REPORTING ON THE STATUS OF TECHNOLOGY EDUCATION IN THE U.S.

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The data on *STL* and *AETL* usage is positive in the respect that more and more states are becoming informed about what technology/ technological literacy encompasses.

The International Technology Education Association's Technology for All Americans Project (ITEA-TfAAP) conducted a survey in the spring and summer academic semesters of 2004 to determine the current state of technology education. This survey was a follow-up to a 2001-2002 study by Pamela Newberry, former staff member at TfAAP, in 2000-2001 (Newberry, 2001). It is intended to contribute to longitudinal data on technology education.

As indicated by Newberry, states in the last two decades have moved toward mandating a core set of subject areas for all students as a way to meet national educational standards. This trend has been encouraged by the need for states to comply with the No Child Left Behind (NCLB) Act in terms of accountability. This survey sought to obtain a snapshot of the current state of technology education and place the data obtained in the context of the standards movement, NCLB requirements, and the increasing need for a technologically literate citizenry.

Survey Method

Questionnaires were sent via e-mail to all state technology education supervisors in the 50 states, the District of Columbia, and Puerto Rico. In cases where no supervisor was available, alternate contacts in the state education departments were used. Telephone follow-up was conducted in summer 2004 to attempt to gather unreported data and clarify responses as necessary.

The survey consisted of five questions. The first three questions were duplicated from the Newberry 2000-2001 study. Questions 4 and 5 were added in the 2004 survey.

1. Is technology education in your state framework?
2. Is technology education required in your state? If so, at what grade levels?
3. How many technology education teachers are in your state?
4. Is *Standards for Technological Literacy: Content for the Study of Technology* used in your state? If so, how?
5. Is *Advancing Excellence in Technological Literacy: Student Assessment, Professional Development, and Program Standards* used in your state? If so, how?

Based upon responses received by Newberry in 2001 and by TfAAP staff in 2004, telephone follow-up was conducted on Question 2, asking respondents to clarify their answers based on the following choices: yes, no, under local control, it is an elective, the requirement is pending/proposed.

The data tables that follow this report are abbreviated. Brackets indicate interpretation by TfAAP staff based upon the comments provided by the respondent. The full data tables with comments are viewable online at www.iteawww.org/TAA/Resources MainPage.htm.

Who Responded?

All 50 states and the District of Columbia contributed to this survey. Puerto Rico did not respond, making the return rate 98%. For ease of reporting, the term "states" is used to refer to the 50 states as well as the District of Columbia and Puerto Rico.

Technology Education in State Frameworks

Data indicate that 38 states (73.1%) include technology in the state framework. This is an increase over the 2001 report of 30 states (57.7%). Correspondingly, the number of states that answered "no" to Question 1 decreased from 18 (34.6%) in 2001 to 12 (23.1%) in 2004 (see Figure 1). New Jersey indicated that a proposal for state standards for technological literacy was being considered.

Out of the 38 states that responded affirmatively, five states (13.2%), Alabama, Hawaii, Kentucky, Oregon,

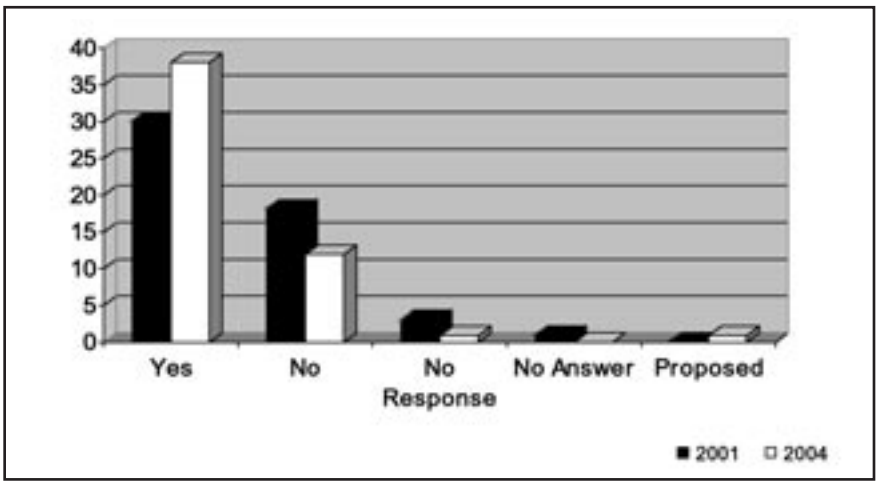

Figure 1: Summary of 2001 and 2004 Responses to "Is technology education in your state framework?"

and Vermont, indicated that technology education was part of a career preparation framework. Iowa includes technology education as part of "Industrial Technology," which also includes industrial education and trade and industry.

Also, five of the 38 states (13.2%) (Colorado, Maine, Maryland, Massachusetts, and New Hampshire) commented that technology education was embedded into the curricular framework. In other words, technology education was not being delivered separately but as part of other core subject classes. Maryland is planning to present content standards aligned with *Standards for Technological Literacy* (*STL*) (ITEA, 2000/2002) to the Maryland State Board of Education for approval, thereby shifting from an embedded framework to an independent framework for technology education. In Massachusetts, technology education is incorporated into a science, technology, and engineering curricular framework, and all of their curricular frameworks are available for viewing on the Internet at www.doe.mass.edu/frameworks/current.html. And Colorado reported specifically that, while technology education is embedded, *STL* Standards 14-20 are not embedded, but are under district or local control. These standards deal with The Designed World, which includes medical technologies, agricultural and related biotechnologies, energy and power technologies, information and communication technologies, transportation technologies, manufacturing technologies, and construction technologies.

Technology Education Requirements

When asked in Question 2 if technology education was required, 12 states (23.1%) answered yes (see Figure 2). This is a slight decrease from the 2001 figure of 14 states (27%).

Respondents provided a variety of explanatory comments when answering Question 2 that begged the question: How many of those who responded "no" would have chosen to answer "local control" or "elective" if those options had been provided? All of those who initially responded negatively were contacted via telephone and provided with the options: "Yes," "No," "Under Local Control," "Elective," or "Pending/Proposed as a Requirement." As a result, there were no states (0%) that answered negatively in the 2004 survey, as compared to the 2001 data of 10 states (19.2%). A comparison between responses other than "yes" to Question 2 in the 2001 and 2004 surveys is not valid, because although 22 states indicated "local control" or "elective" in the 2001 survey, and the data was reported in that fashion, there is no indication that follow-up phone calls were made to give respondents the opportunity to revise their negative answer. It is recommended that follow-up surveys on this question be conducted in a fashion similar to the 2004 survey rather than being asked a "yes or no" question.

As a result of the revision of Question 2, 15 states (28.8%) indicated that technology education requirements were under local or district control. Twenty-two states (42.3%) indicated that technology education was offered as an elective.

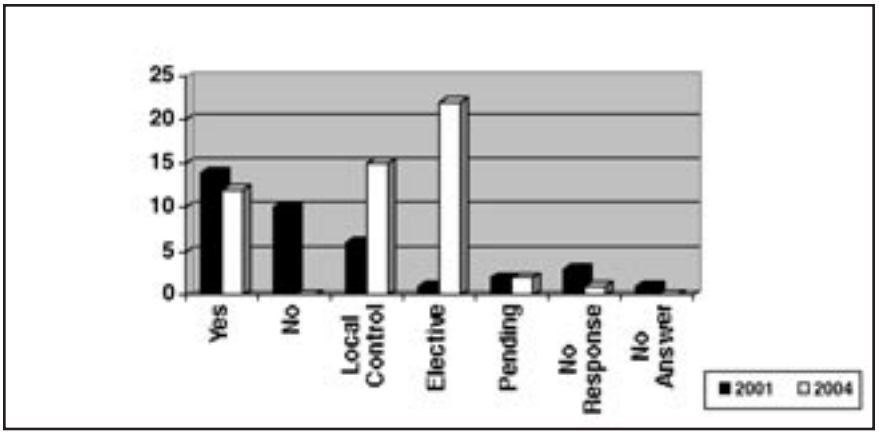

Figure 2: Summary of 2001 and 2004 Responses to "Is technology education required?"

Additionally, two states (3.8%) are proposing technology education as a requirement. In New Jersey, it is to become required in Grades K-8 and offered as an elective in Grades 9-12. In Oregon, it is currently under local control, but state mandates as a requirement are pending.

Of the states with requirements for technology education, the grade levels at which it is required vary. Arizona and Massachusetts report requirements K-12. Nevada has standards that must be achieved at Grades 3, 5, and 12. New Jersey is proposing required integration with other school subjects from Grades K-8. New York requires a unit of study by Grade 8. Wyoming has requirements at Grades 4, 8, and 11. And Iowa, Maryland, Michigan, Mississippi, Montana, Pennsylvania, and Utah all have requirements at the secondary level.

Number of Technology Education Teachers

Responding to Question 3, 20 states indicated that the number of technology education teachers was an approximation, which may imply that the same is true for other states, although it was not indicated. One state, New Jersey, was unable to provide any data on Question 3. The comments provided by respondents indicate potential inconsistency on what defines a technology education teacher. For example, in the case of an embedded curricular framework, should the science or social studies teacher be counted as a technology education teacher?

In any case, comparison of the 2004 approximation with previous surveys indicates an overall decrease in the number of technology education teachers across the nation (see Figure 3). In 2003, Hassan Ndahi and John Ritz reported on follow-up research being conducted by Old Dominion University based on a graduate study conducted by Shirley Weston there in 1997. The Old Dominion research focused on technology education teacher demand. The Weston figures for 1997 estimate that 37,968 technology education teachers were employed in the United States, with one state unreported. Ndahi and Ritz reported that there were 36,261 technology education teachers employed in 2001 (Ndahi & Ritz, 2003). This is different from the results of the 2000-2001 academic year findings of Newberry, which reported 38,537 technology education teachers with two states not reporting. Potentially, this inconsistency is due to the sources used: The Old Dominion studies used state supervisors and state boards of education for their figures, while the Newberry study reportedly made use of alternative sources. In any case, the 2004 study, which relied upon state supervisors and state boards of education similar to the methods used in the Old Dominion studies, indicates 35,909 technology education teachers, with one state unreported.

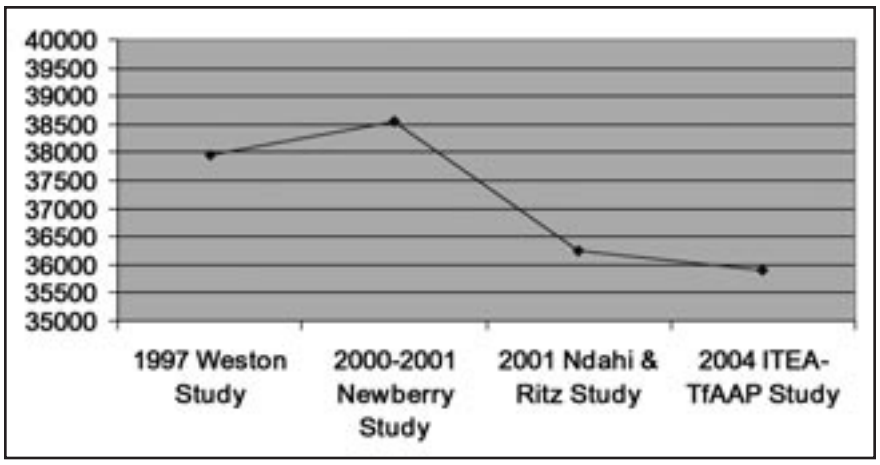

Figure 3: Summary of 1997 Weston study, 2001 Newberry study, 2001 Ndahi & Ritz Study, and 2004 ITEA-TfAAP Study on the number of technology education teachers in the United States.

National Technological Literacy Standards Usage

In response to Question 4, state supervisors report that 41 states (78.8%) are using *Standards for Technological Literacy* (*STL*) (ITEA, 2000/2002) either at the state level or in localities and districts, with two states reporting as unknown. This compares to the 2001 Ndahi & Ritz findings (reported in 2003) that 43 states (83%) were using *STL*. Both the 2004 survey and the Ndahi & Ritz survey showed that seven states (13.5%) were not using *STL*. Averaging these data indicates that *STL* is used by four out of every five states across the nation.

Based on the comments provided in the responses, 28 states (53.8%) have either based their own standards and curricular materials on *STL* or aligned their standards and curricular frameworks with *STL*. An additional five states (9.6%) have adopted or adapted *STL*: North Dakota, Ohio, South Dakota, Tennessee, and Washington. It is interesting to note that three of these states—North Dakota, Ohio, and Tennessee—are members of ITEA's 2004 Center to Advance the Teaching of Technology & Science (CATTS) Consortium, which provides many benefits in terms of professional development and implementation of the standards in *STL* and *AETL*. Additionally, of the 12 CATTS states, eight of them indicated that their own standards and/or curricular materials are based on or aligned with *STL*: Florida, Georgia, Kentucky, Missouri,

North Carolina, Virginia, Utah, and Wisconsin. The final CATTS state, Maryland, is in the process of presenting standards based on *STL* to the state board of education for approval.

The companion standards to *STL*, which were published by ITEA in 2003 in a document entitled *Advancing Excellence in Technological Literacy: Student Assessment, Professional Development, and Program Standards* (*AETL*), show less usage than *STL*. In Response to Question 5, *AETL* usage was reported by 22 states (42.3%). Twenty-three states (44.2%) are not using *AETL* yet. The difference between *STL* and *AETL* usage is not unexpected, considering *AETL* had been published one year prior to the time the survey was conducted. Four states—Florida, Georgia, Indiana, and North Carolina—commented on the need for implementation procedures for *AETL.* Comments also revealed that, at the state level, the professional development standards in *AETL* were of particular use.

	STL Used? 2004	*STL* Used? 2003*	*AETL* Used? 2004
Yes	41	43	22
No	7	7	23
Unknown	2	0	5
No Response	1	0	1
No Answer	1	0	1

Table 1: Summary of 2004 ITEA-TfAAP Study and 2003 Ndahi & Ritz Report on the usage of national technological literacy standards in the United States.

Conclusions/Discussion

The increase in the number of states that include technology education in the state framework may indicate that, as a nation, we are placing increasing importance on technology education as part of the overall learning experience. This trend is likely instigated by research on the increasing need for a technologically literate populace. (ITEA, 1996; ITEA 2000/2002; ITEA 2003; NAE & NRC, 2002; Rose & Dugger, 2002; Rose, Gallup, Dugger, & Starkweather, 2004.)

Requiring technology education is another issue, however. While nearly a quarter of the nation requires technology education in some way, and the other three-quarters of the nation offer it as an elective or leave the decision to localities or districts, the method used to deliver technology education varies considerably. While conclusive data is not available, comments indicate that some states offer technology education as a separate subject, one designed to deliver technological literacy. Other states embed technological literacy concepts into the curriculum of other core subject areas, such as science. And still other states provide technology education as part of a career and technical context.

While NCLB does not identify technology education as a subject area, it does require *technology literacy*—sometimes referred to interchangeably in U.S. Department of Education documents as *technological literacy*—for all students by 2006. However, NCLB does not define precisely what technology/technological literacy means. The Partnership for 21st Century Skills, which brought together educators, administrators, parents, businesses, and community leaders to define twenty-first century skills, has been building a consensual definition of what technology/technological literacy means. Information on the Partnership can be found online at www.21stcenturyskills.org. The U.S. Department of Education is identified as a key partner of this group, and discussions with the Office of Educational Technology reveal that the U.S. Department of Education is very much interested in a definition that extends beyond informational/educational technology alone and includes relevance to such things as agriculture, medicine, manufacturing, and construction, much like the definition in *STL*. For example, a math and science initiative is underway to examine how a broader definition of technological literacy can be delivered in the classroom.

Hence, it appears that the intent of NCLB mandates for technology/technological literacy are very much in line with the vision for technological literacy defined in *STL*. It remains to be seen, however, whether implementation of NCLB mandates will focus, through a lack of awareness, on information and communication technology alone. And while aspects of technological literacy can and should be delivered through mathematics, science, and other core subject classrooms, full implementation of the standards in *STL* is unlikely through embedded curricula at the secondary level. Technology education is the only subject area specifically designed to deliver technological literacy. Identifying technology education as a core subject area—and therefore a requirement for graduation—is one way to ensure that all students will become technologically literate as intended by NCLB and *STL*. Such a distinction would also ensure that

technological literacy is delivered in a practical, real-world fashion, incorporating hands-on teaching and learning strategies, as mandated by the standards in *STL*. The U.S. Department of Education commented that delivery of technology/technological literacy to meet NCLB requirements is not specified as either a separate subject or an integrated/embedded subject, thus giving states flexibility on the issue of implementation. In any case, it is important that efforts continue to educate educators, administrators, and the public on the broader definition of technology/technological literacy as supported by NCLB, the U.S. Department of Education, and *STL*.

Indications that the number of technology education teachers is decreasing is cause for concern in the wake of the NCLB mandates for technology/technological literacy. The seeming decrease may be misleading, as it does not reflect the science, social studies, and other core subject teachers who are expected to deliver technological literacy in addition to their traditional curriculum. Additionally, the numbers collected have little or no reflection on the number of elementary teachers delivering technological literacy in the classroom. Future studies on the state of technology education in grade school classrooms is much needed, as engagement by the early learner is important to the vision of technological literacy for all students. It is important that elementary teachers, as well as core subject area teachers at the secondary level who are teaching technological literacy, be well acquainted with the standards in *STL*, as they are the only nationally-accepted accountability measures for technological literacy.

The data on *STL* and *AETL* usage is positive in the respect that more and more states are becoming informed about what technology/technological literacy encompasses. Continued implementation and dissemination efforts will likely help maintain and even increase the number of states using the standards, particularly in the case of *AETL*, which was released relatively recently.

Considered in totality, the survey data and the implications of that data reinforce the need for continued implementation and dissemination of *STL* and *AETL*, with an emphasis on professional development and outreach efforts. And with the publication of the first addendum to the standards (on student assessment), *Measuring Progress: A Guide to Assessing Students for Technological Literacy* (ITEA 2004), and the expected publication of three additional addenda on programs for technology, professional development, and curricula, the tools are becoming available to enhance implementation of the standards in both *STL* and *AETL*.

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Special thanks to **Lisa Delany**, *former staff member, and* **Crystal Nichols**, *Administrative Assistant for Office Operations, for their considerable work in sending out questionnaires and compiling data. Appreciation is also given to* **Steve Shumway**, *Brigham Young University, who assisted with this research.*

Table 2: Data on the Status of Technology Education in the U.S., 2004.

States	TE in State Framework?	TE Required, grades?	Number of Tech Ed Teachers?	*STL* Used? How?	*AETL* Used? How?
Alabama	Yes*	Elective	180	Yes*	No
Alaska	[No]*	Elective	Approx. 200	[Yes]*	[Unknown]*
Arizona	Yes	Yes*	2,355	No*	No*
Arkansas	Yes	Elective*	85	No	No
California	[No]*	Local*	Approx. 1500*	[No]*	[No]*
Colorado	Yes*	[Local]*	100-250*	Yes*	No
Connecticut	Yes	Elective	625	Yes*	No
Delaware	No	Elective*	92	Yes*	Yes*
District of Columbia	[No]*	Elective*	61*	Yes*	Yes*
Florida	[Yes]*	Elective*	1635*	Yes*	[Yes]*
Georgia	Yes*	Elective*	650	Yes*	Yes*
Hawaii	Yes*	Elective*	35	[Yes]*	No
Idaho	No	[Local]*	95*	Yes*	No
Illinois	No	[Local]*	1086*	Yes*	[Unknown]*
Indiana	Yes	Elective*	1044*	[Yes]*	[Yes]*
Iowa	[Yes]*	Yes*	1,100*	[Yes]*	[No]*
Kansas	[Yes]*	Local	Estimate 450*	Yes*	[No]*
Kentucky	[Yes]*	Local*	285	Yes*	[Yes]*
Louisiana	Yes	Elective*	500	Yes*	Yes*
Maine	No*	Local	270	No*	No
Maryland	[Yes]*	Yes*	1021*	[Yes]*	No*
Massachusetts	Yes*	Yes*	700	[No Answer]	[No Answer]
Michigan	Yes*	Yes*	1288*	Yes*	Yes*
Minnesota	Yes	Local*	Approximately 850	Yes*	Yes*
Mississippi	Yes	[Yes]*	390	Yes*	No
Missouri	No	[Elective]*	926	Yes*	Yes*
Montana	Yes	Elective*	230	Yes*	No
Nebraska	Yes	Elective*	487*	Yes*	Yes*
Nevada	[Yes]*	Yes*	Approximately 60	[No]*	[No]*
New Hampshire	[Yes]*	[Yes]*	155	Yes*	[No]*
New Jersey	[Proposed]*	[Proposed]*	[No Answer]*	Yes*	Yes*
New Mexico	No	No	Approximately 250	[Yes]*	[Unknown]*
New York	Yes	Yes*	Approximately 2800	Not sure. Unknown	Not sure. Unknown.
North Carolina	Yes*	Elective*	650*	Yes*	[Yes]*
North Dakota	Yes	[Local]*	Approximately 120*	Yes*	[Yes]*
Ohio	[Yes]*	[Elective]*	1,900??	[Yes]*	[Yes]*
Oklahoma	Yes	Local	250	Yes*	No
Oregon	Yes*	Pending/Proposed*	2700+	No	No
Pennsylvania	No	Yes*	About 2,000	Yes*	[No]*
Puerto Rico	[No Response]	[No Response]	[No Response]	[No Response]	[No Response]
Rhode Island	No	Local Control*	425	No*	[No]*
South Carolina	No	Elective*	200-250	Yes*	Yes*
South Dakota	Yes	[Elective]*	About 210*	Yes*	[No]*
Tennessee	Yes*	[Elective]*	389*	Yes*	Yes*
Texas	[Yes]*	[Local]*	2,171	[Yes]*	[No]*
Utah	Yes	Yes*	279 active teachers	Yes*	Yes*
Vermont	Yes*	Local Control	260*	[Unknown]*	[Unknown]*
Virginia	Yes*	Elective*	1,100	Yes*	Yes*
Washington	Yes	Elective	Less than 50	Yes*	Yes*
West Virginia	Yes*	Elective	208*	Yes*	No
Wisconsin	[Yes]*	Local Control	Approximately 1,100	Yes*	Yes*
Wyoming	Yes	Yes*	192*	Yes*	Yes*

Table 2: *(Continued)*

TE in State Framework?	Totals:		Percentages:	
	2001	2004	2001	2004
Yes	30	38	57.7%	73.1%
No	18	12	34.6%	23.1%
No Response	3	1	5.8%	1.9%
No Answer	1	—	1.9%	—
Proposed	—	1	—	1.9%

Number of Tech Ed Teachers?

2001: 38,537

2004: 35,909

TE Required?	Totals:		Percentages:	
	2001	2004	2001	2004
Yes	14	12	27%	23.1%
No	10	0	19.2%	—
Local	6	15	11.5%	28.8%
Elective	1	22	30.8%	42.3%
Pending	2	2	3.8%	3.8%
No Response	3	1	5.8%	1.9%
No Answer	1	0	1.9%	—

	***STL* Used?** (2004 Only)		***AETL* Used?** (2004 Only)	
	Totals:	Percentages:	Totals:	Percentages:
Yes	41	78.8%	22	42.3%
No	7	13.5%	23	44.2%
Unknown	2	3.8%	5	9.6%
No Response	1	1.9%	1	1.9%
No Answer	1	1.9%	1	1.9%

Notes:
Data collected as of August 16, 2004 from 50 states and the District of Columbia. Puerto Rico did not respond.

[ ] Indicates staff interpretation of comment.

* Indicates additional information/comments were received. The full data tables are available at www.iteawww.org/TAA/ResourcesMainPage.htm.

2001 figures from Newberry, 2001.