

EXECUTIVE SUMMARY

Advancing Excellence in Technological Literacy:

Student Assessment, Professional Development,
and Program Standards



The International Technology Education Association and its Technology for All Americans Project developed *Advancing Excellence in Technological Literacy: Student Assessment, Professional Development, and Program Standards* through funding from the National Science Foundation under Grant No. ESI-0000897 and the National Aeronautics and Space Administration under Grant No. NCC5-519. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation or the National Aeronautics and Space Administration.

Copyright© 2003 by the International Technology Education Association (ITEA). All rights reserved. Except as permitted under the United States Copyright Act of 1976, no part of this publication may be reproduced or distributed in any form or by any means, or stored in a database or retrieval system, without the prior written permission of ITEA.

Copies of this Executive Summary, *Advancing Excellence in Technological Literacy: Student Assessment, Professional Development, and Program Standards*, and *Standards for Technological Literacy: Content for the Study of Technology* are being distributed by



**International Technology
Education Association**

Technology for All Americans Project

1914 Association Drive, Suite 201
Reston, VA 20191-1539

Phone (703) 860-2100

Fax (703) 860-0353

Email itea@iris.org

URL www.itea.org

What is *Advancing Excellence in Technological Literacy*?

Advancing Excellence in Technological Literacy: Student Assessment, Professional Development, and Program Standards (AETL) was published in 2003 as a companion to *Standards for Technological Literacy: Content for the Study of Technology (STL)*, published in 2000. The three sets of standards in *AETL* support *STL*. *AETL* provides standards and guidelines that address student assessment, professional development, and program enhancement.

STL provides a significant foundational basis for the study of technology in terms of content. *AETL* was created to provide the means for implementing *STL* in K–12 laboratory-classrooms. Both documents are based on the vision that all students can and should become technologically literate.

Why is *Advancing Excellence in Technological Literacy* Important?

AETL is vital because *STL* alone cannot make sufficient educational reform in the study of technology. Students need and deserve the opportunity to attain technological literacy through the educational process.

Who Developed *Advancing Excellence in Technological Literacy*?

ITEA's Technology for All Americans Project (TfAAP) Advisory Group provided valuable counsel to project staff on the best practices of standards development. The TfAAP Standards Writing

Team was made up of 27 people (three teams of nine). The team members provided detailed input in fashioning the initial draft of *AETL*, and their continued review and input have added strength and quality to the final document. In addition, hundreds of other educators and experts in the fields of education, technology, mathematics, science, engineering, and other disciplines were involved in the development and refinement of *AETL*, which took place over three years (2000–2003). Their input was attained through various methods, including hearings, Web-based electronic document review, and individual reviews through the mail and in person. Three formal drafts of *AETL* were developed and reviewed before the final draft was prepared in autumn 2002.

The Vision of *Advancing Excellence in Technological Literacy*

AETL is based on the vision that all students can and should become technologically literate.



What is Technological Literacy?

Technological literacy is the ability to use, manage, assess, and understand technology.

Characteristics of a Technologically Literate Person

Technologically literate people understand the major technological concepts behind current issues and appreciate the importance of fundamental technological developments. They are skilled in the safe use of technological processes that may be prerequisites for their careers, health, or enjoyment. Technologically literate people have a fundamental approach to technology:

- They are **problem solvers** who consider technological issues from different points of view and relate them to a variety of contexts.
- They understand **technological impacts** and **consequences**, acknowledging that solutions often involve tradeoffs, accepting less of one quality in order to gain more of another.
- They use a strong **systems-oriented, creative, and productive approach** to thinking about and solving technological problems.

- They use concepts from **science, mathematics, social studies, language arts, and other content areas** as tools for understanding and managing technological systems.
- They appreciate the interrelationships between technology and **individuals, society, and the environment**.
- They understand that technology is the result of **human activity** or **innovation**.

Why is Technological Literacy Important?

We live in a technological world. Living in the twenty-first century requires much more from every individual than a basic ability to read, write, and perform simple mathematics. Technology affects virtually every aspect of our lives, from enabling citizens to perform routine tasks to requiring that they be able to make responsible, informed decisions that affect individuals, our society, and the environment. Citizens of today must have a basic understanding of how technology affects their world and how they exist both within and around technology.

Technological literacy is as fundamentally important to students as traditional core subject area knowledge and abilities. It has often been left for individuals to gain through their daily activities. However, technological processes and systems have become so complex that the happenstance approach is no longer effective. A massive, coordinated effort is needed that should involve schools, mass media and entertainment outlets, book publishers, and museums. Schools, in collaboration with the community, must bear the bulk of this effort, because the educational system can provide the most comprehensive study of technology.



Features of *Advancing Excellence in Technological Literacy*

Advancing Excellence in Technological Literacy consists of three separate but interrelated sets of standards. The standards are statements about what is valued that can be used for making a judgment of quality:

- **Chapter 3: Student Assessment Standards**
- **Chapter 4: Professional Development Standards**
- **Chapter 5: Program Standards**

Chapters 1 and 2 of *AETL* provide valuable introductory material. Chapter 1 is an overview that presents the rationale of need and conceptually introduces the three sets of standards. Chapter 2 discusses relevant principles and definitions. Chapter 6 of *AETL* invites users to participate in the visionary basis of *STL* and *AETL*. Appendices include:

- Appendix A: History of TfAAP
- Appendix B: Acknowledgements
- Appendix C: Listing of *STL* Content Standards
- Appendix D: Listing of *AETL* Standards with Guidelines
- Appendix E: Correlation Chart
- Appendix F: References and Resources
- Appendix G: Glossary
- Appendix H: Index

Guidelines

Guidelines play a vital role in *AETL*. The guidelines under each standard must be addressed to enable the user to meet the standard. ITEA does not recommend that users eliminate any of the guidelines; however, users may add to the guidelines to accommodate local differences.

Vignettes

Vignettes, by nature, provide “snapshots” of what may happen in student assessment, professional development, or programs and are located in chapters 3, 4, and 5. They provide detailed examples of how the standards can be put into practice. Some of the vignettes are authentic, having been successfully used in laboratory-classrooms, and others were generated especially for *AETL*.

Correlations

Although the three sets of standards in *AETL* are presented in three separate chapters (3, 4, and 5), they are broadly overlapping in nature. For example, professional development must address both student assessment and program enhancement. Likewise, programs must incorporate the elements of both student assessment and professional development. Some correlations are indicated within the chapters, as well as in Appendix E, that identify connections within and between the three sets of *AETL* standards as well as connections to the standards in *STL*.



CHAPTER 3:

Student Assessment Standards

Student assessment, as presented in *AETL*, is the systematic, multi-step process of collecting evidence on student learning, understanding, and abilities and using that information to inform instruction and provide feedback to the learner, thereby enhancing student learning. The primary audience for the student assessment standards is teachers. It is important to note that the standards are applicable to those who educate students on any aspect of technology.

The five organizational topics for the student assessment standards are:

- Consistency with *STL*
- Intended Purpose
- Research-Based Assessment Principles
- Practical Contexts
- Data Collection

Teachers should use student assessment data to improve classroom practices, plan curricula, develop self-directed learners, report student progress, and research teaching practices.



CHAPTER 4:

Professional Development Standards

Chapter 4 presents criteria for professional development providers (including teacher educators, supervisors, and administrators) to use in planning professional development. Professional development is a continuous process of lifelong learning and growth that begins early in life, continues through the undergraduate, pre-service experience, and extends through the in-service years.

The standards are applicable to those who prepare teachers on any aspect of technology, including educators whose primary focus may be a subject area other than technology.

The seven organizational topics for the professional development standards are:

- Consistency with *STL*
- Students as Learners
- Curricula and Programs
- Instructional Strategies
- Learning Environments
- Continued Professional Growth
- Pre-Service and In-Service

Users of *AETL* should focus on preparing teachers to continue to pursue professional development to keep up with changing technologies and current research on how students learn. These standards are pertinent to programs that prepare any teacher, including K–5 elementary teachers and teachers of science, mathematics, social studies, language arts, and other content areas.



CHAPTER 5:

Program Standards

AETL defines program as everything that affects student learning, including content, professional development, curricula, instruction, student assessment, and the learning environment, implemented across grade levels. Programs for the study of technology support student attainment of technological literacy through technology programs as well as other content area programs. In other words, programs for the study of technology are cross-curricular in nature. The technology program incorporates the study of technology across grade levels as a core subject of inherent value. The cross-curricular technology program manages the study of technology across grade levels and disciplines. The primary audiences for the program standards are twofold: (1) teachers and (2) administrators (including supervisors). Consequently, the programs standards contain two sets of guidelines. The standards are applicable to those who organize the learning of students on any aspect of technology.

The five organizational topics for the program standards are:

- Consistency with *STL*
- Implementation
- Evaluation
- Learning Environments
- Management

Users of the program standards should recognize that thoughtful design and implementation of technology programs are necessary to provide comprehensive and coordinated experiences for all students across grade levels and disciplines, including science, mathematics, social studies, language arts, and other content areas. The program standards call for extending technology programs beyond the domain of the school. Technology programs should, for example, involve parents, the community, business and industry, school-to-work programs, and higher education as well as professionals in engineering and other careers related to technology. And finally, it is essential that adequate support for professional development be provided by administrators to ensure that teachers remain current with the evolving fields of technology and educational research.

Innovation: Designing the Future

In the future, ITEA will encourage the adoption of *STL* and *AETL*. However, this will require not only ITEA's leadership, but also the collaborative leadership of many groups and individuals. ITEA is committed to the process of implementing the standards nationally to advance technological literacy for all students. The ITEA Center to Advance the Teaching of Technology and Science (CATTS) is offering support to states/provinces in developing curricula based on *STL*. Furthermore, ITEA is continuing to develop instructional materials, publications, and professional development activities centered around *STL* and *AETL* to assist teachers in putting the standards into practice. As with other standards documents, *AETL* should be viewed as dynamic and open to review, revision, and improvement.

Advancing Excellence in Technological Literacy

Student Assessment Standards

Standard A-1: Assessment of student learning will be consistent with *Standards for Technological Literacy: Content for the Study of Technology (STL)*.

Guidelines for meeting Standard A-1 require that teachers consistently

- A. Administer comprehensive planning and development across disciplines.
- B. Incorporate comprehensive planning and development across grade levels.
- C. Include cognitive learning elements for solving technological problems.
- D. Include psychomotor learning elements for applying technology.
- E. Guide student abilities to operate within the affective domain, utilizing perspective, empathy, and self assessment.

Standard A-2: Assessment of student learning will be explicitly matched to the intended purpose.

Guidelines for meeting Standard A-2 require that teachers consistently

- A. Formulate a statement of purpose for assessment tools.
- B. Identify and consider the intended audience in designing assessment tools and reporting assessment data.
- C. Utilize fair and equitable student assessment methods.
- D. Establish valid and reliable measurements that are reflective of classroom experiences.

Standard A-3: Assessment of student learning will be systematic and derived from research-based assessment principles.

Guidelines for meeting Standard A-3 require that teachers consistently

- A. Remain current with research on student learning and assessment.
- B. Devise a formative assessment plan.
- C. Establish a summative assessment plan.
- D. Facilitate enhancement of student learning.
- E. Accommodate for student commonality and diversity.
- F. Include students in the assessment process.

Standard A-4: Assessment of student learning will reflect practical contexts consistent with the nature of technology.

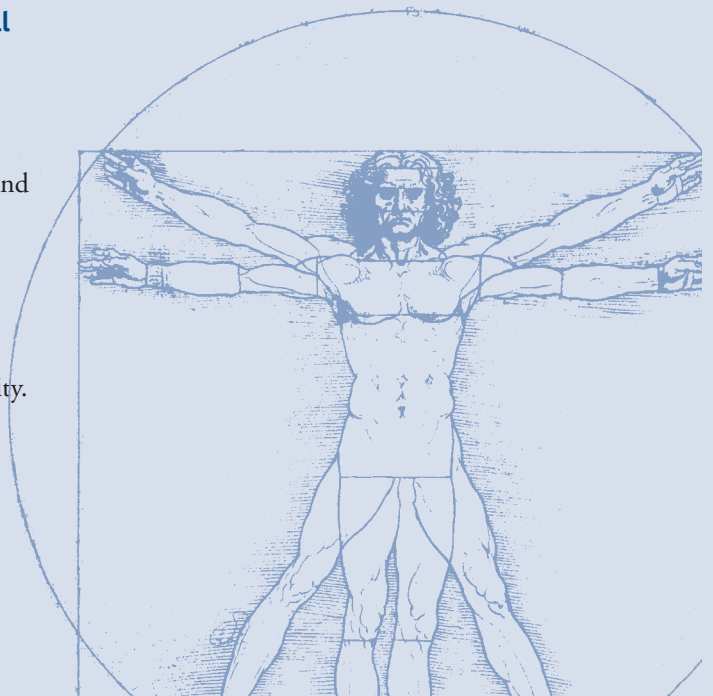
Guidelines for meeting Standard A-4 require that teachers consistently

- A. Incorporate technological problem solving.
- B. Include variety in technological content and performance-based methods.
- C. Facilitate critical thinking and decision making.
- D. Accommodate for modification to student assessment.
- E. Utilize authentic assessment.

Standard A-5: Assessment of student learning will incorporate data collection for accountability, professional development, and program enhancement.

Guidelines for meeting Standard A-5 require that teachers consistently

- A. Maintain data collection for accountability.
- B. Use student assessment results to help guide professional development decisions.
- C. Use student assessment results to help guide program enhancement decisions.



Advancing Excellence in Technological Literacy

Professional Development Standards

Standard PD-1: Professional development will provide teachers with knowledge, abilities, and understanding consistent with *Standards for Technological Literacy: Content for the Study of Technology (STL)*.

Guidelines for meeting Standard PD-1 require that professional development providers consistently prepare teachers to

- A. Understand the nature of technology.
- B. Recognize the relationship between technology and society.
- C. Know the attributes of design.
- D. Develop abilities for a technological world.
- E. Develop proficiency in the designed world.

Standard PD-2: Professional development will provide teachers with educational perspectives on students as learners of technology.

Guidelines for meeting Standard PD-2 require that professional development providers consistently prepare teachers to

- A. Incorporate student commonality and diversity to enrich learning.
- B. Provide cognitive, psychomotor, and affective learning opportunities.
- C. Assist students in becoming effective learners.
- D. Conduct and use research on how students learn technology.

Standard PD-3: Professional development will prepare teachers to design and evaluate technology curricula and programs.

Guidelines for meeting Standard PD-3 require that professional development providers consistently prepare teachers to

- A. Design and evaluate curricula and programs that enable all students to attain technological literacy.
- B. Design and evaluate curricula and programs across disciplines.
- C. Design and evaluate curricula and programs across grade levels.
- D. Design and evaluate curricula and programs using multiple sources of information.

Standard PD-4: Professional development will prepare teachers to use instructional strategies that enhance technology teaching, student learning, and student assessment.

Guidelines for meeting Standard PD-4 require that professional development providers consistently prepare teachers to

- A. Coordinate instructional strategies with curricula.
- B. Incorporate educational (instructional) technology.
- C. Utilize student assessment.

Standard PD-5: Professional development will prepare teachers to design and manage learning environments that promote technological literacy.

Guidelines for meeting Standard PD-5 require that professional development providers consistently prepare teachers to

- A. Design and manage learning environments that operate with sufficient resources.
- B. Design and manage learning environments that encourage, motivate, and support student learning of technology.
- C. Design and manage learning environments that accommodate student commonality and diversity.
- D. Design and manage learning environments that reinforce student learning and teacher instruction.
- E. Design and manage learning environments that are safe, appropriately designed, and well maintained.
- F. Design and manage learning environments that are adaptable.

Standard PD-6: Professional development will prepare teachers to be responsible for their own continued professional growth.

Guidelines for meeting Standard PD-6 require that professional development providers consistently prepare teachers to

- A. Assume commitment to self assessment and responsibility for continuous professional growth.
- B. Establish a personal commitment to ethical behavior within the educational environment as well as in private life.
- C. Facilitate collaboration with others.
- D. Participate in professional organizations.
- E. Serve as advisors for technology student organizations.
- F. Provide leadership in education.

Standard PD-7: Professional development providers will plan, implement, and evaluate the pre-service and in-service education of teachers.

Guidelines for meeting Standard PD-7 require that professional development providers consistently

- A. Plan pre-service and in-service education for teachers.
- B. Model teaching practices that teachers will be expected to use in their laboratory-classrooms.
- C. Evaluate professional development to assure that the needs of teachers are being met.
- D. Support technology teacher preparation programs that are consistent with state/provincial/regional and national/federal accrediting guidelines.
- E. Provide teacher preparation programs, leading to licensure, that are consistent with *AETL* and *STL*.
- F. Provide in-service activities to enhance teacher understanding of technological content, instruction, and assessment.
- G. Obtain regular funding for in-service professional development opportunities.
- H. Create and implement mentoring activities at both in-service and pre-service levels.

Advancing Excellence in Technological Literacy

Program Standards for Teachers

Standard P-1: Technology program development will be consistent with *Standards for Technological Literacy: Content for the Study of Technology (STL)*.

Guidelines for meeting Standard P-1 require that the teacher(s) responsible for the technology program(s) consistently

- A. Align program content with *STL*.
- B. Align program content with school district, state/provincial/regional, and national/federal standards in other academic areas.
- C. Plan and develop the program across disciplines.
- D. Plan and develop the program across grade levels.
- E. Assure that the program incorporates suitable cognitive, psychomotor, and affective learning elements.
- F. Promote adaptability for program enhancement.

Standard P-2: Technology program implementation will facilitate technological literacy for all students.

Guidelines for meeting Standard P-2 require that the teacher(s) responsible for the technology program(s) consistently

- A. Provide instruction that is consistent with research on how students learn technology.
- B. Provide instruction that is designed to meet curricular goals and student needs.
- C. Design and implement curricula that enable all students to attain technological literacy.
- D. Develop student leadership opportunities.

Standard P-3: Technology program evaluation will ensure and facilitate technological literacy for all students.

Guidelines for meeting Standard P-3 require that the teacher(s) responsible for the technology program(s) consistently

- A. Develop and utilize evaluation that is consistent with standards and guidelines in “Program Standards.”
- B. Implement and use systematic, continuous evaluation.
- C. Evaluate instruction on a regular basis.
- D. Plan for program revision.
- E. Accommodate for student commonality and diversity.
- F. Utilize effective student assessment.

Standard P-4: Technology program learning environments will facilitate technological literacy for all students.

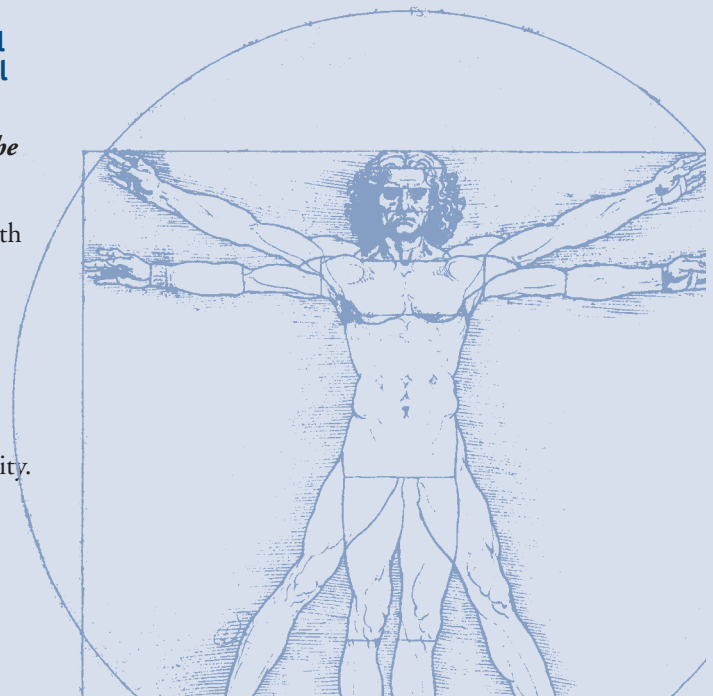
Guidelines for meeting Standard P-4 require that the teacher(s) responsible for the technology program(s) consistently

- A. Create and manage learning environments that are supportive of student interactions and student abilities to question, inquire, design, invent, and innovate.
- B. Create and manage learning environments that are up-to-date and adaptable.
- C. Implement a written, comprehensive safety program.
- D. Promote student development of knowledge and abilities that provides for the safe application of appropriate technological tools, machines, materials, and processes.
- E. Verify that the number of students in the technology laboratory-classroom does not exceed its capacity.

Standard P-5: Technology program management will be provided by designated personnel at the school, school district, and state/provincial/regional levels.

Guidelines for meeting Standard P-5 require that the teacher(s) responsible for the management of the technology program(s) consistently

- A. Develop and use action plans based on *STL*.
- B. Maintain data collection for accountability.
- C. Market and promote the study of technology.



Advancing Excellence in Technological Literacy

Program Standards for Administrators

Standard P-1: Technology program development will be consistent with *Standards for Technological Literacy: Content for the Study of Technology (STL)*.

Guidelines for meeting Standard P-1 require that administrators responsible for establishing the cross-curricular technology program consistently

- G. Stipulate that content be aligned with *STL*.
- H. Mandate instruction in the study of technology as part of the core educational experience for all students.
- I. Advocate content that complements school district, state/provincial/regional, and national/federal standards in other academic areas.
- J. Assure that the study of technology occurs across disciplines.
- K. Assure that the study of technology occurs across grade levels.
- L. Promote adaptability to enhance the study of technology.

Standard P-2: Technology program implementation will facilitate technological literacy for all students.

Guidelines for meeting Standard P-2 require that administrators responsible for establishing the cross-curricular technology program consistently

- E. Employ licensed teachers to deliver technology content.
- F. Support sustained professional growth and development of all educators.
- G. Encourage instruction that is consistent with research on how students learn technology.
- H. Advocate instruction that is designed to meet curricular goals and student needs.
- I. Commit to the recruitment of technologically competent teachers.
- J. Encourage all teachers to develop student leadership opportunities.

Standard P-3: Technology program evaluation will ensure and facilitate technological literacy for all students.

Guidelines for meeting Standard P-3 require that administrators responsible for establishing the cross-curricular technology program consistently

- G. Assure that evaluation is consistent with standards and guidelines in “Program Standards.”
- H. Employ systematic, continuous evaluation.
- I. Encourage evaluation of instruction on a regular basis.
- J. Plan for program revision.

Standard P-4: Technology program learning environments will facilitate technological literacy for all students.

Guidelines for meeting Standard P-4 require that administrators responsible for establishing the cross-curricular technology program consistently

- F. Provide learning environments that are designed to facilitate delivery of *STL* and satisfy “Program Standards.”
- G. Provide learning environments that are safe, up-to-date, and adaptable.
- H. Ensure that the number of students in a dedicated technology laboratory-classroom does not exceed its capacity.
- I. Provide elementary school classrooms with adequate physical space for teaching technology.
- J. Provide dedicated technology laboratory-classrooms in middle and high schools with a minimum allotment of 100 square feet per pupil, inclusive of safe ancillary space.

Standard P-5: Technology program management will be provided by designated personnel at the school, school district, and state/provincial/regional levels.

Guidelines for meeting Standard P-5 require that administrators responsible for the management of the cross-curricular technology program consistently

- D. Develop and use action plans based on *STL*.
- E. Maintain data collection for accountability.
- F. Market and promote the study of technology.
- G. Provide funding, support, and resources to accomplish missions, goals, and curricular objectives.
- H. Align technology programs with state/provincial/regional accreditation systems.
- I. Establish articulated and integrated technology programs district wide.
- J. Establish and utilize a management system.
- K. Support professional technology organization engagement by teachers and management personnel.
- L. Provide resources and opportunities to support technology teachers and other content area teachers in the teaching and learning process.

To Order, Contact:



**International Technology
Education Association**

Technology for All Americans Project

1914 Association Drive, Suite 201
Reston, VA 20191-1539

Phone (703) 860-2100

Fax (703) 860-0353

Email itea@iris.org

URL www.iteawww.org