

Twenty-First Century Skills



"The current and future health of America's 21st Century Economy depends directly on how broadly and deeply Americans reach a new level of literacy—'21st Century Literacy'—that includes strong academic skills, thinking, reasoning, teamwork skills, and proficiency in using technology."

-21st Century Workforce Commission National Alliance of Business

What Will America's Students Learn?

The driving force for the 21st century is the intellectual capital of citizens. Political, social, and economic advances in the United States during this millennium will be possible only if the intellectual potential of America's youth is developed *now*. It should be no surprise that what students learn—as well as how they learn it and how often they must refresh these skills sets—is changing.

The urgency for building the capacity of American workers to meet the needs of the 21st century is readily apparent in the number of high profile groups publishing reports as calls for action.

This list of 21st century skills has been compiled from the many excellent works published in the 1990's, as well as from contemporary literature, emerging research and the voice of representatives from education, business and industry. It is intended to serve as a bridge across public, business, industry, and education sectors through common definitions, and contexts for the skills most needed by students and workers in the emerging digital age.

P-12 schools should incorporate 21st century skills and proficiencies into school curricula within the context of academic standards. A matrix that cross-matches the enGauge 21st century skills with those of eight previous works is included in the full report at <http://engauge.ncrel.org>.

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In order to thrive in a digital economy, students will need digital age proficiencies. It is important for the educational system to make parallel changes in order to fulfill its mission in society, namely the preparation of students for the world beyond the classroom. Therefore, the educational system must understand and embrace the following 21st century skills within the context of rigorous academic standards.

1. Digital Age Literacy—Today’s Basics

- **Basic, Scientific, and Technological Literacies**
As society changes, the skills that citizens need to negotiate the complexities of life also change. In the early 1900s, a person who had acquired simple reading, writing, and calculating skills was considered literate. It has only been in recent years that the public education system has expected all students to learn to read critically, write persuasively, think and reason logically, and solve complex problems in mathematics and science. [\[i\]](#)
- **Visual and Information Literacy**
The graphic user interface of the World Wide Web and the convergence of voice, video, and data into a common digital format have increased the use of visual imagery dramatically. Advances such as digital cameras, graphics packages, streaming video, and common imagery standards, allow for the use of visual imagery to communicate ideas. Students need good visualization skills to be able to decipher, interpret, detect patterns, and communicate using imagery. Information Literacy includes accessing information efficiently and effectively, evaluating information critically and competently, and using information accurately and creatively. [\[ii\]](#)
- **Cultural Literacy and Global Awareness**
The world is rapidly becoming wired and the resulting globalization of commerce and trade has increased the need for cultural literacy. In such a global economy, with the U.S. concerned about interactions, partnerships and competition from around the world, there is a greater necessity for knowing, understanding and appreciating other cultures, including cultural formations established as norms in a technological society, such as virtual realities. [\[iii\]](#)

2. Inventive Thinking—Intellectual Capital

- **Adaptability/Managing Complexity and Self-Direction**
The interconnectedness of today’s world brings with it unprecedented complexity. Globalization and the Web are inherently complex, accelerating the pace of change in today’s world. Interaction in such an environment requires individuals to be able to identify and react to changing conditions independently—self-directed learners who are able to analyze new conditions as they arise, identify the new skills that will be required to deal with these conditions and independently chart a course that responds to these changes. They must be able to take into account contingencies, anticipating changes, and understanding interdependencies within systems.
- **Curiosity, Creativity and Risk-taking**
Today’s knowledge workers are expected to adjust and adapt to changing environments. Inherent in such lifelong learning is a curiosity about the world and how it works. Researchers now understand how the very structure of the brain can be changed through intellectual pursuits—“there is a corresponding relationship between the amount of experience in a complex environment and the amount of structural change in the brain—in other words, learning organizes and reorganizes the brain.” [\[iv\]](#) Curiosity fuels lifelong learning as it contributes to the quality of life, and to the intellectual capital of the country. Equally as important is risk taking—without which there would be few quantum leaps in discoveries, inventions, and learning.
- **Higher Order Thinking and Sound Reasoning**
For decades reports have been calling for higher order thinking and sound reasoning in P-12 curricula. The SCANS report [\[v\]](#), for example, defines thinking skills as “thinking creatively, making decisions, solving problems, seeing things in the mind’s eye, knowing how to learn and reasoning.” Furthermore, sound reasoning enables students to plan, design, execute, and evaluate solutions—processes that are often carried out more efficiently and effectively using technological tools. [\[vi\]](#)

What does it mean to be 'literate and educated' in today's knowledge-based digital age?

3. Interactive Communication—Social and Personal Skills

▪ Teaming and Collaboration

The rapid pace of today's society and communications networks have caused—and enabled—a shift in the level of decision-making down to the worker closer to the client or product. At the same time the complexity of today's world requires a high degree of specialization by decision makers—hence the need for teaming of specialists to accomplish complex tasks in ways that are efficient, effective and timely. Information technology plays a key role in the ease with which individuals and groups collaborate. Email, faxes, voice mail, audio and video conferencing, chat rooms, shared documents, and virtual workspaces can provide more timely, iterative collaborations.

▪ Personal and Social Responsibility

Emerging technologies of today often present ethical and values dilemmas. As the technical complexity increases, our society needs to advance ethics and values to guide the application of science and technology in society—to manage the use of these powerful tools at the personal, community, and governmental levels. It will be important for students to grasp this responsibility and contribute as informed citizens at all levels.^[viii]

▪ Interactive Communication

In today's wired, networked society it is imperative that students understand how to communicate using technology. This includes asynchronous and synchronous communication such as person-to-person email interactions, listservs, group interactions in virtual learning spaces, chat rooms, MOOs, MUDs, interactive videoconferencing, phone/audio interactions, and interactions through simulations and models. Such interactions require knowledge of etiquette often unique to that particular environment. Information technologies do not change what is required for high quality interactive communications, but it does add new dimensions that need to be mastered so they become transparent; otherwise they may interfere with rather than enhance communication. A few new dimensions introduced through global communication include scheduling over time zones, cultural diversity, and language issues.

4. Quality, State-of-the-Art Results

Hank Levin asserts that, "When it is argued that the prime reason for high standards and high stakes testing is to create a productive workforce for the economy, we should be cautious."^[ix] Based on his studies in the 1990s, Levin concluded that how well students do on current tests in no way correlates to how productive they will be in the workforce. High productivity, on the other hand, though currently not a high stakes focus of schools, often determines whether a person succeeds or fails in the workforce.

▪ Prioritizing, Planning, and Managing for Results

High levels of complexity require careful planning, managing, and anticipating contingencies. This means more than simply concentrating on reaching the main goals of the project or keeping an eye on the project outcomes. It also requires the flexibility and creativity to anticipate unexpected outcomes as well.

▪ Effective Use of Real-World Tools

Bill Gates' 12th rule for business at the speed of thought, is to "use digital tools to help customers solve problems for themselves."^[x]—an idea dependent on ubiquitous, networked communication. Choosing appropriate tools for the task and applying them to real-world situations in ways that add significant value results in increased collaboration, promotion of creativity, construction of models, preparation of publications and other creative works.^[xii] Doug Henton^[xii] describes three types of knowledge important to today's economy: Know-what, Know-how, ^[v]and Know-who. He suggests that while everyone now has access to the Know-what, "what really matters most in the new economy is know-how and know-who."

▪ High Quality Results with Real-World Application

Researchers are finding learning benefits for students who build authentic products with tools—whether they be sand castles, computer programs, documents, graphs, LEGO constructions, or musical compositions. Such experiences provide students with deep insights into whatever domain of knowledge and whatever tools they use.

Methodology:

The enGauge 21st Century Skills were developed through a process that included literature reviews, research on emerging characteristics of the Net-Generation, a review of current reports on workforce trends from business and industry, analysis of nationally recognized skill sets, input from educators, data from educator surveys, and reactions from constituent groups. Sources are listed below and cross-matched in a matrix included in the full report.

- National Education Technology Standards (1998).
- International Society for Technology in Education
- SCANS (Secretary's Commission on Achieving Necessary Skills) (1991). U.S. Department of Labor,
- Standards for Technological Literacy, Content for the Study of Technology (2000). International Technology Education Association www.iteawww.org
- FIT: Being Fluent with Information Technology (1999). Committee on Information Technology Literacy, National Research Council
- Information Literacy Standards for Student Learning (1998) American Association of School Librarians (AASL), Association of Educational Communications Technology (AECT), American Library Media Association
- Nation of Opportunity: Building America's 21st Century Workforce. (2000) 21st Century Workforce Commission, U.S. Congress.
- Growing Up Digital (1998). Don Tapscott
- Preparing Students for the 21st Century (1996). American Association of School Administrators, www.aasa.org

In addition, data was gathered from educators at state-level conference sessions in ten states, educator surveys, and focus groups in Chicago and Washington DC. Initial drafts of the enGauge 21st Century Skills were reviewed by experts in the field prior to publication.

Summary

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National Alliance of Business* [\[xiv\]](#)

An extensive review of the literature about 21st century skills suggests that educational decision makers must acknowledge that the academics of yesterday are not sufficient for today. To adequately prepare, students must learn content within the context of 21st century skills.

The definition of enGauge's 21st century skills is an important step toward that end. The translation of these skills in digital age places of learning, and, most importantly, the appropriate assessment of these skills through multiple measures will ultimately determine whether today's children will be prepared to live, learn, work, and serve the public good in a digital, global society. For a full report see <http://ncrel.engage.org>.

End Notes:

- [i] Bransford, John; Brown, Ann; et al. (1999). How People Learn: Brain, Mind, Experience, and School. National Research Council. Page 4.
- [ii] American Association of School Librarians and Association for Educational Communications and Technology. (1998). Information Literacy Standards for Student Learning. American Library Association. P. 1.
- [iii] Trilling, B. and Hood, P. (1999). Learning technology and education reform in the knowledge age or "We're wired, webbed and windowed, now what?" Educational Technology/May-June 1999 pp. 5-18.
- [iv] Bransford, John, et al. (1999). How People Learn: Brain, Mind, Experience, and School. National Research Council. Executive Summary, page xvi.
- [v] SCANS (The Secretary's Commission on Achieving Necessary Skills), U.S. Department of Labor U.S. Department of Labor. 1991. What Work Requires of School: A SCANS report for America 2000.
- [vi] Committee on Information Technology Literacy. National Research Council. (1999). Being Fluent with Information Technology. National Academy Press. Pp. 2-4 through 2-5.
- [vii] Committee on Information Technology Literacy. National Research Council. (1999). Being Fluent with Information Technology. National Academy Press. Pp. 2-14
- [viii] Uchida, Donna, et al. 1996. Preparing Students for the 21st Century. American Association of School Administrators. Pages 11-12.
- [ix] Levin, Henry M. 1998. High Stakes Testing and Economic Productivity. Paper prepared for the Conference on "High Stakes K-12 Testing." Sponsored by the Civil Rights Project, Harvard University, Teachers College and the Law School, Columbia. Stanford University.
- [x] Gates, Bill. 1999. Bill Gates' New Rules. Book excerpt (Business @ The Speed of Thought) in Time magazine, March 22, 1999, page 12.
- [xi] ISTE 1998. National Education Technology Standards (NETS) for Students. Page 5.
- [xii] Henton, Doug. Building Digital Government in the 21st Century. Government Technology. May 2000. Volume 13, Issue 7. pp. 17-19
- [xiii] Committee on Information Technology Literacy. National Research Council. (1999). Being Fluent with Information Technology. National Academy Press. Pp. 2-4
- [xiv] National Alliance of Business (June 2000). Building America's 21st Century Workforce. Executive Summary, page 5. <http://www.workforce21.org/downloads/report1.pdf>