

Young Children's Computer Inventory  
Irving ISD 2006  
TIP Treatment vs. Comparison School Report<sup>1</sup>  
July 2006

**Introduction**

In October 2003, the Texas Education Agency (TEA) was awarded a federal grant for a Technology Immersion Pilot (TIP) project to produce scientifically-based research evidence about the effectiveness of educational technology in K-12 education.

According to the Texas Education Agency (TEA), the funding source, the goal of TIP is to:

“increase the academic progress of students who are participating in the pilot project by immersing the campus with appropriate innovative technologies including, but not limited to, wireless mobile computing devices, software, online formative assessment tools, and online resources.”

<http://www.tea.state.tx.us/technology/tip/>

Most of the 20+ school districts selected were involved as treatment sites for middle school 1-to-1 computing, but Irving Independent School District (ISD) was selected to implement the one-student-to-one-computing device technology on three campuses, forming a vertical team of elementary, middle and high schools. Because the treatment schools could not be randomly assigned, carefully matched comparison campuses without 1-to-1 laptops were selected for assessment of the impact of the 1-to-1 treatment at the elementary and middle school levels. No comparison school was possible at the high school level because all high schools in Irving had laptops for all students at the beginning of the TIP project.

Thus Irving High School, de Zavala Middle School, and Lively Elementary School formed the Irving ISD vertical team for this project. The three campuses shared \$850,000 over a two-year period to implement the program. Every student had a personal computing device with Dell laptops for most and AlphaSmarts for the younger grades. All classrooms had a data projector, teacher laptop, printer and wireless access. This report contains findings from elementary school treatment (Lively) versus a comparison school as of the second year of the project.

This report contains findings for one component of the Irving ISD spring 2006 initiative to gather data for the evaluation of the Technology Immersion Pilot (TIP) grant. Findings in this report are based on surveys completed by elementary school students from two Irving ISD elementary schools, one school involved in the grant with access to laptops (or AlphaSmarts) and a comparison school.

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The comparison school was selected by applying scaling methods to demographic indicators from the state database. Two schools very similar to Lively Elementary were presented to the Irving ISD project personnel and one was selected based on practical, feeder-school issues.

### **Young Children's Computer Inventory**

The Young Children's Computer Inventory (YCCI-v5.14) is a 52-item Likert instrument for measuring elementary school children's attitudes on seven major indices:

#### Attitudes Toward Computers

- includes two subscales (Computer Importance and Computer Enjoyment) described below

#### Computer Importance

- perceived value or significance of knowing how to use computers

#### Computer Enjoyment

- amount of pleasure derived from using computers

#### Motivation to Study

- includes two subscales (Motivation and Study Habits) described below

#### Motivation

- unceasing effort; perseverance; never giving up

#### Study Habits

- mode of pursuing academic exercises within and outside class

#### Empathy

- a caring identification with the thoughts or feelings of others

#### Creative Tendencies

- inclinations toward exploring the unknown, taking individual initiative, finding unique solutions

#### Attitudes Toward School

- perceived value or significance of school.

Computer Importance and Computer Enjoyment can be combined into the scale Attitudes Toward Computers, which has higher reliability for young children. Similarly, Study Habits and Motivation can be combined to form the scale Motivation to Study.

### **Background Information on Subjects**

As shown in Tables 1-4, the 656 subjects studied for this report were in Grade Two through Grade Five at two elementary schools. The majority of students were part of the

TIP grant school (80.5%) while 19.5% were from a comparison school. Males slightly outnumbered the females, 55% to 45%. Approximately 68% of the treatment group and 55% of the comparison group reported having access to a computer at home, while 52% of the treatment group and 45% of the comparison group reported access to the World Wide Web at home.

Table 1.  
*Respondents by Elementary School*

	Frequency	Percent
Lively Elementary	528	80.5
Comparison Elementary	128	19.5
Total	656	100.0

Table 2.  
*Number of Subjects with Home Access to Computer*

	Frequency	Percent
Lively Elementary	361	68.4
Comparison Elementary	70	54.7

Table 3.  
*Number of Subjects with Home Access to WWW*

	Frequency	Percent
Lively Elementary	276	52.3
Comparison Elementary	58	45.3

Table 4.  
*Gender Frequencies for Elementary Students*

	Male	Female
Lively Elementary	285	243
Comparison Elementary	73	55
Total	358	298

### **Student Attitudes Toward Computers and Learning Dispositions**

Summary statistics for all students by school (across Grades 2-5) on major YCCI measurement indices are listed in Table 5. As indicated by the effect size indices shown in Table 5, the greatest differences between treatment and control schools were in Computer Importance, Creative Tendencies and Attitudes Toward Computers with the treatment school being higher on all three. These differences are all significant at the  $p < .05$  level. All other five attitudinal indices also show the treatment school (Lively Elementary) being higher but not at a statistically significant ( $p < .05$ ) level.

Table 5.  
*Comparison of attitudinal measures between Lively Elementary (TIP Treatment School) and the Comparison School*

	Comparison/ Treatment	N	Mean	Std. Deviation	Sig	ES
Computer Enjoyment	Comparison	128	3.60	.50		
	Treatment	528	3.66	.43		
	Total	656	3.65	.45	.162	.18
Computer Importance	Comparison	128	3.32	.60		
	Treatment	524	3.56	.46		
	Total	652	3.51	.50	.000	.45
Study Habits	Comparison	127	3.25	.54		
	Treatment	520	3.33	.49		
	Total	647	3.32	.50	.117	.15
Motivation	Comparison	127	3.17	.55		
	Treatment	520	3.18	.56		
	Total	647	3.18	.56	.873	0
Attitudes Toward School	Comparison	128	2.87	.92		
	Treatment	528	2.98	.94		
	Total	656	2.96	.93	.254	.11
Creative Tendencies	Comparison	126	3.09	.49		
	Treatment	516	3.21	.51		
	Total	642	3.19	.51	.012	.24
Attitudes Toward Computers	Comparison	128	3.45	.50		
	Treatment	528	3.61	.37		
	Total	656	3.58	.40	.000	.32
Motivation to Study	Comparison	127	3.22	.46		
	Treatment	520	3.26	.44		
	Total	647	3.25	.44	.285	.09

Attitudinal indices can also be interpreted by comparing the sub-groupings by Grade Level, Gender, whether or not students have a computer and/or WWW at home, and whether or not English is the primary language spoken at home. The comparisons are shown in Tables 6 - 11. Data for both comparison and treatment groups were combined for some of the analyses so there would be an adequate amount of data in each analysis (for example by grade level).

Grade Level Distinctions. As shown in Table 6, there were significant differences by grade level for all dispositions measured. Figure 1 illustrates that the general trend was toward less positive attitudes as grade level increases. These trends are consistent with findings from previous studies.

Table 6.

*Comparison of Attitudinal Measures by Grade Level for Combined Treatment and Comparison School Students, 2006*

Attitudinal Indices	Grade	N	Mean	Std. Deviation	Sig
Computer Enjoyment	2	163	3.62	.48	
	3	160	3.74	.35	
	4	151	3.70	.38	
	5	182	3.55	.52	
	Total	656	3.65	.45	.001
Computer Importance	2	162	3.71	.39	
	3	159	3.49	.45	
	4	150	3.45	.54	
	5	181	3.40	.55	
	Total	652	3.51	.50	.000
Study Habits	2	161	3.39	.47	
	3	159	3.35	.51	
	4	146	3.26	.55	
	5	181	3.26	.45	
	Total	647	3.32	.50	.031
Motivation	2	161	3.32	.53	
	3	159	3.16	.59	
	4	146	3.10	.57	
	5	181	3.12	.54	
	Total	647	3.18	.56	
Attitudes Toward School	2	163	3.20	.87	.001
	3	160	2.84	.93	
	4	151	3.12	.92	
	5	182	2.70	.92	
	Total	656	2.96	.93	.000
Creative Tendencies	2	160	3.34	.52	
	3	157	3.19	.47	
	4	144	3.12	.52	
	5	181	3.10	.48	
	Total	642	3.19	.51	.000
Attitudes Toward Computers	2	163	3.68	.36	
	3	160	3.61	.33	
	4	151	3.57	.39	
	5	182	3.47	.47	
	Total	656	3.58	.40	.000
Motivation to Study	2	161	3.36	.39	
	3	159	3.27	.46	
	4	146	3.19	.49	

	5	181	3.20	.40	
	Total	647	3.25	.44	.001

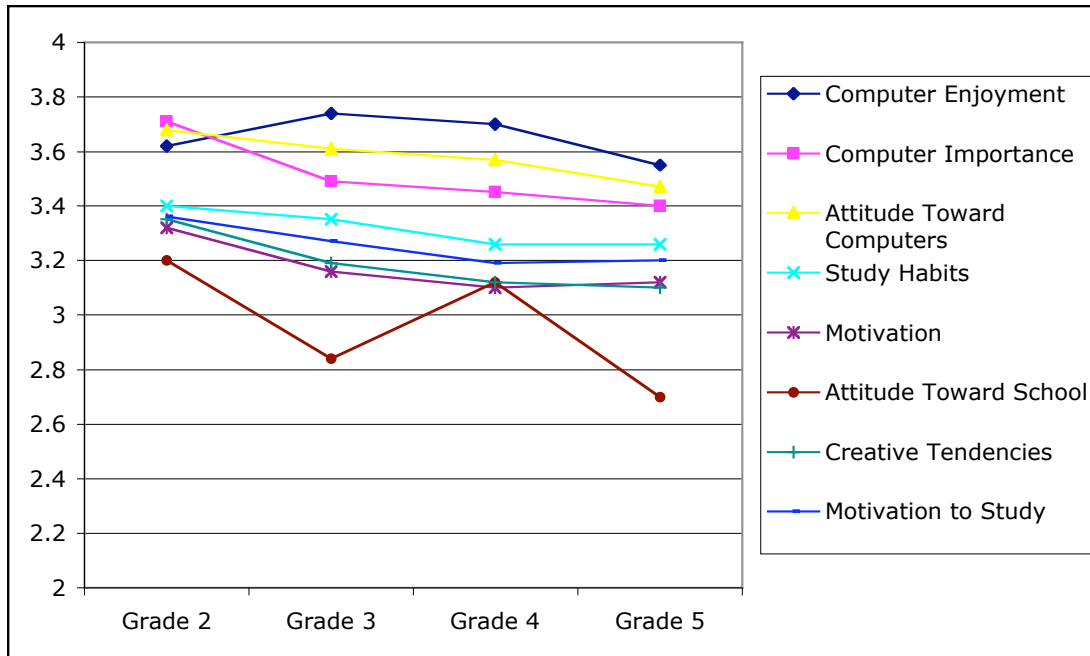


Figure 1. Attitudinal indices by grade level for combined comparison and treatment school data.

Gender Distinctions. As shown in Table 7, significant ( $p < .05$ ) differences were found between males and females for Computer Enjoyment, Study Habits, Motivation, Attitudes Toward School, Creative Tendencies, Attitudes Toward Computers and Motivation to Study. In addition, females were also higher on Computer Importance although it was not statistically significant. In all cases, female attitudes were more positive than males, and in the cases of Attitudes Toward School ( $ES = .64$ ) the difference is between ‘moderate’ ( $ES = .5$ ) and ‘large’ ( $ES = .8$ ) according to guidelines provided by Cohen (1969). Although the finding regarding Computer Enjoyment is relatively new to the literature (Christensen & Knezek, 2003) the others are well established and consistent with findings for comparable data gathered for the KIDS Project (Knezek & Christensen, 2000; Christensen & Knezek, 2001; Knezek & Christensen, 2002) using the same instrument.

Table 7.

*Comparison of Grades 2 – 5 Males and Females on Attitudinal Measures for Combined Comparison and Treatment Schools, Irving 2006*

Attitudinal Indices	Gender	N	Mean	Std. Deviation	Sig	ES
Computer Enjoyment	Male	358	3.61	.49		

	Female	298	3.69	.39	.028	.18
Computer Importance	Male	356	3.49	.52		
	Female	296	3.54	.48	.246	.08
Study Habits	Male	354	3.25	.53		
	Female	293	3.39	.45	.000	.28
Motivation	Male	354	3.11	.58		
	Female	293	3.26	.52	.001	.27
Attitudes Toward School	Male	358	2.70	.97		
	Female	298	3.27	.79	.000	.64
Creative Tendencies	Male	352	3.11	.53		
	Female	290	3.28	.46	.000	.34
Attitudes Toward Computer	Male	358	3.55	.45		
	Female	298	3.61	.34	.055	.15
Motivation to Study	Male	354	3.19	.47		
	Female	293	3.33	.39	.000	.32

As shown in Table 8, an analysis of effect size indices for treatment versus comparison schools, within measurement scale and separated by gender, revealed several trends. First, treatment school ratings were more positive than comparison school ratings for males and females on most computer attitudes and learner dispositions. The effect was notably strong on Attitudes Toward Computers for both males and females, and males appear to have been somewhat more positively affected than females. For example, on the composite measure, Attitudes Toward Computers the treatment vs. comparison effect size was .40 for males versus .33 for females; in the subscale Computer Importance the effect size was .48 for males vs. .37 for females. These effects are in the small ( $ES = .2$ ) to moderate ( $ES = .5$ ) range according to guidelines provided by Cohen (1988) and may be deemed educationally meaningful according to the  $ES = .3$  cut-off often employed for judging the practical significance of an intervention.

Another trend is that the effect of the laptop treatment was consistently positive on most learner dispositions. This appears to have been somewhat stronger for females than males. For example, as shown in Table 8, for Study Habits the effect size for females was .23 versus .09 for males, and for Creative Tendencies the Effect Size was .32 for females versus .20 for males.

A third trend is that Attitude Toward School in general appears to have been more positively affected among males than among females. Note the effect size of .15 for

males versus .01 for females in Table 8. Closer examination of this data revealed that the attitudes toward school of the females in both the treatment and comparison school were high, whereas the attitudes toward school of the males rose closer to the females in the laptop school.

Another way to look at male and female Attitudes Toward School for the treatment school versus the comparison school is to compare the effect size of male to female at each school. At Lively/treatment the effect size between males and females was .58 (which is educationally meaningful) but for the comparison school, the effect size was .74 between males and females, which is moderately large. Both schools had females with more positive attitudes toward school, but the differences were less dramatic in the laptop school.

In summary, across all eight measures with separate indicators for males versus females, effect size was positive (treatment vs. comparison) for 15 of 16 indices ( $p < .001$ ). This indicates a positive effect overall of the laptop program on the students in the laptop school, for both males and females.

Table 8.

*Comparison of Attitudinal Measures by Gender at Both Treatment and Comparison Schools (Combined)*

Attitudinal Indices	Treatment				Comparison				T Vs C Effect Size	
	N	Mean	Std. Dev.	Sig.	N	Mean	Std. Dev.	Sig.		
Computer Enjoyment	Male	285	3.63	.46		73	3.55	.60		.16
	Female	243	3.70	.40		55	3.67	.32		.07
	Total	528	3.66	.43	.092	128	3.60	.50	.156	
Computer Importance	Male	283	3.54	.46		73	3.27	.66		.48
	Female	241	3.57	.47		55	3.39	.52		.37
	Total	524	3.56	.46	.559	128	3.32	.60	.290	
Study Habits	Male	282	3.26	.52		72	3.21	.58		.09
	Female	238	3.41	.44		55	3.31	.49		.23
	Total	520	3.33	.49	.001	127	3.25	.54	.350	
Motivation	Male	282	3.11	.58		72	3.11	.61		-.01
	Female	238	3.26	.54		55	3.24	.47		.04
	Total	520	3.18	.56	.001	127	3.17	.55	.190	
Attitudes Toward School	Male	285	2.73	.97		73	2.58	.95		.15
	Female	243	3.27	.80		55	3.26	.72		.01
	Total	528	2.98	.94	.000	128	2.87	.92	.000	
Creative	Male	281	3.13	.53		71	3.03	.52		.20

Tendencies	Female	235	3.31	.46		55	3.16	.44		.32
	Total	516	3.21	.51	.000	126	3.09	.49	.127	
Attitudes Toward Computers	Male	285	3.59	.40		73	3.40	.58		.40
	Female	243	3.63	.33		55	3.52	.36		.33
	Total	528	3.61	.37	.191	128	3.45	.50	.176	
Motivation to Study	Male	282	3.19	.46		72	3.17	.51		.05
	Female	238	3.34	.40		55	3.28	.39		.17
	Total	520	3.26	.44	.000	127	3.22	.46	.195	

Home Computer Access. As shown in Table 9, an analysis of effect size indices for treatment versus comparison schools, within measurement scale and presented separately by level of home computer access, revealed several trends. First, it appears the treatment school was more positive than the comparison school for students with home access to a computer as well as for those without home access to a computer. This was true for most computer attitudes and learner dispositions. The effect was strongest in Attitudes Toward Computers and in Creative Tendencies, with a positive ( $ES > .2$ ) impact on both groups in these areas.

In addition, there appears to have been a differential impact on those with versus without access to computers at home, in the area of attitudes toward computers. In particular, if students had access to computers at home but were not in the laptop program in school, their perception of the importance of computers was lower. If students in this type of home environment (computer access at home) were also in the laptop program in school, then their perception of the importance of computers was more positive and in fact comparable to the perceived importance of students without access to other computers at home. The implication of this finding is that just because students have access to other computers at home, this does not mean they perceive them as important (relevant) for school and careers. The laptop program in their school apparently influenced their perceived importance of computers in a positive manner.

A third trend emerged in the area of attitudes toward school. Attitudes Toward School was higher for students who did not have computer access at home. The difference was significant ( $p < .01$ ) for Lively and close to significant ( $p = .09$ ) for the comparison school. It is possible that having computer access at school and not at home affects the students' attitudes toward school in a positive manner.

Table 9.

*Comparison of Attitudinal Measures by Access to a Home Computer -Treatment Versus Comparison*

		Treatment School				Comparison School				*ES T vs C
		N	Mean	Std. Dev	Sig	N	Mean	Std. Dev	Sig	
Computer Enjoyment	No Home Comp	167	3.65	.49		58	3.57	.57		.14
	Home Comp	361	3.67	.41	.645	70	3.62	.44	.573	.11
Computer Importance	No Home Comp	164	3.54	.48		58	3.42	.57		.23
	Home Comp	360	3.56	.46	.575	70	3.24	.62	.100	.59
Study Habits	No Home Comp	163	3.33	.55		57	3.26	.55		.13
	Home Comp	357	3.33	.45	.888	70	3.25	.53	.986	.16
Motivation	No Home Comp	163	3.24	.59		57	3.18	.52		.11
	Home Comp	357	3.15	.55	.090	70	3.16	.58	.817	-.02
Attitudes Toward School	No Home Comp	167	3.14	.85		58	3.02	.93		.13
	Home Comp	361	2.90	.96	.006	70	2.75	.90	.091	.17
Creative Tendencies	No Home Comp	162	3.18	.58		56	3.05	.46		.25
	Home Comp	354	3.23	.47	.370	70	3.11	.51	.470	.23
Attitudes Toward Computers	No Home Comp	167	3.60	.41		58	3.49	.51		.24
	Home Comp	361	3.61	.35	.727	70	3.42	.48	.410	.47
Motivation to Study	No Home Comp	163	3.29	.49		57	3.22	.44		.14
	Home Comp	357	3.25	.41	.381	70	3.21	.48	.891	.09

Note: \* The effect size for treatment versus comparison school is across schools by whether or not there is access to a computer

Home WWW Access. As shown in Table 10, the trends for whether or not students had access to the WWW at home are very similar to the trends for home access to a computer. An interesting contrast is that attitudes toward school were higher at Lively if students did not have WWW access at home. Creative Tendencies were higher if students did have WWW access at home. Trends were similar for comparison school but not significant, probably because the comparison had a smaller number of students. These findings imply that WWW access in school (laptop program or not) may positively influence attitudes toward school among students who do not have WWW access at home.

Table 10.

*Comparison of Attitudinal Measures by Home Access to the WWW –Treatment and Comparison*

Attitudinal Indices	Access to WWW	Treatment School				Comparison School				ES for T vs C
		N	Mean	Std. Dev	Sig	N	Mean	Std. Dev	Sig	
Computer Enjoyment	No Home WWW	252	3.67	.47		70	3.61	.53		.11
	Home WWW	276	3.66	.40	.991	58	3.59	.47	.888	.16
Computer Importance	No Home WWW	249	3.54	.48		70	3.38	.55		.32
	Home WWW	275	3.57	.45	.559	58	3.25	.66	.232	.57
Study Habits	No Home WWW	247	3.32	.53		69	3.25	.52		.14
	Home WWW	273	3.34	.45	.687	58	3.26	.57	.931	.16
Motivation	No Home WWW	247	3.20	.59		69	3.18	.52		.03
	Home WWW	273	3.16	.54	.373	58	3.15	.59	.750	.01
Attitudes Toward School	No Home WWW	252	3.13	.88		70	2.98	.95		.16
	Home WWW	276	2.84	.96	.000	58	2.75	.87	.160	.10
Creative Tendencies	No Home WWW	244	3.16	.55		68	3.06	.45		.21
	Home WWW	272	3.26	.46	.038	58	3.12	.53	.499	.28
Attitudes Toward Computer	No Home WWW	252	3.61	.41		70	3.48	.48		.27
	Home WWW	276	3.61	.33	.805	58	3.41	.51	.392	.49
Motivation to Study	No Home WWW	247	3.27	.47		69	3.22	.41	.918	.11
	Home WWW	273	3.26	.40	.789	58	3.21	.51		.10

Distinctions by Language Spoken at Home. As shown in Table 11, an analysis of effect size indices for treatment versus comparison schools, within each measurement scale and reported separately by primary language spoken at home (English vs. other), revealed several trends. First, the overall finding was that the treatment school was more positive than the comparison school for non-English as well as English primary - language students, on most computer attitudes and learner dispositions.

Regarding home computer access vs. none, the effect was strongest in attitudes toward computers. For example, on the composite measure, Attitudes Toward Computers the

treatment vs. control effect size was .42 for English primary language versus .33 for non-English; for Computer Importance the effect size was .46 for English primary language and .42 for non-English. These effects are educationally meaningful according to the ES = .3 cutoff often employed for judging the practical significance of an intervention. It appears the laptop program had a positive effect on student perceptions of the importance (relevance to schooling and careers) of computers among English-first-language as well as non-English first language students.

Effect size was positive (treatment vs. comparison) for 15 of 16 measurements on eight indicators ( $p < .001$ ). This indicates a positive effect overall of the laptop program on the students in the laptop school.

Table 11.  
Comparison of Attitudinal Measures by Whether English is the Primary Language Spoken at Home

Attitudinal Indices		Treatment				Comparison				T vs C ES
		N	Mean	Std. Dev	Sig	N	Mean	Std. Dev	Sig	
Computer Enjoyment	No	272	3.64	.44		69	3.59	.48		.11
	Yes	256	3.68	.43	.328	59	3.61	.53	.888	.16
Computer Importance	No	270	3.58	.45		69	3.37	.57		.42
	Yes	254	3.53	.48	.186	59	3.27	.64	.370	.46
Study Habits	No	267	3.34	.48		69	3.24	.48		.20
	Yes	253	3.32	.50	.689	58	3.27	.60	.810	.10
Motivation	No	267	3.22	.54		69	3.19	.49		.07
	Yes	253	3.13	.59	.061	58	3.14	.62	.655	-.02
Attitudes Toward School	No	272	3.04	.90		69	2.97	.87		.08
	Yes	256	2.91	.97	.111	59	2.76	.97	.217	.15
Creative Tendencies	No	265	3.21	.54		68	3.05	.47		.32
	Yes	251	3.22	.48	.750	58	3.13	.51	.328	.18
Attitudes Toward Computers	No	272	3.61	.37		69	3.47	.49		.33
	Yes	256	3.60	.36	.776	59	3.42	.51	.588	.42
Motivation to Study	No	267	3.29	.43		69	3.22	.39		.16
	Yes	253	3.24	.44	.191	58	3.21	.54	.921	.05

## Summary

The laptop program appears to have positively influenced elementary students' attitudes toward computers and other learning dispositions. The greatest differences between treatment and control schools were in Computer Importance, Creative Tendencies and Attitudes Toward Computers with the treatment school being significantly ( $p < .05$ ) higher on all three. All other five attitudinal indices also show the treatment school (Lively Elementary) being higher but not at a statistically significant ( $p < .05$ ) level. This effect appears to have been similar on males and females, home access versus non-home access students and English versus non-English primary language speaking students.

One effect emerged for students without computer access at home across both treatment and comparison schools. Students without access to computers at home tended to have higher attitudes toward school.