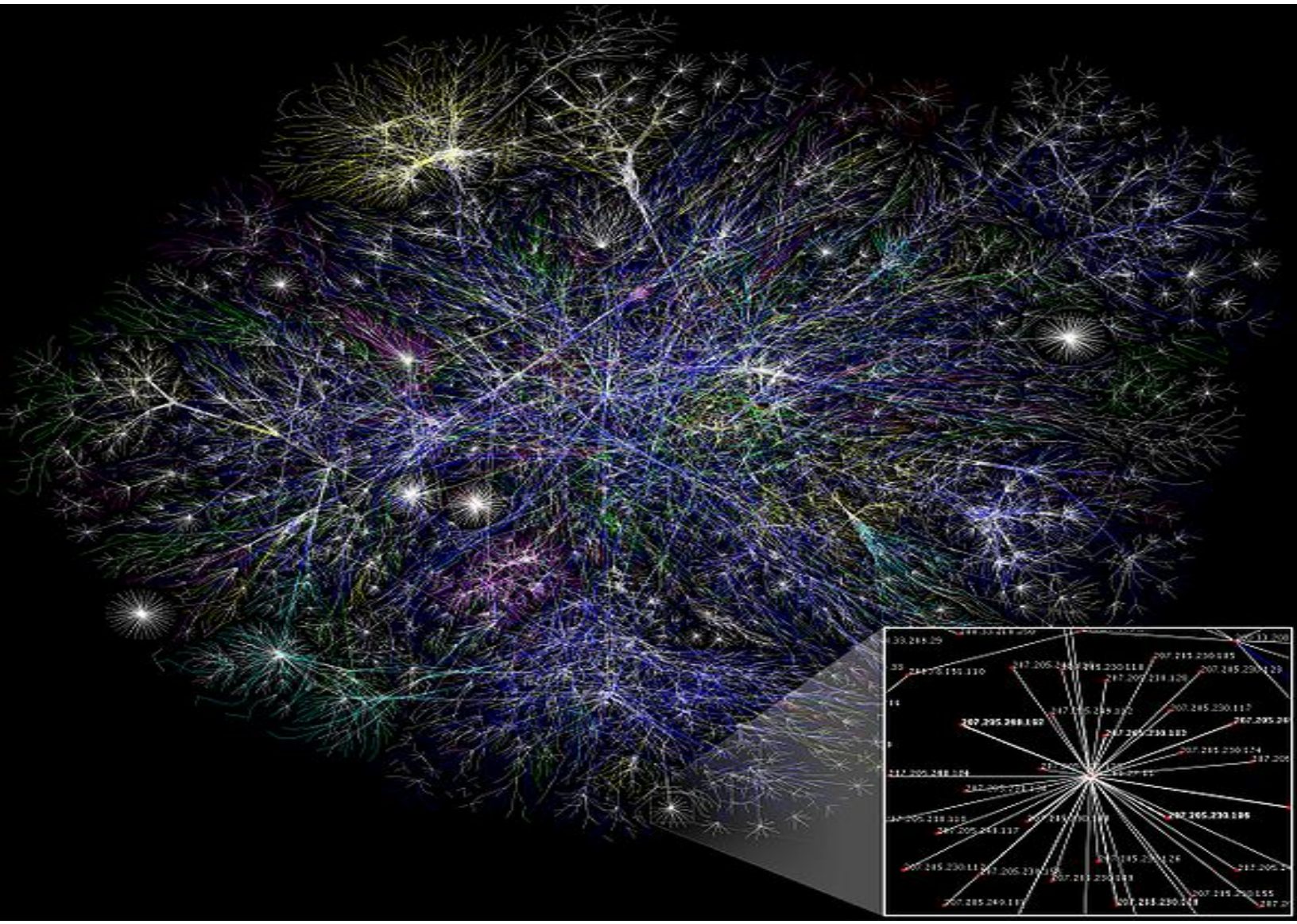
# DIGITAL LITERACY PATHWAYS IN CALIFORNIA

ICT Leadership Council Action Plan Report

July 2010



PREPARED IN ACCORDANCE WITH CALIFORNIA GOVERNOR ARNOLD SCHWARZENEGGER'S EXECUTIVE ORDER S-06-09 WHICH ESTABLISHED THE CALIFORNIA ICT DIGITAL LITERACY LEADERSHIP COUNCIL, AND TASKED THE COUNCIL WITH DEVELOPING AN ICT DIGITAL LITERACY POLICY AND ACTION STEPS TO ENSURE ALL CALIFORNIANS CAN COMPETE IN TODAY'S GLOBAL KNOWLEDGE-BASED ECONOMY

## TABLE OF CONTENTS


| **Section I: Executive Summary** | **Page** |
|---|---|
| Defining Digital Literacy | 3 |
| Policy Statement | 4 |
| Summary of Recommended Actions | 4 |
| **Section II: Introduction** | 6 |
| **Section III: Digital Literacy Pathways in California** | 7 |
| California ICT Digital Literacy Policy Statement | 7 |
| The California ICT Digital Literacy Action Plan | 8 |
| Definition of the Basic Elements of Digital Literacy | 10 |
| Continuum of Skills required for Digital Literacy and Frameworks for Assessment & Certification | 11 |
| Implication of the Proposed Framework and Continuum for Future Policies | 14 |
| Strategies for Incorporating Digital Literacy into Pre K-12 and Higher Education | 14 |
| Pre K-12 | 14 |
| Higher Education | 18 |
| Workforce Preparation | 18 |
| Recommended Curricula Consistent with the Assessment Frameworks | 19 |
| Summary of Recommended Actions and Timeline for Implementation | 20 |
| Identification of Metrics to Ascertain Achievement of ICT Digital Literacy | 22 |
| Conclusion | 22 |
| **Section III: Appendices** | |
| Appendix A - Executive Order S-06-09 By the Governor of the State of California | 23 |
| Appendix B – Potential Definitions of Digital Literacy | 27 |
| Appendix C – California Emerging Technology Fund Report | 28 |
| Appendix D - Characteristics of Programs of Info. Literacy that Illustrate Best Practices | 62 |
| Appendix E - Teacher professional development framework to help build the 'Digital Literacy pathway' for California educators and students | 66 |
| Appendix F –Members of the ICT Digital Literacy Council and Advisory Committee | 68 |

## SECTION I: EXECUTIVE SUMMARY

In accordance with California Governor Arnold Schwarzenegger's Executive Order issued on May 22, 2009, the ICT Digital Literacy Leadership Council established an Advisory Committee (see Appendix F for Members of the Leadership Council and Advisory Committee), and together the two groups have developed the enclosed ICT Digital Literacy Policy Statement and ICT Digital Literacy Action Plan. These documents reflect the Governor's vision for California as a global leader in producing residents capable of working collaboratively with colleagues in every part of the world in the 21st Century.

The overall purpose of the California ICT Digital Literacy Policy Statement and Action Plan is to ensure that learners of all ages are successful content creators and users of technologies that foster the sharing, gathering and interpreting of information, ideas and texts central to active and effective participation in society. Implementation of the policy and plan will support the needs of California's workforce that are critical to a thriving and robust 21st Century economy. The California Department of Labor, in its report on *Information & Communications Technologies in California* (September 2009) estimated growth in employment of nearly 40% in computer systems design and related services, a direction that accounts for almost one-fourth of all new jobs created in California over the next five years.

The Digital Literacy Action Plan is a response to this vision and the need of Californians to use new technologies to address perplexing challenges, build intercultural and global understandings, and create innovative and novel ways of learning, communicating, and working. Additionally, the Action Plan addresses the competencies necessary for Californians to benefit fully from the high-speed telecommunication networks, satellite communication systems, and other technology resources and tools that play a vital role in statewide, nationwide, and worldwide collaborations. The Action Plan seeks to ensure that all Californians and individuals with whom they interact and work with in the global society can benefit from the power and promise of new technologies available, not only in today's digital age but well into the 21st Century.

The Action Plan places emphasis on Digital Literacy as an ongoing and developing process rather than a destination. Individuals must continually improve their knowledge and understanding of how to use existing and emerging technologies. Becoming and remaining "digitally literate" requires lifelong learning. Individuals must learn how to engage with, and use, new technologies as they transition across levels of school and move from school to work, and from one career to another. In addition, Digital Literacy facilitates staying in communication with family, friends, and associates in social and professional networks. Given this dynamic, and changing nature of technology, the variety of knowledge and technologies to be mastered and the different ways of interacting with technologies in different contexts, individuals must, over time, acquire a range of knowledge and skills that comprise Digital Literacies rather than just one framework and skill that is Digital Literacy. This plurality of knowledge and skills is acquired over time and encompassed in the more general term "Digital Literacy".

No single state agency, board, or commission has broad enough authority to be given the sole responsibility for ensuring access to opportunities for individuals to develop digital literacies. Leadership in providing access for all Californians to the required learning opportunities is a shared responsibility of many state and local entities, employers, non-profit organizations, communities and individuals. The Action Plan for California depends on a broad community of stakeholders that contribute to an expanded definition of crucial Digital Literacy practices, develop new programs, share new knowledge, build coherent systems of technological support, and collaborate across areas of expertise and work. The Action Plan seeks to support this collaborative approach by ensuring that a cross-section of key State of California leaders gather on a biennial basis to revisit the state's progress in promoting Digital Literacy for all of its residents. The recommended ongoing monitoring, reports and updates are intended to keep the importance of this issue at the forefront of the state's policy agenda and to ensure continued progress over time.

### Defining Digital Literacy

To ensure a common understanding among all key stakeholders within the state and various local and regional entities the ICT Digital Leadership Council has chosen to define Digital Literacy as *"a lifelong learning process of capacity building for using digital technology, communications tools, and/or networks in creating, accessing, analyzing, managing, integrating, evaluating, and communicating information in order to function in a knowledge-based economy and society".* The definition of Digital Literacy adopted by the Leadership Council reflects a

desire for knowledge, skills and behaviors that go beyond the technical operations of a computer or other technology device.

## Policy Statement

The ICT Digital Leadership Council recognizes that the advancement of Digital Literacy in a state as large and diverse as California requires numerous individuals in positions of authority within the State's distributed leadership structure to take responsibility for crafting and promoting Digital Literacy policies. This report identifies the key entities that will play a critical role in advancing Digital Literacy in California. Each entity's associated Digital Literacy policy and implementation plan will need to reflect the unique context in which it is being implemented. While policies will vary it is essential that they spring from a common conceptual framework. Similarly, multiple funding approaches for Digital Literacy programs and services will need to originate within each entity that has a role in advancing Digital Literacy.

## Summary of Recommended Actions

To address the action items outlined in Governor Arnold Schwarzenegger's Executive Order S-06-09, the ICT Digital Literacy Leadership Council recommends the following steps that can be found on pages 20-22, with a timeline and the responsible organizations. The recommendations are grouped into six categories:

Leadership

- Enlist the support of the State's elected officials and civic leaders to generate greater public awareness of the importance of Digital Literacy to California and advocate for policies and programs that support opportunities for Pre K-20 learners and workers to develop Digital Literacy skills.
- Encourage the leaders of California's key entities to support closing the digital divide by developing and providing a seamless, consistent system of support that allows all residents to benefit from reliable technology access, training and assistance as they move between home, school, college, library, and other community-based and workforce settings, and by continuing to pursue efforts to drive availability and affordability of technology in the home for all areas of the state.
- Request the 21 entities identified as being in key leadership roles (pg. 8-9) to adopt ICT Digital Literacy policies and programs that support access, training, and adoption of "successful practices". These organizations should also be encouraged and incentivized to develop an Implementation Action Plan and present the progress made towards implementation to the Leadership Council by January 1, 2012.

Accountability

- The State Chief Information Officer shall reconvene the Leadership Council, the Advisory Committee, and the entities with key leadership roles surrounding ICT Digital Literacy policies and programs by January 31, 2012 to assess the State of California's progress in promoting Digital Literacy, and to revisit the definition of Digital Literacy so that the state recognized definition continues to reflect current perspectives on literacy and its relationship to new and emerging technologies.

Communications and Outreach

The entities with key leadership roles surrounding ICT Digital Literacy policies and programs may wish to:

- Communicate revised definitions of Digital Literacy to stakeholders every two years and forecast changing practices necessary for capacity building.
- Document and share successful policies and programs that promote Digital Literacies.
- Identify opportunities for partnerships between public libraries, community technology centers, and other community-based organizations to provide ICT literacy services to local families and communities.

Process Improvements and Tool Development

The entities with key leadership roles surrounding ICT Digital Literacy policies and programs may wish to:

- Develop a framework for analyzing and certifying methods of Digital Literacy assessment that address requirements of different schooling and workforce contexts (work, school, home, etc.).
- Identify different tools and methods for assessing Digital Literacy proficiency within specific contexts.
- Invest in the strategic development of a strong information technology (IT) sector that is responsive to the needs of the community, schooling, and workforce sectors.

- Develop an online site that allows formal and informal educators to share examples of ways technology can be used to enhance instruction in accordance with state academic standards while simultaneously building students', teachers', administrators', and higher education faculty's digital literacy skills.
- Make common and centrally hosted Digital Literacy assessment tools and systems available to local decision makers and families at low or no cost to support Digital Literacy development.
- Complete the development of the searchable Career Technical Education (CTE) Pathways database so that students can identify IT college/career preparation programs in their local area.

Education and Workforce

The entities with key leadership roles surrounding ICT Digital Literacy policies and programs may wish to:

- Ensure that prior to adopting the Digital Literacy recommendations related to curricula integration strategies across Pre K-20 and workforce that:
    1) Clarity is provided regarding ways of developing, accessing, and assessing knowledge, skills, and practices in each level for the four layers of competencies described on pages 13 -14; and
    2) Digital Literacy curriculum and instruction includes the four layers of competency development described herein exists and are widely available to teachers and students.
- Locate resources to fund the creation and/or expansion of curricula to support educators (communities, families, schools, colleges, and workforce) in:
    1) Assisting learners in situations where there is an immediate need to know/learn (i.e. just in time support); and
    2) Developing knowledge, skills, and practices that support Digital Literacy needed for future work and schooling.

Use of digital materials by teachers and others should be left to the local decision makers to avoid any unintended increases in burdens and requirements placed on classroom teachers.

Together, the Governor's Executive Order and the groundwork laid by the California Emerging Technology Fund provide an excellent foundation for California's next steps to ensure that learners of all ages can be successful creators and/or users of technologies and technology-enabled content. Such actions enable the sharing of information, thoughts and ideas; the production and delivery of goods and services; and participation in modern society. The California ICT Digital Literacy Action Plan contains essential "suggested next steps" and proposed action plans for connecting with the various entities that have unique opportunities to provide leadership in this area. Continued progress is contingent on the actions of California leaders and key entities whose respective agencies and organizations have the authority to adopt, implement and provide the resources necessary to implement digital literacy policies and implementation programs.

*"The digital age is creating an information and communications renaissance. But it is not serving all Americans and their local communities equally. It is not yet serving democracy fully. How we react, individually and collectively, to this democratic shortfall will affect the quality of our lives and the very nature of our communities."*
*-Knight Commission on the Needs of Informing Communities, 2009*[i]

## SECTION II: INTRODUCTION

On May 22, 2009, California Governor Arnold Schwarzenegger signed into law Executive Order S-06-09, which established the California ICT Digital Literacy Leadership Council (see Appendix A). Per the Order, the Leadership Council is chaired by the Chief Information Officer and membership includes the Secretary of Education; the Secretary of Labor and Workforce Development; the Secretary of Business, Transportation and Housing; and the Secretary of State and Consumer Affairs. The Superintendent of Public Instruction has also been invited to participate.

The Leadership Council established an ICT (Information & Communications Technologies) Digital Literacy Advisory Committee, and together the two groups have developed the enclosed ICT Digital Literacy Policy Statement and ICT Digital Literacy Action Plan. The overall purpose of the California ICT Digital Literacy Policy Statement and Action Plan is to ensure that learners of all ages are successful content creators and users of technologies that foster the sharing of information, thoughts and ideas central to active and effective participation in modern society. Implementation of the policy and plan will also support California workforce needs that are critical to the production and delivery of goods and services.

Implementation of the policy and plan will support the needs of California's workforce that are critical to a thriving and robust 21st Century economy. The California Department of Labor forecast in its September 2009 *Information & Communications Technologies in California* report that employment in computer systems design and related services is estimated to grow nearly 40% and account for almost one-fourth of all new jobs created in California over the next five years.

The overall purpose of the California ICT Digital Literacy Policy Statement and Action Plan is to ensure that learners of all ages are successful content creators and users of technologies that foster the sharing of information, thoughts, and ideas central to active and effective participation in society. An individual's ability to read, write, do math, problem solve, work in a team, think critically, and use information and communications technologies is essential to education and workforce preparation, employment success, civic participation, health care, and access to entertainment. ICT Digital Literacy will not solve all of California's challenges, yet it is vital to California's ability to compete successfully in a global information and knowledge economy. This report lays the foundation for what ICT Digital Literacy looks like as a lifelong learning process while inviting twenty-one key entities in California to lead Digital Literacy movements at school, at work, and at home.

To ensure a common understanding among all leaders and stakeholders within the state and various local and regional entities the ICT Digital Leadership Council defined Digital Literacy as *"a lifelong learning process of capacity building for using digital technology, communications tools and/or networks in creating, accessing, analyzing, managing, integrating, evaluating and communicating information in order to function in a knowledge-based economy and society".*

The Leadership Council and Advisory Committee kept the Governor's vision and these requirements in the forefront of their minds as they crafted the ICT Policy Statement and Action Plan. Both groups drew upon the substantial amount of work from the California Emerging Technology Fund (CETF) ICT Digital Literacy Leadership Group and its Consensus Report (see Appendix C). As Sunne Wright McPeak, President and CEO of CETF, indicates, "The California Emerging Technology Fund is pleased to support the implementation of this initiative that will ensure all Californians possess the skills needed to succeed in the 21st Century labor force".

Throughout the report, emphasis was placed on Digital Literacy as an ongoing and developing process, rather than a destination. Individuals must continually improve their knowledge and understanding of how to use existing and emerging technologies. Becoming and remaining "digitally literate" requires lifelong learning. Individuals must learn how to engage with and use new technologies as they transition through school, to work,

and move from one career to another. Additionally, Digital Literacy is important for staying in communication with family, friends, and associates in social and professional networks. Given this dynamic and changing nature of technology, the variety of knowledge and technologies to be mastered and the different ways of interacting with technologies in different contexts, individuals must, over time, acquire a range of knowledge and skills that comprise Digital Literacy rather than just one framework and skill that is Digital Literacy. This plurality of knowledge and skills is acquired over time and encompassed in the more general term "Digital Literacy".

No single entity can be tasked with the sole responsibility for ensuring access to opportunities for individuals to develop lifelong learning habits that keep them digitally literate. Leadership in providing access for all Californians to the required learning opportunities is a shared responsibility of the State of California and many local entities, employers, non-profit organizations, communities and each individual. The Action Plan for California depends on a broad community of stakeholders that contribute to an expanded definition of crucial digital literacy practices, develop new programs, share new knowledge, build coherent systems of technological support, and collaborate across areas of expertise and work. The Action Plan seeks to support this collaborative approach by recommending that a cross-section of key state leaders gather on a biennial basis to revisit the state's progress in promoting digital literacy for all of its residents. The recommended ongoing check-ins and updates are intended to keep the importance of this issue at the forefront of the State's policy agenda and to ensure continued progress over time.

At the federal level, the Federal Communications Commission issued a Notice of Inquiry in April 2009, held 36 public workshops, and gathered thousands of comments from the public. On March 16, 2010, the FCC sent to Congress a National Broadband Plan which includes Section 9.3 on "Addressing Digital Literacy Barriers to Broadband Adoption and Utilization." The FCC noted that 22% of non-adopters cite digital literacy as their main barrier to broadband adoption. Acknowledging there is no standard definition, the FCC stated that:

> [D]igital literacy generally refers to a variety of skills associated with using ICT to find, evaluate, create and communicate information. It is the sum of the technical skills and cognitive skills people employ to use computers to retrieve that information. It also includes the ability to communicate and collaborate using the Internet – through blogs, self-published documents and presentations and collaborative social networking platforms. Digital literacy has different meanings at different stages of a person's life . . . Digital literacy is a necessary life skill, much like the ability to read and write.

The FCC made Recommendation 9.3 that the federal government should launch a National Digital Literacy Program that creates a Digital Literacy Corp, increases the capacity of digital literacy partners and creates an Online Digital Literacy Portal.

## SECTION III: DIGITAL LITERACY PATHWAYS IN CALIFORNIA

Having a common definition for Digital Literacy is a start. The next steps will enable leaders in California, with state government leading the way, to implement Digital Literacy policies and programs. This section addresses the California policy statement and a Digital Literacy Action Plan that will need to be reviewed and possibly revised after two years by the voluntary joint efforts of the entities with key leadership roles surrounding ICT Digital Literacy policies and programs.

### California ICT Digital Literacy Policy Statement

The Leadership Council recognizes that responsibility for ensuring that state-funded or state-initiated programs promote Digital Literacy is shared among leaders across numerous agencies, departments, commissions and levels of government (state, regional and local). Given this reality, the adoption of a single policy is not practical. The advancement of Digital Literacy in a state as large and diverse as California requires numerous individuals in positions of leadership as well as authority within the State's distributed leadership structure to take responsibility for crafting and promoting effective Digital Literacy policies. This report identifies 21 entities that will play a lead role in the implementation of the California Digital Literacy initiative. Each entity's Digital Literacy policy will need to reflect the unique context in which it is being implemented. While policies will vary, it is essential that they spring from the common conceptual framework as it is described in this plan. Similarly, multiple funding approaches for Digital Literacy programs and services will need to originate within each entity having a role in advancing Digital Literacy.

**The California ICT Digital Literacy Action Plan**

The overall purpose of California ICT Digital Literacy Policy Statement and Action Plan are to ensure that learners of all ages can be successful content creators as well as users of technologies that foster the sharing of information, thoughts and ideas central to active and effective participation in modern society. Implementation of the policy and plan will also support California workforce needs that are critical to the production and delivery of goods and services.

As stated in the ICT Digital Literacy Policy Statement, the Leadership Council recognizes that any plan initiated will require leaders across many agencies, departments, commissions and levels of government (state, regional and local) who oversee state-funded or state-initiated programs to share responsibility and interest in promoting development of Digital Literacy through the adoption of policies appropriate in specific contexts. The Leadership Council strongly encourages action by those leaders who are in positions that enable them to adopt policies and programs to support opportunities for learners to develop Digital Literacy skills. In addition, the Council encourages all of the state's civic leaders to raise public awareness of the importance of Digital Literacy training, and encourages the public at-large to take advantage of resources/programs that can support individuals' personal development.

The Leadership Council has identified twenty-one key entities that have unique opportunities to provide leadership in this area.

| SEGMENT OF THE CALIFORNIA POPULATION | ENTITY |
|---|---|
| All residents | California State Library |
| All residents | Local Public Libraries via the Califa Library Group and the California Library Association (CLA) |
| All residents | Community-Based Organizations |
| California workers | California Workforce Investment Board |
| California workers | Local Workforce Investment Boards via the California Workforce Association (CWA) |
| All residents able to benefit from higher education (generally age 16+) | California Community College Board of Governors |
| All residents able to benefit from higher education (generally age 16+) | Local Community College's Board of Trustees |
| Faculty and students in four year colleges and universities | California State University Board of Trustees |
| Faculty and students in four year colleges and universities | University of California Board of Regents |
| Faculty and students in four year colleges and universities | Association of Independent California Colleges and Universities (AICCU) |
| Students in grades Pre-K through 12, adult learners, teachers and administrators | Office of the Secretary of Education, the Superintendent of Public Instruction, the California State Board of Education, and the California Department of Education, |

| | |
|---|---|
| | Local and district school teacher librarians via the California School Library Association (CSLA)<br>Local school district governing boards via the CA School Boards Association (CSBA) |
| Technology leaders across the Pre-K through adult spectrum in both formal and informal education settings | K-20 California Educational Technology Collaborative (K-20 CETC) |
| Seniors and retirees | City Parks and Recreation Departments via the California League of Cities, and the California State Association of Counties |
| Business community leaders | Leading Industry Associations and businesses, Tech America, California Chamber of Commerce |

The anticipated benefits to the learners served by these entities and to the state as a whole for adopting and implementing ICT Digital Literacy policies, gleaned from the findings contained in the Governor's Order, are an:

- Increase in Californians' competitiveness in the knowledge-based economy.
- Ability to attract capital investment that will generate higher quality jobs.
- Ability to compete successfully in a global information and knowledge economy by helping workers develop the capacity to benefit from the changes in the nature of work, shifts in the labor demand, and changes in required ICT skills for the jobs being generated.
- Increase in productivity, improvements to quality of life, and enhanced global competitiveness.
- Increase in capacity to close and keep closed the Digital Divide as technology evolves.
- Ability to help individuals develop their capacity to read, write, do math, problem solve, work in a team, think critically and use ICT for education and workforce preparation, employment success, civic participation, health care, and access to entertainment.
- Ability to afford all residents the opportunity for full participation in the educational, civic, cultural, and economic sectors of California society by providing accessibility to and appropriate skills for fully utilizing government, education, workforce, health care, business, and other services.
- Ability to enhance the learning environment and to support teaching methods which have been shown to engage and challenge learners of all ages.

To shape key strategies in the initial California ICT Digital Literacy Action Plan, the Leadership Council focused on eight items. All eight items are consistent with and build upon the recommendations of the "***California Broadband Task Force Report -- January 2008: The State of Connectivity Building Innovation Through Broadband***." The Broadband Task Force had recommended (1) ensuring literacy standards and relevant curriculum for the State's students, (2) increasing the use and adoption of broadband and computer technology at home and in the community, in order to provide the foundation for a digital literate society, and (3) continuation of state-level and statewide leadership. The eight items are:

1. Definition of the basic elements of Digital Literacy.
2. Description and articulation of a "continuum" of skills required for Digital Literacy.
3. Strategies and actions for incorporating Digital Literacy into workforce training statewide.
4. Strategies and actions for incorporating Digital Literacy into P-12 and higher education.
5. Acceptable frameworks for assessment and certification.
6. Recommended curricula consistent with the assessment frameworks.
7. Summary of Recommendations and a timeline for implementation of the Action Plan.
8. Identification of metrics to ascertain the achievement of ICT Digital Literacy.

**Item 1: Definition of the Basic Elements of Digital Literacy**

The first task before the ICT Digital Leadership Council was to define what is meant by the term "digital literacy." A careful analysis of the Governor's Executive Order revealed the fact that the terms "Information and Communications Technologies (ICT) Digital Literacy" and "Digital Literacy" were used interchangeably. A review of the research literature surrounding the term "digital literacy" revealed that "digital literacy" is used to refer to a diverse range of definitions of literate practices or "new literacies" that involve the use of technologies in some manner. The definitions shown in Appendix B attempt to summarize some of the different areas of emphasis that fall under the broad category of "digital literacy." These definitions were drawn from an edited volume of work on defining digital literacy that delineates concepts, policies and practices in international contexts. (Lankshear & Knobel, 2008) A review of the numerous articles contained within the *Handbook of Research on New Literacies* (Coiro, Knobel, Lankshear & Leu, 2008) further illustrated the wide range of perspectives regarding what constitutes a digitally literate individual and the issues associated with trying to assess digital literacy.

The Leadership Council drew on its understandings from this review as it modified, slightly, the digital literacy definition found in one of the "whereas" clauses in the Governor's Executive Order. The recommended definition is as follows, "an ongoing process of capacity building for using digital technology, communications tools and/or networks in creating, accessing, analyzing, managing, integrating, evaluating and communicating information in order to function in a knowledge-based economy and society." Additional information regarding the origins of this definition can be found in the CETF consensus document which is included in Appendix C.

The Leadership Council also agreed with the basic elements of digital literacy identified in a consensus document published by the CETF in November 2008. These basic elements are outlined in the following table.

| 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** | Communicating 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. |

**Note:** Existing international and national digital literacy frameworks and assessment instruments all share these common elements. (Source CETF, 2008)

**Item 2: "Continuum" of Skills required for Digital Literacy and Frameworks for Assessment and Certification**

The definition and basic elements of ICT Digital Literacy described above are perceived as being broad enough to be relevant to the wide range of contexts and environments in which they will be applied. The identification of a "continuum" of skills and frameworks for assessing and certifying Digital Literacy that could be applied in P-12 schools, in higher education settings, and in settings outside traditional school environments proved to be much more challenging.

For Pre K-12, the CETF document cited the National Education Technology (NET) standards and performance indicators developed by the International Society for Technology in Education (ISTE) and those recommended by the Partnership for 21st Century Skills. CETF then aligned related elements of existing assessments offered by private companies to these two sets of standards.

For higher education, the CETF consensus document referenced above recommended the adoption of the National ICT Literacy Policy Council's 5 standards and 22 performance indicators. It also went on to note that foundational-level skills have been identified for students entering college, and indicated that assessment publishers like the Educational Testing Service (ETS) have developed assessments to measure such skills (such as the California State University system's iSkills test).

The ICT Literacy Advisory Committee struggled with these descriptions of standards (or continuum of skills), performance indicators and assessments for the following major reasons:

1. **Existing disparities in opportunities for learning**. At present, the resources available in libraries, schools, colleges, universities, community-based technology programs, workforce preparation programs, and in people's homes are known to be inadequate. Given the disparities in opportunities for learning, both at home and in state funded programs/services, the committee could not recommend uniform assessments that would likely mirror the deficits created by the lack of opportunities for learning.

2. **Need to define an individual's level of literacy or display of literate practices within the specific context in which they are required.** Given the time allowed for the development of the plan and the resources available to complete the plan, the committee was not able to validate the applicability and relevance of commercial assessments to the range of contexts in which they would be applied. The committee identified "context" as a key variable in assessing digital literacy. A student who can send text messages and navigate Facebook pages, for example, would not be considered technologically literate in an architecture class if he/she could not use a Computer Assisted Drafting (CAD) system. Without a more detailed analysis, the committee would need to select a test that could be universally applied such as one that measured the individual's ability to simply use a computer (i.e. functional use). Since that is just a small component of ICT literacy, the assessment would be of little value.

3. **Need to control for potential bias against English language learners and special education students**. Tests of individuals' digital literacy skills could falsely identify someone as lacking in skills when, in fact, they may simply not be able to navigate the test due to reading difficulties associated with taking the test. Given the high proportion of California residents who are acquiring English as a second language, additional attention must be given to this area. The committee was not able to explore the validity, reliability and relevance of commercial assessments from this perspective given the time allowed for the development of the plan and the resources available to complete the plan.

4. **Perceived disparity between the learner outcomes reflected in the ISTE NET standards and the Partnership for 21st Century Skills and what is measured by existing assessments**. The definition of digital literacy adopted by the Leadership Council reflects a desire for knowledge, skills and behaviors that go beyond the technical operations of a computer or other technology device. It speaks to managing, integrating, evaluating, creating and communicating information in order to function in a knowledge-based economy and society. The definition is similar to the knowledge and skills reflected in the bottom tiers of a Competency Model for the Information Technology Industry that was published by the Information Technology Association of American (ITAA). ITAA developed the model in conjunction with the US Department of Labor Employment and Training Administration (US DOL/ETA).

According to Dr. Kemi Jonah (2009) of Northwestern University, the ITAA model portrays competencies at various levels of specificity, ranging from fundamental competencies necessary to operate effectively in life to competencies required in specific IT occupations or positions. As part of a separate grant funded effort, Dr.

Jonah and his colleagues (2009) conducted a very preliminary mapping of how existing assessments appear to map onto the ITAA model. Dr. Jonah's preliminary work, depicted in the chart below, suggests that assessments that cover the full range of meaning envisioned by California's definition of ICT Literacy are not yet readily available.

**Figure 1: ITAA Competencies and Existing Assessments**

| Workplace Competencies | Assessments |
|---|---|
| Collaboration | Pending P21 Assessments |
| Planning & Organizing | Pending P21 Assessments |
| Innovative Thinking | Pending P21 Assessments |
| Problem Solving & Decision Making | Pending P21 Assessments |
| Working with Tools & Technology | Institute for Certified Computing Professionals (ICCP) Core<br>European Computing Driver's License (ECDL) Core |
| Business Fundamentals | ICCP Core<br>ECDL Core |
| | |
| Academic Competencies | Assessments |
| Reading | OECD PISA<br>Pending P21 Assessments |
| Writing | OECD PISA<br>Pending P21 Assessments |
| Mathematics | OECD PISA<br>Pending P21 Assessments |
| Science | OECD PISA<br>Pending P21 Assessments |
| Communication – Listening & Speaking | OECD PISA<br>Pending P21 Assessments |
| Critical & Analytical Thinking | Pending P21 Assessments |
| Basic Computer Skills | ICT Literacy Assessment<br>ECDL Equal Skills |
| | |
| Personal Effectiveness Competencies | Assessments |
| Interpersonal Skills & Teamwork | Pending P21 Assessments |
| Integrity | Pending P21 Assessments |
| Professionalism | Pending P21 Assessments |
| Ethics | Pending P21 Assessments |
| Adaptability & Flexibility | Pending P21 Assessments |
| Dependability & Reliability | Pending P21 Assessments |
| Lifelong Learning | Pending P21 Assessments |

Given the time allowed for the development of the ICT Digital Literacy Action Plan and the limited resources available to complete the plan, the Advisory Committee was not comfortable making recommendations in support of specific assessments or certification tools.

Ultimately, the Digital Literacy Advisory Committee recommended and the Leadership Council affirmed the need to invest additional time and resources in the development of a framework and methods for assessing and certifying digital literacy within and across four "layers" or different contexts that are initially described as follows:

**Layer A: ICT Digital Literacy as a Fundamental Building Block for Learning Pre K-Adult Learners**
Description: At this layer, individuals would be learning the fundamentals of technologies required to participate in hybrid or distributed learning environments, protocols for participation, and technical basics. This includes a)

developing a comfort level with technology, b) using technology to acquire knowledge/services, c) developing his or her capacity to use technology, and d) developing an awareness of 21st Century skills, what those skills look and sound like in practice, and ways to generate evidence of self-attainment.

Continuum: At one end of the spectrum, individuals would be learning how to use a particular technology tool or set of tools and discovering the potential value of the technology. At mid-range, individuals would be fluent in their use of one or more technology tools or applications. At the far end of the spectrum, they are using what they know about one or more technology tools and applications to their exploration and use of numerous other tools and applications.

**Layer B: ICT Digital Literacy for Lifelong Learning In and Out of School (Generally)**
Description: Use of technology skills to participate in a distributed learning environment (school, work, home or other settings) in which 21st Century knowledge is generated and assessed.

Continuum: At one end of the spectrum, individuals have developed the capacity to use a technology tool and/or applications to acquire knowledge and information. At mid-range, individuals are using one or more technology tools and applications to test new ideas and theories, to convey knowledge, to engage in two-way communications with others outside their immediate environment, and to accomplish goals. At the far end of the spectrum, individuals are exploring and creating new knowledge that leads to improved understanding and/or advancements in specific fields or areas of study (school or work). Individuals would have developed proficiencies that allow them to harness the capacity of technology to lead discussions or convey/teach information to others, including the capacity to make judgments about how to convey information across distances and the appropriate tools to use in different contexts.

**Layer C: ICT Digital Literacy for Lifelong Learning In and Out of School (Contextual/Discipline Specific)**
Description: Opportunities across time for learning about, experimenting with, and developing expertise in the use of technologies specific to various disciplines or content areas.

Continuum: At one end of the spectrum, individuals are developing skills related to the use of technology tools and applications that are unique to the specific workforce or academic context (typically related to acquiring, documenting or sharing knowledge and information). At mid-range, individuals are applying technology in sophisticated ways that allows them to contribute to the operations of their company or business, or to build upon prior knowledge in their field or course of study (create new findings or discoveries). At the far end of the spectrum, individuals are using technology to explore and create new knowledge, improved understanding and/or advancements in specific fields or areas of study (school or work). They are evolving practices and are developing new innovations.

**Layer D: ICT Digital Literacy for IT Sector College/Career Pathways**
Description: Opportunities across time for developing knowledge, skills, and ways of knowing, thinking, being and doing, as a member of the technology industry/community.

Continuum: At one end of the spectrum, individuals have a broad understanding and are proficient in the technologies that are of priority in his/her IT area of emphasis. At mid-range, individuals possess in-depth knowledge that relates to an IT area of emphasis. They are able to troubleshoot problems in numerous situations, understand nuances of use, management and support. At the far end of the spectrum, they are creating new technologies or applications that advance the field and contribute to the United States' national security and/or its economic competitiveness.

It is important to note that the four layers of digital literacy described above are non-linear (development occurs in different layers at different times), interconnected and are not mutually exclusive. An individual may be developing capacity at multiple layers simultaneously. When he or she moves from one career to another, ICT literacy skills developed in one context contribute to what he or she brings to the next situation.

The Digital Literacy Advisory Committee also recommended, and the Leadership Council affirmed, the potential value in identifying a number of different assessment tools and methods for the various layers of proficiency, all of which could be archived within an e-portfolio that belongs to the learner. A pilot program underway within the K-20 California Educational Technology Collaborative (see http://eportfolioca.org/) will inform future exploration of the

ability to export information from the e-portfolio system to support the tracking of the growth of digital literacy competencies over time.

**Item 3: Implication of the Proposed Framework and Continuum for Future Policies**

Both the Advisory Committee and the Leadership Council recognize that the framework for developing the continuum and assessment/certification of digital literacy skills has significant implications for educators and learners. Given time and resource limitations, the Advisory Committee and the Leadership Council was not able to recommend the adoption of a specific state sanctioned assessment and certification system. However, both groups agree that specific steps must be taken to ensure that any new assessment and/or certification system builds on and helps to inform opportunities for learning (versus penalizing students for lacking knowledge/skills that were never taught or made available to learn). Both groups also recommend that the Governor and the Legislature, working in partnership with the California Emerging Technology Fund (CETF) and others:

- Acknowledge and take steps to overcome the new Digital Divide (practices, skills and processes not just connectivity and computers).
- Bridge the Digital Divide by developing and providing a seamless, consistent system of support that allows all residents to benefit from reliable technology access, training and assistance as they move between home, school, college, library, and other community-based and workforce settings, and by continuing to pursue efforts to drive availability and affordability of technology in the home for all areas of the state.
- Invest in the strategic development of a strong IT sector that is responsive to the needs of the community, school and workforce sectors.

Further, the Leadership Council recognizes that implementation of this action plan will require collaboration between multiple entities.

**Item 4: Strategies/Actions for Incorporating Digital Literacy into Pre K-12 and Higher Education**

While the Leadership Council recognizes and respects the role and responsibilities of other agencies, boards and commissions to determine appropriate digital literacy policies for the constituencies they serve, the Council also seeks to ensure that California's digital literacy efforts adequately prepare California residents to compete in today's global society. Thus, all entities with a leadership role in this area are strongly encouraged to adopt policies and programs that adhere to successful practices for supporting digital literacy development. The American Library Association's "Characteristics of Programs for Information Literacy That Demonstrate Best Practices (2009)" are included in Appendix D as an example of what is meant by "successful practices."

The Leadership Council also recognizes the severe resource constraints facing the education community. Thus, the Council encourages the education community to look for opportunities to partner with public libraries and community technology centers that also provide ICT literacy services to local communities.

Other suggested strategies and actions for Pre K-12, higher education and workforce preparation programs are as follows:

1. California Technology Assistance Project (CTAP): For the past 10 years, the Legislature has authorized the California Technology Assistance Project (CTAP) consisting of eleven regional programs agencies that represent the counties and districts in each of eleven regions in the state. The overall purpose of CTAP is to contribute to an increase in knowledge and use of technology to improve teaching and learning by providing professional development to educators on a regional basis to include: 1) selecting and integrating technology into curriculum, 2) planning and using hardware and telecommunications networks, 3) using technology to support school management and data-driven decision-making, and 4) identifying and applying for state and federal funding for instructional uses of technology. CTAP assists counties and districts in their regions to provide needed services to all school districts while addressing needs of rural and technologically underserved schools. Appendix E provides a framework that defines a list of evaluation-based skills, knowledge, services, and information that are the focus CTAP takes in helping to build the digital literacy pathway for education.

CTAP is consolidating many resources at the new state K-12 Educational Technology Portal, MyCTAP

(www.myctap.org). This website provides a variety of professional development opportunities for teachers, quality instructional resources, technology planning resources for stakeholders, links to the CTAP regional websites and the CTAP SETS (Statewide Education Technology Services) projects. As a part of MyCTAP, the CTAP Community started as an online network for discussing and sharing resources and ideas about effective teaching and learning with technology. One of CTAP's missions is to provide professional development and support for using electronic resources in teaching and learning. Through the MyCTAP website, teachers and administrators can participate in free, live online workshops. To participate in these workshops, individuals require a high-speed Internet connection and a computer. The workshops last two hours and are held after school hours. Many of the courses offer certificates verifying professional development hours.

2. Statewide Education Technology Services (SETS): Four Statewide Education Technology (SETS) projects provide information and support, most cost-effectively delivered on a statewide basis, disseminated and used by CTAP regions to assist local districts. These four SETS projects include 1) California Learning Resource Network (CLRN)–an online resource to locate electronic and Internet-based learning resources aligned with State Content Standards, and technology applications supporting data-driven decision making, 2) Technical Support for Education Technology in Schools (TechSETS)–an online resource providing training, support and information to school technology staff, 3) The Technology Information Center for Administrative Leadership (TICAL) –an information and staff development resource to support school administrators use of technology in support of school management and data-driven decision making, and 4) EdTechProfile (ETP) to provide access to online technology proficiency assessments as well as related reports of educator and student proficiency assessment data.

Comprehensive evaluations of both CTAP and SETS have been conducted over the past three years.

3. K-12 High Speed Network: K12HSN is a state program funded by the California Department of Education. K12HSN provides the California K-12 community including educators, students and staff across the state with access to reliable high speed network which has the capacity to deliver high quality online resources to support teaching and learning and promote academic achievement.

In addition to the state supported programs described above, federal funding has been provided to states for education technology under Title 2, part d of the No Child Left Behind Act. The EETT (Enhancing Education Through Technology) program has provided funding administered by California Department of Education directly to school districts for the past eight years. Half of this funding is allocated to competitive grants and the other half is allocated as an entitlement to school districts. While this funding will be increased federally to about $90 million for EETT under the stimulus (ARRA [American Recovery and Reinvestment Act) legislation in 2010, the state allocated funding level for California will most likely be reduced to about $10 million in 2011. The stated purpose of the federal program is "To assist every student in crossing the digital divide by ensuring that every student is technologically literate by the time the student finishes the eighth grade, regardless of the student's race, ethnicity, gender, family income, geographic location, or disability."

Among other things, EETT grant recipients were required by the California Department of Education to "develop process and accountability measures that will be used to evaluate the extent to which activities funded under the program effectively:

- Increase technology literacy among students.
- Enable students to use technology to meet or exceed state academic content standards.
- Increase technology literacy among teachers.
- Increase the ability of teachers to integrate technology into curriculum and instruction.
- Increase the ability of teachers to analyze and use longitudinal achievement to improve instruction and student learning.
- Expand student and teacher access to technology.
- Enhance communication and collaboration between home, school, and community."

The Effective EETT Competitive Projects, awarded through the state department of education, will identify and disseminate information about the most effective and sustainable applications of technology in California schools that have received EETT Competitive Grants over the past 5 years. An emphasis is being placed on determining practices that can be cost-effectively replicated or adapted in other locations. Also, lessons learned about the

planning, implementation and evaluation of technology are being documented. The findings will be made accessible to the public-at-large via the evolving MYCTAP state education technology portal referenced above.

Other federal education programs offer additional opportunities to advance Pre K - 12 digital literacy goals. For example, as this report was being written, several members of the Leadership Council were working to develop the state's second round application for federal grant funding known as "Race to the Top." To achieve the competitive preference priority points, states must have a STEM component to their plan. Whatever California proposes for the "T" in STEM will undoubtedly serve as a key driver for accomplishing digital literacy goals in schools across the state.

Despite these investments over time, as of the writing of this report, California has not chosen to establish specific technology standards for students at the various grade levels. However, potential uses of technology are integrated within the California curriculum frameworks (created based on state academic content standards), which guide the development of textbooks. California's approach to allowing local school districts to determine how to support digital literacy and the No Child Left Behind requirements can be contrasted with state driven models in other parts of the United States. For example:

- Massachusetts' learning standards are grouped into four strands, and one of the four strands is Technology/Engineering. The standards are developed for grade spans (Pre K-2, 3-5, 6-8 and high school). These updated standards, adopted in 2008, expanded their definition of technology/engineering to outline specific technology skills. For example, the new definition broadened the focus to 21st century skills and digital citizenship, ethics, society and safety.
- The Texas Department of Education has identified Essential Knowledge and Skills for Technology Education/Industrial Technology Education for middle school and high school students.

Additionally, a comprehensive Pre K -12 digital literacy plan or educational technology plan would include the goals, activities, and timeframe for developing and implementing the Pre K-12 digital literacy guidelines as well as the services needed to support these guidelines. The plan should primarily focus on ways that the existing education programs, policies, and initiatives can be adjusted to include the infusion of technology to support needed data-informed program improvements. It should also define the support needed to implement the necessary professional development, technical assistance, coordination within and between programs, agencies, and education entities.

Strong school library programs could be among the services called for in the Pre K -12 digital literacy plan given the evidence that students perform better academically in schools with strong school library programs *[Dr. Doug Achterman Ph.D. dissertation on "Haves and Have-Nots: School Libraries and Student Achievement," University of North Texas, December, 2008.]* Key elements of a strong school library program could include:

* Many carefully selected books, databases, and other learning resources.
* A program which provides instruction and activities for students to use the research process in finding the information they need.
* Technology, including hardware, software, and networking that form a virtual library without walls linking students to the world of information, and a library that supports the school curriculum 24/7.
* A full time, certified school Teacher Librarian and a full-time paraprofessional working as a team.

The Leadership Council recognizes that the authority to adopt standards for Pre K -12 students and the authority for making funding decisions required to implement the standards rests with the Governor, the Legislature, the Superintendent of Public Instruction, the State Board of Education and others. However, the Leadership Council has been directed by the Governor's Executive Order to take steps to ensure that digital literacy needs are addressed. Therefore, as an interim measure, the Leadership Council recommends that an online site be developed that allow formal and informal educators to share examples of ways technology can be used to enhance instruction in accordance with state academic standards, while simultaneously building students', teachers', administrators', and higher education faculty's digital literacy skills.

It is also recommended that the Governor, the Legislature, the Superintendent of Public Instruction and the State Board of Education consider implementing the recommendations of the independent evaluation of K-12 educational technology programs that has been submitted to the state in each of the last three years. The recommendations are part of a 70-page report that include data collection procedures, analysis, and report of

findings for each of the eleven CTAP and four SETS projects discussed above. The full report is available at the website for California Department of Education. (The report can be found at http://www.cde.ca.gov/ls/et/rs/sets.asp). The recommendations are as follows:

- Develop a statewide educational technology plan that is clearly integrated with current education priorities established by the State Superintendent of Public Instruction (SPI), State Board of Education (SBE), the Governor, and the Legislature.

- Develop and implement a process for increasing active collaboration with CTAP, SETS, and other state-supported educational technology programs with education programs managed by the CDE such as Title I, Curriculum, Staff Development, Assessment, Before and After School Programs, Special Education, and others.

- Continue to plan, fund, and implement a statewide "web-portal" (known as MyCTAP) that links to all other state funded Pre K-12 educational technology as well as regular education programs, projects, and initiatives.

- Continue to evaluate CTAP and SETS in terms of their impact on enabling educators to develop, implement, and assess both teacher and student–digital literacy skills and ensure that major findings are disseminated to the legislature, the SPI, the SBE, and other educational technology stakeholders.

- Make every effort to continue and possibly increase funding for services to educators that help them to enable students to develop 21st century digital literacy skills. The evaluation has consistently shown that individuals who use the CTAP and SETS services have increased the infusion of technology into teaching and learning and report a need for additional assistance.

Strategies for Higher Education

The Leadership Council recognizes that each of the three segments of higher education have different missions, and that strategies to incorporate digital literacy across the three institutions and in private colleges and universities needs to reflect such differences. Community colleges, for example, prepare students for transfer to four-year colleges and universities, address workforce needs and are available for residents to pursue lifelong learning goals. While state policy can emphasize the importance of affording an opportunity to individuals to enhance their skills as part of a course designed to address personal learning goals unrelated to college or career, it is not the Leadership Council's intent to mandate the development of such skills for all individuals.

Similarly, the Leadership Council recognizes that significant differences exist within the higher education community regarding perspectives on the ways people learn and the ways that technology supports/constrains learning. A paper written by Harvard Professor, Chris Dede (2008) entitled *Theoretical Perspectives Influencing the Use of Information in Teaching and Learning* (available at http://edusummit.nl/furtherreading) illustrates ways that the selection or emphasis surrounding one or more particular technologies can be perceived as advantaging professors/researchers in one research tradition over another. These kinds of subtleties have tremendous implications for digital literacy implementation strategies and related curriculum adoption efforts.

The Leadership Council also recognizes that efforts to embrace digital literacy are well underway within the California State University (CSU) system. Snapshots for each of the 23 CSU campuses collected in the Spring of 2007 are available at Campus Programs -Teaching Commons (see http://teachingcommons.cdl.edu/ictliteracy/campus_pro/program_overviews.htm.) The CSU system has worked with ETS to develop an assessment known as iSkills (see http://www.ets.org/skills/). iSkills is described as a "scenario- and web-based test to assess students' skills in information and communication technology (ICT) literacy. It contains interactive and realistic simulations of information resources and applications such as the Web, article databases, and spread sheeting and word processing to track and evaluate how students actually go about solving problems with information technology. It will provide group and individual level diagnostic information for the key ICT proficiencies needed for success in higher education and beyond in the work environment. It encompasses both the technical skills and cognitive information competence abilities needed to effectively access, evaluate and use information from a wide range of resources."

Given the diversity in approaches to developing digital literacy that exists across the higher education segments, it is likely that one single assessment will not satisfy the differing needs, conditions, and purposes of the various

instructional programs. Assessments are likely to be needed across the four layers of digital literacy and the different points along the continuum for each layer. Given the different governance structures that exist, responsibility for selecting the assessments will need to be as decentralized as possible. This will make it difficult to gather, aggregate and analyze data that can inform assessments of the state's progress in growing the digital literacy capacity of its residents over time. This reality led the Digital Literacy Advisory Committee to recommend, and the Leadership Committee to agree, that incentives will need to be provided that encourage local decision makers to use common assessments preferred at the state level. Incentives could include cost subsidies for centralized assessments, and services that provide faculty/staff with custom reports, etc. Again, if this route is chosen, those selecting the tests will need to be sensitive to what is being measured as well as the ways it is measured and the underlying assumptions (or research traditions) guiding the development of the assessment.

**Item 5: Workforce Preparation**

ICT literacy is critical to California's sustainable economic future, both as a global leader in technology and as home to more than 38 million residents and a labor force in excess of 18.3 million. Numerous entities play important roles in educating and reeducating California's workforce. This includes, but is not limited to public libraries, workforce investment boards, adult schools, apprenticeship programs, and the California Community College system.

Many California public libraries offer courses in using technology to communicate, write resumes, fill out job applications, etc. Some libraries, such as the one in downtown Salinas, have managed to acquire and make available the "tools" required for professional digital media production including green screens, cameras, and related software.

California community colleges are also well situated to respond effectively to business and industry by addressing specific workforce skills needed by employers. With a network of 110 community colleges, the infusion of new strategies and approaches into existing programs, courses and curricula related to information and communication technology can have a statewide impact on more than 2.9 million students and countless others.

The Leadership Council recognizes the particular value of the work being done by the California Community Colleges' Centers of Excellence (COE) who are conducting a comprehensive assessment of ICT functions and activities that will attempt to measure the demand for technology and skill competencies across industry sectors. By quantifying and comparing industry needs with current education and workforce preparation efforts, gaps in training and curricula misalignments will surface. This type of analysis will inform and better equip stakeholders at all levels of digital literacy education and workforce preparation. The COE's Phase One Overview report published in September 2009 is available at http://www.coeccc.net. Phases two and three (a statewide employer survey) will be conducted in partnership with the Mid-Pacific Information and Communications Technologies Center if funds can be identified.

The joint project of the California Association of Veterans Services Agencies (CAVSA), the LINK AMERICAS Foundation, and the Los Rios Community College District to provide California's returning veterans with an on-line, self-paced digital literacy training program and related services is another example of the many ways the community colleges can support the state's digital literacy goals. Among other benefits, this innovative project will graduate 5,000 veterans through the Certiport Digital Literacy boot camp.

The Leadership Council commends efforts that have led to the development of the California Pathways website that allows residents in Northern California to see what educational pathways exist for those seeking technology related careers (see http://www.capathways.org/). It is recommended that IT Career Technical Education program providers across the state take steps to populate the fields in the online searchable database so that residents across the state can access similar information that illuminates their pathway to IT college/career programs.

The assessment of general ICT digital literacy skills across the wide variety of workforce preparation programs is especially complex. In some instances, assessment will relate to the basic use of computers for commonly available office applications (such as Microsoft Word). In others, the required technology skills may be highly specific to the occupation or discipline (such as the use of MatLab in an engineering course). Workforce preparation providers will need flexibility to mix and match assessments from the four layers of competencies described above in order to meet their unique needs and audiences.

**Item 6: Recommended Curricula Consistent with the Assessment Frameworks**

The Digital Literacy Advisory Committee recommended, and the Leadership Council affirmed, the need to avoid making recommendations related to curriculum until:

1) There is greater clarity regarding ways assessing knowledge, skills and behaviors in the four layers of competencies described above; and

2) A gap analysis has been conducted between the existing curriculum and that needed to adequately address the competencies needed for each of the four layers.

The Digital Literacy Advisory Committee also recommended that one or more of the entities with a role in digital literacy policies and programs, work to identify curricula as well as find resources to fund the creation of curricula that supports two conditions:

1) Conditions in which educators are working to develop knowledge, skills and behaviors related to digital literacy just in case they are needed by the learner at some point in time; and

2) Conditions in which the educator or learner has an immediate need (i.e. just in time support).

Both conditions are certain to exist, and often-subtle nuances of the curriculum can enhance/detract from their effectiveness under the two conditions. Each resource will need to be evaluated for these conditions.

**Item 7: <u>Summary of Recommended Actions and Timeline for Implementation</u>**

The following chart summarizes the recommendations included throughout this report and provides a timeframe for completing work associated with the recommendations.

To address the action items as outlined in Governor Arnold Schwarzenegger's Executive Order S-06-09, the ICT Digital Literacy Leadership Council recommends the following next steps:

| RECOMMENDATION | RESPONSIBLE PARTY | TIMELINE |
|---|---|---|
| **Leadership** | | |
| Enlist the support of the State's elected officials and civic leaders to generate greater public awareness of the importance of Digital Literacy to California and advocate for policies and programs that support opportunities for Pre K-20 learners and workers to develop Digital Literacy skills. | Letter from the State CIO issued along with a copy of the report when it is publicly released. | Within one week of the public release of the plan |
| Encourage the leaders of California's key entities to support closing the Digital Divide by developing and providing a seamless, consistent system of support that allows all residents to benefit from reliable technology access, training and assistance as they move between home, school, college, library, and other community-based and workforce settings, and by continuing to pursue efforts to drive availability and affordability of technology in the home for all areas of the state. | See page 8 | See above |
| Request the 21 entities identified as being in key leadership roles (pg. 8-9) to adopt ICT Digital Literacy policies and programs that support access, training, and adoption of "successful practices". These organizations should also be encouraged and | See page 8 | Progress report to be submitted to the State CIO by January 1, 2012 |

| | | |
|---|---|---|
| incentivized to develop an Implementation Action Plan and present the progress made towards implementation on a yearly basis. | | |
| **Accountability** | | |
| Conduct an assessment of the state's progress in promoting digital literacy every two years and issue a report that describes current conditions in California. | Entities identified as being in key leadership roles to adopt ICT Digital Literacy policies and programs | January 31, 2012 and every 2 years thereafter |
| Revisit the definition of digital literacy every two years in order to reflect current perspectives on literacies and their relationship to new and emerging technologies. | Entities identified as being in key leadership roles to adopt ICT Digital Literacy policies and programs | Ongoing, every two years, commencing in January, 2012 |
| **Communications and Outreach** | | |
| Communicate revised definitions of Digital Literacy to stakeholders every two years and forecast changing practices necessary for capacity building. | Entities identified as being in key leadership roles to adopt ICT Digital Literacy policies and programs | Ongoing, every two years, commencing in January, 2012 |
| Document and share successful policies and programs that promote Digital Literacies. | Entities identified as being in key leadership roles to adopt ICT Digital Literacy policies and programs | Examples, collected and reflected on a central online site no later than January 31st of each year |
| Identify opportunities for partnerships between public libraries, community technology centers, and other community-based organizations to provide ICT literacy services to local families and communities. | Entities identified as being in key leadership roles to adopt ICT Digital Literacy policies and programs | Ongoing |
| **Process Improvements and Tool Development** | | |
| Develop a framework for analyzing and certifying methods of Digital Literacy assessment that address requirements of different schooling and workforce contexts (work, school, home, etc.)." | Working group(s) to be convened by the entities identified as being in key leadership roles to adopt ICT Digital Literacy policies and programs | Timeline to be developed by the affected entities. |
| Identify different tools and methods for assessing Digital Literacy proficiency within specific contexts. | Working group(s) to be convened by the entities identified as being in key leadership roles to adopt ICT Digital Literacy policies and programs | Timeline to be developed by the affected entities. |
| Invest in the strategic development of a strong information technology (IT) sector that is responsive to the needs of the community, schooling, and workforce sectors. | Governor, the Legislature, the California Emerging Technology Fund (CETF), and others | Ongoing |
| Develop an online site that allows formal and informal educators to share examples of ways technology can be used to enhance instruction in accordance with state and federal academic standards while simultaneously building students', teachers', administrators', and higher education faculty's digital literacy skills. | Lead entity to be selected by the entities identified as being in key leadership roles (pg. 8-9) to adopt ICT Digital Literacy policies and programs | No later than January 31, 2011 |
| Make common and centrally hosted Digital Literacy assessment tools and systems available to local decision makers and families at low or no cost to support Digital Literacy development. | Lead entity to be selected by the entities identified as being in key leadership roles to adopt ICT Digital Literacy policies and programs | January 31, 2012 |
| Complete the development of the searchable Career Technical Education (CTE) Pathways database so | California Department of Education, California Community | January 31, 2012 |

| | | |
|---|---|---|
| that students can identify IT college/career preparation programs in their local area. | College Chancellor's Office and their partners | |
| **Education and Workforce** | | |
| Ensure that prior to adopting the Digital Literacy recommendations related to curricula integration strategies across Pre K-20 and workforce:<br>1) There is greater clarity regarding ways of developing, accessing, and assessing knowledge, skills, and practices in each level for the four layers of competencies described on pages 16 -18; and<br>2) It is determined that Digital Literacy curriculum and instruction that includes the four layers of competency development described herein exists and is widely available to teachers and students. | Included as part of the working group discussions referenced above. | Ongoing |
| Locate resources to fund the creation and/or expansion of curricula to support educators (communities, families, schools, colleges, and workforce) in:<br><br>1) Assisting learners in situations where there is an immediate need to know/learn (i.e. just in time support); and<br><br>2) Developing knowledge, skills, and practices that support Digital Literacy needed for future work and schooling.<br><br>Note: Use of such curricula by teachers and others would be voluntary in order to avoid unintended increases in the burdens and requirements placed on classroom teachers. | Entities identified as being in key leadership roles (pg. 8-9) to adopt ICT Digital Literacy policies and programs | Ongoing |

**Item 8: Identification of Metrics to Ascertain the Achievement of ICT Digital Literacy**

The California ICT Digital Leadership Council acknowledges the need to measure the achievement of the state's ICT Digital Literacy goals on an ongoing basis in order to document progress over time. Doing so will be challenging since the Council does not currently have any resources to support such work. Therefore, it will need to rely on the voluntary cooperation of the various entities with leadership roles in the attainment of the state's ICT Digital Literacy goals.

Metrics for the assessment that will be conducted every two years could include:

- Adherence to the process of revisiting the state's definition of ICT Digital Literacy and assessing outcomes and revising the State Action Plan at least once every two years.
- Progress toward meeting the goals and objectives contained in the Action Plan.
- Evidence that ICT Digital Literacy is being integrated into course and curriculum assessments as well as institutional evaluations and regional/professional accreditation initiatives.
- Evidence of the adoption and use of multiple methods and purposes for assessment/evaluation (formative and summative, and short term and longitudinal) within the entities that have a direct role in promoting digital literacy.
- Review of assessment/evaluation methods (at the institutional/program level and, for educational and workforce preparation programs, ways of assessing student outcomes).

## CONCLUSION

Together, the Governor's Executive Order and the groundwork laid by the California Emerging Technology Foundation provide an excellent foundation for California's next steps to ensure that learners of all ages can be successful creators and/or users of technologies and technology-enabled content that enable the sharing of information, thoughts and ideas, the production and delivery of goods and services, and participation in modern society. The California ICT Digital Literacy Action Plan contains essential "next steps" for connecting with the various entities that have unique opportunities to provide leadership in this area.

Forward progress is contingent on the actions of key partners, the continued work and monitoring efforts of the California ICT Digital Literacy Leadership Council, and the ability to identify and secure resources to support the actions called for within the plan. In many instances, efforts to promote ICT digital literacy simply require individuals to develop ways of including this focus within activities that are already underway. In that sense, progress can be made even in this era of limited funding. The members of the Digital Literacy Advisory Committee and the Leadership Council are committed to the Governor's vision, and look forward to continuing to do their part to advance the recommendations contained herein.

## APPENDIX A

**EXECUTIVE ORDER S-06-09**
**By the Governor of the State 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; and

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

**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; and

**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 essential for increasing productivity, improving quality of life, and enhancing global competitiveness; and

**WHEREAS** even though the first inaugural annual survey by the Public Policy Institute of California in partnership with the California Emerging Technology Fund and Zero Divide (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, there is a persistent Digital Divide in California as evidenced by the fact that:

- Less than half of Latinos (48%) have home computers, compared with about 86% for Whites, 84% for Asians, and 79% for Blacks.
- Only 53% of Latinos have Internet access, and only 39% of Latinos have broadband connections at home, while majorities of other racial or ethnic groups have both Internet access and broadband connections.
- Only 32% of Californians are very confident about using the Internet.
- More than 56% of parents indicate that they visit their children's school websites, but only 30% of those with household incomes under $40,000 indicate doing so, as compared to 84% of those with incomes of $80,000 or more.
- Those with incomes under $40,000 remain far less likely than those with incomes over $80,000 to use the Internet (58% vs. 97%) or to have broadband at home (40% vs. 89%).
- There is a disparity among ethnic/racial groups, income levels, and regions when comparing rates of computer ownership, Internet access, and broadband connections at home.
- A majority of residents express concern that Californians in lower-income areas and rural areas have less access to broadband Internet technology than others.
- There are indications that since 2000, computer use has grown among whites (79% to 85%) and blacks (76% to 83%), as has Internet use (70% to 81% for Whites, 60% to 82% for Blacks), but among Latinos, computer use has declined (64% to 58%) and Internet use is unchanged (47% to 48%), while Asians have seen declines in both their use of computers (91% to 81%) and the Internet (84% to 80%). [NOTE: These numbers and percentages have been updated using latest data from *California's Digital Divide* published by Public Policy Institute of California – report dated June 2009 available at http://www.ppic.org/content/pubs/jtf/JTF_DigitalDivideJTF.pdf.]

**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; and

**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 access to entertainment; and

**WHEREAS** the State of California supports ICT for applications in government, education, 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 accessibility to and appropriate skills for fully utilizing government, education, workforce, health care, business, and other services; and

**WHEREAS** it is an important goal to ensure that California residents are digitally literate, and that they recognize the importance of (1) access to information and communications technologies regardless of income, geographic location or advantage; (2) the provision of ubiquitous broadband service in a competitive marketplace at affordable cost; (3) opportunities for residents to acquire ICT digital literacy skills in order to benefit academically, economically and socially; (4) the development of a California ICT Digital Literacy Policy that declares that all residents of California should be digitally literate; and (5) 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; and

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

**WHEREAS** an ICT Digital Literacy Policy would be consistent with the Administration's goal to strengthen the economy, expand the skilled workforce, and increase competitiveness in sciences, technology, engineering and math industries and careers.

**NOW, THEREFORE, I, ARNOLD SCHWARZENEGGER,** Governor of the State of California, by virtue of the power and authority vested in me by the Constitution and laws of the State of California, do hereby order effective immediately:

1. A California ICT Digital Literacy Leadership Council (Leadership Council) is hereby established. It shall be chaired by my Chief Information Officer. Membership on the Leadership Council shall include the Secretary of Education, the Secretary of Labor and Workforce Development, the Secretary of Business, Transportation and Housing, and the Secretary of State and Consumer Affairs. The Leadership Council shall invite the Superintendent of Public Instruction to participate as a member of the Leadership Council.
2. The Leadership Council shall establish an ICT Digital Literacy Advisory Committee (Advisory Committee). Membership on the Advisory Committee shall include representatives of entities with an interest in ICT Digital Literacy, such as the California Economic Strategy Panel, California Workforce Investment Board, 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. The Majority and Minority Leaders of the Senate and Assembly shall be invited to each appoint a Legislator to serve on the Advisory Committee.
3. The Leadership Council, in consultation with the Advisory Committee, shall develop an ICT Digital Literacy Policy, to ensure that California residents are digitally literate.
4. The Leadership Council, in consultation with the Advisory Committee, shall also develop a California Action Plan for ICT Digital Literacy (Action Plan). The Action Plan 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 frameworks for assessment and certification

f) Recommended curricula consistent with the assessment frameworks

g) A timeline for implementation of the Action Plan

h) Identification of metrics to ascertain the achievement of ICT Digital Literacy

5. The Action Plan shall be consistent with the recommendations of the California Broadband Task Force Report - January 2008: *The State of Connectivity Building Innovation Through Broadband*.

6. The California Workforce Investment Board (WIB) shall develop a technology literacy component for its five-year Strategic State Plan to:

   a) Raise the level of Digital Literacy in California by supporting technology training and integrating Digital Literacy skills into workforce development activities

   b) Expand Career Technical Education (CTE) opportunities and Digital Literacy programs in community colleges

   c) 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

   d) Provide workforce examples of skills training and job-placement community-value projects for e-government, e-health or other conveniences

   e) Engage the ICT industry and entertainment mega-industry along with large employers to promote applications

   f) Highlight collaborative models in underserved communities and culturally diverse populations

   g) Build and resource a strong coalition empowered to achieve near-term action and results-oriented outcomes

   h) Reward success to reinforce best practices, individual champions, economic results, and public awareness and support

7. These activities are to be accomplished through realignment of existing personnel and resources without additional state funding. However, the 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 this Executive Order.

8. The Leadership Council shall submit the Action Plan to me by December 31, 2009 or sooner.

9. The Leadership Council shall comply with applicable open-meeting laws.

**I FURTHER REQUEST** that the Legislature and Superintendent of Public Instruction consider adopting similar goals, and that they join the Leadership Council 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:

1. Incorporating ICT Digital Literacy into workforce training programs and curricula.

2. Supporting and promoting ICT Digital Literacy by encouraging all public agencies to optimize e-government and the availability of public services online.

3. Requiring employers and employer organizations to identify requisite ICT Digital Literacy skills for 21st century jobs and to articulate appropriate training and assessment standards to local, regional and state agencies responsible for workforce training.

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

**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 hereunto set my hand and caused the Great Seal of the State of California to be affixed this 22nd day of May 2009.

## APPENDIX B

Potential Definitions of Digital Literacy (or Literacies) - (Lankshear and Knobel, 2008)

***Information literacy*** – Encompasses aspects of the evaluation of information, and an appreciation of the nature of information resources (Bawden 21*).

***Skills -*** Recognizing a need for information, identifying what information is needed, finding the information, evaluating the information, organizing the information, using the information. OR connecting with information (orientation, exploring, focusing, locating), interacting with information (thinking critically, evaluating), and making use of information (transforming, communicating, applying) (Bawden 21-22).

***Computer literacy*** – Discreet skill set (Martin 157).

***ICT literacy*** – Using digital technology, communications tools, and/or networks to access, manage, integrate, evaluate and create information in order to function in a knowledge society. Continuum, changes over time (not mastery of static or technical skills) (Soby 130).

***Skills*** - Assess, manage, integrate, evaluate, and create (Soby 131).

***Digital competencies*** – Use tools interactively, interact in heterogeneous groups, act autonomously. Mere knowledge and skills are not sufficient in themselves. Strategies, attitudes and procedures are also required (Soby 133).

***E-literacy*** – Combines the traditional skills of computer literacy, aspects of information literacy (the ability to find, organize and make use of digital information) with issues of interpretation, knowledge construction and expression (Bawden 25).

***Network literacy*** - Focuses on effective use of Internet and other networked resources (Bawden 24).

***Multimedia literacy*** – Ability to match the medium we use to the kind of information we are presenting and the audiences we are presenting it to (Soby 139*).

Lankshear, C., & Knobel, M. (Ed.). (2008). *Digital literacies: concepts, policies and practices.* New York: Peter Lang Publishing, Inc.

**APPENDIX C**

CETF Report

# California ICT Digital Literacy

# Assessments and Curriculum Framework

Prepared
for
California Emerging Technology Fund
by

KEMPSTER GROUP

## Table of Contents

Section I: Page

Purpose ..... 3

- Definition, Elements, and Competencies..... 3
- Standards, Performance Indicators, and Outcomes..... 4

Section II:

Standards, Performance Indicators and Outcomes..... 6

A. Four Year Post Secondary Education..... 6
B. Community Colleges, Vocational Programs, Schools and Institutions and Industry... 7
C. Need for Vendor Independent Seamless Continuum for ICT Digital Literacy Certification..... 8

Section III:

Standards and Performance Indicators - K-12 Education..... 10

A. Standards and Performance Indicators for Students..... 10
B. Performance Indicators for Teachers and Teacher Librarians..... 12
C. Performance Indicators for Administrators..... 13
D. Social Networking, Web 2.0 and Acceptable Use Policies (AUP)..... 13

APPENDIX

National ICT Literacy Policy Council ICT Literacy Skills..... 14

- Post Secondary Standards, Performance Indicators, and Outcomes..... 15
- International Computer Driving License (ICDL) Modules..... 19
- Certiport – IC3..... 21
- ISTE NET*S for Students..... 23
- ISTE NET*S for Teachers..... 27
- ISTE NET*S for Administrators..... 29
- Partnership for 21st Century Skills..... 31
- ICT Digital Literacy Resources and Assessment Tools..... 33

## California ICT Digital Literacy Assessments and Curriculum Framework

### Section I: Purpose, Competencies and Performance Outcomes

### Purpose:

The purpose of the *California ICT Digital Literacy Assessments and Curriculum Framework* is to provide a standardized approach for assessment, 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 *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 21st Century life.
- Adoption of global standards and performance indicators for ICT digital literacy.

### Definition, Elements and Competencies:

ICT digital literacy as delineated in the *California ICT Digital Literacy Assessments and Curriculum Framework* 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. |
| **Note:** Existing international and national digital literacy frameworks and assessment instruments all share these common elements. | | |

**Standards, Performance Indicators and Outcomes:**

The standards, performance indicators and outcomes discussed in the following sections are based on the above ICT literacy elements, definitions, and competencies and are intended to:

- Provide guidance for development of 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 development.
- Validate that certification of competency in basic ICT digital literacy skills achievement is based on globally acceptable standards and performance indicators.

The *post secondary standards and performance indicators* and outcomes are presented in Section II and relate to the ICT digital literacy skills necessary for completion of academic and professional degrees as recommended by the National ICT Literacy Policy Council. They are based on extensive research and development efforts by national organizations and major assessment developers. 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 these performance indicators and outcomes into academic requirements. However, to date, there is no standard policy in place for the State. It is recommended that California adopt these standards for the post secondary segment.

*Community Colleges, vocational programs, schools and institutions and the industry* entry level digital literacy assessment requirements have been grouped together in Section II under a separate category. This grouping rests 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 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.

In the ***K-12 education*** segment, ICT digital literacy competencies and assessment presents a 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 21st 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 already incorporating the ISTE National Education Technology Standards (NET*S) and performance indicators into their curriculum and technology planning processes. It is recommended that California adopt the ISTE NET*S Standards for K-12 education which are discussed in more detail in Section III.

In summary, in each of these segments the current approaches for standardization and certification of ICT digital literacy skills vary. However, there is consensus among key stakeholders that measurement of ICT digital literacy skills and performance outcomes must be in compliance to a common definition, consistent competencies, and globally acceptable standards. It is clear that the post-secondary academic segment and the K-12 segment have made much progress in this regard, and that it would be to the benefit of California to adopt the working models already in progress that are discussed herein.

However, there remains a need for development of a seamless continuum of ICT digital literacy competencies that are aligned to assessments, certification and curricula. California has the opportunity to take a leadership role in developing such an innovative model to standardized certification for ICT digital literacy skills. Therefore, it is recommended that a vendor independent seamless continuum for *California ICT Digital Literacy Assessment and Certification* be developed that incorporates ICT digital literacy standards, competencies, and alignment of assessments for K-20 and the workforce. Such a continuum would facilitate the assessment and certification of students and the workforce in ICT digital literacy. Furthermore, individuals could be better informed and self-empowered to acquire the necessary skills needed for educational attainment and reaching career goals. The rationale and approach are discussed further in Section II.

## Section II: Standards, Performance Indicators, and Outcomes

### A. Four Year Post Secondary Education

The Association of College and Research Libraries (ACRL), a division of the American Library Association (ALA) is considered the premier source for standards, performance indicators, and outcomes for assessment of ICT digital literacy competencies at the Post-Secondary Level. The ALA standards were reviewed and approved by the ACRL Standards Committee and Board of Directors. The ACRL framework has been adopted by multiple academic institutions and commercial assessment developers. 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 (ETS) iSkills™ Assessment. ETS is already using the assessment in pilot programs in the California State University System and with multiple four-year institutions nationwide.

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 the 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**

## B. Community Colleges, Vocational Programs, Schools and Institutions, and Industry

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 – Certiport with its *Internet and Computing Core Certification* (IC3) and *International Computer Driver's License (ICDL)* with a work skills assessment, 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 training providers, institutions and employers throughout California.

Non-profit organizations have also entered the IT assessment area. Most notably, the National Workforce Center for Emerging Technologies (NWCET) in Bellevue Washington and Education Development Corporation (EDC) are considered the two leaders in developing IT skills sets for the workforce. Their career clusters, standards and frameworks are adopted nationally and internationally. However, their skill sets are primarily focused on the technical requirements for job skills and do not, per se, delineate basic competencies for ICT digital literacy that incorporate both the technical and cognitive competencies of a 21st Century workforce.

These various approaches, while of a quality standard individually, only provide partial solutions to the broader need for standardized measuring of a candidate's competencies on all the basic elements of ICT digital literacy. They are, at best, a "patchwork quilt" approach to standardized assessment and certification for job training initiatives, private sector employers, vocational training programs, and public sector training needs throughout California. Furthermore, the lack of a standard assessment and certification of basic ICT digital literacy contributes to a general confusion as to what assessment measures what skill, and if all competencies are covered by the various assessments, and most importantly, if the candidate can be certified as competent at a basic level of ICT digital literacy.

**C. Need for a Vendor Independent Seamless Continuum for ICT Digital Literacy Certification**

As stated previously, a variety of commercial assessment instruments are currently available for assessment of various performance indicators of ICT digital literacy skills. However, no overarching standardized continuum of skills exists that is in alignment with the California definition of ICT digital literacy or globally recognized ICT digital literacy certifications. Furthermore, the available assessments tend to be costly to the candidate, and most likely cost prohibitive to the public sector for large scale benchmarking at a regional or state level.

There is consensus that a vendor independent seamless continuum of ICT digital literacy skills is necessary to track continuous progress from K-20, to workforce skills preparation to ongoing workforce training requirements. Such a comprehensive continuum could be used to determine a student's or candidate's initial level of digital literacy skills for placement, diagnosis, and remediation as well as ongoing competency achievements.

The continuum must be based on California's definition of basic elements and competencies of ICT digital literacy, developed to accepted global standards, and aligned to assessment instruments and curriculum syllabi. This will ensure benchmarking, uniformity in the mastery of digital literacy competencies, and alignment for comprehensive diagnostic and remediation.

Assessment developers and standards developers collaborating with CETF on the California ICT digital literacy effort indicate that certifications aligned with a seamless continuum of ICT digital literacy skills, and supported by aligned curriculum, are critical to achieving a goal of a digitally literate citizenry for California. Once placed on a continuum by an initial assessment of basic ICT digital literacy, candidates could then continue to refine their skills development, and could more effectively be directed to curriculum requirements for mastery of higher levels of competencies throughout their educational process and career path.

Therefore, CETF, in collaboration with assessment developers, businesses, associations, and vocational stakeholders, is taking the lead in convening the expertise to develop this seamless continuum in order to attain the *California ICT Digital Literacy Assessment and Certification*.

A statewide collaborative effort will require an implementation strategy that clearly delineates accountability for decision-making processes, timelines, provisions for large-scale deployments and rollouts to validate the continuum, alignment and metrics. There must be from the onset clarity and a shared vision for success. In working with key stakeholders to develop such an approach, CETF must insist that the continuum and assessments 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.**

There is no reason to reinvent the wheel. Standards, performance indicators, and assessments currently exist. The challenge is to assemble the piece parts in a coherent and seamless way to achieve a model that meets the requirements for California.

At a minimum, the following widely used standards, assessments, performance indicators and certifications must be reviewed and considered in assembling the continuum:

- ACT Work Keys Assessments
- Certiport IC3
- ETS iskills/ICT Certification Exam
- ICDLUS – Digital Literacy Assessment
- ACRL and the National ICT Literacy Policy Council Standards
- ISTE*NET*S (discussed in Section III).

Summary descriptions of the skills performance outcomes and assessments are in the Appendix, pages 14-22.

## Section III: Standards and Performance Indicators – K-12 Education

### A. Standards and Performance Indicators for Students

The International Society for Technology in Education and Training (ISTE) is considered the premier source for standards, performance indicators, and outcomes for assessment of ICT digital literacy competencies at the K-12 Level. The ISTE National Educational Technology Standards for Students (NETS) have been adopted by multiple institutions and K-12 commercial assessment developers. In addition, the Partnership for 21st Century Skills, a leading advocacy group for digital literacy skills, and collaborative effort of educators and business stakeholders, has developed guidelines with elements of 21st Century learning for K-12 that incorporate NETS. It is recommended that the California K-12 systems also adopt these standards into student performance outcomes, and that the NETS be considered in the development of a seamless continuum for ICT digital literacy assessment and certification for California. The detailed NETS performance standards for K-12 students are found in Appendix, page 23.

Educational professionals regard eighth grade as a good benchmarking grade for assessing digital literacy. An assessment targeted directly at eighth grade is the *NET*S Online Technology Assessment* developed jointly by the International Society for Technology in Education (ISTE) and Microsoft. It focuses on the use of 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. To date no similar standardized evaluation instrument for high school exit proficiency is available.

ISTE has developed a resource list of vendor products that are in alignment with all or selected NETS standards. K-12 districts can refer to this reference in selecting assessments.

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.

| 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 |
| **Emerging** 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. |
| **Applying** 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. |
| **Infusing** 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. |
| **Transforming** 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. |

**Progress in implementing ICT at a school and indicators that describe ICT literacy.**

Anderson, J. & Weert, T. (2002). *Information and communication technology in education. A curriculum for schools and programme of teacher development*.

## B. 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.

The categories of standards with performance indicators listed below are designed to be general enough to be customized to fit state, university, or district guidelines and yet specific enough to define the scope of the topic. Performance indicators for each standard provide specific outcomes to be measured when developing a set of assessment tools. The standards categories and the performance indicators also provide guidelines for teachers currently in the classroom. It is recommended that these categories of standards be built into the teacher credentialing requirements in-service training competencies, and are considered in the development of a seamless continuum of ICT digital literacy competencies in California. The categories of standards with overall performance indicators are:

**TECHNOLOGY OPERATIONS AND CONCEPTS**
*Teachers demonstrate a sound understanding of technology operations and concepts.*

1. **PLANNING AND DESIGNING LEARNING ENVIRONMENTS AND EXPERIENCES**
   *Teachers plan and design effective learning environments and experiences supported by technology.*
2. **TEACHING, LEARNING, AND THE CURRICULUM**
   *Teachers implement curriculum plans that include methods and strategies for applying technology to maximize student learning.*
3. **ASSESSMENT AND EVALUATION**
   *Teachers apply technology to facilitate a variety of effective assessment and evaluation strategies.*
4. **PRODUCTIVITY AND PROFESSIONAL PRACTICE**
   *Teachers use technology to enhance their productivity and professional practice.*
5. **SOCIAL, ETHICAL, LEGAL, AND HUMAN ISSUES**
   *Teachers understand the social, ethical, legal, and human issues surrounding the use of technology in PK-12 schools and apply those principles in practice.*

Complete skills performance requirements for all teachers can be found in Appendix, page 27.

## C. Performance Indicators for Administrators

Recognizing that administrative vision and leadership is a key ingredient in successful technology programs in school districts, ISTE has also developed standardized performance indicators for administrators. They identify performance in the following categories:

1. Leadership and Vision
2. Learning and Teaching
3. Productivity and Professional Practice
4. Support, Management, and Operations
5. Assessment and Evaluation
6. Social, Ethical and Legal Issues

Full descriptions of the performance indicators for these categories can be found in Appendix, page 29.

## D. Social Networking, Web 2.0, and Acceptable Use Policies (AUP)

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). This has added hundreds of curriculum connection ideas to already available curriculum. Yet, many teachers and students are unable to access these resources due to district blocking.

Districts require 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. For example, a prerequisite tutorial would be appropriate before signing an annual AUP. Each district could contribute to the advancement of digital literacy by using an online tutorial to meet this need. 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.

# APPENDIX

*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 3rd 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 )*

## 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.**

| Performance Indicators | |
|---|---|
| **1. The information literate student defines and articulates the need for information.** | |
| *Outcomes Include* | a. Confers with instructors and participates in class discussions, peer workgroups, and electronic discussions to identify a research topic, or other information need.<br>b. Develops a thesis statement and formulates questions based on the information need.<br>c. Explores general information sources to increase familiarity with the topic.<br>d. Defines or modifies the information need to achieve a manageable focus.<br>e. Identifies key concepts and terms that describe the information need.<br>f. Recognizes that existing information can be combined with original thought, experimentation, and/or analysis to produce new information. |
| **2. The information literate student identifies a variety of types and formats of potential sources for information.** | |
| *Outcomes Include* | a. Knows how information is formally and informally produced, organized, and disseminated.<br>b. Recognizes that knowledge can be organized into disciplines that influence the way information is accessed.<br>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).<br>d. Identifies the purpose and audience of potential resources (e.g., popular vs. scholarly, current vs. historical).<br>e. Differentiates between primary and secondary sources, recognizing how their use and importance vary with each discipline.<br>f. Realizes that information may need to be constructed with raw data from primary sources. |
| **3. The information literate student considers the costs and benefits of acquiring the needed information.** | |
| *Outcomes Include* | 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).<br>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.<br>c. Defines a realistic overall plan and timeline to acquire the needed information. |
| **4. The information literate student reevaluates the nature and extent of the information need.** | |
| *Outcomes Include* | a. Reviews the initial information need to clarify, revise, or refine the question.<br>b. Describes criteria used to make information decisions and choices. |

## Standard Two

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

| Performance Indicators | |
|---|---|
| **1. The information literate student selects the most appropriate investigative methods or information retrieval systems for accessing the needed information** | |
| *Outcomes Include* | a. Identifies appropriate investigative methods (e.g., laboratory experiment, simulation, fieldwork).<br>b. Investigates benefits and applicability of various investigative methods.<br>c. Investigates the scope, content, and organization of information retrieval systems.<br>d. Selects efficient and effective approaches for accessing the information needed from the investigative method or information retrieval system. |
| **2. The information literate student constructs and implements effectively designed search strategies.** | |
| *Outcomes Include* | a. Develops a research plan appropriate to the investigative method.<br>b. Identifies keywords, synonyms and related terms for the information needed.<br>c. Selects controlled vocabulary specific to the discipline or information retrieval source.<br>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).<br>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.<br>f. Implements the search using investigative protocols appropriate to the discipline. |
| **3. The information literate student retrieves information online or in person using a variety of methods.** | |
| *Outcomes Include* | 1. Uses various search systems to retrieve information in a variety of formats.<br>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.<br>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).<br>4. Uses surveys, letters, interviews, and other forms of inquiry to retrieve primary information. |
| **4. The information literate student refines the search strategy if necessary** | |
| *Outcomes Include* | a. Assesses the quantity, quality, and relevance of the search results to determine whether alternative information retrieval systems or investigative methods should be utilized.<br>b. Identifies gaps in the information retrieved and determines if the search strategy should be revised.<br>c. Repeats the search using the revised strategy as necessary. |
| **5. The information literate student extracts, records, and manages the information and its sources.** | |
| *Outcomes Include* | 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)<br>b. Creates a system for organizing the information<br>c. Differentiates between the types of sources cited and understands the elements and correct syntax of a citation for a wide range of resources<br>d. Records all pertinent citation information for future reference<br>e. Uses various technologies to manage the information selected and organized |

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 |
|---|---|
| | **1. The information literate student summarizes the main ideas to be extracted from the information gathered** |
| *Outcomes Include* | a. Reads the text and selects main ideas<br>b. Restates textual concepts in his/her own words and selects data accurately<br>c. Identifies verbatim material that can be then appropriately quoted |
| | **2. The information literate student articulates and applies initial criteria for evaluating both the information and its sources.** |
| *Outcomes Include* | a. Examines and compares information from various sources in order to evaluate reliability, validity, accuracy, authority, timeliness, and point of view or bias<br>b. Analyzes the structure and logic of supporting arguments or methods<br>c. Recognizes prejudice, deception, or manipulation<br>d. Recognizes the cultural, physical, or other context within which the information was created and understands the impact of context on interpreting the information |
| | **3. The information literate student synthesizes main ideas to construct new concepts.** |
| *Outcomes Include* | a. Recognizes interrelationships among concepts and combines them into potentially useful primary statements with supporting evidence<br>b. Extends initial synthesis, when possible, at a higher level of abstraction to construct new hypotheses that may require additional information<br>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 |
| | **4. The information literate student compares new knowledge with prior knowledge to determine the value added, contradictions, or other unique characteristics of the information.** |
| *Outcomes Include* | a. Determines whether information satisfies the research or other information need<br>b. Uses consciously selected criteria to determine whether the information contradicts or verifies information used from other sources<br>c. Draws conclusions based upon information gathered<br>d. Tests theories with discipline-appropriate techniques (e.g., simulators, experiments)<br>e. Determines probable accuracy by questioning the source of the data, the limitations of the information gathering tools or strategies, and the reasonableness of the conclusions<br>f. Integrates new information with previous information or knowledge<br>g. Selects information that provides evidence for the topic |
| | **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.** |
| *Outcomes Include* | a. Investigates differing viewpoints encountered in the literature<br>b. Determines whether to incorporate or reject viewpoints encountered |
| | **6. The information literate student validates understanding and interpretation of the information through discourse with other individuals, subject-area experts, and/or practitioners.** |
| *Outcomes Include* | a. Participates in classroom and other discussions<br>b. Participates in class-sponsored electronic communication forums designed to encourage discourse on the topic (e.g., email, bulletin boards, chat rooms)<br>c. Seeks expert opinion through a variety of mechanisms (e.g., interviews, email, listservs) |
| | **7. The information literate student determines whether the initial query should be revised** |
| *Outcomes Include* | a. Determines if original information need has been satisfied or if additional information is needed<br>b. Reviews search strategy and incorporates additional concepts as necessary<br>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 | |
|---|---|
| | **1. The information literate student applies new and prior information to the planning and creation of a particular product or performance.** |
| *Outcomes Include* | a. Organizes the content in a manner that supports the purposes and format of the product or performance (e.g. outlines, drafts, storyboards)<br>b. Articulates knowledge and skills transferred from prior experiences to planning and creating the product or performance<br>c. Integrates the new and prior information, including quotations and paraphrasing, in a manner that supports the purposes of the product or performance<br>d. Manipulates digital text, images, and data, as needed, transferring them from their original locations and formats to a new context |
| | **2. The information literate student revises the development process for the product or performance.** |
| *Outcomes Include* | a. Maintains a journal or log of activities related to the information seeking, evaluating, and communicating process<br>b. Reflects on past successes, failures, and alternative strategies |
| | **3. The information literate student communicates the product or performance effectively to others.** |
| *Outcomes Include* | a. Chooses a communication medium and format that best supports the purposes of the product or performance and the intended audience<br>b. Uses a range of information technology applications in creating the product or performance<br>c. Incorporates principles of design and communication<br>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.**

| Performance Indicators | |
|---|---|
| | **1. The information literate student understands many of the ethical, legal and socio-economic issues surrounding information and information technology** |
| *Outcomes Include* | a. Identifies and discusses issues related to privacy and security in both the print and electronic environments<br>b. Identifies and discusses issues related to free vs. fee-based access to information<br>c. Identifies and discusses issues related to censorship and freedom of speech<br>d. Demonstrates an understanding of intellectual property, copyright, and fair use of copyrighted material |
| | **2. The information literate student follows laws, regulations, institutional policies, and etiquette related to the access and use of information resources.** |
| *Outcomes Include* | a. Participates in electronic discussions following accepted practices (e.g. "Netiquette")<br>b. Uses approved passwords and other forms of ID for access to information resources<br>c. Complies with institutional policies on access to information resources<br>d. Preserves the integrity of information resources, equipment, systems and facilities<br>e. Legally obtains, stores, and disseminates text, data, images, or sounds<br>f. Demonstrates an understanding of what constitutes plagiarism and does not represent work attributable to others as his/her own<br>g. Demonstrates an understanding of institutional policies related to human subjects research |
| | **3. The information literate student acknowledges the use of information sources in communicating the product or performance.** |
| *Outcomes Include* | a. Selects an appropriate documentation style and uses it consistently to cite sources<br>b. Posts permission granted notices, as needed, for copyrighted material |

CONSENSUS DOCUMENT

## 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** | **Greece** | **Namibia.** | **South Africa** |
| **Herzegovina (BiH)** | **Hungary** | **New Zealand** | **Switzerland** |
| **Canada** | **Ireland** | **Oman** | **United Arab** |
| **Chile** | **Israel** | **Poland** | **Emirates** |
| **China** | **Italy** | **Portugal** | **United Kingdom** |
| **Colombia** | **Jamaica** | **Romania** | **USA** |
| **Croatia** | **Jordan** | **Serbia &** | |
| **Cyprus** | **Libya** | **Montenegro** | |
| **Czech Republic** | **Lithuania** | **Slovenia** | |

### 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 spreadsheet8 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*12, 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)*

CONSENSUS DOCUMENT

## Certiport – ICT Digital Literacy Assessment

### IC³ 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

### IC³ 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

CONSENSUS DOCUMENT

**IC³ 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.certiport.com

## ISTE's National Educational Technology Standards for Students

1. **Creativity and Innovation**
   Students demonstrate creative thinking, construct knowledge, and develop innovative products and processes using technology. Students:
   a. apply existing knowledge to generate new ideas, products, or processes.
   b. create original works as a means of personal or group expression.
   c. use models and simulations to explore complex systems and issues.
   d. identify trends and forecast possibilities.

2. **Communication and Collaboration**
   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. Students:
   a. interact, collaborate, and publish with peers, experts or others employing a variety of digital environments and media.
   b. communicate information and ideas effectively to multiple audiences using a variety of media and formats.
   c. develop cultural understanding and global awareness by engaging with learners of other cultures.
   d. contribute to project teams to produce original works or solve problems.

3. **Research and Information Fluency**
   Students apply digital tools to gather, evaluate, and use information. Students:
   a. plan strategies to guide inquiry.
   b. locate, organize, analyze, evaluate, synthesize, and ethically use information from a variety of sources and media.
   c. evaluate and select information sources and digital tools based on the appropriateness to specific tasks.
   d. process data and report results.

4. **Critical Thinking, Problem-Solving & Decision-Making**
   Students use critical thinking skills to plan and conduct research, manage projects, solve problems and make informed decisions using appropriate digital tools and resources. Students:
   a. identify and define authentic problems and significant questions for investigation.
   b. plan and manage activities to develop a solution or complete a project.
   c. collect and analyze data to identify solutions and/or make informed decisions.
   d. use multiple processes and diverse perspectives to explore alternative solutions.

5. **Digital Citizenship**
   Students understand human, cultural, and societal issues related to technology and practice legal and ethical behavior. Students:
   a. advocate and practice safe, legal, and responsible use of information and technology.
   b. exhibit a positive attitude toward using technology that supports collaboration, learning, and productivity.
   c. demonstrate personal responsibility for lifelong learning.
   d. exhibit leadership for digital citizenship.

6. **Technology Operations and Concepts**
   Students demonstrate a sound understanding of technology concepts, systems and operations. Students:
   a. understand and use technology systems.
   b. select and use applications effectively and productively.
   c. troubleshoot systems and applications.
   d. transfer current knowledge to learning of new technologies.

CONSENSUS DOCUMENT

## *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)

CONSENSUS DOCUMENT

**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)

CONSENSUS DOCUMENT

**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)

Copyright © 2007, ISTE ® (INTERNATIONAL SOCIETY FOR TECHNOLOGY IN EDUCATION) www.iste.org All rights reserved. This material may be reproduced for nonprofit, educational purposes only -- not to be distributed beyond focused educational work group. Please use the above accreditation. For all other permission requests, contact copyright owner at permissions@iste.org.

CONSENSUS DOCUMENT

## ISTE Educational Technology Standards and Performance Indicators for All Teachers

Building on the NET*S for Students, the ISTE NET*S for Teachers (NET*S•T), which focus on preservice teacher education, 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.

The six standards areas with performance indicators listed below are designed to be general enough to be customized to fit state, university, or district guidelines and yet specific enough to define the scope of the topic. Performance indicators for each standard provide specific outcomes to be measured when developing a set of assessment tools. The standards and the performance indicators also provide guidelines for teachers currently in the classroom.

### TECHNOLOGY OPERATIONS AND CONCEPTS

*Teachers demonstrate a sound understanding of technology operations and concepts. Teachers:*

- Demonstrate introductory knowledge, skills, and understanding of concepts related to technology (as described in the ISTE National Education Technology Standards for Students)
- Demonstrate continual growth in technology knowledge and skills to stay abreast of current and emerging technologies.

### PLANNING AND DESIGNING LEARNING ENVIRONMENTS AND EXPERIENCES

*Teachers plan and design effective learning environments and experiences supported by technology. Teachers:*

- Design developmentally appropriate learning opportunities that apply technology-enhanced instructional strategies to support the diverse needs of learners.
- Apply current research on teaching and learning with technology when planning learning environments and experiences.
- Identify and locate technology resources and evaluate them for accuracy and suitability.
- Plan for the management of technology resources within the context of learning activities.
- Plan strategies to manage student learning in a technology-enhanced environment.

### TEACHING, LEARNING, AND THE CURRICULUM

*Teachers implement curriculum plans that include methods and strategies for applying technology to maximize student learning. Teachers:*

CONSENSUS DOCUMENT

- Facilitate technology-enhanced experiences that address content standards and student technology standards.
- Use technology to support learner-centered strategies that address the diverse needs of students.
- Apply technology to develop students' higher order skills and creativity.
- Manage student learning activities in a technology-enhanced environment.

ASSESSMENT AND EVALUATION

*Teachers apply technology to facilitate a variety of effective assessment and evaluation strategies. Teachers:*

- Apply technology in assessing student learning of subject matter using a variety of assessment techniques.
- Use technology resources to collect and analyze data, interpret results, and communicate findings to improve instructional practice and maximize student learning.
- Apply multiple methods of evaluation to determine students' appropriate use of technology resources for learning, communication, and productivity.

PRODUCTIVITY AND PROFESSIONAL PRACTICE

*Teachers use technology to enhance their productivity and professional practice. Teachers:*

- Use technology resources to engage in ongoing professional development and lifelong learning.
- Continually evaluate and reflect on professional practice to make informed decisions regarding the use of technology in support of student learning.
- Apply technology to increase productivity.
- Use technology to communicate and collaborate with peers, parents, and the larger community in order to nurture student learning.

SOCIAL, ETHICAL, LEGAL, AND HUMAN ISSUES

*Teachers understand the social, ethical, legal, and human issues surrounding the use of technology in PK-12 schools and apply those principles in practice. Teachers:*

- Model and teach legal and ethical practice related to technology use.
- Apply technology resources to enable and empower learners with diverse backgrounds, characteristics, and abilities.
- Identify and use technology resources that affirm diversity
- Promote safe and healthy use of technology resources.
- Facilitate equitable access to technology resources for all students.

CONSENSUS DOCUMENT

## 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.

CONSENSUS DOCUMENT

## Partnership for 21st 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 for21st 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*

**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*

**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 8th 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.

CONSENSUS DOCUMENT

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

## APPENDIX D

***Characteristics of Programs of Information Literacy that Illustrate Best Practices***
http://www.ala.org/ala/mgrps/divs/acrl/standards/characteristics.cfm

**Category 1: Mission**

A mission statement for an information literacy program:

- Includes a definition of information literacy;
- Is consistent with the "Information Literacy Competency Standards for Higher Education" [http://www.ala.org/acrl/ilcomstan.html];
- corresponds with the mission statements of the institution;
- Corresponds with the format of related institutional documents;
- Clearly reflects the contributions of and expected benefits to all institutional constituencies;
- Appears in appropriate institutional documents;
- Assumes the availability of and participation in relevant lifelong learning options for all—faculty, staff, and administration; and
- Is reviewed periodically and, if necessary, revised.

**Category 2: Goals and Objectives**

Goals and objectives for an information literacy program:

- Are consistent with the mission, goals, and objectives of programs, departments, and the institution;
- Establish measurable outcomes for evaluation for the program;
- Reflect sound pedagogical practice;
- Accommodate input from various constituencies;
- Articulate the integration of information literacy across the curriculum;
- Accommodate student growth in skills and understanding throughout the college years;
- Apply to all learners, regardless of delivery system or location;
- Reflect the desired outcomes of preparing students for their academic pursuits and for effective lifelong learning; and are evaluated and reviewed periodically.

**Category 3: Planning**

Planning for an information literacy program:

- Articulates its mission, goals, objectives, and pedagogical foundation;
- Anticipates and addresses current and future opportunities and challenges;
- Is tied to library and institutional information technology planning and budgeting cycles;
- Incorporates findings from environmental scans;
- Accommodates program, department, and institutional levels;
- Involves students, faculty, librarians, administrators, and other constituencies as appropriate to the institution;
- Establishes formal and informal mechanisms for communication and ongoing dialogue across the academic community;
- Establishes the means for implementation and adaptation;

- Addresses, with clear priorities, human, technological and financial resources, current and projected, including administrative and institutional support;
- Includes mechanisms for articulation with the curriculum;
- Includes a program for professional, faculty, and staff development; and
- Establishes a process for assessment at the outset, including periodic review of the plan to ensure flexibility.

**Category 4: Administrative and Institutional Support**

Administration within an institution:

- Identifies or assigns information literacy leadership and responsibilities;
- Plants information literacy in the institution's mission, strategic plan, policies, and procedures;
- Provides funding to establish and ensure ongoing support for
    - Formal and informal teaching facilities and resources
    - Appropriate staffing levels
    - Professional development opportunities for librarians, faculty, staff, and administrators; and
- Recognizes and encourages collaboration among disciplinary faculty, librarians, and other program staff and among institutional units;
- Communicates support for the program;
- Rewards achievement and participation in the information literacy program within the institution's system.

**Category 5: Articulation with the Curriculum**

Articulation with the curriculum for an information literacy program:

- Is formalized and widely disseminated;
- Emphasizes student-centered learning;
- Uses local governance structures to ensure institution-wide integration into academic or vocational programs;
- Identifies the scope (i.e., depth and complexity) of competencies to be acquired on a disciplinary level as well as at the course level;
- Sequences and integrates competencies throughout a student's academic career, progressing in sophistication; and
- Specifies programs and courses charged with implementation.

**Category 6: Collaboration**

Collaboration among disciplinary faculty, librarians, and other program staff in an information literacy program:

- Centers around enhanced student learning and the development of lifelong learning skills;
- Engenders communication within the academic community to garner support for the program;
- Results in a fusion of information literacy concepts and disciplinary content;
- Identifies opportunities for achieving information literacy outcomes through course content and other learning experiences; and
- Takes place at the planning stages, delivery, assessment of student learning, and evaluation and refinement of the program.

**Category 7: Pedagogy**

Pedagogy for an information literacy program:

- Supports diverse approaches to teaching;
- Incorporates appropriate information technology and other media resources;
- Includes active and collaborative activities;
- Encompasses critical thinking and reflection;
- Responds to multiple learning styles;
- Supports student-centered learning;
- Builds on students' existing knowledge; and
- Links information literacy to ongoing coursework and real-life experiences appropriate to program and course level.

**Category 8: Staffing**

Staff for an information literacy program:

- Include librarians, disciplinary faculty, administrators, program coordinators, graphic designers, teaching/learning specialists, and others as needed;
- Serve as role models, exemplifying and advocating information literacy and lifelong learning;
- Are adequate in number and skills to support the program's mission;
- Develop experience in instruction/teaching and assessment of student learning;
- Develop experience in curriculum development and expertise to develop, coordinate, implement, maintain, and evaluate information literacy programs;
- Employ a collaborative approach to working with others;
- Receive and actively engage in systematic and continual professional development and training;
- Receive regular evaluations about the quality of their contribution to the program.

**Category 9: Outreach**

Outreach activities for an information literacy program:

- Communicate a clear message defining and describing the program and its value to targeted audiences;
- Provide targeted marketing and publicity to stakeholders, support groups and media channels;
- Target a wide variety of groups;
- Use a variety of outreach channels and media, both formal and informal;
- Include participation in campus professional development training by offering or co-sponsoring workshops and programs that relate to information literacy for faculty and staff;
- Advance information literacy by sharing information, methods and plans with peers from other institutions; and
- Are the responsibility of all members of the institution, not simply the librarians.

**Category 10: Assessment/Evaluation**

Assessment/evaluation of information literacy includes program performance and student outcomes and:

***For program evaluation:***

- Establishes the process of ongoing planning/improvement of the program;
- Measures directly progress toward meeting the goals and objectives of the program;

- Integrates with course and curriculum assessment as well as institutional evaluations and regional/professional accreditation initiatives; and
- Assumes multiple methods and purposes for assessment/evaluation
    - Formative and summative
    - Short term and longitudinal;

***For student outcomes:***

- Acknowledges differences in learning and teaching styles by using a variety of appropriate outcome measures, such as portfolio assessment, oral defense, quizzes, essays, direct observation, anecdotal, peer and self review, and experience;
- Focuses on student performance, knowledge acquisition, and attitude appraisal;
- Assesses both process and product;
- Includes student, peer, and self-evaluation;

***For all:***

- Includes periodic review of assessment/evaluation methods.

## APPENDIX E

**Teacher professional development framework to help build the 'digital literacy pathway' for California educators and students**

**Digital Literacy Framework:** A 'framework' to help build the "digital literacy pathway" by guiding the planning, implementation, and evaluation of professional development and support services provided by the eleven *California Technology Assistance Projects* (CTAP). This Framework is based on continuously updated guidelines for the services provided by the eleven Statewide CTAP Regions over the past 6 years. Data to inform updates is based on responses by educators across the state regarding their specific needs related to assistance in the planning and integration of technology into teaching and learning as part of the statewide and local evaluations of CTAP services provided to educators. The Framework was reviewed and updated with input from k-12 teachers and administrators in June 2009.

The Framework is organized according to four Program Areas supporting the "digital literacy pathway" for educators and students with statements relating to what an educator might be able to do as a result of using professional development services and information resources. It also provides the basis for surveys used at the regional and local level to prioritize need for local planning and evaluation as 1=low, 2=moderate, and 3=high.

| **Program Area 1. Professional development supporting technology in curriculum and instruction** | Priority | | |
|---|---|---|---|
| | 1 | 2 | 3 |
| **Regional technology assistance should increase the extent to which are educators able to . . .** | | | |
| a. Integrate electronic learning applications into adopted curriculum & instruction to include but not be limited to: web-based instructional resources, digital textbooks and related supplements, Internet supported research tools and information sources. | | | |
| b. Assisting educators on how to incorporate new and emerging "digital literacy standards" into instructional practice at all grade levels (pre-school through grade 12) | | | |
| c. Acquire specific technology-use skills related to current digital Literacy knowledge and skills | | | |
| d. Develop instructional strategies (units or lessons) that apply and utilize current state-of-the-art technology tools and delivery methods | | | |
| e. Coach and mentor colleagues on technology integration as a professional development strategy | | | |
| f. Identify and select online courses to support K-12 curriculum and instruction | | | |
| g. Develop and deliver instructional lessons and units online | | | |
| h. Access and utilize the *California Learning Resource Network* (CLRN) to identify and select electronic learning resources (ELRs), Web Information Links (WILs), and "digital textbooks", aligned to CA Content Standards | | | |
| i. Utilize the statewide education technology website (known as MyCTAP) as 'one-stop' access to Regional CTAP and SETS services as well as other information and update relating to technology to support teaching and learning | | | |
| j. Access and participate in professional development events co-sponsored or enabled by CTAP with professional associations such as *Computer Using Educators* (CUE), *International Society for Technology in Education* (ISTE), *Consortium on School Networking* (COSN), and programs such as RSDSS, and BTSA. | | | |
| k. Integrate technology into Program Improvement and technologically under served schools. | | | |
| l. Make effective educational use of personal networking applications | | | |
| m. Understand and implement cyber-safety and copyright policies | | | |

| **Program Area 2. Professional development supporting hardware and network implementation** | Priority | | |
|---|---|---|---|
| | 1 | 2 | 3 |

| | | | |
|---|---|---|---|
| Regional technology assistance should increase the extent to which are educators able to . . . | | | |
| a. Develop and submit district technology plans that meet the EETT and E-rate network infrastructure and hardware requirements | | | |
| b. Be informed about new and emerging technologies | | | |
| c. Plan, implement, and sustain hardware and network infrastructure | | | |
| d. Utilize TechSETS and other resources such as CETPA, CoSN, to assist in infrastructure design, implementation, and sustainability | | | |
| e. Access and utilize the K-12 High Speed Network | | | |

| **Program Area 3. Professional development supporting technology to manage student information** | Priority | | |
|---|---|---|---|
| | 1 | 2 | 3 |
| Regional technology assistance should increase the extent to which are educators able to . . . | | | |
| a. Select technology applications to manage and analyze student information | | | |
| b. Use technology to access student information and assessment data | | | |
| c. Use student assessment data to inform instructional strategies | | | |
| d. Use Ed Tech Profile to assist staff determine professional development needs | | | |
| e. Utilize the *Technology Information Center for Administrative Leadership* (TICAL) and the *Electronic Learning Assessment Resource* (ELAR) component of CLRN as an information resource for administrative technology applications | | | |
| f. Utilize additional resources such as TICAL, ACSA, CoSN, and other resources for using technology to support data-driven-decision-making | | | |
| g. Identify resources and support for documenting implementation, evaluating impact, and identifying effective practices of EETT Competitive Grants and other education programs and projects. | | | |

| **Program Area 4. Funding and coordination with other federal, state, and local programs.** | Priority | | |
|---|---|---|---|
| | 1 | 2 | 3 |
| Regional technology assistance should increase the extent to which are educators able to . . . | | | |
| a. Prepare and submit EETT-Competitive grants that meet the current State and Federal requirements | | | |
| b. Apply for E-Rate discounts or *California Teleconnect* funding (CTF) | | | |
| c. Learn about, and apply for new state, federal, and other educational technology grants. | | | |
| d. Use electronic learning resources to support other educational programs (i.e. Program Improvement, Title I, Before and After School Programs, Sp. Ed. Etc.) | | | |
| e. Become aware of and use the instructional technology resources as well as information that can accessed through the Internet from school, community, and state libraries. | | | |
| f. Collaborate with and use instructionally relevant resources (accessible through the use of technology) of institutions of higher education to support and expand learning opportunities of p-12 students. | | | |
| g. Expand the awareness, use, and impact of CTAP resources through partnerships with other programs and initiatives such as BTSA, Title I, RSDSS, AB 430, and other resources as appropriate to the goals of CTAP. | | | |

*For additional information regarding specific evaluation instruments and procedures relate to this framework, contact John Cradler: cradler@earthlink.net*

## APPENDIX F

### The California ICT Digital Literacy Leadership Council and Advisory Committee

The Leadership Council is chaired by the **Chief Information Officer** of the State of California.

Membership includes:

the **Secretary of Education** of California;
the **Secretary of Labor and Workforce Development** of California;
the **Secretary of Business, Transportation and Housing** of California;
and the **Secretary of State and Consumer Affairs** of California.
The **Superintendent of Public Instruction** of California has also been invited to participate.

**REFERENCES IN THE REPORT**


Coiro, J., Knobel, M., Lankshear, C., & Leu, D. J. (2008). *Handbook of Research on New Literacies.* New York: Lawrence Erlbaum Associates.

California Technology Assistance Project (CTAP): Statewide Evaluation Report. California Department of Education: http://www.cde.ca.gov/ls/et/rs/sets.asp

Dede, C. (2008). Theoretical Perspectives Influencing the Use of Information Technology in Teaching and Learning. In J. Voogt, & G. Knezek, *International Handbook of Information Technology in Primary and Secondary Education* (pp. 43-62). Springer Science + Business Media, LLC.

*ITAA Headline.* (2008, September 30). Retrieved December 23, 2009, from ITAA Policy Issues: http://www.itaa.org/policy/sourcing/headline.cfm?ID=2922

Lankshear, C., & Knobel, M. (2008). *Digital Literacies: Cencepts, Policies and Practices.* New York: Peter Lang Publishing Inc.

Statewide Education Technology Services (SETS): Statewide Evaluation Report, California Department of Education: http://www.cde.ca.gov/ls/et/rs/sets.asp

(January 2008). *The State of Connectivity Building Innovation Through Broadband.* California Broadband Task Force Report.

**ACKNOWLEGEMENTS**

In crafting the ICT Policy and Action Plan, the writers of this report drew upon the substantial amount of work conducted by the California Emerging Technology Fund (CETF) Committee (see Appendix C).

Contributions to the background literature review on digital literacies and to an analysis of the standards for digital literacy across groups (national, state and international standards for digital literacy, as well as those from business and industry) was made by a Study Group on Digital Literacies from the Center for Literacy & Inquiry in Networking Communities which is part of the University of California, Santa Barbara. Members of the group contributing to the contrastive analysis and to the literature review include, Azure Stewart (MA, Instructional Development and doctoral student), Christopher Bolaza (BA Law & Society and MA student) and Judith Green (Professor & Co-Director, LINC).

Other contributors included:
Doug Cremer, Executive Director, California Virtual Campus
Stephanie Couch, Director, CENIC and K20 CA Educational Technology Collaborative
Lisa Buschmann, Program Director, K20 CA Educational Technology Collaborative
Rowland Baker, Director, Brokers of Expertise and K12 High Speed Network
Teri Takai, State Chief Information Officer
Joe Camicia, Deputy Director, State Chief Information Officer
Bill Maile, Director of Communications, State Chief Information Officer
Anne McKinney, Deputy Secretary, Office of the Secretary of Education
Tori Hurtado, Federal Policy Director, Office of the Secretary of Education
Stacey Aldrich, California State Librarian
Dr. Barbara O'Connor, Professor, California State University, Sacramento & CETF Lead Director for Digital Literacy
Agustin Urgiles, Director of Education, CA Emerging Technology Fund (CETF)
Brenda Kempster, President, Kempster Group and Consultant, CETF
Wendy Lazurus, Founder and Co-President, The Children's Partnership
Dan Throgmorton, Associate Vice Chancellor, Los Rios CCD
Mike Lawrence, Executive Director, Computer Using Educators (CUE)
John Cradler, President, Educational Support Systems
Jackie Siminitus, VP-Communications and web 2.0 Project Manager, CA School Library Association

[i] FN: http://report.knightcomm.org/executive-summary