
Technology Literacy Assessment Pilot

Final Results for 2007-08 and 2008-09

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**Prepared for
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Background

Texas students are currently required by federal law to be technology literate by the end of the eighth grade. The state defines a “technology literate student” as a student who meets the requirements of the state’s Technology Applications Texas Essential Knowledge and Skills (TEKS). In addition, the Texas Education Agency’s (TEA’s) Long-Range Plan for Technology, 2006-2020, includes a priority for Technology Applications accountability at grades 2, 5, and 8. The state has rigorous Technology Applications content standards and has adopted Technology Applications instructional materials; however, there is no standard statewide process in place for assessing students’ technology literacy.

During the 80th Texas Legislature, 2007, the passage of House Bill (HB) 2503 added Texas Education Code (TEC), §39.0235. The law and accompanying regulation required the establishment of a pilot program in which participating school districts measured student technology proficiency using an agency-adopted testing instrument designed to assess an individual student’s mastery of the essential knowledge and skills in technology. According to law, the designated assessment was to be administered by the school districts participating in the pilot program. After issuing a Request for Product and analyzing applicants, Learning.com’s TechLiteracy Assessment product was chosen for the pilot study. The law stipulated that the existing instrument must be administered online, align with the Technology Applications TEKS, incorporate performance-based measures including a requirement that students perform certain technological tasks and respond to questions based on the completion of those tasks, and be designed in a manner to provide the district with an automatic report of the technology literacy proficiency of a student in a format that is compatible with the school district and state data information systems.

Sections to follow describe features of the TechLiteracy Assessment, explain the pilot study’s research design and sampling process, and present findings from the analysis of assessment data collected by 17 school districts in spring 2008 and spring 2009.

TechLiteracy Assessment

The TechLiteracy Assessment is a web-delivered assessment designed to authentically assess students’ technology knowledge and skills. Elementary students (grades 3 to 5) and middle-school students (grades 6 to 8) complete seven technology skill modules.

Skill Modules. Each module is designed to assess and report meaningful measures of student proficiency with technology tools and related knowledge and skills. The seven modules include:

- **Systems and Fundamentals.** This module assesses tasks central to the understanding and use of computer systems (e.g., creating, storing, and retrieving data; knowledge of basic computer parts and technology vocabulary; troubleshooting computer problems).
- **Social and Ethical.** This module assesses knowledge about accepted ethical norms as they relate to technology, as well as the impact of technology, past and present, on society (e.g., understanding the basics of online safety, identifying ethical and unethical behaviors relative to the transmission of electronic files).

- **Telecommunications and Internet.** This module assesses tasks central to telecommunications, including intra- and inter-office Networks, and Internet software such as browsers and email.
- **Word Processing.** This module assesses tasks central to formatting text and text/page layout (e.g., publishing, printing, and saving documents; applying layout options).
- **Spreadsheets.** This module assesses tasks unique and central to creating, editing, manipulating, and interpreting data in spreadsheet tables, charts, and graphs.
- **Database.** This module assesses tasks central to the use of common database interfaces, such as Web search engines, school library records, and specialized database design software.
- **Multimedia and Presentations.** This module assesses tasks unique and central to the creation and manipulation of graphic, audio, video, and other non-textual products by electronic means (e.g., inserting graphics and other multimedia into documents).

The TechLiteracy Assessment uses a combination of multiple-choice questions and interactive performance-based items to assess student knowledge and skills. The assessment was designed to be completed within a 50-minute class period, and the average duration of the test is about 30 minutes. The test is not timed, so students can have as much time as they need to complete the modules. The complexity of tasks included in each module increases from the elementary level to the middle-school level.

Scores. The TechLiteracy Assessment yields reports at the district, school, class, and student levels. Student performance is measured in two ways.

- **Skill Module Results.** The TechLiteracy Assessment measures student technology literacy through questions in seven skill areas. Results for skill modules indicate the number of items *correct* out of the *possible* number of items, with an overall possibility of a total of 42 items correct. The number of items in each skill module varies slightly from year to year based on adjustments recommended by independent assessment and statistics experts. For the 2007-08 assessment, there was the possibility of 6 items correct for each of the seven eighth-grade modules. Two adjustments were made to the 2008-09 eighth-grade assessment. One redundant item was eliminated from the Word Processing module (resulting in 5 rather than 6 items) and one item was added to the Systems and Fundamentals module (resulting in 7 rather than 6 items). Score validity was unaffected by the change. Skill module results provide indicators of students' strengths and weaknesses in each of the skill areas. Individual results are aggregated at the district, school, or class levels as skill module average, or mean, scores.
- **Proficiency Standard.** The proficiency standard is the scale score that a student must achieve to be deemed proficient with technology tools and concepts. This is a criterion-referenced assessment, with the proficiency standard set by a group of educational technology practitioners and independent psychometricians. The "met proficiency" standard for middle-school students is a scale score of at least 220. Individual student results are aggregated at the district, school, or class levels to produce an average scale score, standard deviation, percent of students met Proficiency Standard, and percent of students below Proficiency Standard.

Research Design

Study Purpose and Questions. The main research purpose for the pilot study was to use a valid and reliable assessment to gauge the extent to which Texas students have mastered the Texas Technology Applications standards by the end of eighth grade, and accordingly, have acquired the technology skills necessary to be successful in the 21st Century global economy. We also investigated the extent to which students' mastery of technology standards varied by school characteristics (student English proficiency, poverty, ethnicity, mobility, and campus size). To answer our questions, we sought a sample of middle-school students for testing that would be representative of the state population.

Sample Selection. The sample size and the selection process were driven to a large extent by the availability of state funds (\$30,000) to administer the TechLiteracy Assessment to a sample of approximately 3,600 students. In January 2008, the TEA released a Request for Statement of Interest (RFSOI) from public school districts and charter schools for participation in the pilot program. Participating school districts had to agree to the administration of the assessment in fifth, sixth, seventh, eighth, or ninth grade. The assessment was provided at "no cost," but districts had to have the infrastructure needed to administer the online assessment to all participating students (in one-to-three days) within the testing window of March to May 2008 and March to May 2009.

Responses to the RFSOI produced a pool of 64 schools nested within 26 districts. Districts typically were interested in assessing a variety of grade levels (mainly 6 through 8). Of the responding districts, seven (27%) were already administering the TechLiteracy Assessment at some grade levels. As a first step in the sampling process, TEA staff and a research consultant agreed that the administration of the pilot assessment at grade 8 would produce the most useful data. Thus, our second pool included 22 districts and 56 middle, intermediate, and junior high schools that proposed testing at grade 8 or that might agree to test grade 8 students. For this sample of districts and schools, we compiled statistics on student enrollment, percentage of economically disadvantaged students, campus and district size, location (e.g., Major Urban, Rural), Education Service Center region, and average STAAR chart score. Our next objective was to select a sample of districts/schools from the pool that would represent Texas eighth graders overall.

Table 1 compares the characteristics of all Texas middle schools that enrolled grade 8 students ($N = 1,407$) with the characteristics of our final sample of TechLiteracy Pilot districts/schools ($N = 17$). Statistics are from AEIS 2007 campus and district reports. Our sample selection process involved the generation of "sample options" and comparisons of the sample's characteristics with statewide distributions and averages. Our sample selection process produced a statistically valid sample of schools, given there were no statistically significant differences between statewide and sample statistics. Our final sample also included just two of the seven districts that were administering the TechLiteracy Assessment prior to the pilot. We excluded most of those districts to eliminate a potential source of bias. We reasoned that districts that purchased the TechLiteracy Assessment with their own funds might make students' mastery of technology skills a higher priority compared to other districts. We included two districts in the sample that had purchased the TechLiteracy Assessment with their own funds because the characteristics of those campuses and students contributed to a statistically representative sample.

Table 1. Characteristics of All Texas Middle Schools (with Grade 8) and TechLiteracy Assessment Pilot Sample Schools

Indicator	Texas Middle Schools N = 1,407	TechLiteracy Pilot Sample N = 17
District Size^a		
% Very small (999 or less)	17.3	23.5
% Small (1,000-2,999)	18.0	17.6
% Mid-Size (3,000-9,999)	16.1	17.6
% Large (10,000 or more)	48.6	41.2
Campus Size^a		
% Small (300 or less)	28.6	29.4
% Mid-Size (301-600)	19.8	17.6
% Large (601 or more)	51.6	52.9
Student Characteristics^b		
Average number of students	614	644
Average number of students in Grade 8	229	219
% Economically disadvantaged	55.5	52.8
% African American	13.9	14.2
% Hispanic	42.6	35.4
% White	40.8	48.7
% Special Education	13.9	14.4
% Limited English Proficient	7.9	9.2
% Passing All TAKS tests	70.8	71.2

Source: AEIS 2007 campus and district reports.

^a Pearson χ^2 tests for differences in size distributions revealed no statistically significant differences between groups.

^b t-tests for differences between group means were not statistically significant.

Findings

Table 2 provides outcomes for the 3,221 eighth graders in 17 districts/schools who completed the first phase of testing in spring 2008, and 3,286 eighth graders in the same districts/schools who completed the second phase of testing in spring 2009. Skill-module comparisons are made between testing years and with a national sample of eighth graders who completed the TechLiteracy Assessment across the same two school years.

Table 2. Summary Statistics for TechLiteracy Assessment Completed by Eighth Graders in Spring 2008 and Spring 2009

Measure	Range ^a	Spring 2008		Spring 2009			
		Texas ^b		Nat'l ^c	Texas ^b		Nat'l ^c
		Mean	SD	Mean	Mean	SD	Mean
Scale Score	100-296	216.4	37.2	222.3	218.2	36.9	220.5
Skill Module Score ^a							
Systems & Fundamentals	0-6, 0-7	2.8	1.5	3.1	3.3	1.8	3.4
Social & Ethical	0-6	3.2	1.4	3.5	3.4	1.2	3.5
Telecommunications & Internet	0-6	3.8	1.6	3.9	3.6	1.5	3.7
Word Processing	0-6, 0-5	3.2	1.5	3.4	3.0	1.2	3.0
Spreadsheets	0-6	2.8	1.6	3.0	3.1	1.6	3.0
Database	0-6	2.9	1.5	3.0	2.3	1.4	2.5
Multimedia & Presentations	0-6	2.3	1.4	2.5	2.6	1.4	2.7
Proficiency Score ^a							
% Met Proficiency Standard		59.1	--	63.5	61.5	--	62.9
% Below Proficiency Standard		40.9	--	36.5	38.5	--	37.1

^a In 2008, each module had a possibility of 6 items correct. In 2009, Systems & Fundamentals had a possibility of 7 items correct, Word processing had a possibility of 5 items correct, and other modules had a possibility of 6 items correct. The middle-school proficiency standard was a Scale Score of 220.

^b Statistics are for Texas eighth graders who completed the TechLiteracy Assessment in spring 2008 (3,221) and spring 2009 (3,286).

^c Statistics are for eighth graders nationally who completed the TechLiteracy Assessment in spring 2008 (101,983) and 2009 (148,566). These students may not comprise a nationally representative sample.

Key Findings

- The average Scale Scores for the samples of Texas eighth graders (216.4 and 218.2 in spring 2008 and 2009, respectively) improved in the second pilot study year but still fell short of the middle-school Proficiency Standard (Scale Score of 220).
- Mean scores for most of the Skill Modules across two testing years indicated that Texas eighth graders completed about half of the module items correctly. Across two years, students had the highest module scores for Telecommunications and Internet, which probably reflects their personal use of technology as a communication tool both within and outside of school.
- Spring 2008-to-spring 2009 comparisons for Texas eighth graders' average Skill Module Scores showed small improvements for modules assessing Systems and Fundamentals (2.8 vs. 3.3), Social and Ethical (3.2 vs. 3.4), Spreadsheets (2.8 vs. 3.1), and Multimedia and Presentations (2.3 vs. 2.6). However, average Skill Module Scores declined across years for Telecommunications and Internet (3.8 vs. 3.6), Word Processing (3.2 vs. 3.0), and Database (2.9 vs. 2.3).
- Across two years, about 6 of 10 Texas eighth graders met the Proficiency Standard needed to show proficiency with technology tools and concepts (59.1% and 61.5% of eighth graders met the Proficiency Standard in spring 2008 and spring 2009, respectively). Results indicate that many Texas eighth graders are failing to acquire the technology knowledge and skills needed to compete in a global society.
- Comparisons with national averages show that the technology proficiency gap between Texas eighth graders and all eighth graders who completed the TechLiteracy Assessment narrowed in spring 2009, with 61.5% of Texas students meeting the proficiency standard compared to 62.9% of eighth graders nationally.

Additional analyses were conducted to determine whether any of the changes in eighth graders scores across years differed to a statistically significant degree. Paired sample *t*-tests were used to compare each schools' average TechLiteracy Assessment scores for eighth graders who completed assessments in spring 2008 and spring 2009. Mean school-level scores were analyzed separately for the Scale Score and Skill Modules. Table 3 displays the mean scores, *t*-values, *p*-values, and effect sizes.

Table 3. Technology Proficiency Differences Between Eighth Graders Who Completed TechLiteracy Assessments in Spring 2008 and Spring 2009 (School-Level Scores)

Measure	Spring 2008 Eighth Graders <i>N</i> = 17		Spring 2009 Eighth Graders <i>N</i> = 17		Differ- ence	<i>t</i> -value	Effect Size
	Mean	<i>SD</i>	Mean	<i>SD</i>			
Scale Score	219.18	14.39	222.19	15.04	2.94	2.250*	0.20
Skill Module Score							
Systems & Fundamentals	2.91	0.53	3.49	0.67	0.57	7.506***	0.87
Social & Ethical	3.24	0.40	3.46	0.33	0.22	4.998***	0.59
Telecommunications & Internet	3.82	0.47	3.61	0.48	-0.20	-4.360***	-0.42
Word Processing	3.29	0.49	3.09	0.39	-0.20	-3.346**	-0.44
Spreadsheets	3.04	0.69	3.30	0.63	0.27	3.831**	0.40
Database	2.87	0.36	2.45	0.41	-0.43	-5.997***	-0.97
Multimedia & Presentation	2.35	0.43	2.72	0.48	0.37	4.067**	0.77

Note. Statistics based on paired-samples *t*-tests for school-level scores of eighth graders tested in 2008 and 2009.

p* < .05. *p* < .01. ****p* < .001. Effect size is Cohen's *d* value. The interpretation is that an effect size greater than 0.5 is large, 0.5-0.3 is moderate, and 0.3-0.1 is small.

Key Findings

- Eighth graders who attended schools that administered the TechLiteracy Assessment in spring 2009 had statistically significant, higher mean Scale Scores (222.2) than eighth graders who completed the assessment in spring 2008 (219.2). However, the difference between groups was small (effect size = .20).
- Eighth graders who completed the TechLiteracy Assessment in spring 2009 compared to eighth graders tested in spring 2008 had higher scores for four modules by statistically significant margins. Moderate to large effect sizes showed that eighth graders in 2009 had better module scores for Systems and Fundamentals (0.96), Multimedia and Presentations (0.82), Social and Ethical (0.61), and Spreadsheets (0.40).
- Eighth graders who completed the TechLiteracy Assessment in spring 2009 compared to eighth graders tested in spring 2008 had lower scores for three modules by statistically significant margins. Moderate to large effect sizes showed that eighth graders in 2009 had lower module scores for Database (-1.10), Word Processing (-0.45), and Telecommunications and Internet (-0.42).

Differences between student groups must be interpreted cautiously because they involve comparisons between cross-sectional cohorts (students at a particular grade level are compared across years). Thus, detected score disparities may reflect differences in the characteristics of students tested across years.

To explore the association between student characteristics and mastery of the Texas Technology Applications Standards, we conducted an analysis of the strength of relationships between student characteristics (measured at the school level), school characteristics, and

students' Scale Scores in 2008 and 2009. Table 4 displays the correlation coefficients with statistically significant coefficients denoted with asterisks.

Table 4. Correlations Between School Characteristics and Eighth Graders' TechLiteracy Scale Scores by Year (School-Level Scores)

School Characteristics	Mean 2008 Scale Score	Mean 2009 Scale Score
Student		
% Limited English	-.74**	-.68**
% Economically disadvantaged	-.75**	-.72**
% African American	.08	.02
% Hispanic	-.69**	-.71**
% White	.62**	.66**
School		
% Mobility	-.34	-.45
Enrollment (student count)	-.33	-.45

** $p < .01$.

Key Findings

- Analyses of the relationships between average student and school characteristics and average Scale Scores show that the percentages of limited English proficient, economically disadvantaged, and Hispanic students at a campus were negatively associated with the TechLiteracy Scale Score at a statistically significant level.
- In contrast, the percentage of White students at a campus was significantly and positively associated with eighth graders Scale Score. Findings for African American students were neutral.
- Results suggest that many disadvantaged students need stronger school supports for their mastery of technology knowledge and skills. The technology-related experiences of White students and more economically advantaged students outside of school may help to explain their superior performance.

Table 5 provides the average TechLiteracy Assessment outcomes for each of the 17 districts/schools that completed assessments in spring 2008 and spring 2009. Scores for 2009 are highlighted in **bold** if the Mean Scale Score increased by at least 5 scale-score points or the Percent Met Proficiency Standard increased by at least 5 percentage points.

Key Findings

- In 2008, the percentage of eighth graders meeting the technology Proficiency Standard varied considerably, from a low of 17.0% (District Q) to a high of 82.7% (District A). In 2009, 7 of 17 districts (41%) had noteworthy increases in the percentages of eighth graders meeting the technology Proficiency standard. However, proficiency rates continued to vary greatly across districts from a low of 33.0% (District Q) to a high of 96.6% (District B).
- In 2008, the mean Scale Score ranged from a low of 180.9 (District Q) to a high of 237.4 (District A). Similarly, in 2009, the mean Scale score ranged from a low of 185.4 (District Q) to a high of 241.8 (District B).
- In both 2008 and 2009, 10 of 17 districts (59%) had an average Scale Score that met or exceeded the proficiency standard of 220.

Table 5. Summary Statistics for TechLiteracy Assessment Completed by Students in Spring 2008 and Spring 2009, by District/School

District/School (student count)	Mean Scale Score	Mean Skill Module Score ^a							% Met Proficiency Standard ^b
		Systems & Fundamentals	Social & Ethical	Telecom. & Internet	Word Processing	Spread- sheets	Database	Multimedia/ Presentation	
District A									
2008 (75)	237.4	3.6	3.8	4.2	3.9	3.9	3.2	3.4	82.7
2009 (66)	240.3	4.5	3.9	4.1	3.5	3.7	3.4	3.1	80.3
District B									
2008 (29)	230.4	3.6	2.9	4.1	3.8	4.6	2.8	2.2	75.9
2009 (29)	241.8	4.7	3.4	3.6	3.6	4.5	2.9	3.8	96.6
District C									
2008 (294)	230.4	3.4	3.8	4.3	3.6	2.9	3.3	2.6	73.5
2009 (304)	229.0	3.7	3.8	4.1	3.0	3.6	2.6	2.9	73.7
District D									
2008 (70)	228.7	3.4	3.5	4.3	3.6	3.1	3.1	2.6	72.9
2009 (46)	232.0	4.0	3.6	4.0	3.5	3.8	2.5	2.7	84.8
District E									
2008 (40)	232.7	3.3	3.5	3.8	4.2	3.9	2.9	2.8	72.5
2009 (39)	233.0	3.4	3.6	3.9	3.7	4.1	2.7	3.5	76.9
District F									
2008 (305)	226.7	3.0	3.6	4.1	3.5	3.3	3.2	2.3	71.5
2009 (253)	225.3	3.3	3.7	3.7	3.2	3.6	2.6	2.7	71.1
District G									
2008 (348)	227.2	3.2	3.5	4.3	3.5	3.1	3.1	2.5	69.8
2009 (358)	225.4	3.5	3.6	3.8	3.2	3.5	2.5	2.7	68.2
District H									
2008 (150)	225.6	3.5	3.3	4.1	3.3	3.2	3.1	2.4	68.7
2009 (167)	236.4	4.4	3.8	4.1	3.5	3.6	2.7	3.0	82.6
District I									
2008 (116)	218.5	2.8	3.3	3.6	3.0	3.1	3.0	2.2	62.9
2009 (121)	217.3	3.4	3.4	3.5	2.6	3.1	2.4	2.4	62.0
District J									
2008 (91)	223.6	3.1	3.4	4.0	3.3	3.0	3.0	2.5	62.6
2009 (86)	230.5	3.8	3.5	3.9	3.3	3.6	2.7	2.9	77.9
District K									
2008 (279)	220.3	2.8	3.1	4.0	3.4	3.1	3.0	2.2	62.4
2009 (282)	214.8	3.0	3.2	3.5	3.0	3.1	2.2	2.3	57.1

Continued

Table 5 (continued)

District/School (student count)	Mean Scale Score	Mean Skill Module Score ^a							% Met Proficiency Standard ^b
		Systems & Fundamentals	Social & Ethical	Telecom. & Internet	Word Processing	Spread- sheets	Database	Multimedia/ Presentation	
District L									
2008 (164)	214.9	2.5	3.2	3.7	3.1	2.8	3.0	2.2	59.1
2009 (202)	210.7	2.8	3.3	3.4	2.8	2.8	2.1	2.5	48.5
District M									
2008 (286)	214.1	2.6	3.2	3.8	3.1	2.6	2.8	2.2	59.1
2009 (307)	225.4	3.5	3.6	3.8	3.1	3.3	2.5	2.9	67.4
District N									
2008 (110)	210.6	2.5	3.1	3.6	3.0	2.6	2.6	2.2	52.7
2009 (104)	218.1	3.5	3.4	3.5	3.2	2.8	2.4	2.5	60.6
District O									
2008 (355)	209.0	2.3	2.9	3.6	2.8	2.5	2.8	2.1	51.0
2009 (407)	215.2	2.9	3.4	3.6	2.8	3.0	2.3	2.5	56.5
District P									
2008 (315)	195.0	2.2	2.6	3.0	2.7	2.2	2.2	1.7	37.8
2009 (333)	195.5	2.5	2.8	2.7	2.5	2.4	1.7	2.0	37.5
District Q									
2008 (194)	180.9	1.8	2.3	2.5	2.1	1.6	1.9	1.5	17.0
2009 (182)	185.4	2.3	2.7	2.3	2.3	1.9	1.7	1.8	33.0
State									
2008 (3,221)	216.4	2.8	3.2	3.8	3.2	2.8	2.9	2.3	59.1
2009 (3,286)	218.2	3.3	3.4	3.6	3.0	3.1	2.3	2.6	61.5

Note. Scores for 2009 are highlighted in **bold** if the Mean Scale Score increased by at least 5 scale-score points or the Percent Met Proficiency Standard increased by at least 5 percentage points between 2008 and 2009.

^a Each module in 2008 had a possibility of 6 items correct. In 2009, Systems & Fundamentals had 7 items, Word Processing had 5 items, and other modules had 6 items.

^b The middle school proficiency standard is a Scale Score of 220.