

Advancing Excellence in Technological Literacy: Student Assessment, Professional Development, and Program Standards

STL sets forth the vision that all students can become technologically literate. To realize this vision, *STL* and *AETL* must be implemented.

Introduction

In March 2003, the International Technology Education Association (ITEA) will release *Advancing Excellence in Technological Literacy: Student Assessment, Professional Development, and Program Standards (AETL)* at its 65th annual conference in Nashville, Tennessee. *AETL* is based on *Standards for Technological Literacy: Content for the Study of Technology (STL)* and is designed as a companion to *STL*. *AETL* was developed from 2000 to 2003 by ITEA's Technology for All Americans Project (TfAAP), through grants from the National Science Foundation (NSF) and the National Aeronautics and Space Administration (NASA).

The three sets of standards in *AETL* support *STL*. *AETL* provides standards and guidelines that address student assessment, professional development, and program enhancement. The

primary goal of all the standards is to help students achieve technological literacy.

The TfAAP Advisory Group provided valuable counsel in the best practice of standards development to

International Technology Education Association's Technology for All Americans Project Staff

the project. A listing of the people who served on this Advisory Group is given in Table 1. They met annually in Washington, DC.

The TfAAP Standards Writing Team was made up of 27 people (three teams of nine). They 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. The develop-

ment and refinement of *AETL* took place over three years (2000-2003) and involved hundreds of educators and experts in the fields of technology, mathematics, science, engineering, and other disciplines. 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.

Overview of AETL

Chapters 1 and 2 of *AETL* provide valuable introductory material. Chapter 1 is an overview that presents the rationale of need and conceptually introduces chapters 3, 4, and 5. Chapter 2 discusses relevant principles and definitions.

AETL consists of three separate but interrelated sets of standards:

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

The standards in *AETL* are based upon *STL*. To fully and effectively implement the content standards in *STL*, all of the *AETL* standards presented in chapters 3, 4, and 5 must be met through the guidelines. While

Table 1. ITEA-TfAAP Advisory Group

Rodger Bybee, President, Biological Sciences Curriculum Study, Colorado Springs, CO
 Rodney Custer, Chair, Department of Technology, Illinois State University, Normal, IL
 Elsa Garmire, Professor of Engineering, Dartmouth College, Hanover, NH
 Gene Martin, Special Assistant to the Vice President of Academic Affairs for Extended Learning, Southwest Texas State University, San Marcos, TX
 JoEllen Roseman, Director, Project 2061, American Association for the Advancement of Science, Washington, DC
 Linda Rosen, Senior Vice President, Education, National Alliance of Business, Washington, DC
 James Rubillo, Executive Director, National Council of Teachers of Mathematics, Reston, VA
 Gerald Wheeler, Executive Director, National Science Teachers Association, Arlington, VA
 Pat White, Executive Director, Triangle Coalition for Science and Technology Education, Washington, DC
 Michael Wright, Coordinator of Technology and Occupational Education, Central Missouri State University, Warrensburg, MO

- Research-Based Assessment Principles
- Practical Contexts
- Data Collection

While the student assessment standards (see Table 3) define how assessment of technological literacy should be designed and implemented, chapter 3 does not provide a test, quiz, or other handy instrument to be photocopied and used in the laboratory-classroom. This task is left—as it should be—to individual teachers and others.

Users of the student assessment standards should recognize that student assessment should be *formative* (ongoing) as well as *summative* (occurring at the end). Further, users should recognize that the assessment process should be *informative*; that is, it should inform students and teachers about progress toward technological literacy and provide data on the effectiveness of instruction and the program. Teachers should use student assessment data to improve classroom practices, plan curricula, develop self-directed learners, report student progress, and research teaching practices.

Professional Development Standards (Chapter 4)

Chapter 4 presents criteria for professional development providers

AETL is designed to leave specific curricular decisions to educators, teachers, professional development providers, and administrators should use *STL* and *AETL* as guides for advancing technological literacy for all students. And finally, chapter 6 of *AETL* invites users to participate in the visionary basis of *STL* and *AETL*. The Appendices include a history of TfAAP (Appendix A), acknowledgements (Appendix B), a listing of *STL* content standards for technological literacy (Appendix C), a listing of the standards and guidelines from *AETL* (Appendix D), a correlation chart (Appendix E), references and resources (Appendix F), a glossary (Appendix G), and an index (Appendix H).

Student Assessment Standards (Chapter 3)

The definition for student assessment presented in *AETL* is “the systematic, multi-step process of collecting evidence on student learning, under-

standing, 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

Table 2. The Number of Standards and Guidelines in *AETL*

<i>AETL</i> Standards	Standards	Guidelines
Student Assessment	5	23
Professional Development	7	36
Program	5	24* 30**

* Guidelines for Teachers

** Guidelines for Administrators

(including teacher educators, supervisors, and administrators) to use in planning professional development. Professional development includes 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 teachers whose primary focus may be another subject area.

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 this document should focus on preparing teachers to continue to pursue professional development to keep up with changing technologies and current research on how students learn. The necessity to address issues of technological literacy is pertinent to all programs that prepare teachers of every grade level, including K-5 elementary teachers and teachers of science, mathematics, social studies, language arts, and other content areas. Therefore, faculty members in every teacher preparation program can use *STL* and *AETL* to determine how the technological literacy of teacher candidates can be enhanced.

Program Standards (Chapter 5)

As defined in *AETL*, the program refers to everything that affects student learning, including content, professional development, curricula, instruction, student assessment, and the learning environment implemented across grade levels. The

Table 3. Student Assessment Standards

- A-1. Assessment of student learning will be consistent with *Standards for Technological Literacy: Content for the Study of Technology (STL)*.
- A-2. Assessment of student learning will be explicitly matched to the intended purpose.
- A-3. Assessment of student learning will be systematic and derived from research-based assessment principles.
- A-4. Assessment of student learning will reflect practical contexts consistent with the nature of technology.
- A-5. Assessment of student learning will incorporate data collection for accountability, professional development, and program enhancement.

system-wide technology program manages the study of technology in technology laboratory-classrooms as well as in other content area classrooms. The primary audiences for the program standards are twofold: (1) teachers and (2) administrators (including supervisors). As a result of this, the guidelines are divided for addressing these two audiences.

Chapter 5 presents criteria for teachers and administrators (including supervisors) responsible for the technology program and system-wide technology program. 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

Table 4. Professional Development Standards

- 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)*.
- PD-2. Professional development will provide teachers with educational perspectives on students as learners of technology.
- PD-3. Professional development will prepare teachers to design and evaluate technology curricula and programs.
- PD-4. Professional development will prepare teachers to use instructional strategies that enhance technology teaching, student learning, and student assessment.
- PD-5. Professional development will prepare teachers to design and manage learning environments that promote technological literacy.
- PD-6. Professional development will prepare teachers to be responsible for their own continued professional growth.
- PD-7. Professional development providers will plan, implement, and evaluate the pre-service and in-service education of teachers.

Table 5. Program Standards

- P-1. Technology program development will be consistent with *Standards for Technological Literacy: Content for the Study of Technology (STL)*.
- P-2. Technology program implementation will facilitate technological literacy for all students.
- P-3. Technology program evaluation will ensure and facilitate technological literacy for all students.
- P-4. Technology program learning environments will facilitate technological literacy for all students.
- P-5. Technology program management will be provided by designated personnel at the school, school district, and state/provincial/regional levels.

given standard. ITEA does not recommend that users eliminate any of the guidelines; however, users may add to the guidelines if there is a need to accommodate local differences. A sample standard (A-4) with related guidelines is presented in Table 6.

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. A few of the vignettes were generated especially for *AETL* and are fictional, not having been tried and tested. Users should be cautioned not to read any vignette too literally or narrowly.

Redundancy of the Standards

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, program standards must incorporate the elements of both student assessment and professional development. Some correlations are indicated within the chapters as well as in Appendix E; those which identify connections within and between the three sets of *AETL* standards as well as connections to the standards in *STL*. As with other standards documents, *AETL* should be viewed as dynamic and open to review, revision, and improvement.

Innovating the Future

In the future, ITEA will encourage the adoption of *STL* and *AETL*. However, this will require not only ITEA’s

- Evaluation
- Learning Environments
- Management

Users of the program standards should recognize that thoughtful design and implementation of technology programs at school levels and of system-wide technology programs at district levels 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 (see Table 5) 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.

Guidelines, Enablers to Meet the Standards

Guidelines play a vital role in *AETL*. Under each standard a number of guidelines are presented and must be addressed to enable the user to meet a

Table 6. Standard A-4 with Related Guidelines

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

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 developed around *STL* and *AETL* to assist teachers in putting the standards into practice.

STL sets forth the vision that all students can become technologically literate. To realize this vision, *STL* and *AETL* must be implemented. This will take considerable time and effort, but the rewards will be worthwhile in terms of personal, national, and global achievement, resulting in a populace that has knowledge and abilities to understand how human innovation can modify the world and universe in positive and productive ways.

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Appreciation is given to all those who assisted in the development, review, and refinement of AETL.

Questions or comments may be e-mailed to standards@itea-tfaap.org.

MILLERSVILLE
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**INDUSTRY AND TECHNOLOGY DEPARTMENT
TECHNOLOGY EDUCATION
ASSISTANT/ASSOCIATE PROFESSOR**

Full-time, tenure-track beginning August 2003. Primary teaching responsibilities will be for undergraduate and graduate courses taught to technology education and industrial technology majors. Teach some combination of courses in Electrical/Electronic Systems I; Student Teaching Professional Seminar; and/or Energy, Power and Transportation. Develop and implement assignments and activities for professional and laboratory-based courses in technology education and industrial technology. Demonstrate effective laboratory organization and management. Supervise student teachers. Teach day or evening courses.

Secondary teaching responsibilities could include teaching other introductory-level technological literacy courses and a graduate course entitled Teaching Technology in the Elementary School.

Opportunity: Contribute to the development of modern technology education laboratories during the construction of a Center of Excellence for the study of industry and technology.

Required: Master's degree plus thirty (30) earned graduate credits toward a doctorate (completion of doctorate required by the time of the reappointment to the fifth year); earned baccalaureate degree in technology education or a closely related field; three years professional experience in teaching technology education; evidence of technical expertise in electricity, electronics, energy, power, and transportation; demonstrated proficiency in the use of instructional technology equipment; evidence of ability to conduct and supervise scholarly activities; evidence of commitment to serve diverse populations; evidence of commitment to a safe and healthy laboratory environment; evidence of ability to work cooperatively with colleagues; and successful interview and teaching demonstration.

Preferred: Completed doctorate; documented teaching effectiveness as evidenced by student evaluations and peer reviews; and evidence of technical expertise in one or more subject areas most closely associated with technology education in addition to electronics, power, and transportation.

Full consideration given to applications received by **February 14, 2003**. Send letter of application addressing qualifications; curriculum vitae; copies of undergraduate and graduate transcripts; and three original, current letters of recommendation to: **Dr. Joseph M. McCade, Search Committee Chair, Industry and Technology Department/TT0203, Millersville University, P. O. Box 1002, Millersville, PA 17551-0302, Phone: (717) 872-3321; Fax: (717) 872-3318, E-mail: itec@millersville.edu.**

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