALL STAKEHOLDERS

- Implementation of the National Knowledge Society Strategy
- Switching to information society structures, processes, operating models and services
- Maintenance of citizens' and employees' competence and well-being
- Promoting competitiveness
- Cooperation between the public and private sectors
- Broad utilization of ICT when developing operations
- Leadership development
- International influencing

## **POLITICAL ACTORS**

- Creation of a national strategic intent
- Inclusion of information society policy in the Government programme
- Ensuring resources

## **CENTRAL GOVERNMENT**

- Ensuring a functional operating environment (incl. legislation)
- Development and implementation of good practices in Government activities (forerunner)
- Promoting output efficiency
- Interoperability and standardization
- Investment in research and development activities
- Maintenance of the required knowledge in cooperation with enterprises and the third sector
- Ensuring quality basic education

## **LOCAL GOVERNMENT**

- Development and implementation of good practices in municipal activities (forerunner)
- Promoting output efficiency
- Ensuring a functional operating environment for local enterprises
- Using basic services to ensure people's quality of life
- Ensuring quality basic education

## **BUSINESS AND INDUSTRY**

- Development of innovative new technical solutions and services as well as rapid implementation of solutions that improve efficiency in production and services
- Investment in research and development activities
- Internationalization
- Interoperability and standardization

## **BUSINESS AND LABOUR ORGANISATIONS, ASSOCIATIONS AND THE THIRD SECTOR**

- Development of knowledge in cooperation with Government and enterprises

## **INDIVIDUALS**

- Ensuring personal expertise
- Active and responsible citizenship

## **INTERNATIONAL FORUMS**

- Creation of global consensus and vision
- Interoperability and standardization

(Source: [http://www.vnk.fi/julkaisukansio/2006/tietoyhteiskuntaneuvosto/A\\_Renewing\\_Human-centric\\_and\\_Competitive\\_Finland\\_net.pdf](http://www.vnk.fi/julkaisukansio/2006/tietoyhteiskuntaneuvosto/A_Renewing_Human-centric_and_Competitive_Finland_net.pdf))

## JAPAN

Japan has had an ongoing commitment for several years to the advancement of ICT Digital Literacy. The 'e-Japan Strategy' was announced as a national strategy for information technology (IT) on 22 January 2001<sup>15</sup>. e-Japan envisions a society "where everyone can actively utilize IT and fully enjoy its benefits". To achieve this goal, government must "establish an environment where the private sector, based on market forces, can exert its full potential and make Japan the world's most advanced IT nation within five years".

The specific goals of the e-Japan strategy are to:

- **Build an ultra high-speed Internet network and provide constant Internet access at the earliest date possible;**
- **Establish rules on electronic commerce**
- **Realize an electronic government; and**
- **Nurture high-quality human resources for the new era.**

On 29 March 2001, the 'e-Japan Priority Policy Programme' was adopted to realize the e-Japan Strategy and clarify all measures that the government should rapidly implement by 2006. The roles of the private and public sectors are detailed in the Programme: the private sector is to play the leading role in the area of IT. The Programme also identifies five areas for action:

- Formation of the world's most advanced information and telecommunications networks;
- Promotion of education and learning as well as development of human resources;
- Facilitation of electronic commerce;
- Digitization of the administration and application of IT in other public areas; and
- Ensure security and reliability of advanced information and telecommunications networks.

'e-Japan Strategy II', launched in July 2003, aims to create a "vibrant, safe, impressive and convenient" society with the active use of IT. The new strategy proposes to implement leading measures in seven areas that are closely related to the lives of the people: medical treatment; food; life; small- and medium-sized enterprises; finance; knowledge; employment; and government service. The strategy also seeks to advance the development of a new IT social infrastructure, which is essential for the sophisticated use of IT during this second phase. Japan also launched an IT use promotion strategy – 'Building A New, Japan-Inspired IT Society' – when it discovered that despite low access fees to high-speed Internet, availability of lines outstripped subscription.

The government also launched its 'e-Project' to provide a glimpse of its vision of Japan as "the world's most advanced IT nation".

(Sources: [http://www.cicc.org.sg/Seminar/Japan's\\_IT\\_Strategy.pdf](http://www.cicc.org.sg/Seminar/Japan's_IT_Strategy.pdf)  
[http://www.kantei.go.jp/foreign/it/network/0122full\\_e.html](http://www.kantei.go.jp/foreign/it/network/0122full_e.html)  
<http://unpan1.un.org/intradoc/groups/public/documents/apcity/unpan002771.pdf>  
[http://www.apricot.net/apricot2005/slides/C3-4\\_3.pdf](http://www.apricot.net/apricot2005/slides/C3-4_3.pdf)

# JORDAN

## REACH: Strategies for Jordan ICT Development

In 1999, a strategy was initiated to transform Jordan into a knowledge society. The REACH initiative was published by Intaj, the IT Association of Jordan in mid-2000 followed by the REACH 2.0, 3.0 and finally the REACH 4.0 report in 2004; thus presenting a national strategy for Jordan to develop an export-oriented information technology services sector, capitalizing on its core human capital advantage.

The REACH Initiative is a comprehensive framework that embraces actions in the following areas:

- **R**egulatory Framework
- **E**nabling Environment and Infrastructure
- **A**dvancement of National IT Programs
- **C**apital and Finance
- **H**uman Resource Development

## VISION

Jordan shall become a regional IT leader and internationally recognized exporter of IT products and services, exploiting its core human capital advantages. The key to success is the central role of the private sector, which shall spearhead the sustained entry of the sector into international markets.

It shall also require strong and active support from all levels of Jordan's Government to create a positive regulatory and promotional environment for IT success now and into the future. This IT industry - Government of Jordan partnership is the key to sustained growth and creation of economic benefits for all Jordanians.

Two aspects of the underlying philosophy of the Vision are at its core:

- **Private sector leadership:** By adopting this philosophy, Jordan will not only achieve success, but will distinguish itself from most other countries of the region that continue to embrace ineffective Government-dominated approaches.
- **Partnership with the Government:** Active support of the GoJ to create a positive regulatory framework and actively support the IT industry is essential.

## **STRATEGIC THRUSTS**

### **ICT Industry Development**

The capabilities of existing IT services firms and the sector as a whole need to be upgraded to effectively compete in regional and global markets.

### **Policy and Regulatory Strengthening**

Success will require the establishment of a supportive regulatory framework for the IT industry, and streamlining of procedures.

### **Human Resource Development**

Long-term competitiveness depends on the ability of Jordan's educational initiatives to produce the quality and quantity of IT professionals that meet the requirements of the marketplace, and to open equal opportunities for both men and women.

### **Government Support**

Total commitment and active Government leadership is required to stimulate, facilitate and promote the software and IT services sector.

### **Capital and Financing**

Innovative mechanisms are required to provide funding to the industry and facilitate Initial Public Offerings (IPOs) of successful companies.

### **Infrastructure Improvement**

The development of telecommunications and purpose-built physical facilities to increase the competitiveness of the IT industry, and the productivity of Jordanian IT workers.

Integrated actions in each of these areas, undertaken in tandem by the IT Industry, the government of Jordan, and a wide range of stakeholders, are vital to ensuring the success of the REACH Initiative.

(Source: <http://www.reach.com.jo/Downloads/R4/REACH%204.0.pdf>)

## KOREA

Since the mid 1990s, the Korean government has established three master plans for the development of the information society: 1) the Informatization Promotion Act(1995) followed by the First Master Plan for Informatization Promotion(1996), 2) CYBER KOREA 21(1998), 3) e-KOREA VISION 2007(2003). In particular, CYBER KOREA 21 was one of the most important policies to cope with the changing environment as a result of the Asian financial crisis. Through these plans, Korea came one step closer to a knowledge-based society with the construction of an advanced information infrastructure, the introduction of various information systems in public services and in the private sector, as well as growth in the overall IT industry.

### Cyber Korea 21

CYBER KOREA 21 refers to Korea's comprehensive plan to transform itself into a knowledge-based society where everyone can have easy access to the ever-shifting tide of information anywhere, anytime.

In the coming "knowledge-based society," where information and knowledge are the prime sources of added value, government, businesses, and individuals are called upon to join the information revolution so that they may freely acquire useful information, process it, and utilize it to their best advantage. To achieve this, CYBER KOREA 21 envisages soon building a nationwide ultra-high-speed information infrastructure in what amounts to an information superhighway of the knowledge-based society and, building on this momentum, pushing ahead with informatization throughout the government and private sector. Leveraging an advanced broadband telecommunications network and information technology will not only improve productivity and transparency across the government and society at large, but will also allow current industries to develop into knowledge-based industries. The unemployment problem should be resolved by fostering new industries, such as e-commerce, that effectively absorb downsized labor forces in society.

The Korean government's efforts to create an information-based society were strengthened with the announcement of *Cyber Korea 21*. The purpose of *Cyber Korea 21* is to realize the vision of becoming a knowledge-based economy under the guidance of the government-led information promotion committee.

The first initiative is to improve the quality of life for the general public. To do this, the government is providing PC units to schools.

The second initiative involves general steps to ensure the competitiveness of Korean industries as a whole, such as support for the construction of e-commerce system in steel, shipbuilding and other traditional industries.

The third initiative is to establish an electronic document distribution system to be used by administrative bodies.

## Status of Korea's ICT development

### *Broadband and Mobile communications*

Korea ranked first in the world in terms of broadband Internet penetration rates as of 2002 and 4<sup>th</sup> in terms of Internet user rates as of 2003. Over 65% of Koreans are now utilizing the Internet in their everyday lives. And nearly 12 million Korean households or 77% of total households are connected to the broadband Internet at the minimum of 1-Mbps. Broadband Internet service is becoming a universal service to its people.

These facts will allow Korea to be recognized as one of the countries that have reached the highest level of informatization: Korea was ranked 4<sup>th</sup> in the Digital Access Index survey by conducted by the ITU in 2003.

Korea has the second most advanced technological infrastructure, the largest broadband subscribers, and the second lowest broadband cost in the world, according to the IMD World Competitive Yearbook 2005.

Since the successful and world's first commercialization of the CDMA technology, 76% of the total population, or 36 million people, have subscribed to the mobile service in 2004. Korea is a leading country in CDMA mobile communications, starting the 3rd generation mobile communication service as one of the first countries in the world, with over 14 million mobile Internet subscribers using the 3G services.

### *ICT industry*

The ICT sector has emerged as the single most important economic growth engine. The ICT industry in Korea contributed 41.9% to total economic growth in 2003. ICT's portion of total exports has been steadily growing since the 1990's. In 2004, IT exports amounted to US\$ 74.7 billion, or 29.4% of total exports. Based on broadband networks and information technologies, the country is leading the world particularly in hardware - semi-conductor, mobile phones, TFT-LCD, and digital TV. Its global competitiveness has also expanded to some of the software sector, most prominently in the online game industry.

### *E-government*

IT applications are increasingly integrated into government services and Korea's e-government initiative has made steps forward. It was ranked 5<sup>th</sup> in the UN Global E-Government Readiness Report 2004, as the only nation among top 10 countries, which neither uses English as mother tongue nor belongs to the Nordic countries.

Among others, Korea's e-Procurement service (G2B) has made the country belong to the few countries that have a full-fledged e-government procurement system in place, receiving the First Public Service Award sponsored by the UN in 2003. Currently, more than 400 government forms can be requested over the Internet and the use of mobile phone payment system has exceeded 20% of the total payment in 2004.

### *E-life -- other ICT applications*

Thanks to the world's best IT infrastructure, Korea has made significant progress with many forms of digital technology. In 2004, OECD declared the country's national e-commerce system needed 'no further action required' and suggested Korea's example as a benchmark for other governments. Up to 100,000 students can use high-speed Internet connections simultaneously to take free tutorials for the national aptitude test, which can determine college admissions.

The number of individuals using ICT-related services is also constantly on the rise: the number of subscribers to Internet banking services reached 21 million in 2003; Internet trade accounted for 66% of the total trading as of 2003; market value of e-commerce has rapidly increased from 50 billion KRW in 1998 to 177 trillion in 2003, accounting for 12% of total business transactions.

## **Success Factors**

*Focused strategy*

*Proactive Government*

*Harmony between government intervention and market economy*

*Balanced approach in demand and supply*

A simultaneous consideration of supply-push and demand-pull was also a key factor. While trying to expand the supply in ICT through building ICT infrastructure nationwide and developing high-end technologies, the government also came up with strategies for the other side of broadband equation - demand creation. The ambitious plan of "ICT training for 10M people" is one of the most notable initiatives among others.

*People*

Thanks to the traditional emphasis on education, Korea has a high rate of literacy and school enrollment, which are essential prerequisites for the widespread adoption of ICT. Moreover, a large consumer base of technology-savvy Koreans actually helped the rapid deployment of Internet and various new digital services.

(Source: <http://siteresources.worldbank.org/INTEGOVERNMENT/Resources/NoteKoreaICT.doc>)

# New Zealand

## Digital Strategy

The Digital Strategy is a core element of the Growth and Innovation Framework. New Zealand will be a world leader in using information and technology to realize its economic, social, environmental, and cultural goals, to the benefit of all its people.

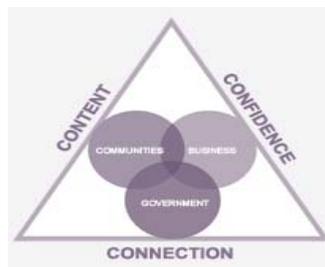
The Digital Strategy is about creating a digital future for all New Zealanders, using the power of information and communications technology (ICT) to enhance all aspects of our lives. The Ministry led a whole-of-government approach to developing the strategy and is now leading the implementation of the strategy. This is a strategy for ensuring New Zealand is a world leader in using information and technology to realise our economic, environmental, social and cultural goals. The Digital Strategy isn't just about technology ... it's about people and their ability to connect to the things that matter to them.

## Why we need a Digital Strategy

- promote innovation
- increase productivity
- enrich the quality of lives
- Lifting productivity
- environmental benefits

**Transformation through information and communication there is an international consensus on the importance of intellectual input in creating value, underlining the need for investment in education and skills in general, with a special focus on ICT skills and research and development. ICT has changed the face of modern science and technology research, requiring our research organizations to be linked to each other through an Advanced Network that is connected to the rest of the world. Ready access to a safe, secure, and affordable communications infrastructure that enables national and international collaboration is the other half of the equation to take us forward to the Knowledge Society:**

Collaboration and partnerships will be essential in implementing the Digital Strategy.



It is important that we keep all the dimensions of the Digital Strategy in line. **Content**, **Connection**, and **Confidence** are the three enablers. Connection is necessary but not sufficient – it simply provides the means. Confidence gives us the skills and a secure online environment, whilst accessing or creating Content provides a compelling reason to make it happen.

Government, business, and communities are the agents of change and their initiatives all impact upon each other. Whilst we set out below some issues that relate specifically to communities and businesses, including not-for-profit organizations, they are clearly interwoven. Since the full benefits of ICT can only be realized when everyone is able to participate, we have emphasized the importance of partnership and collaboration.

This is therefore a document for all New Zealanders. By working together, we can make it happen.

(Source: <http://home.inter.net/takakuwa/search/search.html>)

### **Literacy and numeracy strategy**

With the objective of raising overall achievement and closing the gap between the lowest and highest achievers, particularly in mathematics and English, the Government has set the target that "by 2005, every child aged 9 will be able to read, write and do math for success". Linked to this goal, the New Zealand Government has launched a literacy and numeracy strategy, which includes:

- ensuring that the (above) goal for 9-year-olds is well understood in the education sector and by parents and the wider community;
- working out the most effective way to measure the progress of individuals and groups towards the goal;
- supporting the best possible teaching of all children;
- ensuring that government interventions to support children's learning in literacy are as effective and efficient as possible;
- providing extra support for programmes through a special proposals pool; and
- encouraging parents and the wider community to support children's learning at school and in early childhood through a public information campaign.

(Source: THE LITERACY TASK FORCE (1999). Report of the Literacy Taskforce. Advice to the Government on Achieving its Goal that "by 2005, every child turning nine will be able to read, write and do math for success". Wellington: Ministry of Education.

(The literacy and numeracy strategy website is at [http://www.tki.org.nz/r/literacy\\_numeracy/litnum\\_stra\\_e.php](http://www.tki.org.nz/r/literacy_numeracy/litnum_stra_e.php))

### **Information and communications technology**

The purpose of the ICT Strategic Framework for Education is to provide the mechanism to guide and co-ordinate ICT investment towards the government's vision of improved education outcomes.

The Framework is aligned with, and supports the government's E-government and National Digital Strategies and provides the foundation for effective (e) learning practices to be integrated into New Zealand educational practices.

#### **VISION**

To improve learner achievement in an innovative education sector, fully connected and supported by the smart use of ICT.

## GOALS

The ICT Strategic Framework for Education seeks to deliver this vision through:

1. A more learner-centered education system transcending organizational boundaries.
2. More informed decision making within the education sector by learners, teachers, parents, communities, public, businesses, researchers, policy makers, and administrators.
3. Increased ease and opportunity of access and reduced compliance costs for all participants.
4. Increased confidence, capability and capacity from the use of ICT by all participants in the education sector.
5. Greater opportunities for the generation, application and sharing of new ideas and technologies.
6. More effective and efficient investment in ICT by education sector government agencies.

These goals will be achieved through:

- Developing a more learner-centered service culture where education agencies and organizations focus on the outcome rather than the technology;
- Recognizing that successful design, development and implementation is as much about people as about technology;
- Interoperability and ease of access to, and between, systems and information where learners can engage as and when required, and decision-making is better informed at all levels;
- Balancing local choice and national direction;
- Coherence through open standards rather than standardization;
- Achieving greater effectiveness and efficiency in the design, development, implementation and use of ICT in supporting education based on a user-focused approach;
- Establishing and maintaining a cooperative culture and communities that support and nurture innovation, creativity and the sharing of ideas and practices;
- Recognizing and accommodating the considerable legacy<sup>2</sup> investment and levels of ICT capability and resource across the Sector.

The ICT Strategic Framework for Education aims to deliver across the following National Digital Strategy components:

Connectivity	Access to a robust national open standards-driven ICT infrastructure for education.
Content	Digital content from a variety of sources, and repositories for many purposes and users to support teaching, learning, research and administration, including support for lifelong learners and preserving New Zealand's digital heritage for future generations of learners.
Confidence & Capability	All New Zealanders have or are developing/acquiring the skills and confidence needed to turn the information into knowledge; collaborative working practices are utilized to deliver education outcomes for all.

The **ICT Strategic Framework for Education** strategy can be accessed via the Ministry of Education website at [http://www.minedu.govt.nz/web/downloadable/dl11734\\_v1/web-version---ict-strategic-framework-for-educatio.pdf](http://www.minedu.govt.nz/web/downloadable/dl11734_v1/web-version---ict-strategic-framework-for-educatio.pdf)

# SAUDI ARABIA

## PURPOSE OF POLICY STATEMENT

The Ministry of Communications and Information Technology (MCIT) recognizes that all the constituents of the Information and Communication Technology (ICT) sector, particularly domestic and foreign investors, attach great importance to removing uncertainty, creating a favorable regulatory atmosphere, and pursuing a policy of speedy reform to keep pace with the needs of the market, and attract more investment to the ICT sector.

The purpose of this policy statement is to state the policies that have been adopted by MCIT in the past few years, as well as those MCIT plans to pursue over the next few years in the development of the ICT sector in the Kingdom of Saudi Arabia. The Communications and Information Technology Commission (CITC) has ensured that it regulates the ICT sector in accordance with these policies and the existing legal and regulatory framework that has been established for the sector.

## ICT VISION AND OBJECTIVES

The Kingdom's vision for ICT aims at transforming the country to an information society through the utilization of ICT for providing information services to all strata of society, in all parts of the country, and by building a solid ICT industry to become a major source of national income.

The government views information as a strategic resource, and thus sees ICT as a major facilitator and driver for growth and prosperity. In particular, over the next few years, the objectives for ICT will focus on the following:

Continuing the development of the regulatory environment to ensure fair and effective competition in a free ICT market;

- Working towards increased availability and consumer choice in the provision of voice, data, and high quality broadband services across the Kingdom;
- Bridging the digital divide in the country by utilizing different strategies from infrastructure outreach to education and awareness;
- Exerting all required efforts for attaining an information society, characterized by a knowledge based economy, ICT-enabled learning, electronic government services, and efficient electronic commerce (E-Commerce);
- Working towards building a solid ICT industry, that is locally vibrant and internationally competitive.

## ICT USAGE AND CONTENT

Saudi Arabia is under transformation towards becoming an information society, with the main engines for this transformation being ICT applications, services, and content.

The government believes that E-Government will have a major effect on the public sector, the private sector, the national economy, and society at large. This is currently being implemented through a dedicated E-Government Program (Yesser), a joint program among MCIT, Ministry of Finance, and CITC. Yesser is based on best practices and international experiences, and is being executed in a coordinated, transparent, and decentralized fashion. The requirements for a successful E-Commerce and E-Government are to be met through enhancing telecommunication backbones; establishing relevant laws and regulations; ensuring information security and privacy; building a Public Key Infrastructure (PKI)<sup>7</sup>; developing common standards; establishing the national technical infrastructure; building an e-payment gateway<sup>8</sup>; using smart cards and creating the national e-services portal; introducing change management program across the public sector; and improving on postal delivery and related services.

Without rich and proper information content, ICT has a limited use. To that end, and as detailed in the national ICT Plan, MCIT is working towards instituting policies for the placement of Arabic digital content on the Internet, translating electronic content into Arabic, and using Arabic domain names for Internet addresses, a practical way for addressing Arabic web sites. Local publishers are encouraged to provide digital summaries for all books and reports they may have published or printed.

## BRIDGING THE DIGITAL DIVIDE

The digital divide is being addressed by enhancing digital Arabic content, and spreading ICT awareness by means of computer and Internet literacy education, and by boosting the usage of PCs in the country. The home computing initiative, launched in mid 2005, aims at enabling one million homes to own personal computers within a period of 5 years.

MCIT is also working on plans to freely distribute to the public training material on CDs, which cover basic PC and internet skills. The training material will be available also through the MCIT learning portal.

Small and Medium Businesses (SMBs) are a major vehicle for economic growth and job creation. The government is coordinating an initiative to provide a complete solution to automate SMBs, promote awareness and standardization, and facilitate ownership of basic ICT tools and solutions. The policy on universal access and universal service, soon to be enacted, will bring the benefits of ICT to all geographic areas and to all social strata.

Developing the nation's human resources is a basic element of national development, and a major contributor to bridging the digital divide. The privatization program<sup>12</sup> attaches particular importance to Saudization, and aims at developing appropriate regulations and incentives to encourage the private sector to hire Saudi citizens, and provide opportunities for training and professional development.

(Source: <http://css.escwa.org.lb/ICTpolicymaking/5.pdf>)

## APPENDIX E

### References for Development of California Basic Elements of ICT Digital Literacy – Continuum of Assessment

*National ICT Literacy Policy Council ICT Literacy Skills  
Educational Testing Service (ETS)  
Post Secondary Focus  
Intermediate Foundational ICT Literacy Skills*

Demonstrate abilities that build on the core foundational skills of ICT literacy (define, access, manage, and use information). The learner selects and applies appropriate ICT tools to synthesize, integrate, and assimilate information, to evaluate evidence and infer conclusions, to create and reflect on information processes and products, and to communicate results in a persuasive, ethical, and legal manner. These abilities are demonstrated at a skill level necessary to succeed in 3<sup>rd</sup> year postsecondary studies and/or the workplace.

**Define:** Articulate a need for information that defines a hypothesis or problem in operational terms.

**Access:** Develop and apply a systematic strategy for ethically and legally finding, retrieving, and sorting information from a variety of relevant sources, representing a wide spectrum of perspectives, acknowledging sources appropriately.

**Evaluate:** Judge veracity, bias, primacy, persuasiveness, and completeness of information and information sources for a specific purpose.

**Manage:** Develop and apply a comprehensive system to classify and prioritize information in order to identify and clarify interrelationships.

**Integrate:** Synthesize information from a variety of sources and perspectives, compare and contrast arguments, identify trends and patterns, and infer conclusions.

**Create:** Generate information new to the learner through critical review and revision of assimilated information. Develop supported arguments and warranted conclusions to address the task at hand.

**Communicate:** Communicate information persuasively to meet needs of various audiences through the use of an appropriate medium.

(Source: [www.ets.org](http://www.ets.org))

**Post Secondary Standards, Performance Indicators, and Outcomes**  
***(American Library Association – ACRL Standards for Information Literacy)***

Source: <http://www.ala.org/ala/acrl/acrlstandards/informationliteracycompetency.cfm#ilassess>

**Standard One**

**The information literate student determines the nature and extent of the information needed.**

<b>Performance Indicators</b>	
<b>1. The information literate student defines and articulates the need for information.</b>	
<i>Outcomes Include</i>	<ul style="list-style-type: none"> <li>a. Confers with instructors and participates in class discussions, peer workgroups, and electronic discussions to identify a research topic, or other information need.</li> <li>b. Develops a thesis statement and formulates questions based on the information need.</li> <li>c. Explores general information sources to increase familiarity with the topic.</li> <li>d. Defines or modifies the information need to achieve a manageable focus.</li> <li>e. Identifies key concepts and terms that describe the information need.</li> <li>f. Recognizes that existing information can be combined with original thought, experimentation, and/or analysis to produce new information.</li> </ul>
<b>2. The information literate student identifies a variety of types and formats of potential sources for information.</b>	
<i>Outcomes Include</i>	<ul style="list-style-type: none"> <li>a. Knows how information is formally and informally produced, organized, and disseminated.</li> <li>b. Recognizes that knowledge can be organized into disciplines that influence the way information is accessed.</li> <li>c. Identifies the value and differences of potential resources in a variety of formats (e.g., multimedia, database, website, data set, audio/visual, and book).</li> <li>d. Identifies the purpose and audience of potential resources (e.g., popular vs. scholarly, current vs. historical).</li> <li>e. Differentiates between primary and secondary sources, recognizing how their use and importance vary with each discipline.</li> <li>f. Realizes that information may need to be constructed with raw data from primary sources.</li> </ul>
<b>3. The information literate student considers the costs and benefits of acquiring the needed information.</b>	
<i>Outcomes Include</i>	<ul style="list-style-type: none"> <li>a. Determines the availability of needed information and makes decisions on broadening the information seeking process beyond local resources (e.g., interlibrary loan; using resources at other locations; obtaining images, videos, text, or sound).</li> <li>b. Considers the feasibility of acquiring a new language or skill (e.g., foreign or discipline-based) in order to gather needed information and to understand its context.</li> <li>c. Defines a realistic overall plan and timeline to acquire the needed information.</li> </ul>
<b>4. The information literate student reevaluates the nature and extent of the information need.</b>	
<i>Outcomes Include</i>	<ul style="list-style-type: none"> <li>a. Reviews the initial information need to clarify, revise, or refine the question.</li> <li>b. Describes criteria used to make information decisions and choices.</li> </ul>

## **Standard Two**

### **The information literate student accesses needed information effectively and efficiently**

<b>Performance Indicators</b>	
<b>1. The information literate student selects the most appropriate investigative methods or information retrieval systems for accessing the needed information</b>	
<i>Outcomes Include</i>	<ol style="list-style-type: none"><li>a. Identifies appropriate investigative methods (e.g., laboratory experiment, simulation, fieldwork).</li><li>b. Investigates benefits and applicability of various investigative methods.</li><li>c. Investigates the scope, content, and organization of information retrieval systems.</li><li>d. Selects efficient and effective approaches for accessing the information needed from the investigative method or information retrieval system.</li></ol>
<b>2. The information literate student constructs and implements effectively designed search strategies.</b>	
<i>Outcomes Include</i>	<ol style="list-style-type: none"><li>a. Develops a research plan appropriate to the investigative method.</li><li>b. Identifies keywords, synonyms and related terms for the information needed.</li><li>c. Selects controlled vocabulary specific to the discipline or information retrieval source.</li><li>d. Constructs a search strategy using appropriate commands for the information retrieval system selected (e.g., Boolean operators, truncation, and proximity for search engines; internal organizers such as indexes for books).</li><li>e. Implements the search strategy in various information retrieval systems using different user interfaces and search engines, with different command languages, protocols, and search parameters.</li><li>f. Implements the search using investigative protocols appropriate to the discipline.</li></ol>
<b>3. The information literate student retrieves information online or in person using a variety of methods.</b>	
<i>Outcomes Include</i>	<ol style="list-style-type: none"><li>1. Uses various search systems to retrieve information in a variety of formats.</li><li>2. Uses various classification schemes and other systems (e.g., call number systems or indexes) to locate information resources within the library or to identify specific sites for physical exploration.</li><li>3. Uses specialized online or in person services available at the institution to retrieve information needed (e.g., interlibrary loan/document delivery, professional associations, institutional research offices, community resources, experts and practitioners).</li><li>4. Uses surveys, letters, interviews, and other forms of inquiry to retrieve primary information.</li></ol>
<b>4. The information literate student refines the search strategy if necessary</b>	
<i>Outcomes Include</i>	<ol style="list-style-type: none"><li>a. Assesses the quantity, quality, and relevance of the search results to determine whether alternative information retrieval systems or investigative methods should be utilized.</li><li>b. Identifies gaps in the information retrieved and determines if the search strategy should be revised.</li><li>c. Repeats the search using the revised strategy as necessary.</li></ol>

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<b>5. The information literate student extracts, records, and manages the information and its sources.</b>	
<i>Outcomes Include</i>	<ul style="list-style-type: none"> <li>a. Selects among various technologies the most appropriate one for the task of extracting the needed information (e.g., copy/paste software functions, photocopier, scanner, audio/visual equipment, or exploratory instruments)</li> <li>b. Creates a system for organizing the information</li> <li>c. Differentiates between the types of sources cited and understands the elements and correct syntax of a citation for a wide range of resources</li> <li>d. Records all pertinent citation information for future reference</li> <li>e. Uses various technologies to manage the information selected and organized</li> </ul>

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**Standard Three**

**The information literate student evaluates information and its sources critically and incorporates selected information into his or her knowledge base and value system.**

**Performance Indicators**

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<b>1. The information literate student summarizes the main ideas to be extracted from the information gathered</b>	
<i>Outcomes Include</i>	<ul style="list-style-type: none"> <li>a. Reads the text and selects main ideas</li> <li>b. Restates textual concepts in his/her own words and selects data accurately</li> <li>c. Identifies verbatim material that can be then appropriately quoted</li> </ul>
<b>2. The information literate student articulates and applies initial criteria for evaluating both the information and its sources.</b>	
<i>Outcomes Include</i>	<ul style="list-style-type: none"> <li>a. Examines and compares information from various sources in order to evaluate reliability, validity, accuracy, authority, timeliness, and point of view or bias</li> <li>b. Analyzes the structure and logic of supporting arguments or methods</li> <li>c. Recognizes prejudice, deception, or manipulation</li> <li>d. Recognizes the cultural, physical, or other context within which the information was created and understands the impact of context on interpreting the information</li> </ul>
<b>3. The information literate student synthesizes main ideas to construct new concepts.</b>	
<i>Outcomes Include</i>	<ul style="list-style-type: none"> <li>a. Recognizes interrelationships among concepts and combines them into potentially useful primary statements with supporting evidence</li> <li>b. Extends initial synthesis, when possible, at a higher level of abstraction to construct new hypotheses that may require additional information</li> <li>c. Utilizes computer and other technologies (e.g. spreadsheets, databases, multimedia, and audio or visual equipment) for studying the interaction of ideas and other phenomena</li> </ul>
<b>4. The information literate student compares new knowledge with prior knowledge to determine the value added, contradictions, or other unique characteristics of the information.</b>	
<i>Outcomes Include</i>	<ul style="list-style-type: none"> <li>a. Determines whether information satisfies the research or other information need</li> <li>b. Uses consciously selected criteria to determine whether the information contradicts or verifies information used from other sources</li> <li>c. Draws conclusions based upon information gathered</li> <li>d. Tests theories with discipline-appropriate techniques (e.g., simulators, experiments)</li> <li>e. Determines probable accuracy by questioning the source of the data, the limitations of the information gathering tools or strategies, and the reasonableness</li> </ul>

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	of the conclusions
	f. Integrates new information with previous information or knowledge
	g. Selects information that provides evidence for the topic
<b>5. The information literate student determines whether the new knowledge has an impact on the individual's value system and takes steps to reconcile differences.</b>	
<i>Outcomes Include</i>	a. Investigates differing viewpoints encountered in the literature
	b. Determines whether to incorporate or reject viewpoints encountered
<b>6. The information literate student validates understanding and interpretation of the information through discourse with other individuals, subject-area experts, and/or practitioners.</b>	
<i>Outcomes Include</i>	a. Participates in classroom and other discussions
	b. Participates in class-sponsored electronic communication forums designed to encourage discourse on the topic (e.g., email, bulletin boards, chat rooms)
	c. Seeks expert opinion through a variety of mechanisms (e.g., interviews, email, listservs)
<b>7. The information literate student determines whether the initial query should be revised</b>	
<i>Outcomes Include</i>	a. Determines if original information need has been satisfied or if additional information is needed
	b. Reviews search strategy and incorporates additional concepts as necessary
	c. Reviews information retrieval sources used and expands to include others as needed

#### **Standard Four**

**The information literate student, individually or as a member of a group, uses information effectively to accomplish a specific purpose.**

#### **Performance Indicators**

<b>1. The information literate student applies new and prior information to the planning and creation of a particular product or performance.</b>	
<i>Outcomes Include</i>	a. Organizes the content in a manner that supports the purposes and format of the product or performance (e.g. outlines, drafts, storyboards)
	b. Articulates knowledge and skills transferred from prior experiences to planning and creating the product or performance
	c. Integrates the new and prior information, including quotations and paraphrasing, in a manner that supports the purposes of the product or performance
	d. Manipulates digital text, images, and data, as needed, transferring them from their original locations and formats to a new context
<b>2. The information literate student revises the development process for the product or performance.</b>	
<i>Outcomes Include</i>	a. Maintains a journal or log of activities related to the information seeking, evaluating, and communicating process
	b. Reflects on past successes, failures, and alternative strategies
<b>3. The information literate student communicates the product or performance effectively to others.</b>	
<i>Outcomes Include</i>	a. Chooses a communication medium and format that best supports the purposes of the product or performance and the intended audience
	b. Uses a range of information technology applications in creating the product or performance
	c. Incorporates principles of design and communication
	d. Communicates clearly and with a style that supports the purposes of the intended audience

## **Standard Five**

**The information literate student understands many of the economic, legal, and social issues surrounding the use of information and accesses and uses information ethically and legally.**

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### **Performance Indicators**

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#### **1. The information literate student understands many of the ethical, legal and socio-economic issues surrounding information and information technology**

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<i>Outcomes Include</i>	a. Identifies and discusses issues related to privacy and security in both the print and electronic environments
	b. Identifies and discusses issues related to free vs. fee-based access to information
	c. Identifies and discusses issues related to censorship and freedom of speech
	d. Demonstrates an understanding of intellectual property, copyright, and fair use of copyrighted material

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#### **2. The information literate student follows laws, regulations, institutional policies, and etiquette related to the access and use of information resources.**

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<i>Outcomes Include</i>	a. Participates in electronic discussions following accepted practices (e.g. "Netiquette")
	b. Uses approved passwords and other forms of ID for access to information resources
	c. Complies with institutional policies on access to information resources
	d. Preserves the integrity of information resources, equipment, systems and facilities
	e. Legally obtains, stores, and disseminates text, data, images, or sounds
	f. Demonstrates an understanding of what constitutes plagiarism and does not represent work attributable to others as his/her own
	g. Demonstrates an understanding of institutional policies related to human subjects research

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#### **3. The information literate student acknowledges the use of information sources in communicating the product or performance.**

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<i>Outcomes Include</i>	a. Selects an appropriate documentation style and uses it consistently to cite sources
	b. Posts permission granted notices, as needed, for copyrighted material

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### **NET•S Standards Performance Indicators for Students**

A major component of the NET•S Project is the development of a general set of profiles describing technology-literate students at key developmental points in their pre-college education. These profiles reflect the underlying assumption that all students should have the opportunity to develop technology skills that support learning, personal productivity, decision making, and daily life. These profiles and associated standards provide a framework for preparing students to be lifelong learners who make informed decisions about the role of technology in their lives.

The Profiles for Technology Literate Students provide performance indicators describing the technology competence students should exhibit upon completion of the following grade ranges:

- Grades Pre K - 2
- Grades 3 - 5
- Grades 6 - 8
- Grades 9 - 12

These profiles are indicators of achievement at certain stages in PreK-12 education. They assume that technology skills are developed by coordinated activities that support learning throughout a student's education. These skills are to be introduced, reinforced, and finally mastered, and thus, integrated into an individual's personal learning and social framework. They represent essential, realistic, and attainable goals for lifelong learning and a productive citizenry. The standards and performance indicators are based on input and feedback from educational technology experts as well as parents, teachers, and curriculum experts. In addition, they reflect information collected from professional literature and local, state, and national documents.

### **ISTE NETS for Student Profiles**

#### **Profile for Technology Literate Students Grades Pre K-2 (Ages 4-8)**

The following experiences with technology and digital resources illustrate examples of learning activities in which students might be expected to engage during preK-Grade2 (ages 4-8 years):

1. Illustrate and communicate original ideas and stories using digital tools and media-rich resources. (1, 2)
2. Identify, research, and collect data on an environmental issue using digital resources and propose a developmentally appropriate solution. (1, 3, 4)
3. Engage in learning activities with learners from multiple cultures through email and other electronic means. (2, 6)
4. In a collaborative work group, use a variety of technologies to produce a digital presentation or product in a curriculum area. (1, 2, 6)
5. Find and evaluate information related to a current or historical person or event using digital resources. (3)
6. Use simulations and graphical organizers to explore and depict patterns of growth such as the life cycles of plants and animals. (1, 3, 4)
7. Demonstrate safe and cooperative use of technology. (5)
8. Independently apply digital tools and resources to address a variety of tasks and problems. (6, 4)
9. Communicate about technology using developmentally appropriate and accurate terminology. (6)
10. Demonstrate the ability to navigate in virtual environments such as electronic books, simulation software, and websites. (6)

#### **Profile for Technology Literate Students Grades 3-5 (Ages 8-11)**

The following experiences with technology and digital resources illustrate examples of learning activities in which students might be expected to engage during Grades 3-5 (Ages 8-11):

1. Produce a media rich digital story about a significant local event based on first person interviews. (1, 2, 3, 4)
2. Use digital imaging technology to modify or create works of art for use in a digital presentation. (1, 2, 6)
3. Recognize bias in digital resources while researching an environmental issue with guidance from the teacher. (3, 4)
4. Select and apply digital tools to collect, organize, and analyze data to evaluate theories or test hypotheses. (3, 4, 6)
5. Identify and investigate a global issue to research and generate possible solutions using digital tool and resources.(3, 4)
6. Conduct science experiments using digital instruments and measurement devices. (4, 6)
7. Conceptualize, guide, and manage individual or group learning projects using digital planning tools with teacher support (4, 6)
8. Practice injury prevention by applying a variety of ergonomic strategies when using technology. (5)
9. Debate the effect of existing and emerging technologies on individuals, society, and the global community.(6, 5)
10. Apply previous knowledge of digital technology operations to analyze and solve current hardware and software problems. (4, 6)

#### **Profile for Technology Literate Students Grades 6-8 (Ages 11-14)**

The following experiences with technology and digital resources illustrate examples of learning activities in which students might be expected to engage during Grades 6-8 (Ages 11-14):

1. Describe and illustrate a content-related concept or process using a model, simulation, or concept mapping software. (1, 2)
2. Create original animations or videos documenting school, community or local events. (1, 2, 6)
3. Gather data, examine patterns, and apply information for decision-making using digital tools and resources. (1, 4)
4. Participate in a cooperative learning project in an online learning community. (2)
5. Evaluate digital resources to determine the credibility of the author and publisher and the timeliness and accuracy of content. (3)
6. Employ data collection devices such as probes, handheld devices, geographic mapping systems to gather, view, analyze and report results for content-related problems. (3, 4, 6)
7. Select and use appropriate tools and digital resources to accomplish a variety of tasks and solve problems. (3, 4, 6)
8. Using collaborative electronic authoring tools to explore common curriculum content from multicultural perspectives with other learners. (2, 3, 4, 5)
9. Integrate a variety of file types to create and illustrate a document or presentation. (6, 1)
10. Independently develop and apply strategies for identifying and solving routine hardware and software problems. (4, 6)

#### **Profile for Technology Literate Students Grades 9-12 (Ages 14-18)**

The following experiences with technology and digital resources illustrate examples of learning activities in which students might be expected to engage during Grades 9-12 (Ages 14-18):

1. Design, develop and test a digital learning game to demonstrate knowledge and skills related to curriculum content. (1, 4)
2. Create and publish an online art gallery with examples and commentary that demonstrate an understanding of different historical periods, cultures and countries. (1, 2)
3. Select digital tools or resources to use for a real-world task and justify the selection based on their efficiency and effectiveness. (3, 6)
4. Employ curriculum-specific simulations to practice critical thinking processes. (4, 1).
5. Identify a complex global issue to research, develop a systematic plan of investigation, and present innovative, sustainable solutions. (1, 2, 3, 4)
6. Analyze the capabilities and limitations of current and emerging technology resources and assess their potential to address personal, social, lifelong learning, and career needs. (4, 5, 6)
7. Design a web site that meets accessibility requirements. (5)
8. Model legal and ethical behaviors when using information and technology by properly selecting, acquiring, and citing resources. (3, 5)
9. Create media-rich presentations for other students on the appropriate and ethical use of digital tools and resources. (5, 1)
10. Configure and troubleshoot hardware, software and network systems to optimize their use for learning and productivity. (4, 6)

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## ISTE NETS for Teachers

Board Approved April 3, 2008 – Copyright ISTE® 2008

Effective teachers model and apply the National Educational Technology Standards for Students (NETSoS) as they design, implement, and assess learning experiences to engage students and improve learning; enrich professional practice; and provide positive models for students, colleagues, and the community. All teachers should meet the following standards and performance indicators. Teachers:

### 1. Facilitate and Inspire Student Learning and Creativity

Teachers use their knowledge of subject matter, teaching and learning, and technology to facilitate experiences that advance student learning, creativity, and innovation in both face-to-face and virtual environments. Teachers:

- a. promote, support, and model creative and innovative thinking and inventiveness
- b. engage students in exploring real-world issues and solving authentic problems using digital tools and resources
- c. promote student reflection using collaborative tools to reveal and clarify students' conceptual understanding and thinking, planning, and creative processes
- d. model collaborative knowledge construction by engaging in learning with students, colleagues, and others in face-to-face and virtual environments

### 2. Design and Develop Digital-Age Learning Experiences and Assessments

Teachers design, develop, and evaluate authentic learning experiences and assessments incorporating contemporary tools and resources to maximize content learning in context and to develop the knowledge, skills, and attitudes identified in the NETSoS. Teachers:

- a. design or adapt relevant learning experiences that incorporate digital tools and resources to promote student learning and creativity
- b. develop technology-enriched learning environments that enable all students to pursue their individual curiosities and become active participants in setting their own educational goals, managing their own learning, and assessing their own progress
- c. customize and personalize learning activities to address students' diverse learning styles, working strategies, and abilities using digital tools and resources
- d. provide students with multiple and varied formative and summative assessments aligned with content and technology standards and use resulting data to inform learning and teaching

### 3. Model Digital-Age Work and Learning

Teachers exhibit knowledge, skills, and work processes representative of an innovative professional in a global and digital society. Teachers:

- a. demonstrate fluency in technology systems and the transfer of current knowledge to new technologies and situations
- b. collaborate with students, peers, parents, and community members using digital tools and resources to support student success and innovation

- c. communicate relevant information and ideas effectively to students, parents, and peers using a variety of digital-age media and formats
- d. model and facilitate effective use of current and emerging digital tools to locate, analyze, evaluate, and use information resources to support research and learning

#### **4. Promote and Model Digital Citizenship and Responsibility**

Teachers understand local and global societal issues and responsibilities in an evolving digital culture and exhibit legal and ethical behavior in their professional practices. Teachers:

- a. advocate, model, and teach safe, legal, and ethical use of digital information and technology, including respect for copyright, intellectual property, and the appropriate documentation of sources
- b. address the diverse needs of all learners by using learner-centered strategies and providing equitable access to appropriate digital tools and resources
- c. promote and model digital etiquette and responsible social interactions related to the use of technology and information
- d. develop and model cultural understanding and global awareness by engaging with colleagues and students of other cultures using digital age communication and collaboration tools

#### **5. Engage in Professional Growth and Leadership**

Teachers continuously improve their professional practice, model lifelong learning, and exhibit leadership in their school and professional community by promoting and demonstrating the effective use of digital tools and resources. Teachers:

- a. participate in local and global learning communities to explore creative applications of technology to improve student learning
- b. exhibit leadership by demonstrating a vision of technology infusion, participating in shared decision-making and community building, and developing the leadership and technology skills of others
- c. evaluate and reflect on current research and professional practice on a regular basis to make effective use of existing and emerging digital tools and resources in support of student learning
- d. contribute to the effectiveness, vitality, and self-renewal of the teaching profession and of their school

# ISTE Educational Technology Standards and Performance Indicators for Administrators

## I. LEADERSHIP AND VISION.

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

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

## II. LEARNING AND TEACHING.

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

- A. identify, use, evaluate, and promote appropriate technologies to enhance and support instruction and standards-based curriculum leading to high levels of student achievement.
- B. facilitate and support collaborative technology-enriched learning environments conducive to innovation for improved learning.
- C. provide for learner-centered environments that use technology to meet the individual and diverse needs of learners.
- D. facilitate the use of technologies to support and enhance instructional methods that develop higher-level thinking, decision-making, and problem-solving skills.
- E. provide for and ensure that faculty and staff take advantage of quality professional learning opportunities for improved learning and teaching with technology.

## III. PRODUCTIVITY AND PROFESSIONAL PRACTICE.

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

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

#### IV. SUPPORT, MANAGEMENT, AND OPERATIONS.

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

- A. develop, implement, and monitor policies and guidelines to ensure compatibility of technologies.
- B. implement and use integrated technology-based management and operations systems.
- C. allocate financial and human resources to ensure complete and sustained implementation of the technology plan.
- D. integrate strategic plans, technology plans, and other improvement plans and policies to align efforts and leverage resources.
- E. implement procedures to drive continuous improvement of technology systems and to support technology replacement cycles.

#### V. ASSESSMENT AND EVALUATION.

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

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

#### VI. SOCIAL, LEGAL, AND ETHICAL ISSUES.

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

- A. ensure equity of access to technology resources that enable and empower all learners and educators.
- B. identify, communicate, model, and enforce social, legal, and ethical practices to promote responsible use of technology.
- C. promote and enforce privacy, security, and online safety related to the use of technology.
- D. promote and enforce environmentally safe and healthy practices in the use of technology.
- E. participate in the development of policies that clearly enforce copyright law and assign ownership of intellectual property developed with district resources.

## Partnership for 21<sup>st</sup> Century Skills

### Assessment of 21st century skills should:

- Support a balance of assessments, including high-quality standardized testing along with effective classroom formative and summative assessments
- Emphasize useful feedback on student performance that is embedded into everyday learning
- Require a balance of technology-enhanced, formative and summative assessments to measure student mastery of 21st century skills
- Enable development of portfolios of student work that demonstrate mastery of 21st century skills to educators and prospective employers
- Enable a balanced portfolio of measures to assess the educational system's effectiveness at reaching high levels of student competency in 21st century skills.

*Meeting the demands of today's world requires a shift in assessment strategies to measure the skills now prized in a complex global environment. The Partnership for 21st Century Skills believes that such a shift is vital to the widespread adoption of 21st century skills in our schools. We must move from primarily measuring discrete knowledge to measuring students' ability to think critically, examine problems, gather information, and make informed, reasoned decisions while using technology. In addition to posing real world challenges, such assessments should accept a range of solutions to a task. For example, one possible assessment of 21st century skills would focus more on a student's operational skills, such as her expertise in using multiple sources appropriately and efficiently, rather than on whether or not a correct response was submitted.*

[http://www.21stcenturyskills.org/route21/images/stories/epapers/r21\\_assessment\\_epaper.pdf](http://www.21stcenturyskills.org/route21/images/stories/epapers/r21_assessment_epaper.pdf)

### How can states create and implement assessments to promote 21st century skills in their classrooms?

Implementing an assessment of 21st century skills strategy is a challenging process that will require effort from educators at all levels of a state. Both summative and formative assessments need to be aimed at core subject knowledge, as well as learning and thinking skills, 21st century content, ICT literacy, and life skills. This will require a large commitment from your state as well as the recognition that the implementation process will be a gradual one and will require multiple cycles of creation, implementation, and evaluation strategies. With that in mind, it is important to start with the following actions:

### **1) Create necessary standards.**

Guidelines and standards need to be drawn by the state for teachers and educators to begin the process of creating summative and formative assessments. Assessments should be made to match the units and lessons outlined in the states' reformed standards. The standards could provide examples of assessments as well as indicate how and when to use them. For further assistance with this, see the Standards section on the Route 21 website.

### **2) Develop, implement, evaluate and improve assessments.**

A plan must be created to implement the created assessments into districts, schools, and classrooms and to evaluate their effectiveness in adjusting teacher strategies to target students' 21st century skills. In addition, the assessments must be evaluated, in terms of their adherence to state standards, their usefulness in improving teaching and learning, and their effective use in the classroom. Any or all of these aspects will probably require constant adjustment and improvement across several years before truly effective strategies for assessment can be realized. Structured research, consultations with assessment experts, and regular multi-level, multidisciplinary discussions amongst

stakeholders will provide a strong preliminary step towards bringing 21st century skills into the education system.

### **3) Align formative and summative assessments to curriculum and instruction.**

In many ways, assessment drives what is taught, as schools focus resources and time on the content and skills that are tested. Helping teachers understand how to integrate 21st century skills within their classroom practice and how to adjust teaching strategies accordingly is a vital step to reforming statewide assessment strategies.

### **4) Develop a professional development strategy.**

A professional development initiative that will help teachers incorporate skills necessary for using assessments of 21st century skills, especially of the formative variety, is another important step in the process. Utilizing this assessment strategy will likely require the development of several new skills, including assessment creation, implementation, analysis, and teaching strategy adjustment. For further assistance with this, see the Professional Development section on the Route 21 website.

<http://www.21stcenturyskills.org>

# Kentucky Technology Standards

## Academic Expectation 1.16

Students use computers and other kinds of technology to collect, organize, and communicate information and ideas.

### Learning Links

Fiberoptics / Modems / Distance Learning / Microwave Transmission / Satellites / FAX Machines / Remote Sensing / CAD/CAM / Robotics / Bulletin Boards / E-Mail Demonstrators should be read from bottom to top, but need not be demonstrated sequentially.

### Elementary Demonstrators

- Use a variety of technologies in various ways.
- Use technology to display information in various ways.
- Gather and manipulate data using technology.
- Express information and ideas using technology.

### Middle School Demonstrators

- Express information and ideas creatively using technology.
- Analyze relationships/patterns to draw inferences using technology.
- Integrate the use of a variety of technologies.
- Expand knowledge by identifying and using technology for a specific purpose.
- Compare and analyze the effectiveness of various technologies for a specific purpose.

### High School Demonstrators

- Conduct investigations; solve problems; create products; complete tasks by integrating various forms of technologies.
- Analyze and select appropriate technologies to efficiently complete a task and/or enhance productivity.

### Sample Teaching/Assessment Strategies

Collaborative Process: Cooperative Learning, Peer Tutoring / Continuous Progress Assessment: Portfolio Development / Graphic Organizers: Time Line, Graphic Representations / Problem Solving: Creative Problem Solving, Inquiry, Future Problem Solving, Research, Case Studies, Simulations / Technology/Tools: Computers, Calculators, Telecommunications, Distance Learning, Interactive Video, Multimedia, Videotaping /Writing Process.

These sample strategies offer ideas and are not meant to limit teacher resourcefulness. More strategies are found in the resource section.

### Ideas for Incorporating Community Resources

- Interview a representative from KET on the ways technology influences programming.
- Invite a local doctor to discuss how technology influences diagnosis and treatment.
- Interview a representative from a newspaper on technological changes in the industry.

#### Core Concept - Using Electronic Technology

##### Sample Elementary Activities

- Create a database to record information about different trees. Recommend whether a given tree would flourish in Kentucky based on understanding of climate and weather in the state.
- Use a spreadsheet to record and graph the growth of plants given different soil and atmospheric conditions. Using a multimedia platform, present your findings as to the best methods to promote or hinder plant growth.
- Use CD-ROM reference materials to gather information to produce a report using multimedia (e.g., a word processor with graphing capabilities) comparing the metamorphosis of caterpillars to moths and tadpoles to frogs.
- Use audio or video tape to collect an oral history of your community. Write a report using multimedia to compare the variations in story versions.
- Use hypermedia to present the sequence of events in the growth of a flower from a seed.

##### Sample Middle School Activities

- Compare the damage created by earthquakes and volcanoes in the 20th century in the United States using a spreadsheet and graphing program. Use multimedia to report the results in a narrative document.
- Compare the personal characteristics of heroes from literature using a database. Present the results as posters created with graphic software.
- Demonstrate the movement of the planets in our solar system using hypermedia.
- Demonstrate how to proportionally increase ingredients in various recipes using a spreadsheet.
- Share autobiographies with students from another district using an electronic bulletin board via telecommunications.

##### Sample High School Activities

- Record and analyze, in a database, information related to capital punishment. Write a position paper, using research from CD-ROM and telecommunications

resources, which either supports or refutes capital punishment as a means of crime prevention.

- Demonstrate the effects of changing variables in algebraic equations using a spreadsheet and graphs.  
Demonstrate, using hypermedia, the differences in energy use between monocotyledons and dicotyledons.
- Discuss political issues with other students who are of a different political party or cultural background (e. g., Republican, Democrat, Independent, etc.) using telecommunications. Enter commentaries from discussions in a reflective journal.
- Present the economic, social, political, and entertainment issues related to the Kentucky Derby using multimedia. Reflect an opinion in the presentation as to the effects of these factors.
- Gather and analyze information regarding lotteries across the United States, using CD-ROM reference material and a spreadsheet with graphing capability. Prepare a position paper, using a word processor, about the value of lotteries with regard to the number of dollars spent by consumers, dollars won by consumers, dollars spent on advertising, and operational costs and the amount used for other purposes (a. g., funding state initiatives or special projects).

(Source: Kentucky Department of Education

<http://www.education.ky.gov/KDE/Instructional+Resources/Curriculum+Documents+and+Resources/Academic+Expectations/Academic+Expectation+116.htm>)

## New Hampshire K-12 ICT Curriculum Standards

**Preface:** The ideal ICT Literacy Program in grades K-8 weaves technology experiences into all content areas and all grade levels, so that a student can demonstrate ICT competency at the end of 8<sup>th</sup> grade. The ideal ICT Literacy Program in high school provides courses which allow students to focus on technology experiences that match their career aspirations. Digital portfolios at the K-8 and 9-12 levels are ideal demonstrations of competence, as they can show how students competently use technology tools and resources within the context of core content areas.

In order to meet the new ICT standards, schools which currently provide a middle school course in computer literacy should review their course requirements to ensure that assessment rubrics applied to digital portfolios are used. High school courses should be reviewed to ensure that topics listed in 306.42(c) are addressed and that a prerequisite for such courses is the completion of a digital portfolio as required in 306.42(a) (5).

### Ed 306.42 Standards

All of the New Hampshire School Minimum Standards were updated and became effective 7/1/5. The ICT Literacy Program Standards, which are contained within the School Minimum Standards, are listed here:

#### Ed 306.42 Information and Communication Technologies Program.

(a) The local school board shall require an integrated approach to the use of 21<sup>st</sup> century tools, including, but not limited to digital technology and communication tools, within all curriculum areas through the adoption of an information and communication technologies literacy (ICT) program in grades K - 12 that provides opportunities at developmentally appropriate levels for students to:

(1) Develop knowledge of ethical, responsible use of technology tools in a society that relies heavily on knowledge of information in its decision-making;

(2) Become proficient in the use of 21<sup>st</sup> century tools to access, manage, integrate, evaluate, and create information within the context of the core subjects of:

- a. Reading;
- b. Mathematics;
- c. English and language arts;
- d. Science;
- e. Social studies, including civics, government, economics, history, and geography;
- f. Arts; and
- g. World languages;

(3) Use 21<sup>st</sup> century tools to develop cognitive proficiency in:

- a. Literacy;
- b. Numeracy;
- c. Problem solving;

- d. Decision making; and
- e. Spatial / visual literacy;

(4) Use 21<sup>st</sup> century tools to develop technical proficiency at a foundational knowledge level in:

- a. Hardware;
- b. Software applications;
- c. Networks; and
- d. Elements of digital technology; and

(5) Create digital portfolios which:

a. Address the following components:

- 1. Basic operations and concepts;
- 2. Social, ethical, and human issues;
- 3. Technology productivity tools;
- 4. Technology communications tools;
- 5. Technology research tools; and
- 6. Technology problem solving and decision-making tools;

b. Represent proficient, ethical, responsible use of 21<sup>st</sup> century tools within the context of the core subjects; and

c. Include, at a minimum, such digital artifacts as:

- 1. Standardized tests;
- 2. Observation;
- 3. Student work; and
- 4. Comments describing a student's reflection on his/her work.

(b) The local school board shall provide opportunities for students to demonstrate ICT competency by the end of 8th grade using assessment rubrics applied to the contents of digital portfolios as required in (a)(5) above. Students who successfully demonstrate knowledge, skill, and understanding of these competencies shall have the opportunity, as high school students, to take a higher level computer course to meet the ½ credit requirement.

(c) The local school board shall provide opportunities for students to complete a ½ credit ICT course prior to high school graduation, including, but not limited to:

- (1) Use of common productivity and web based software;
- (2) Use of a variety of multimedia software and equipment;
- (3) Configuring computers and basic network configurations; and
- (4) Applying programming concepts used in software development.

(Source: New Hampshire Department of Educational Technology:  
<http://www.nheon.org/oet/standards/ICTLiteracy.htm>)

## Appendix E - ASSESSMENT PROVIDER SKILLS REFERENCES

### International Computer Driving License (ICDL) Modules

ECDL / ICDL recognition in the world

Globally 7 Million Certifications Issued or in Progress

Updated December 2007

Argentina	Egypt	Luxemburg	Sri Lanka
Austria	Estonia	Malaysia	St. Lucia
Bosnia and Herzegovina (BiH)	Greece	Namibia.	South Africa
Canada	Hungary	New Zealand	Switzerland
Chile	Ireland	Oman	United Arab Emirates
China	Israel	Poland	United Kingdom
Colombia	Italy	Portugal	USA
Croatia	Jamaica	Romania	
Cyprus	Jordan	Serbia & Montenegro	
Czech Republic	Libya	Slovenia	
	Lithuania		

### Skills and Performance

#### **Module I - Concepts of Information Technology (IT)**

Syllabus for Module 1, *Concepts of Information Technology (IT)*, provides the basis for the theory-based test in this module domain.

**Synopsis: Concepts of Information Technology (IT)**, requires the candidate to have an understanding of some of the main concepts of IT at a general level. The candidate is required to understand the make-up of a personal computer in terms of hardware and software and to understand some of the concepts of Information Technology (IT) such as data storage and memory. The candidate shall also understand how information networks are used within computing and be aware of the uses of computer-based software applications in everyday life. The candidate shall appreciate health and safety issues as well as some environmental factors involved in using computers. The candidate shall be aware of some of the important security and legal issues associated with using computers.

#### **Module 2 - Using the Computer and Managing Files**

Module 2, *Using the Computer and Managing Files*, provides the basis for the practice-based test in this module domain.

**Synopsis: Using the Computer and Managing Files**, requires the candidate to demonstrate knowledge and competence in using the common functions of a personal computer and its operating system. The candidate shall be able to adjust main settings, use the built-in help features and deal with a non-responding application. He or she shall be able to operate effectively within the desktop environment and work with desktop icons and windows. The candidate shall be able to manage and organize files and directories/folders, and know how to duplicate, move and delete files and directories/folders, and compress and extract files. The candidate shall also understand what a computer virus is and be able to use virus-scanning software. The candidate shall demonstrate the ability to use simple editing tools and print management facilities available within the operating system.

#### **Module 3 - Word Processing**

Module 3, *Word Processing*, provides the basis for the practice-based test in this module domain.

**Synopsis: Word Processing** requires the candidate to demonstrate the ability to use a word processing application on a computer. The candidate shall be able to accomplish everyday tasks associated with creating, formatting and finishing small sized word processing documents ready for distribution. He or she shall also be able to duplicate and move text within and between documents. The candidate shall demonstrate competence in using some of the features associated with word processing applications such as creating standard tables, using pictures and images within a document, and using mail merge tools.

### **Module 4 – Spreadsheets**

Syllabus for Module 4, *Spreadsheets*, provides the basis for the practice-based test in this module domain.

**Synopsis: Spreadsheets**, requires the candidate to understand the concept of spreadsheets and to demonstrate the ability to use a spreadsheet application on a computer. The candidate shall understand and be able to accomplish tasks associated with developing, formatting, modifying and using a spreadsheet of limited scope ready for distribution. He or she shall also be able to generate and apply standard mathematical and logical formulas using standard formulas and functions. The candidate shall demonstrate competence in creating and formatting graphs/charts.

### **Module 5 – Database**

Syllabus for Module 5, *Database*, is the basis for the theory and practice-based test in this module domain.

**Synopsis: Database**, requires the candidate to understand some of the main concepts of databases and demonstrate the ability to use a database on a computer. The candidate shall be able to create and modify tables, queries, forms and reports, and prepare outputs ready for distribution. The candidate shall be able to relate tables and to retrieve and manipulate information from a database by using query and sort tools available in the package.

### **Module 6 – Presentation**

Syllabus for Module 6, *Presentation*, is the basis for the practice-based test in this module domain.

**Synopsis: Presentation** requires the candidate to demonstrate competence in using presentation tools on a computer. The candidate shall be able to accomplish tasks such as creating, formatting, modifying and preparing presentations using different slide layouts for display and printed distribution. He or she shall also be able to duplicate and move text, pictures, images and charts within the presentation and between presentations. The candidate shall demonstrate the ability to accomplish common operations with images, charts and drawn objects and to use various slide show effects.

### **Module 7 - Information and Communication**

Syllabus for Module 7, *Information and Communication*, provides the basis for the theory and practice-based test in this module domain.

**Synopsis: Information and Communication**, is divided in two sections. The first section, *Information*, requires the candidate to understand some of the concepts and terms associated with using the Internet, and to appreciate some of the security considerations. The candidate shall also be able to accomplish common Web search tasks using a Web browsing application and available search engine tools. He or she shall be able to bookmark Web sites, and to print Web pages and search outputs. The candidate shall be able to navigate within and complete Web-based forms. In the second section, *Communication*, the candidate is required to understand some of the concepts of electronic mail (e-mail), together with having an appreciation of some of the security considerations associated with using e-mail. The candidate shall also demonstrate the ability to use e-mail software to send and receive messages, and to attach files to mail messages. The candidate shall be able to organize and manage message folders/directories within e-mail software.

(Source: <http://www2.icdlus.com/icdlus-lms-webclient/homepage/syllabus/syllabus.html>)

# Certiport – ICT Digital Literacy Assessment

## IC<sup>3</sup> 2005 - Computing Fundamentals

This exam covers the following areas:

### Computer Hardware:

- Identify types of computers, how they process information and how individual computers interact with other computing systems and devices
- Identify the function of computer hardware components
- Identify the factors that go into an individual or organizational decision on how to purchase computer equipment
- Identify how to maintain computer equipment and solve common problems relating to computer hardware

### Computer Software:

- Identify how software and hardware work together to perform computing tasks and how software is developed and upgraded
- Identify different types of software, general concepts relating to software categories, and the tasks to which each type of software is most suited or not suited
- Identify fundamental concepts relating to database applications
- Using an Operating System:
  - Identify what an operating system is and how it works, and solve common problems related to operating systems
  - Manipulate and control the Windows desktop, files and disks
  - Identify how to change system settings, install and remove software

## IC<sup>3</sup> 2005 - Key Applications

This exam covers the following areas:

- Common Program Functions:
  - Be able to start and exit a Windows application and utilize sources of online help
  - Identify common on-screen elements of Windows applications, change application settings and manage files within an application
  - Perform common editing and formatting functions
  - Perform common printing functions
- Word Processing Functions:
  - Be able to format text and documents including the ability to use automatic formatting tools
  - Be able to insert, edit and format tables in a document
- Spreadsheet Functions:
  - Be able to modify worksheet data and structure and format data in a worksheet
  - Be able to sort data, manipulate data using formulas and functions and add and modify charts in a worksheet
- Presentation Software:
  - Be able to create and format simple presentations

## IC<sup>3</sup> 2005 - Living Online

This exam covers the following areas:

- Networks and the Internet:
  - Identify network fundamentals and the benefits and risks of network computing
  - Identify the relationship between computer networks, other communications networks (like the telephone network) and the Internet
- Electronic Mail:
  - Identify how electronic mail works
  - Identify how to use an electronic mail application
  - Identify the appropriate use of e-mail and e-mail related "netiquette"
- Using the Internet:
  - Identify different types of information sources on the Internet
  - Be able to use a Web browsing application
  - Be able to search the Internet for information
- The Impact of Computing and the Internet on Society:
  - Identify how computers are used in different areas of work, school, and home
  - Identify the risks of using computer hardware and software
  - Identify how to use the Internet safely, legally, and responsibly

Source: [www.certipoint.com](http://www.certipoint.com)

## Digital Literacy Informational Resources and Assessment Tools

These ICT Literacy standards are based on standards and policy recommendations related to educational technology, which have begun to converge in the past few years. Those standards and their originating organizations are listed here:

- [ICT Literacy Portal](#) has many resources on the topic and an active community of online speakers, forums, and discussions.
- [International Society for Technology in Education \(ISTE\)](#) has a wealth of resources on their website. They spearheaded the creation of the National Educational Technology Standards for Students ([NET\\*S-S](#)).
- NH Society for Technology in Education ([NHSTE](#)) is our state's affiliate organization of ISTE.
- [21st Century Skills Website](#) has a wealth of information about ICT skills. One of their initiatives is the creation of [literacy maps](#) in science, geography, math, and English showing concrete examples of how ICT literacy can be integrated into core subjects.
- Second Information Technology in Education Study: Module 2 ([SITES: M2](#)) is an international study of innovative pedagogical practices that use information and communication technology (ICT).

American Association of School Librarians (part of ALA) has several resources related to the [Information Power](#) standards.

- New Hampshire Educational Media Association ([NHEMA](#)) is our state's association of school librarians.
- International Technology Education Association (ITEA) developed the [Standards for Technological Literacy](#).

Here are additional resources for use in developing ICT Literacy Programs:

[NET\\*S Online Performance Based Assessment](#) – This tool was developed jointly by the International Society for Technology in Education (ISTE) and Microsoft, to assess 8<sup>th</sup> graders' competence in the National Educational Technology Standards for Students (NET\*S-S).

[TechYES](#) is a program created for technology literacy certification, which could be incorporated into a middle school ICT course to provide both course content and end-of-course assessment.

[International Computer Driving License \(ICDL\)](#) – Provides a credential program for students.

[Certiport IC3](#) – Provides another path to certifying your students in ICT literacy skills.

[IT Pathway Program](#) – Provides curriculum resources for Information Technology studies in middle through high school. Several NH educators developed this program as part of a Career Pathways grant. Two courses, "IT and Me" and "IT and Me Works", are particularly useful for NH districts developing ICT Literacy Programs.

Vermont's Educational Technology [Performance Tasks](#) – Provides an extensive set of possible tasks from which to build course activities tied to NET\*S.

"Standards and Guidelines for Strong School Libraries" by the California School Library Association.

[http://www.csla.net/pub/pdf/CSLA\\_Standards.pdf](http://www.csla.net/pub/pdf/CSLA_Standards.pdf)

"Standards for the 21st Century Learner," by the American Association of School Libraries,"

<http://www.ala.org/ala/aasl/aaslproftools/learningstandards/standards.cfm>

"Information Power: Building Partnerships for Learning" by American Association of School Librarians and Association for Educational Communications and Technology.

<http://www.ala.org/ala/aasl/aaslproftools/informationpower/informationpower.cfm>