Center for Research in Educational Policy

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Tennessee Department of Education

EdTECH LAUNCH

2005-2006 EVALUATION REPORT

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EXECUTIVE SUMMARY

INTRODUCTION

This report summarizes the 2005-2006 evaluation study results of the Tennessee EdTech Launch 1 (TnETL-1) and TnETL Launch 2 (TnETL-2) program. The threefold purpose of the evaluation remained consistent for both years: (a) to use rigorous research to assess the effects of TnETL in raising student achievement as a function of students becoming more proficient and engaged in using technology as a tool for learning, (b) to provide formative evaluation data to the participant schools to serve as a basis for improvement planning and as documentation of their accomplishments to demonstrate progress; and (c) to provide cumulative evidence of the implementation progress and outcomes of the participant schools**.**

The overall purpose of TnETL is to integrate the use of technology as a tool into curriculum and instruction to prepare students to meet state academic standards. The specific program goals are:

***Goal 1**: All students will be educated in learning environments that have access to educational technology used in support of academic achievement.*

***Goal 2**: All students will demonstrate technology literacy by the end of eighth grade.*

***Goal 3**: All students will be taught by teachers qualified to use technology for instruction.*

RESEARCH QUESTIONS

The TnETL Program evaluation for 2005-2006 was structured around the following primary research questions:

1. Does implementation of the TnETL model raise student achievement in Program schools as compared to Control schools?
2. (a) Does implementation of TnETL improve teachers' skill levels in, and attitudes toward, integrating technology with curriculum and state standards?
   (b) To what degree do teachers at Program and Control schools feel competent in demonstrating the National Education Technology Standards (NETS) for Teachers?
3. Does TnETL foster greater use of research-based teaching practices that increase academically focused instructional time and student attention and engagement?
4. (a) Does TnETL improve students' skill levels in, and attitudes toward, using technology as a tool for enhancing learning?
   (b) To what degree do students at Program and Control schools specifically demonstrate competency in skills representative of NETS for Students?
5. What is the impact of TnETL implementation on school-wide improvement in organization and school climate?
6. What program and school variables (e.g., poverty level, location, size, and school climate) are associated with effective TnETL implementation and improved student achievement?

DESIGN

The evaluation involved two participant cohorts. The first cohort consisted of 26 schools (13 Program and 13 matched control) that participated in TnETL for three years (2003-04, 2004-05, and 2005-2006). The "matched pairs" were formed according to the following criteria: locale, grade levels, number of students,

percent qualified for free/reduced lunch, ethnicity, and achievement. The second cohort included 28 schools (14 Program and 14 randomly selected controls) that participated in 2004-05 and 2005-2006.

EVALUATION MEASURES

Six measurement strategies were used to collect the evaluation data: direct classroom observations, surveys, school-developed technology benchmarks, interviews, focus groups, and. student performance assessments. Details of the instrumentation and administration procedures are below.

Direct Classroom Observation Measures

Five whole school (random visits) and three targeted (pre-scheduled visits) observations were conducted in the Program and Control schools. The following three instruments were used:

- *School Observation Measure (SOM©):* Examines frequency of usage of 24 instructional strategies.
- *Survey of Computer Use (SCU):* Records computer access and student use of technology.
- *Rubric for Student-Centered Activities (RSCA):* Rates the degree of learner engagement in cooperative learning, project-based learning, higher-level questioning, experiential/hands-on learning, independent inquiry, student discussion, and students as producers of knowledge using technology.

Surveys

- *School Climate Inventory (SCI):* Assesses school staff perceptions of school climate on seven dimensions: Order, Leadership, Environment, Involvement, Instruction, Expectations, and Collaboration.
- *Teacher Technology Questionnaire (TTQ):* Collects teacher perceptions regarding impact of computers on instruction and students, teacher readiness to integrate, and support for technology.
- *Technology Skills Assessment (TSA):* Assesses perceived teacher ability for: Computer, Software, Internet and Multimedia Basics, Advanced Skills, Using Technology for Learning, and Policy and Ethics.

Technology Implementation Benchmarks

- *Technology Benchmarks*: Developed and used by Program Schools to rate implementation progress.

Interview/Focus Groups

- *Principal Interview:* Collects Program and Control principal impressions regarding the influence of technology integration on teachers, students, professional development, parents, their role, and overall.
- *Teacher Focus Group*: Collects Program teacher impressions regarding the influence of TnETL-1 on teachers, students, parents, principals, professional development, and overall.

Technology Coach Survey and Interview

- *Technology Coach Survey*: Collects demographic information and frequency with which Coaches engage in 24 tasks related to Technology Coach Responsibilities.
- *Technology Coach Interview*: Collects Technology Coach impressions regarding the influence of TnETL-1 on teachers, students, professional development, parents, principals, and overall.

Student Performance-Based Assessment

- *Problem Solving:* Measures student ability to comprehend problems and formulate solutions by assessing student products with a seven-level problem-solving rubric.
- *Technology Skills*: Assesses student proficiency in completing basic computer tasks with spreadsheets, presentations, and Internet browser software.

Student Academic Performance

- Student-level mathematics and language arts scores on the Tennessee Comprehensive Assessment Program (TCAP) were analyzed to compare Program versus Control student achievement.

PROCEDURE

Data for this evaluation study were collected during the 2005-2006 academic year. Technology Implementation Benchmarks were submitted for analysis in early fall 2004 and again late May 2005 and 2006. Whole school and targeted observations were conducted during late spring 2006 using SOM, SCU and RSCA instruments. The teacher surveys (TTQ, SCI, and TSA) were administered in May 2006 during faculty meetings at each school. Student performance measures (problem-solving and technology) were administered to 8th grade students from matched pairs of 8 Program and 8 Control schools. Also, during spring 2006, Program and Control principals were interviewed, teacher focus groups were conducted at each Program school, and Technology Coaches were interviewed and completed the Technology Coach Survey.

RESULTS

Direct Classroom Observation Results

Whole School Observations

A total of 269 three-hour whole school observations resulted in 807 hours of observation data collected with SOMs, SCUs, and RSCAs during15 minute visits to 2,655 randomly selected classrooms (Program = 1,321; Control = 1,334). Analysis of data revealed significant differences in several key areas; with the most notable being Program as compared to Control students' more frequent use of technology in student-centered learning environments. There was greater and higher-quality or more meaningful use of computers as a learning tool and for instructional delivery, independent inquiry, cooperative learning, and project based learning. Although these findings are quite positive, only Internet browsers and drill and practice software were observed occasionally or more in at least 20% of the Program classes' computer activities. Continued professional development is still required in order to generate a wider variety of use.

Targeted Observations

Three targeted observations were conducted at each Program and Control school, yielding a total of 162 targeted observations (L1 Program = 39, L1 Control = 39; L2 Program = 42, L2 Control = 42). The data were collected with SOMs, RSCAs, and SCUs during prearranged 45 to 60-minute visits in which randomly selected teachers were asked to implement a lesson using technology. Relative to TnETL goals, the most notable SOM result was that L1 and L2 Program students used technology as a learning tool significantly more than students in Control classrooms and L2 Program students were engaged in significantly more project based learning than the L2 Control students. The SCU data showed that program students in L2 classes used Internet browsers significantly more than the L2 Control students. Additionally, students in L1 and L2 Program classrooms as compared to Control classes were engaged in significantly more meaningful computer activities.

Survey Results

School Climate Inventory - Revised (SCI-R)

Program (L1 *n* = 395; L2 *n* = 421) and Control (L1 *n* = 404; L2 *n* = 430) teacher responses to the SCI-R were fairly positive, with the overall mean scores being slightly higher than national norms in all comparisons. Not surprisingly, no group differences occurred, given that Program and Control schools were strategically matched.

Teacher Technology Questionnaire (TTQ)

A total of 1,638 Program (L1 *n* = 393; L2 *n* = 418) and Control (L1 *n* = 401; L2 *n* = 426) teachers completed the survey. The MANOVA, treating the five survey categories (impact on classroom instruction; impact on students; teacher readiness; overall support; and technical support) as dependent measures, was highly significant for Launch 1 and 2. Follow-up univariate analyses yielded significance on all five categories. Most notable, Program teachers had more confidence (L1 = *ES* = +0.78; L2 = *ES* = +0.58) than Control teachers that they were ready to integrate technology and that use of technology positively impacts students.

Technology Skills Assessment

The primary purpose for the TSA was to assess Program (L1 *n* = 394, L2 *n* = 422) vs. Control (L1 *n* = 402; L 2 *n* = 429) teacher perceptions of "How easily…" they could complete 47 tasks related to: computers, software, multimedia, Internet, advanced skills, and using technology for learning and general knowledge of technology policy and ethics. A MANOVA yielded a significant difference for Launch 1 and 2. Univariate analysis of variance (ANOVA) revealed significant L1 Program vs. Control differences for the seven areas. The strongest difference occurred for the category "using technology for learning" (L1 *ES* = +0.69). Less dramatic differences were seen for computer basics (L1 *ES* = +0.40), and Internet basics (L1 *ES* = +0.41). Although L2 schools had higher TSA means scores in all categories, none were found to be significant.

Technology Benchmarks

Each Program school developed and rated Technology Benchmarks for implementation progress. Mean scores for the L1 spring 2006 ratings ranged between 2.50 and 2.70, thus suggesting that the program had almost reached a full level of implementation. The most favorable ratings were for Curriculum and Organization (*M* = 2.70). With regard to spring 2006 ratings for Launch 2, the schools revealed a strong shift towards Phase 3, with curriculum and Organization being rated between Intermediate and Full implementation phase (*M* = 2.50).

Student Performance-based Assessments

Student Problem-solving Task

The problem-solving task was completed by 248 eighth grade students comprised of 115 L1 participants (Program *n* = 87, Control *n* = 28) and 133 L2 (Program *n* = 72, Control *n* = 61). All students exhibited the highest ability in demonstrating understanding of the problem. The lowest overall level of ability for both groups was seen in student descriptions of how to use technology to solve the problem. Although a MANOVA showed marginally significant differences when comparing L2 Treatment to Control schools, follow up analysis showed no differences between any groups across problem solving sub-skills.

Student Technology Task

A total of 258 eighth-grade students completed the technology task (L1 Program *n* = 79, Control *n* = 54; L2 Program *n* = 64, Control *n* = 61). A MANOVA comparing the L1 Program and Control student technology task scores did not reveal any significant differences. However, a MANOVA comparing the L2 Program and Control student technology task scores yielded a highly significant difference ($p = 0.001$). Follow-up analyses showed significant advantages (*ES* = +0.49) for the Program group overall with regard to completing the presentation task.

Principal Interviews

Program Principal Impressions

Interviews were conducted with the 13 L1 and the 14 L2 Program principals. Launch 1 and 2 treatment principals reported positive attitudes among teachers and staff for technology integration. Teachers were reported to be "enthusiastic" and "making headway." Teacher reluctance was most often attributed to "teachers' own perceived lack of knowledge and experience." Students were reported to be excited about technology use and taking great pride in their work and accomplishments. Treatment principals stated that they provided support and encouragement for technology integration in a broad spectrum of ways. Principal concerns were most often the sustainability of the program, especially lack of funding.

Control Principal Impressions

Interview responses from the L1 and L2 Control principals showed that teachers' attitudes toward technology integration were fairly positive. Student engagement and excitement involving technology use was cited by control principals as a source of teachers' enthusiasm. Lack of training was cited as the biggest obstacle of teachers embracing technology use. Control principals supported the use of technology by purchasing more equipment and providing additional professional development. Control principals most often mentioned appropriate use of technology, meeting state standards, and providing sufficient professional development as concerns.

Teacher Focus Groups

A total of 270 Program teachers (L1 = 130; L2 = 140) participated in teacher focus groups at their schools. Overall, teachers reported generally positive attitudes on, although a few teachers were still reluctant to use technology. Focus group participants said students were enthusiastic about the use of technology, and frequently requested more technology based lessons. While teachers' attitudes reflected positively towards

their respective Technology Coaches, they also said they would have benefited from even more professional development. Principals were generally seen as supportive of their schools technology integration efforts. Teachers also stated that they believed that technology integration gave their students a competitive edge, improved the school's image and improved student performance. Focus group participants were, like other respondents, concerned about the sustainability of the program.

Technology Coach Survey and Interview

Survey

Launch 1 and 2 Technology Coaches reported that a great deal of their time and responsibilities involved troubleshooting classroom or lab computer problems. They also reported that they frequently to extensively assisted teachers with their computer skills. Launch 2 Technology Coaches reported providing more one-to-one training for teachers.

Interview

Most Technology Coaches reported that teachers were excited about student computer skills and had positive attitudes towards integrating technology into their classrooms. L1 Coaches most often cited "lack of confidence" as a source for teacher reluctance, while L2 Coaches said teachers were concerned with "taking away from TCAP preparation." L1 and 2 Coaches reported similar activities in regard to ensuring improved student learning and achievement. Most often mentioned were professional development and aligning technology lessons with curriculum standards. Tech Coaches often stated that their greatest disappointments were lack of funding and the reluctance of some teachers to use technology.

Student Achievement

Student-level achievement analyses at the 5th and 8th grade levels revealed mixed results in L1 and L2 Program and Control schools with regard to student performance in mathematics or language arts (see Table 40). Specifically, L1 5th grade students achieved significantly higher mathematics scores than their Control counterparts; yet, there were no differences with regards to language arts scores. There were no differences between L1 8th grade Program and Control students' performance in mathematics or language arts. The L2 results were also mixed in that the 8th grade Program students out-performed the 8th grade Control students in mathematics and language arts, but the reverse occurred for the 8th grade students.

Conclusions

The conclusions of the present study will be presented in association with each of the major research questions for the 2005-2006 evaluation in the respective sections below.

Does implementation of the TnETL model raise student achievement in Program schools compared to Control schools?

When examining the findings, a promising trend emerges as the Program students out-performed or performed as well as Control students in all instances except with regard to Launch 2 5th grade mathematics and language arts, yet they also emerge with more experience using technology as a learning tool in meaningful computer activities. Specifically, students in the Program classrooms were significantly more engaged in student-centered learning activities such as experiential, hands-on learning, independent inquiry/research, and cooperative learning. In other words, the Program students were better able than the Control students to demonstrate the application of critical thinking skills, which for some students resulted in superior or comparable TCAP mathematics and language arts performance.

Does implementation of TnETL improve teachers' skill levels in, and attitudes toward, integrating technology with curriculum and state standards?

Teachers who participated in the TnETL1 and 2 Programs revealed more positive attitudes toward technology integration, and teachers who participated in the L1 Program reported significantly more confidence to complete computer tasks than the Control teachers. For example, Program teachers had higher agreement that they knew how to meaningfully integrate technology into lessons, that their computer skills were adequate to conduct classes that have students using technology, and that integration of technology positively impacted student learning. Yet, more importantly, data from the classroom observations suggest positive program effects on improving teachers' skill levels in, and attitudes toward, integrating technology with curriculum and state standards. The Program teachers as compared to Control teachers integrated more intensive and meaningful student use of technology in student-centered environments. However, the scope or variety of software used in Program classes was rather limited, which implies that although Program teachers demonstrated greater skills and attitudes, the need still exists for continued professional development focused on effective use of technology as a learning tool.

Does TnETL foster greater use of research-based teaching practices while increasing academically focused instructional time and student attention and engagement?

Overall, both the randomly conducted whole school and targeted observations revealed that the instructional strategies implemented in TnETL Program schools were more reflective of research-based practices that accommodate technology integration than those observed in Control classes. These practices included greater use of student-centered strategies such as project-based learning, cooperative learning, and independent inquiry and research on the part of students. Of critical importance to this study, the program teachers were better able to integrate greater and higher-quality use of computers as a learning tool and for instructional delivery, as compared to Control teachers. Further, Program teachers reported a significantly higher agreement that the use of technology positively influenced student learning and their use of student-centered practices. The Program classes were more frequently focused on academics than Control classes; however, the difference was only found to be significant for the L2 classes. Similarly, a high level of student attention and interest was more frequently observed in Program classes vs. Control classes. Although these results are positive and reflective of the TnETL goals, continued professional development is needed to better prepare teachers to increase the frequency and intensity of implementation, which could perhaps yield greater and more consistent improvement in student learning.

(a) Does TnETL improve students' skill levels in, and attitudes toward, using technology as a tool for enhancing learning? (b) To what degree do students at Program and Control schools specifically demonstrate competency in skills representative of the NETS for Students?

Data from the classroom observations revealed that more Program students as compared to Control students were observed to have "very good" computer literacy skills. Further evidence is seen in the Student Technology Task Performance Assessment, which is directly aligned with the ISTE NETS for Students. The Technology Task results revealed that the L2 Program vs. Control students demonstrated significant advantages over the Control students in their ability to use presentation software to create student products. These skills are directly aligned to ISTE Standard #3) that states students should be able to use productivity tools "… to prepare publications" (Standard #3) (ISTE, 2000, Foundation Standards). Although student attitudes were not directly measured, there was a consensus among teachers, principals, and Technology Coaches that students "loved" using computers, but wanted more computers available for classroom use.

What is the impact of TnETL implementation on school-wide improvement in organization and school climate?

The TnETL 1 and 2 schools developed and utilized Technology Implementation Benchmarks to gauge progress regarding Curriculum, Instruction, and Organization. The data regarding improved organization is shown in Benchmark ratings that shifted from Phase 1 or "Beginning" level (L1 – 1.28; L2 = 1.23) nearly to Phase 3 or "Full" level (L1 = 2.70; L2 = 2.50). Further evidence is seen in teacher, principal, and Technology Coach impressions gained from the interviews, focus groups, and surveys. Collectively, the participants were

generally supportive and positive with regard to levels of school organization and climate in the Program schools. In addition, the SCI-R survey results from both Program and Control teachers demonstrated a high level of teacher agreement that school climates were positive. This is substantiated in teacher ratings that were higher than those represented in SCI-R national norms. However, there were no significant differences in Program and Control impressions of their school climates. This lack of difference between the groups may be attributed to the study matching process, which purposefully paired schools that had comparable environmental factors. Therefore, although the results do not indicate that TnETL impacted school-wide improvement in organization and school climate, it can be inferred that the positive environment better enabled the Program schools to achieve significant differences with regard to technology integration efforts.

What program and school variables (e.g., poverty level, location, size, and school climate) are associated with effective TnETL implementation and improved student achievement?

To date, the TnETL data have been examined on a "Program" level that combines all schools for the L1 and L2 Program vs. Control cohorts. The next phase is to examine the three years of TnETL – 1 data (2003-2004, 2004-2005, and 2005-2006), two years of TnETL – 2 (2004-2005, and 2005-2006), and one year of the ORBIT data (2005-2006) on the basis of the identified variables, rather than using them as matching criteria to pair schools. In other words, the collected data will be used to determine if classroom practices differed at small schools as compared to large schools? Did attitudes of teachers from rural schools differ from those in urban settings, or did poverty level impact access to technology or types of classroom practices that were observed. And, of key importance will be to examine whether or not student achievement, as measured by the TCAP varied on the basis of TnETL school poverty level, location, size, or school climate. These results will be presented in a separate report.

TENNESSEE EDTECH LAUNCH 1 AND 2, 2005-2006

EVALUATION REPORT

This report summarizes the 2005-2006 evaluation study results of the Tennessee EdTech TnETL program. The program consisted of 26 Launch 1 (TnETL-1) schools that were in the third year of implementation and 28 Launch 2 (TnETL-2) schools in the second year of implementation. The threefold purpose of the evaluation remained consistent for all years: (a) to use rigorous research to assess the effects of TnETL in raising student achievement as a function of students becoming more proficient and engaged in using technology as a tool for learning, (b) to provide formative evaluation data to the participant schools to serve as a basis for improvement planning and as documentation of their accomplishments to demonstrate progress; and (c) to provide cumulative evidence of the implementation progress and outcomes of the participant schools**.**

The TnETL model grew out of an earlier competitive grant program, the Technology Literacy Challenge Fund (TLCF), designed to prepare "home-grown" Technology Coaches to plan and implement comprehensive, school-based professional development programs for teachers in their own schools. Coaches work with teachers on methods of aligning technology use to the delivery of the curriculum using instructional materials that foster increased student achievement. The overall purpose of TnETL is to integrate the use of technology as a tool into curriculum and instruction to prepare students to meet state academic standards. The specific program goals are:

***Goal 1**: All students will be educated in learning environments that have access to educational technology used in support of academic achievement.*

***Goal 2**: All students will demonstrate technology literacy by the end of eighth grade.*

***Goal 3**: All students will be taught by teachers qualified to use technology for instruction.*

RESEARCH QUESTIONS

The TnETL-1 and TnETL-2 Program evaluations were structured around seven primary research questions that focused on classroom practices, degree and type of technology use, academically focused time, student engagement, student achievement, and school climate. Also of interest were teacher ability with,

use of, and attitudes toward technology, and principal and Technology Coach perceptions of the TnETL program.

1. **Does implementation of the TnETL model raise student achievement in Program schools compared to Control schools?**

2. **(a) Does implementation of TnETL improve teachers' skill levels in, and attitudes toward, integrating technology with curriculum and state standards? (b) To what degree do teachers at Program and Control schools specifically demonstrate competency in the National Education Technology Standards (NETS) for Teachers?**

3. **Does TnETL foster greater use of research-based teaching practices that increase academically focused instructional time and student attention and engagement?**

4. **(a) Does TnETL improve students' skill levels in, and attitudes toward, using technology as a tool for enhancing learning? (b) To what degree do students at Program and Control schools specifically demonstrate competency in skills representative of the NETS for Students?**

5. **What is the impact of TnETL implementation on school-wide improvement in organization and school climate?**

6. **What school variables (e.g., poverty level, location, size, and school climate) are associated with effective TnETL implementation and improved student achievement?**

7. **What program variables (e.g., full TnETL model, ORBIT Center Model) are associated with effective program implementation and improved student achievement?**

PARTICIPANTS

The evaluation involved two participant cohorts. The first cohort consisted of 26 schools (13 Program and 13 matched control) that participated in TnETL for three years (2003-04, 2004-05, and 2005-2006). The "matched pairs" were formed according to the following criteria: locale, grade levels, number of students, percent qualified for free/reduced lunch, ethnicity, and achievement (elementary = reading and mathematics; middle school = algebra; high school = biology). The second cohort included 28 schools (14 Program and 14 randomly selected controls) that participated in 2004-05 and 2005-2006. The schools were the top TnETL-2 applicants that were first matched according to TnETL-1 criteria, and then randomly assigned, by a coin-toss, to be a grant recipient or a control school. Collectively, the schools had 28,735 students (Program = 13,856; Control = 14,879) and 1,746 teachers (Program = 872; Control = 874). Specific distribution of schools by grade level is shown in Table 1.

TABLE 1: TnETL Schools by Grade Levels

	TnETL-1			TnETL-2	
	Program	Control		Program	Control
PK-5	1	0	PK-5	0	1
K-2	1	0	PK-6	1	0
K-5	3	3	K-4	1	0
K-8	2	2	K-5	4	4
K-12	0	2	K-8	3	4
4 -5	0	1	1-5	0	1
4 -6	1	0	3-5	1	0
5 -8	1	1	5-8	1	0
6 -8	2	2	6-8	2	3
6 -12	1	1	9-12	1	1
10 -12	1	1			
Total Schools	13	13	Total Schools	14	14

EVALUATION DESIGN AND MEASURES

Design

A quasi-experimental approach, which involved matching pairs of schools, with one member of the pair receiving the intervention and the other serving as a control, was used for this evaluation. Both quantitative and qualitative data were collected at each of the 54 (27 Program; 27 Control) schools by trained observers (e.g., retired teachers, university faculty, graduate students). The observers spent the major part of their time visiting classrooms (using three instruments to be described below), but they also administered surveys to teachers, conducted interviews with school principals, conducted teacher focus groups at Program schools, and interviewed the Technology Coach. Descriptions of the instruments and data collection procedures are presented below.

Evaluation Measures

Seven measurement strategies were used to collect the evaluation data: direct classroom observations, surveys, student performance assessments, interviews, focus groups, school-developed technology benchmarks, and student achievement analyses. Details of the instrumentation and administration procedures are provided below.

Direct Classroom Observation Measures

Whole-school and targeted classroom visits were conducted by trained and unbiased observers to collect frequency data regarding observed instructional practices. Three data collection instruments were

used: the School Observation Measure (SOM©), the Survey of Computer Use (SCU©), and the Rubric for Student-Centered Activities (RSCA©). The SOM was used to collect data regarding overall classroom activities, the SCU to assess student use of computers, and the RSCA to capture more detailed information about student-centered activities during the targeted observations. The classroom observation instruments are described below.

SOM. The SOM was developed to determine the extent to which different common and alternative teaching practices are used throughout an entire school (Ross, Smith, & Alberg, 1999). The standard, or *whole-school SOM* procedure involves observers' visiting 10-12 randomly selected classrooms, for 15 minutes each, during a three-hour visitation period. The observer examines classroom events and activities descriptively, not judgmentally. Notes are taken relative to the use or nonuse of 24 target strategies. The notes form also contains two global items that use a three-point scale (low, moderate, high) to rate, respectively, the use of academically focused instructional time and degree of student attention and interest. At the conclusion of the three-hour visit, the observer summarizes the frequency with which each of the 24 strategies was observed across all classes in general on a data summary form. The frequency is recorded via a 5-point rubric that ranges from (0) Not Observed to (4) Extensively. The same 5-point scale is used to summarize how frequently *high* academically focused class time and *high* student interest/attention were observed.

Targeted observations were conducted to examine classroom instruction during prearranged one-hour sessions in which randomly selected teachers demonstrated a prepared lesson using technology. The notes forms were completed every 15 minutes of the lesson, and then were summarized on a SOM Data Summary Form.

To ensure the reliability of data, observers received a manual providing definitions of terms, examples and explanations of the target strategies, and a description of procedures for completing the instrument. The target strategies include traditional practices (e.g., direct instruction and independent seatwork) and alternative practices, predominately student-centered methods associated with educational reforms (e.g., cooperative learning, project-based learning, inquiry, discussion, using technology as a learning tool). These strategies were identified through surveys and discussions involving policy makers, researchers, administrators, and

teachers, as those most useful in providing indicators of schools' instructional philosophies and implementations of commonly used reform designs (Ross, Smith, Alberg, & Lowther, 2001).

After receiving the manual and instruction in a group session, each observer participated in sufficient practice exercises to ensure that his/her data were comparable with those of experienced observers. In a 1999 reliability study reported by Lewis, Ross, and Alberg, pairs of trained observers selected the identical overall response on the five-category rubric on 67% of the items, and were within one category on 95% of the items. A 2004 reliability study associated with the TnETL-1 evaluation (Sterbinsky & Burke, 2004) found similar results in that observer ratings were within one category for 96% of the whole-school observations and for 91% of the targeted observations.

SCU. A companion instrument to SOM is the Survey of Computer Use (SCU) (Lowther & Ross, 2001). The SCU was completed as part of the SOM observation sessions, where SCU data were also recorded in 15-minute intervals and then summarized on an overall data form.

The SCU was designed to capture exclusively *student* access to, ability with, and use of computers rather than teacher use of technology. Therefore, four primary types of data are recorded: (a) computer capacity and currency, (b) configuration, (c) student computer ability, and (d) student activities while using computers. Computer capacity and currency is defined as the age and type of computers available for student use and whether or not Internet access is available. Configuration refers to the number of students working at each computer (e.g., alone, in pairs, in small groups). Student computer ability is assessed by recording the number of students who are computer literate (e.g., easily use software features/menus, save or print documents), and the number of students who easily use the keyboard to enter text or numerical information.

The next section of the *SCU* focuses on student use of computers with regard to: the types of activities, subject areas of activities, and software being used. The computer activities are divided into four categories based on the type of software tool: (a) production tools, (b) Internet/research tools, (c) educational software, and (d) testing software. Within each category, primary types of software are identified. For example, the software under Production Tools includes: word processing, database, spreadsheet, draw/paint/graphics, presentation (e.g., PowerPoint®), authoring (e.g., KidPix®), concept mapping (e.g., Inspiration), and planning (MS Project®). For the Internet/Research Tools, three types of software are included: Internet browser, CD reference materials, and communications (e.g., email, listservs, chat rooms).

The Educational Software also has three types of software: drill/practice/tutorial, problem-solving (e.g., Riverdeep ™), and process tools (e.g., Author's Toolkit ™). Testing Software has individualized/tracked (Accelerated Reader™) and generic software. With this type of recording system, several activities can be noted during the observation of one student working on a computer. For example, if a student gathered data from the Internet, created a graph from the data, and then imported the graph into a PowerPoint presentation, the observer would record three types of software tools as being observed: Internet browser, spreadsheet, and presentation. This section ends by identifying the subject area of each computer activity. The categories include: language arts, mathematics, science, social studies, other, and none. The computer activities and software being used are summarized and recorded using a five-point rubric that ranges from (0) Not Observed to (4) Extensively observed. The final section of the SCU is an "Overall Rubric" designed to assess the degree to which the activity reflects "meaningful use" of computers *as a tool* to enhance learning. The rubric has four levels: 1 – Low-level use of computers, 2 – Somewhat meaningful, 3 – Meaningful, and 4 - Very meaningful. Reliability data for the SCU (Sterbinsky & Burke, 2004) shows that observer ratings were within one category for 97% of the whole-school observations and for 91% of the targeted observations.

RSCA. The Rubric for Student-Centered Activities was developed by CREP (Lowther & Ross, 2000) as an extension to SOM and SCU. The RSCA was used by observers to more closely evaluate the degree of learner engagement in seven selected areas considered fundamental to the goal of increasing student-centered learning activities (cooperative learning, project-based learning, higher-level questioning, experiential/hands-on learning, student independent inquiry/research, student discussion, and students as producers of knowledge using technology). These strategies reflect emphasis on higher-order learning and attainment of deep understanding of content. Such learning outcomes seem consistent with those likely to be engendered by well-designed, real-world linked exercises, projects, or problems utilizing technology as a learning tool. Each item includes a two-part rating scale. The first is a four-point scale, with 1 indicating a very low level of application, and 4 representing a high level of application. The second is a Yes/No option to the question: "Was technology used?" with space provided to write a brief description of the technology used. The RSCA was completed as part of SOM/SCU observation periods. The RSCA reliability results indicate that observer ratings were within one category for 97% of the whole-school observations and for 90% of the targeted observations (Sterbinsky & Burke, 2004).

Teacher Surveys

Three surveys were used to collect teacher impressions of the TnETL Launch 1 and 2 programs: the School Climate Inventory (SCI), the Teacher Technology Questionnaire (TTQ), and the Technology Skills Assessment (TSA). The TTQ was also used to collect Technology Coach impressions of the TnETL-Launch 1 and 2 program. Each participating Program (27) and Control (27) school administered the surveys at a faculty meeting conducted late Spring 2006. The surveys are described below.

SCI-R. Researchers at the Center for Research in Educational Policy developed the School Climate Inventory (SCI) in 1989 (Butler & Alberg, 1991). In 2002, the SCI underwent minor revisions to reverse the direction of negatively stated items. The resulting instrument is the SCI-R, with "R" meaning revised. The main purpose of the instrument is to assess impacts of reform initiatives in relation to seven dimensions logically and empirically linked with factors associated with effective school organizational climates. The inventory contains 49 items, with 7 items comprising each scale. Responses are scored through the use of Likert-type ratings ranging from strong disagreement (1) to strong agreement (5). Each scale yields scores ranging from 7 to 35, with higher scores being more positive. Additional items solicit basic demographic information on respondents.

Face validity of the school climate items and logical ordering of the items by scales were established during the development of the inventory (Butler & Alberg, 1991). Subsequent analysis of responses collected through administration of the inventory in a variety of school sites substantiated validity of the items. Scale descriptions and current internal reliability coefficients on the seven scales of the inventory, obtained using Cronbach's alpha are as follows:

School Climate Inventory Internal Reliability and Scale Descriptions

Scale	Internal Reliability	Description
Order	α=.81	The extent to which the environment is ordered and appropriate student behaviors are present
Leadership	α=.84	The extent to which the administration provides instructional leadership
Environment	α=.77	The extent to which positive learning environments exist
Involvement	α=.80	The extent to which parents and the community are involved in the school
Instruction	α=.76	The extent to which the instructional program is well developed and implemented
Expectations	α=.87	The extent to which students are expected to learn and be responsible
Collaboration	α=.81	The extent to which the administration, faculty, and students cooperate and participate in problem solving

TTQ. The Teacher Technology Questionnaire is a two-part instrument used to collect teacher perceptions of computers and technology. In the first section, teachers rate their level of agreement with 20 statements regarding five technology-related areas: impact on classroom instruction, impact on students, teacher readiness to integrate technology, overall support for technology in the school, and technical support. Items are rated with a five-point Likert-type scale that ranges from (1) Strongly Disagree to (5) Strongly Agree. Two primary questions are asked in the second section. The first asks teachers to rate their level of computer ability as very good, good, moderate, poor, or no ability. Next, teachers indicate if they have a home computer, and if they do, if they use the home computer to access instructional materials on the Internet and/or to prepare classroom materials. An extension section of four items was added to the TTQ for the 2004-2005 and 2005-2006 evaluation to examine teacher impressions regarding the impact having an on-site Technology Coach.

TSA. The Technology Skills Assessment (TSA) is a 57-item survey that includes 50 three-point Likert-type questions designed to assess the perceived technological abilities of the participants (Marvin, Lowther, & Ross, 2002). All of the questions are arranged into seven categories, which are aligned to the International Society for Technology in Education's (ISTE's) National Educational Technology Standards (NETS) for Teachers and Students Grades 3-8. The categories of the survey are as follows: Computer Basics, Software Basics, Multimedia Basics, Internet Basics, Advanced Skills, Using Technology for Learning, and Policy and Ethics.

Technology Benchmarks

Implementation Benchmarking Tool

The Implementation Benchmarking Tool was developed by the Center for Research in Educational Policy (CREP). In CREP's work in over 500 schools in multiple states, it was found that a highly critical component of formative evaluation and improvement planning in Comprehensive School Reform is the development of individualized "Implementation Benchmarks." The benchmark development process accomplishes the following:

- *Documents the primary operational components of a whole-school program to increase understanding of both the overall program and individual school goals relative to implementation rate and scope.*
- *Engages the entire school staff in discovering, developing, reflecting on, and refining the school's programs. For example, staff might work to more effectively integrate computer usage with various subjects and with state and local standards.*
- *Provides a framework for evaluating progress from beginning to full implementation.*
- *Provides a tool for communicating implementation status and progress.*

A specific Indicator and Evidence (Narrative) accompanies each Benchmark Statement for implementation Phase I (Beginning), II (Intermediate), and III (Full). The draft benchmarks are then shared with the entire faculty for review. Typical timelines are to complete the implementation benchmarks by mid-October, refine them if needed during the year, and then, by early May, engage the entire faculty in evaluating progress and specifying program goals for the following year. Based on those goals, the Benchmarks are continually revised and refined. Consequently, participating schools are continually aware of all programs, implementation progress, and directions for school improvement directed by data and shared faculty-administrator decision-making.

In early Fall 2004, teams from each TnETL- Launch 1 school were trained in benchmark development, and then asked to develop Technology Benchmarks for the areas of Curriculum, Instruction, and Organization. The following year the Launch 2 schools were trained. After the benchmarks were developed, the schools indicated the Phase for each individual benchmark as of September 1, 2004 (for Launch 1 schools), and submitted a draft copy to CREP for review. After review by an experienced CREP researcher, each school received a personalized report with suggested revisions for their Technology Benchmarks. Benchmarks were revised and resubmitted with Phase indicators as of May 30, 2005. The TnETL-Launch 2 schools followed the same process during their first year of implementation (2004-2005), and submitted benchmarks with Phase indicators as of May 30, 2005 to indicate implementation progress for of the program.

Student Performance-Based Measures

A Problem-Solving Task and Technology Task were administered to examine the impact of TnETL on student ability to solve problems and/or to generate computer products that reflect problem-solving solutions. Student Performance-Based Assessment materials are found in Appendix A and descriptions of each measure are provided below.

Student Problem-Solving Task

The purpose of the Student Problem-Solving Task (Lowther, Ross, & Morrison, 2003) was to assess student ability to comprehend problems and formulate solutions. Students were given a task sheet that presented a problem situation regarding recycling cans in a park and instructions for them to describe different aspects of how they would solve the problem.

Program and Control teachers received written instructions for administering the problem-solving task that indicated students should use computers (*Microsoft Word*®) to complete the task within a 45-minute timeframe. Teachers were asked to read a statement to students at the beginning of the assessment that indicated they should work alone, not include their name on any documents, and to do their best work. Trained reviewers judged the students' responses on a rubric composed of 7 Components x 3 Performance Levels. Components consisted of 1) understands problem, 2) identifies what is known about problem, 3) identifies what needs to be known to solve the problem, 4) determines how the data need to be manipulated to solve the problem, 5) describes use of technology, 6) describes how to present findings, and 7) collaborative learning. Data were also collected regarding student experience, frequency of use, and perceived skill level with *Microsoft Word*®.

Student Technology Task

The intent of the Student Technology Task (Lowther & Marvin, 2004) was to determine the degree of proficiency with which 22 basic computer tasks that reflect the National Education Technology Standards (NETS) for Students in grades 6-8 (ISTE, 2000) could be completed. The performance task categories and number of items per category are as follows: spreadsheets (10), presentations (10), and Internet (2). Items assessing word processing (e.g., bolding text) were embedded within the spreadsheet and presentation categories, as these skills are similarly performed in Excel® and PowerPoint®. Before students started the Technology Task, teachers were asked to read a statement to students indicating they should work alone, not include their name on any documents, and to do their best work.

Students were provided with a set of detailed instructions for "what" needed to be done to complete each task, but were not given any guidance on "how" to finish the step-by-step procedures. For example, instructions within the spreadsheet task state, "After you have entered the data into the spreadsheet, enter or

select an Excel formula that calculates the average number of cans..." rather than "…select the Function (f_x) key and select "Average" from the list of options."

The spreadsheet task required the students to use basic spreadsheet functions to create a chart. Specifically, the students were asked to enter data into *Excel*®, use an *Excel*® formula to calculate averages, and create a chart according to a number of specified requirements. The presentation task required students to create a three slide *PowerPoint*® presentation with specified text and graphics. The students were asked to insert the *Excel*® graph created in the spreadsheet task onto the third slide of the *PowerPoint*® presentation. The Internet items (2) were embedded within the presentation tasks as students were asked to obtain content and an image from a researcher-developed website on the Internet for use in the presentation. The Student Technology Task also included six items related to the computer background of the students with regard to *Excel*® spreadsheet and *PowerPoint*® presentation software. In particular, the students were asked how much experience they had with the software (none, some, a lot), how often they used it (never, once in a while, a lot), and their perceived skill level (none, moderate, excellent).

Trained reviewers used a rubric to assess the two student Technology Task products (spreadsheet and presentation) on the degree to which they completed each task as described: No (0) = Did not complete task as described; Somewhat (1) = Partially completed task as described; and Yes (2) = Completed task as described. Detailed descriptions were included for the "No" and "Yes" rating of each task, while the "somewhat" rating was to be recorded by the reviewer to capture the uniqueness of "partially completed" responses (see Appendix A).

Principal Interviews

The Principal Interview questions were focused on seven areas: teachers, professional development, students, parents, Technology Coach, principal, and technology at their school. Principals were first asked to describe their impressions of teacher attitudes toward the program, causes for teacher excitement and reluctance, and teacher concerns. The professional development items solicited ideas regarding principal perceptions of the most effective interventions. Student questions focused on positive comments from students and student concerns, while the parent items asked about parent involvement and support. The next section asked principals about the benefits and concerns of having a full-time Technology Coach. The principal section asked the principals how they supported the Coach and the overall program. The final questions solicited

perceptions of the greatest successes and disappointments of participating in the program, plans their schools have to continue the program, and additional comments. Principals were interviewed by trained researchers during onsite sessions lasting approximately one hour.

Teacher Focus Groups

The Teacher Focus Group questions were basically the same as those used for the Principal Interview, with wording in some items being modified to reflect teacher rather than principal perspectives. Trained researchers conducted one focus group, comprised of 8 to 10 randomly selected teachers, at each of the 27 Program schools.

Technology Coach Survey and Interview

The Technology Coach Survey was divided into three sections. The first section was used to collect demographic information about participants (gender, age, teaching experience) and their schools (setting, number of teachers, grade levels, and number of students), and how and why the respondents were selected as Technology Coach. In the second section, the Coaches were presented with 24 tasks for which a Technology Coach may be responsible. They were asked to indicate how frequently they were involved in each task (not at all; rarely, occasionally, frequently, extensively). The last section focused on the TnETL program with regard to 1) key achievements; 2) greatest challenges; 3) main strengths; and 4) how the program could be improved.

The Technology Coach Interviews were conducted by trained researchers during on-site sessions that lasted approximately one hour. The interview questions were basically the same as those on the Teacher Focus Group and Principal Interview forms, but also included additional Technology Coach questions. These items focused on how the Coaches ensured that technology use was directed toward improved student learning and achievement, and how they supported teacher efforts.

Student Achievement Analysis

Student achievement analyses were conducted at the fifth and eighth grade levels to compare the mathematics and language performances of Program vs. Control students. Initial pre-TnETL analyses were

conducted to determine if differences existed in the groups prior to program implementation. To control for ability, students' preprogram scores were used as a covariate when comparing current year performances.

PROCEDURES

Technology Benchmarks were drafted and ratings were completed to indicate implementation progress for Program schools on May 30, 2005 (Tn-ETL-1 and TnETL-2). The SOM, SCU and RSCA were completed for both the whole-school and targeted visits during late spring 2006. The whole-school visits were specifically scheduled to occur on varied days and times for each school. For the targeted visits, teachers from each school were randomly selected and informed prior to the observation to demonstrate a prepared lesson using technology. Observers worked with the Technology Coaches at the Program schools and a designated contact person at the Control schools to schedule all data collection events. Data collection at each Program and Control school included five whole school and three targeted observations, principal interviews, teacher completion of the School Climate Inventory, Teacher Technology Questionnaire, and the Technology Skills Assessment. Program schools also participated in teacher focus groups, and Coach interviews and surveys.

The student performance-based measures were administered to 32 intact classes of eighth grade students in 16 randomly selected Program (N = 8) and Control (N = 8) schools. Each school had one class complete the Problem-Solving Task and one class complete the Technology Task. All teachers were given student packets of materials and specific administration instructions.

The procedures used to assess student performance are described by the methods used for Launch 1 and the methods used for Launch 2. Within each are descriptions of the target population and subject areas.

Launch 1 2006 5th grade (4th grade for 2005 and 3rd grade for 2004)

A one-way MANOVA with 2003 NRT mathematics and language scores as the dependent variables was used to examine the differences in students' academic performance between Program schools and Control schools. A one-way MANCOVA with 2003 NRT mathematics and language scores as covariates was used to compare students' 2006 CRT mathematics and language performances between Program schools and Control schools. The dependent variables were 2006 mathematics and language scores. The independent variables included 2003 NRT mathematics, 2003 NRT language, treatment, the interaction between mathematics and treatment, and the interaction between language and treatment.

Launch 1 2006 8th grade (7th grade for 2005 and 6th grade for 2004)

A one-way MANOVA with 2003 NRT mathematics and language scores as the dependent variables was used to examine the differences in students' academic performance between Program schools and Control schools. A one-way MANCOVA with 2003 NRT mathematics and language scores as covariates was used to compare students' 2006 CRT mathematics and language performances between Program schools and Control schools. The dependent variables were 2006 mathematics and language scores. The independent variables included 2003 NRT mathematics, 2003 NRT language, treatment, the interaction between mathematics and treatment, and the interaction between language and treatment.

Launch 2 2006 5th grade (4th grade for 2005)

A one-way MANOVA with 2004 CRT mathematics and language scores as the dependent variables was used to examine the differences in students' academic performance between program schools and control schools. A one-way MANCOVA with 2004 CRT mathematics and language scores as covariates was used to compare students' 2006 CRT mathematics and language performances between program schools and control schools. The dependent variables were 2006 mathematics and language scores. The independent variables included 2004 CRT mathematics, 2004 CRT language, treatment, the interaction between mathematics and treatment, and the interaction between language and treatment.

Launch 2 2006 8th grade (7th grade for 2005)

A one-way MANOVA with 2004 CRT mathematics and language scores as the dependent variables was used to examine the differences in students' academic performance between program schools and control schools. A one-way MANCOVA with 2004 CRT mathematics and language scores as covariates was used to compare students' 2006 CRT mathematics and language performances between program schools and control schools. The dependent variables were 2006 mathematics and language scores. The independent variables included 2004 CRT mathematics, 2004 CRT language, treatment, the interaction between mathematics and treatment, and the interaction between language and treatment.

DATA COLLECTION

Table 2 summarizes for each measure, the number completed, administration timeline, and a brief description of the data collection procedure.

TABLE 2: Data Collection Summary 2005-2006

Measure	Timeline	Instrument	Number Completed: Program L-1	Program L-2	Control L-1	Control L-2	Description
Whole School Classroom Observations	Spring 2006	SOM SCU RSCA	65 65 642	70 70 679	65 65 643	69 69 691	Three-hour sessions in which about 10 randomly selected classes were observed for 15 minutes each to obtain a perspective on common teaching practices and technology use.
Targeted Classroom Observations	Spring 2006	SOM SCU RSCA	39 39 39	42 42 42	39 39 36	42 42 42	Prearranged one-hour sessions in which randomly selected teachers demonstrated a prepared lesson using technology. Notes forms were completed every 15 minutes of the lesson.
Surveys	May 2006	SCI TTQ TSA	395 393 394	421 418 422	404 401 402	430 426 429	Administered during a faculty meeting held during Spring 2006 at each of the 10 schools
Principal Interview	Spring 2006	Principal Interview Protocol	13	14	13	14	Site researchers used the Principal Interview Protocol to conduct 1-hr. individual interviews with Program and Control principals.
Technology Coach: Survey and Interview	Spring 2006	Tech Coach Survey Interview Protocol	10 13	12 14	NA	NA	Site researchers individually conducted 1-hr. interviews with the Technology Coaches. Surveys were mailed to each Coach who returned them in unmarked envelopes.
Teacher Focus Groups	Spring 2006	Teacher Focus Group Protocol	130	140	NA	NA	Site researchers conducted on-site, one-hour focus groups with 8 to 10 randomly selected teachers from each Program school.
Technology Benchmarks	Spring 2006	School-developed Technology Benchmarks	13	14	NA	NA	Program schools developed Benchmarks and indicated the Phases as of September 1, 2004. After review by an experienced CREP researcher, each school received a personalized report with suggested revisions. School Benchmarks were revised and resubmitted with Phase indicators as of May 30, 2006.
Student Performance-Based Assessment	Spring 2006	Problem-Solving Skills	87	72	28	61	The Problem-Solving Task was administered to 8 Program and 8 Control 8th grade classes from randomly-selected schools.
	Spring 2006	Technology Skills	79	64	54	70	The Technology Task was administered to 8 Program and 8 Control 8th grade classes from randomly selected schools.
Student Achievement	Spring 2006 Spring 2006	5th Grade Mathematics 5th Grade Language 8th Grade Mathematics 8th Grade Language	See Student Achievement Section for full breakdown of participants				Student achievement analyses were conducted at the fifth and eighth grade levels to compare the mathematics and language performances of Program vs. Control students.

RESULTS

The results of the study are presented below by measurement strategy. In the Conclusion section, findings are synthesized across instruments to address each research question. Regardless of design employed, Effect Sizes (*ES*) were computed using Cohen's d formula (Cohen, 1988) to determine the educational importance of differences. An *ES* indicates the number of standard deviations by which the "treatment" group surpasses the "control" group. According to Cohen, an *ES* having an absolute value greater than 0.25 is considered educationally important.

Whole School Classroom Observation Results

A total of 269 three-hour whole school observations were conducted for this study. Of these, 135 were completed at Program schools and 134 at Control schools. The 807 hours of observation data were collected with SOMs, SCUs, and RSCAs during 15-minute visits to 2,655 randomly selected classrooms (Program = 1,321; Control = 1,334). Results from each measure are described in the section below.

School Observation Measure (SOM©)

As indicated in the description of SOM, the observation procedure primarily focused on 24 instructional strategies using a five-point rubric (0 = not observed, 1 = rarely, 2 = occasionally, 3 = frequently, and 4 = extensively). Table 3 presents the full, five-category breakdown of the Program and Control whole-school SOM results for L1 and L2 for 2005-2006.

Direct instruction and teachers acting as coach/facilitators were seen in at least 50% of the observations in both program and control classes. However, independent seatwork was also seen occasionally to extensively across program and control classes. As expected, the use of technology as a learning tool and for instructional delivery was seen more frequently during program observations. Independent inquiry was seen more prevalently in program observations, although to a lesser degree than technology use. Higher-level instructional feedback was also observed slightly more often in program schools.

TABLE 3: Whole School SOM© Data Summary

L1 Program *N* = 65 (642 classrooms), L 1 Control *N* = 65 (643classrooms)
L2 Program *N* = 70 (679 classrooms), L 2 Control *N* = 69 (691 classrooms)

The extent to which each of the following was used or present in the classroom.			Percent Observed				
	Launch	Group	None	Rarely	Occasionally	Frequently	Extensively
Instructional Orientation							
Direct instruction (lecture)	L1	Program	0.0	6.2	27.7	33.8	32.3
	L1	Control	4.6	1.5	12.3	40.0	41.5
	L2	Program	2.9	10.0	18.6	40.0	28.6
	L2	Control	2.9	4.3	15.7	50.0	27.1
Team teaching	L1	Program	55.4	27.7	13.8	3.1	0.0
	L1	Control	63.1	24.6	10.8	1.5	0.0
	L2	Program	51.4	31.4	15.7	1.4	0.0
	L2	Control	58.6	32.9	5.7	2.9	0.0
Cooperative/collaborative learning	L1	Program	13.8	35.8	27.7	18.5	1.5
	L1	Control	35.4	47.7	13.8	3.1	0.0
	L2	Program	15.7	45.7	24.3	14.3	0.0
	L2	Control	38.6	32.9	15.7	10.0	2.9
Individual tutoring (teacher, peer, aide, adult volunteer)	L1	Program	67.7	21.5	6.2	4.6	0.0
	L1	Control	72.3	20.0	7.7	0.0	0.0
	L2	Program	72.9	21.4	4.3	1.4	0.0
	L2	Control	70.0	18.6	10.0	1.4	0.0
Classroom Organization							
Ability groups	L1	Program	61.5	12.3	7.7	6.2	12.3
	L1	Control	63.1	18.5	7.7	6.2	4.6
	L2	Program	71.4	20.0	8.6	0.0	0.0
	L2	Control	60.0	22.9	8.6	4.3	4.3
Multi-age grouping	L1	Program	83.1	3.1	3.1	1.5	9.2
	L1	Control	84.6	7.7	4.6	1.5	1.5
	L2	Program	88.6	4.3	2.9	4.3	0.0
	L2	Control	84.3	4.3	1.4	1.4	8.6
Work centers (for individuals or groups)	L1	Program	35.4	27.7	23.1	10.8	3.1
	L1	Control	49.2	26.2	20.0	4.6	0.0
	L2	Program	28.6	38.6	18.6	11.4	2.9
	L2	Control	41.4	40.0	14.3	2.9	1.4
Instructional Strategies							
Higher level instructional feedback (written or verbal) to enhance student learning	L1	Program	27.7	33.8	4.6	12.3	21.5
	L1	Control	33.8	24.6	16.9	16.9	7.7
	L2	Program	20.0	35.7	24.3	17.1	2.9
	L2	Control	25.7	30.0	25.7	10.0	8.6
Integration of subject areas (interdisciplinary/thematic units)	L1	Program	73.8	18.5	4.6	1.5	0.0
	L1	Control	64.6	27.7	6.2	1.5	0.0
	L2	Program	71.4	22.9	5.7	0.0	0.0
	L2	Control	58.6	32.9	7.1	1.4	0.0

TABLE 3: Continued

The extent to which each of the following was used or present in the classroom.	Launch	Group	Percent Observed None	Rarely	Occasionally	Frequently	Extensively
Project-based learning	L1	Program	35.4	40.0	16.9	7.7	0.0
	L1	Control	72.3	23.1	4.6	0.0	0.0
	L2	Program	45.7	41.4	11.4	1.4	0.0
	L2	Control	52.9	35.7	8.6	2.9	0.0
Use of higher-level questioning strategies	L1	Program	15.4	29.2	16.9	18.5	20.0
	L1	Control	13.8	27.7	15.4	33.8	9.2
	L2	Program	2.9	25.7	44.3	21.4	4.3
	L2	Control	18.6	18.6	34.3	21.4	7.1
Teacher as a coach/facilitator	L1	Program	3.1	16.9	36.9	26.2	16.9
	L1	Control	12.3	15.4	40.0	18.5	13.8
	L2	Program	1.4	15.7	31.4	25.7	25.7
	L2	Control	5.7	24.3	30.0	25.7	14.3
Parent/community involvement in learning activities	L1	Program	90.8	7.7	1.5	0.0	0.0
	L1	Control	81.5	15.4	1.5	1.5	0.0
	L2	Program	87.1	10.0	1.4	1.4	0.0
	L2	Control	81.4	15.7	1.4	1.4	0.0
Student Activities							
Independent seatwork (self-paced worksheets, individual assignments)	L1	Program	3.1	15.4	46.2	29.2	6.2
	L1	Control	1.5	4.6	38.5	41.5	13.8
	L2	Program	4.3	31.4	31.4	27.1	5.7
	L2	Control	1.4	17.1	30.0	32.9	18.6
Experiential, hands-on learning	L1	Program	27.7	33.8	20.0	15.4	3.1
	L1	Control	35.4	46.2	12.3	4.6	1.5
	L2	Program	27.1	38.6	31.4	2.9	0.0
	L2	Control	28.6	28.6	31.4	10.0	1.4
Systematic individual instruction (differential assignments geared to individual needs)	L1	Program	78.5	12.3	3.1	3.1	3.1
	L1	Control	92.3	0.0	1.5	4.6	1.5
	L2	Program	87.1	11.4	1.4	0.0	0.0
	L2	Control	88.6	4.3	1.4	4.3	1.4
Sustained writing/composition (self-selected or teacher-generated topics)	L1	Program	56.9	38.5	4.6	0.0	0.0
	L1	Control	67.7	26.2	6.2	0.0	0.0
	L2	Program	60.0	35.7	2.9	1.4	0.0
	L2	Control	67.1	28.6	4.3	0.0	0.0
Sustained reading	L1	Program	35.4	41.5	15.4	7.7	0.0
	L1	Control	38.5	38.5	18.5	3.1	1.5
	L2	Program	32.9	48.6	14.3	4.3	0.0
	L2	Control	24.3	42.9	28.6	2.9	1.4
Independent inquiry/research on the part of students	L1	Program	40.0	40.0	18.5	1.5	0.0
	L1	Control	72.3	21.5	4.6	1.5	0.0
	L2	Program	45.7	44.3	7.1	2.9	0.0
	L2	Control	54.3	32.9	10.0	2.9	0.0
Student discussion	L1	Program	46.2	21.5	9.2	9.2	13.8
	L1	Control	36.9	24.6	12.3	13.8	12.3
	L2	Program	30.0	32.9	24.3	7.1	5.7
	L2	Control	54.3	14.3	12.9	5.7	12.9

TABLE 3: Continued

The extent to which each of the following was used or present in the classroom.			Percent Observed				
	Launch	Group	None	Rarely	Occasionally	Frequently	Extensively
Technology Use							
Computer for instructional delivery (e.g. CAI, drill & practice)	L1	Program	18.5	26.2	16.9	23.1	15.4
	L1	Control	43.1	41.5	7.7	6.2	1.5
	L2	Program	15.7	37.1	35.7	11.4	0.0
	L2	Control	28.6	40.0	22.9	7.1	1.4
Technology as a learning tool or resource (e.g. Internet research, spreadsheet or database creation, multi-media, CD ROM)	L1	Program	16.9	33.8	27.7	20.0	1.5
	L1	Control	56.9	33.8	7.7	1.5	0.0
	L2	Program	14.3	22.9	40.0	18.6	4.3
	L2	Control	38.6	38.6	18.6	4.3	0.0
Assessment							
Performance assessment strategies	L1	Program	80.0	13.8	4.6	0.0	1.5
	L1	Control	86.2	13.8	0.0	0.0	0.0
	L2	Program	68.6	20.0	8.6	1.4	1.4
	L2	Control	60.0	24.3	7.1	0.0	8.6
Student self-assessment (portfolios, individual record books)	L1	Program	72.3	20.0	6.2	1.5	0.0
	L1	Control	89.2	10.8	0.0	0.0	0.0
	L2	Program	85.7	5.7	2.9	1.4	4.3
	L2	Control	82.9	10.0	1.4	0.0	5.7
Summary Items							
Academically focused class time	L1	Program	0.0	0.0	6.2	24.6	69.2
	L1	Control	0.0	6.2	4.6	15.4	73.8
	L2	Program	0.0	1.4	8.6	27.1	62.9
	L2	Control	2.9	8.6	24.3	15.7	48.6
Level of student attention/ Interest/engagement	L1	Program	0.0	0.0	3.1	35.4	61.5
	L1	Control	0.0	6.2	4.6	24.6	64.6
	L2	Program	0.0	1.4	12.9	34.3	51.4
	L2	Control	2.9	5.7	24.3	22.9	44.4

Whole Grade SOM Inferential Results: Program vs. Control

A series of *t-tests* comparing the L1 and L2 Program and Control means on the 26 SOM items showed significantly higher mean scores for L1 Program over Control on 5 items and for L2 Program over Control on 2 items (see Table 4). Effect sizes across L1 and L2 ranged from +0.55 to +1.15, thus indicating relatively large effects. Consistent with program goals, the item revealing the greatest difference for L1 and L2 was technology as a learning tool (L1 Program *M* = 1.55, Control *M* = 0.54; L2 Program *M* = 1.76, Control *M* = 0.89). Also noteworthy were differences in the frequency with which computers were used for instructional delivery in Launch 1 (L1 Program *M* = 1.91, Control *M* = 0.82). Also consistent with program goals, were significant differences in other approaches that are supportive of student-centered learning in a technology-enhanced environment, such as project-based learning, independent inquiry or research on the part of the students, and cooperative or collaborative learning.

TABLE 4: A Summary of SOM© Items Showing Significant Differences Between Program and Control Whole School Observations

Launch 1

	Program (*n = 65*)		Control (*n = 65*)				
SOM Items	***M***	***SD***	***M***	***SD***	***t (128)***	***p***	***ES***
Technology as a learning tool or resource	1.55	1.05	.54	.71	6.48	.000	1.15
Computer for instructional delivery	1.91	1.37	.82	.93	5.32	.000	.94
Project-based learning	.97	.92	.32	.56	4.84	.000	.86
Cooperative/collaborative learning	1.55	1.00	.85	.76	4.51	.000	.80
Independent inquiry/research on the part of students	.82	.79	.35	.65	3.65	.000	.65

* Scale = 0 = Not Observed, 4 = Extensively Observed

Launch 2

	Program (*n =70*)		Control (*n =70*)				
SOM Items	***M***	***SD***	***M***	***SD***	***t (138)***	***p***	***ES***
Technology as a learning tool or resource	1.76	1.06	.89	.86	5.35	.000	.91
Academically focused class time	3.51	.72	2.99	1.61	3.24	.001	.55

* Scale = 0 = Not Observed, 4 = Extensively Observed

Rubric for Student-Centered Activities (RSCA)

Results address the percentage of whole school-sessions in which each RSCA strategy was observed at least once, the quality/strength of strategy applications, and the percentage of sessions in which technology was used with the observed strategy. When a RSCA strategy was observed, the implementation was rated with the following scale (1 = limited application to 4 = strong application) for each of the strategies. Therefore, when reviewing the RSCA mean scores, it is important to note the frequency with which the strategy was observed when examining the overall ratings.

One RSCA was completed for each of the 2,655 classrooms observed (L1 Program 642, Control 643; L2 Program 679, Control 691). A descriptive summary of the L1 and L2 Program and Control data is presented in Table 5. As shown, the mean scores for both groups ranged from a low of *M* = 1.89 for L1 Control “Students as producers of knowledge,” to a high of *M* = 2.98 for L2 Control “Project Based Learning." It should be noted that although “Project Based Learning” had very high means for implementation (L1

Program=*M* 2.92 and L2 Program *M*=2.80) it was only seen during 15% of the L1 Program and 11% of the L2 Program observations.

TABLE 5: Whole-School RSCA: Percent of Observed Strategies by Application Strength and Technology Use

L1 Program N = 642, L 1 Control N = 643
L2 Program N = 679, L 2 Control N = 691

			% Observed		Rating 1		Rating 2		Rating 3		Rating 4			Technology Used	
Item	**Launch**	**Group**	***n***	**%**	***N***	**%**	***n***	**%**	***n***	**%**	***n***	**%**	***Mean***	***n***	**%**
Cooperative Learning	L1	Program	165	25.7	37	15.1	48	19.6	59	24.1	21	8.6	2.39	80	48.4
	L1	Control	85	13.2	17	5.9	15	5.2	28	9.7	25	8.7	2.72	21	24.7
	L2	Program	162	23.8	18	7.0	45	17.5	77	30.0	22	8.6	2.63	73	45.0
	L2	Control	136	19.6	18	7.0	46	18.0	58	22.7	14	5.5	2.50	40	29.4
Project Based Learning	L1	Program	100	15.5	4	1.6	17	16.9	62	25.3	17	6.9	2.92	76	76.0
	L1	Control	29	04.0	5	1.7	7	2.4	9	3.1	8	2.8	2.68	8	27.6
	L2	Program	76	11.2	8	3.1	14	5.4	39	15.2	15	5.8	2.80	58	73.3
	L2	Control	67	09.7	2	0.8	11	4.3	40	15.6	14	5.5	2.98	34	50.7
Higher-level Questions	L1	Program	245	38.1	47	19.2	39	15.9	133	54.3	26	10.6	2.56	78	31.8
	L1	Control	289	44.9	49	17.0	38	13.1	135	46.7	67	23.2	2.76	41	14.1
	L2	Program	255	37.6	32	12.5	70	27.2	120	46.7	33	12.8	2.60	66	25.8
	L2	Control	256	37.0	51	19.9	80	31.3	92	35.9	33	12.9	2.42	32	12.5
Experiential Hands-On	L1	Program	153	23.8	21	8.6	56	22.9	62	25.3	14	5.7	2.45	72	47.1
	L1	Control	87	13.5	19	6.6	21	7.3	30	10.4	17	5.9	2.51	22	25.3
	L2	Program	130	19.1	9	3.5	38	14.8	61	23.7	22	8.6	2.73	52	40.0
	L2	Control	165	23.8	22	8.6	50	19.5	72	28.1	21	8.2	2.55	56	33.9
Independent Inquiry	L1	Program	98	15.2	20	8.2	17	6.9	40	16.3	21	8.6	2.63	77	78.5
	L1	Control	32	04.9	5	1.7	6	2.1	16	5.5	5	1.7	2.65	13	40.6
	L2	Program	73	10.7	9	3.5	15	5.8	37	14.4	12	4.7	2.71	60	82.2
	L2	Control	79	11.4	17	6.6	22	8.6	31	12.1	9	3.5	2.41	53	67.0
Student Discussion	L1	Program	148	23.0	45	18.4	38	15.5	43	17.6	22	9.0	2.28	37	25.0
	L1	Control	202	31.4	32	11.1	28	9.7	84	29.1	58	20.1	2.83	20	09.9
	L2	Program	167	24.6	24	9.3	51	19.8	68	26.5	24	9.3	2.55	61	36.5
	L2	Control	173	25.0	39	15.2	55	21.5	58	22.7	21	8.2	2.35	17	68.0
Students as Producers	L1	Program	93	14.4	20	8.2	12	4.9	42	17.1	19	7.8	2.64	NA	NA
	L1	Control	28	04.3	15	5.2	3	1.0	8	2.8	2	0.7	1.89	NA	NA
	L2	Program	111	16.3	15	5.8	22	8.6	52	20.2	22	8.6	2.72	NA	NA
	L2	Control	68	09.8	18	7.0	20	7.8	20	7.8	10	3.9	2.32	NA	NA

*Rating scale: 1 = limited application; 4 = Strong application.

Inferential results: Program vs. Control

Inferential analyses (*t*-test for independent samples) were conducted to compare Program vs. Control rubric ratings. Significant differences were revealed for the Launch 1 cohort and the Launch 2 cohort. As seen in Table 6, the Launch 1 results favored the Control group for cooperative learning (p =.016; *ES* = 0.33),

student discussion (*p* =.000; *ES* = 0.53), and higher-level questioning (*p* =.018; *ES* = 0.21). The Launch 2 results, on the other hand, favored the Program group on two strategies: Independent inquiry/research (*p* =.042; *ES* = +0.34), higher-level questioning (*p* =.021; *ES* = +0.20).

TABLE 6: A Summary of RSCA Items Showing Significant Differences Between L1 and L2 Program and Control Whole School Observations

Launch 1

		Program (*n =642)*			Control (*n =643)*				
RSCA Items	***n***	***M****	***SD***	***n***	***M***	***SD***	***t)***	***p***	***ES***
Cooperative/collaborative learning	165	2.39	.97	85	2.72	1.10	2.43	.016	-.33
Higher-level questioning strategies	245	2.56	.92	289	2.76	.99	2.37	.018	-.21
Student discussion	148	2.28	1.06	202	2.83	1.02	4.86	.000	-.53

*Rating scale: 1 = limited application; 4 = Strong application.

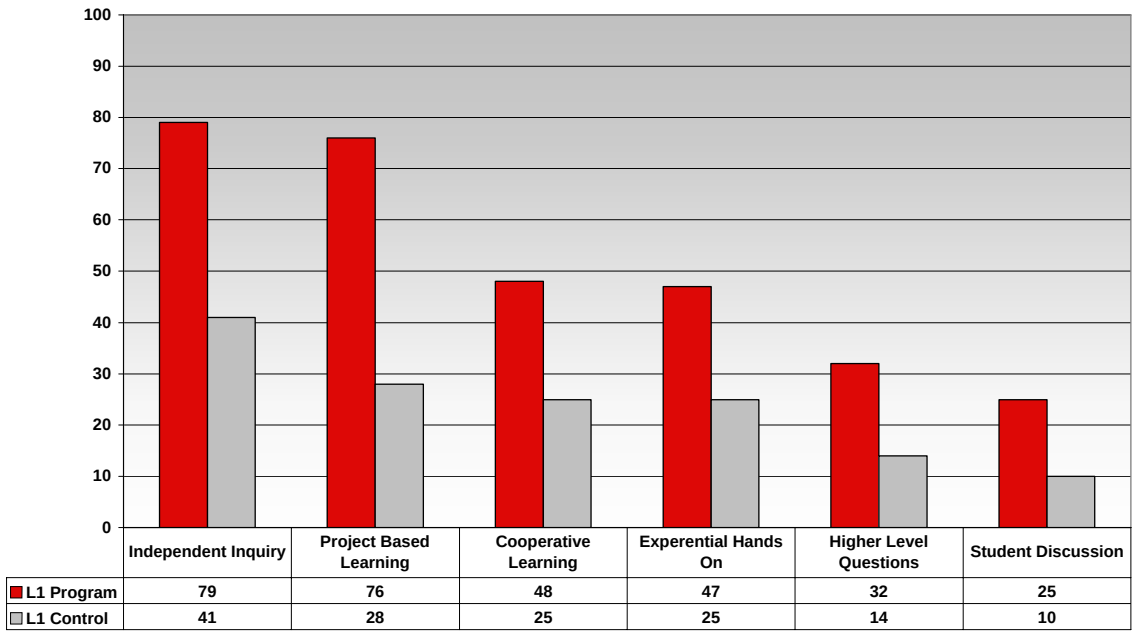
Launch 2

		Program (*n =679)*			Control (*n =691)*				
RSCA Items	**n**	***M****	***SD***	***n***	***M***	***SD***	***t***	***p***	***ES***
Higher-level questioning strategies	255	2.60	.87	256	2.42	.95	2.31	.021	.20
Independent inquiry/research	73	2.71	.89	79	2.41	.95	2.05	.042	.34

*Rating scale: 1 = limited application; 4 = Strong application.

RSCA Technology Use

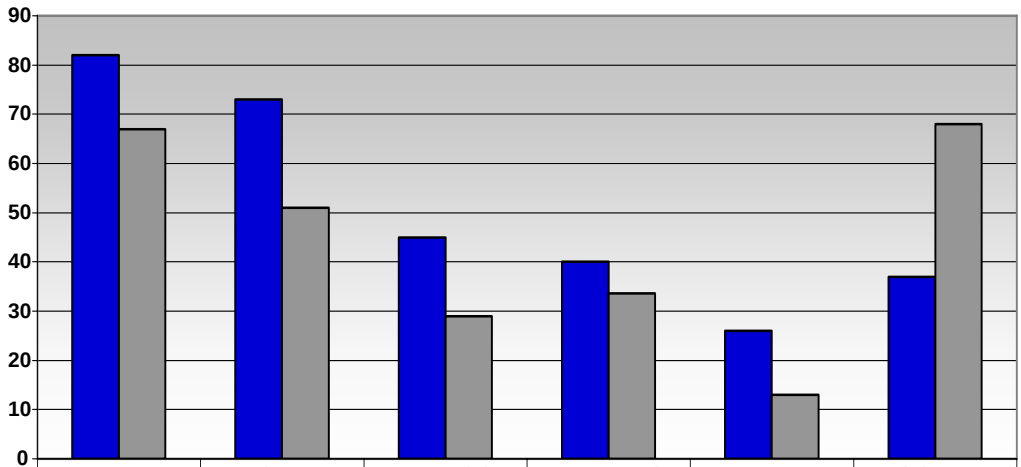
As might be expected, technology was used to support all RSCA strategies to a greater extent in Program classes as compared to Control classes (Figure 1 and Figure 2). The lone exception was Student Discussion as seen in the Launch 2 Control classes. Although there was a lower frequency of technology use in the Control classrooms, the pattern of use was similar across both programs. Understandably, technology was most frequently used to support student independent inquiry, such as searching for information on the Internet and to support project-based learning. Additionally, technology use was also seen extensively associated with Project-Based Learning in Program classes.



	Independent Inquiry	Project Based Learning	Cooperative Learning	Experential Hands On	Higher Level Questions	Student Discussion
L1 Program	79	76	48	47	32	25
L1 Control	41	28	25	25	14	10

Note. Students as producers of knowledge" is not included because use of technology is a required component.

FIGURE 1. Launch 1 Percent of Whole School RSCA with Technology Use



	Independent Inc	Project Based Learning	Experential Har On	Cooperative Learning	Student Discuss	Higher Level Questions
L2 Program	82	73	45	40	26	37
L2 Contro	67	51	29	34	13	68

Note. Students as producers of knowledge" is not included because use of technology is a required component.

FIGURE 2. Launch 2 Percent of Whole School RSCA Activities with Technology Use

Survey of Computer Use (SCU)

A summary of the SCU whole-school observation results for L1 and L2 Program and Control schools is provided in Tables 7 and 8. The data were collected from 2,655 (L1 Program 642; Control 643; L2 Program 679; Control 691) classrooms. When examining the configuration of observed computers available for student use, the Program classrooms understandably had a greater number of computers and newer computers than the Control classrooms (see Table 7). However, both Program (L1 = 98.5%, L2 = 100%) and Control (L1 = 90.8%, L2 = 92.9%) schools had Internet access on the majority of their computers.

Consistent with greater access to computers, students in Program (L1 = 75.4%, L2 = 80.0%) and L2 Control (74.3%) classes more frequently worked individually at computers than did L1 Control (53.8%) students. With regard to student computer literacy and keyboarding skills, the majority (L1 = 81.6%, L2 = 87.2%) of the Program students had moderate to good computer literacy skills as compared to fewer (L1 = 49.2%, L2 = 70.0%) of the Control students. However, only slight differences were found between the keyboarding skills of Program and Control students. Desktops were the most frequently observed type of computers for both groups, while laptops were seen more frequently in Program than in Control classes.

TABLE 7: Whole School SCU Data Summary

L1 Program *N* = 70 (642 classrooms), L 1 Control *N* = 65 (643 classrooms)
L2 Program *N* = 70 (679 classrooms), L 2 Control *N* = 69 (691 classrooms)

Computer Configuration	Launch	Program	Control
Percentages of classrooms with the following numbers of computers or digital tools.			
None	L1	9.2	15.4
	L2	7.1	1.4
One	L1	1.5	10.8
	L2	0.0	5.7
2 – 4	L1	29.2	69.2
	L2	50.0	67.1
5 – 10	L1	52.3	4.6
	L2	37.1	22.9
11 or more	L1	7.7	0.0
	L2	5.7	2.9
Percentages of classrooms in which the majority of the computers were:			
Up-to-date	L1	63.1	30.8
	L2	80.0	34.3
Aging, but adequate	L1	36.9	58.5
	L2	18.6	60.0
Outdated/limited capacity	L1	0.0	3.1
	L2	1.4	2.9
No computers were observed	L1	0.0	7.7
	L2	0.0	2.9

TABLE 7: Continued

Computer Configuration	Launch	Program	Control
Percentages of classrooms in which the majority of the computers were:			
Connected to the Internet	L1	98.5	90.8
	L2	100.0	92.9
Not connected to the Internet	L1	1.5	1.5
	L2	0.0	4.3
No computers were observed	L1	0.0	7.7
	L2	0.0	2.9
Student Computer Use	**Launch**	**Program**	**Control**
Percentages of classrooms in which computers or digital tools were used by:			
Few (less than 10%) students	1	7.7	32.3
	2	8.6	35.7
Some (about 10-50%) students	1	36.9	21.5
	2	42.9	37.1
Most (about 51-90%) students	1	16.9	1.5
	2	7.1	5.7
Nearly all (91-100%) students	1	29.2	10.8
	2	38.6	7.1
Students did not use computers	1	9.2	33.8
	2	1.4	14.3
Percentage of classrooms in which students worked with computers or digital tools			
Alone	1	75.4	53.8
	2	80.0	74.3
In pairs	1	16.9	9.2
	2	15.7	8.6
In small groups	1	1.5	1.5
	2	1.4	1.4
Percentage of classrooms in which student computer literacy skills were:			
Poor	1	1.5	1.5
	2	0.0	0.0
Moderate	1	35.4	20.0
	2	32.9	45.7
Very good	1	46.2	29.2
	2	54.3	24.3
Not observed	1	15.4	49.2
	2	11.4	30.0
Percentage of classrooms in which student keyboarding skills were:			
Poor	1	0.0	0.0
	2	1.4	0.0
Moderate	1	18.5	7.7
	2	28.6	31.4
Very good	1	36.9	27.7
	2	18.6	11.4
Not observed	1	44.6	64.6
	2	50.0	57.1

TABLE 7: Continued

The extent to which each of the following was used or present in the classroom.			Percent Observed				
	Launch	Group	None	Rarely	Occasionally	Frequently	Extensively
Desktop Computers	L1	Program	12.3	16.9	18.5	36.9	15.4
	L1	Control	40.0	40.0	16.9	3.1	0.0
	L2	Program	11.4	17.1	22.9	28.6	20.0
	L2	Control	14.3	32.9	24.3	12.9	15.7
Laptop Computers	L1	Program	49.2	30.8	12.3	7.7	0.0
	L1	Control	93.8	3.1	1.5	1.5	0.0
	L2	Program	58.6	22.9	15.7	1.4	1.4
	L2	Control	91.4	5.7	1.4	1.4	0.0
Personal Data Assistants (PDA)	L1	Program	100.0	0.0	0.0	0.0	0.0
	L1	Control	98.5	1.5	0.0	0.0	0.0
	L2	Program	98.6	1.4	0.0	0.0	0.0
	L2	Control	98.6	1.4	0.0	0.0	0.0
Graphing Calculator	L1	Program	87.8	10.8	0.0	1.5	0.0
	L1	Control	90.8	4.6	4.6	0.0	0.0
	L2	Program	91.4	5.7	2.9	0.0	0.0
	L2	Control	90.0	4.3	4.3	1.4	0.0
Information Processor (e.g., Alphaboard)	L1	Program	92.3	7.7	0.0	0.0	0.0
	L1	Control	98.5	1.5	0.0	0.0	0.0
	L2	Program	81.4	8.6	8.6	1.4	0.0
	L2	Control	100.0	0.0	0.0	0.0	0.0
Digital Accessories (e.g., camera, scanner, probes)	L1	Program	83.1	9.2	7.7	0.0	0.0
	L1	Control	90.8	4.6	4.6	0.0	0.0
	L2	Program	84.3	7.1	5.7	2.9	0.0
	L2	Control	91.4	7.1	1.4	0.0	0.0

Student computer activities by software used

As seen in Table 8, students in Program classrooms were observed using 18 of the 20 software applications, whereas control students used fewer software applications (L1 = 11 of 20; L2 = 16 of 20). However, the frequency with which the different software applications were observed varied greatly. Only two software applications were observed occasionally or more in at least 20% of the computer activities in Program classes: Internet browser (L1 = 41.5%; L2 = 37.2%) and drill/practice educational software (L1 = 26.2%; L2 = 40%). Similarly, data from the Control classes revealed only two software applications were observed occasionally or more in at least 20% of the computer activities: drill/practice educational software (L2 = 22.9%) and Word Processing (L1=21.5%).

TABLE 8: Whole School SCU: Frequency of Observed Program vs. Control Computer Activities

L1 Program *N* = 65 (642 classrooms), L 1 Control *N* = 65 (643 classrooms)
L2 Program *N* = 70 (679 classrooms), L 2 Control *N* = 69 (691 classrooms)

The extent to which each of the following was used or present in the classroom.			**Percent Observed**				
Production Tools	**Launch**	**Group**	**None 0**	**Rarely 1**	**Occasionally 2**	**Frequently 3**	**Extensively 4**
Word Processing	L1	Program	49.2	29.2	20.0	1.5	0.0
	L1	Control	93.8	4.6	1.5	0.0	0.0
	L2	Program	60.0	22.9	14.3	2.9	0.0
	L2	Control	80.0	14.3	4.3	1.4	0.0
Database	L1	Program	98.5	1.5	0.0	0.0	0.0
	L1	Control	100.0	0.0	0.0	0.0	0.0
	L2	Program	98.6	0.0	0.0	0.0	0.0
	L2	Control	97.1	2.9	0.0	0.0	0.0
Spreadsheet	L1	Program	92.3	6.2	1.5	0.0	0.0
	L1	Control	100.0	0.0	0.0	0.0	0.0
	L2	Program	90.0	2.9	4.3	0.0	0.0
	L2	Control	100.0	0.0	0.0	0.0	0.0
Draw/Paint/Graphics	L1	Program	86.2	7.7	6.2	0.0	0.0
	L1	Control	100.0	0.0	0.0	0.0	0.0
	L2	Program	77.1	11.4	7.1	0.0	0.0
	L2	Control	97.1	1.4	1.4	0.0	0.0
Presentation (e.g., MS PowerPoint)	L1	Program	63.1	20.0	15.4	1.5	0.0
	L1	Control	95.4	3.1	1.5	0.0	0.0
	L2	Program	74.3	12.9	10.0	1.4	0.0
	L2	Control	84.3	11.4	2.9	0.0	1.4
Authoring (e.g., HyperStudio)	L1	Program	93.8	1.5	1.5	3.1	0.0
	L1	Control	100.0	0.0	0.0	0.0	0.0
	L2	Program	88.6	5.7	2.9	0.0	0.0
	L2	Control	97.1	2.9	0.0	0.0	0.0
Concept Mapping (e.g., Inspiration)	L1	Program	80.0	15.4	3.1	1.5	0.0
	L1	Control	100.0	0.0	0.0	0.0	0.0
	L2	Program	84.3	8.6	5.7	0.0	0.0
	L2	Control	100.0	0.0	0.0	0.0	0.0
Planning (e.g., MS Project)	L1	Program	96.9	1.5	0.0	0.0	0.0
	L1	Control	98.5	0.0	1.5	0.0	0.0
	L2	Program	97.1	1.4	1.4	0.0	0.0
	L2	Control	98.6	1.4	0.0	0.0	0.0
Other	L1	Program	84.6	12.3	0.0	0.0	0.0
	L1	Control	93.8	6.2	0.0	0.0	0.0
	L2	Program	92.9	4.3	2.9	0.0	0.0
	L2	Control	97.1	2.9	0.0	0.0	0.0
Internet Browser (e.g., Netscape)	L1	Program	26.2	32.3	32.3	7.7	1.5
	L1	Control	89.2	10.8	0.0	0.0	0.0
	L2	Program	37.1	25.7	22.9	8.6	5.7
	L2	Control	62.9	20.0	10.0	2.9	4.3
CD Reference (encyclopedias, etc.)	L1	Program	100.0	0.0	0.0	0.0	0.0
	L1	Control	100.0	0.0	0.0	0.0	0.0
	L2	Program	94.3	2.9	2.9	0.0	0.0
	L2	Control	95.7	4.3	0.0	0.0	0.0
Communications	L1	Program	100.0	0.0	0.0	0.0	0.0
	L1	Control	100.0	0.0	0.0	0.0	0.0
	L2	Program	98.6	1.4	0.0	0.0	0.0
	L2	Control	100.0	0.0	0.0	0.0	0.0

TABLE 8: Continued

The extent to which each of the following was used or present in the classroom.			Percent Observed				
Production Tools	Launch	Group	None 0	Rarely 1	Occasionally 2	Frequently 3	Extensively 4
Other	L1	Program	93.8	3.1	3.1	0.0	0.0
	L1	Control	98.5	1.5	0.0	0.0	0.0
	L2	Program	97.1	1.4	0.0	0.0	0.0
	L2	Control	98.6	1.4	0.0	0.0	0.0
Educational Software	**Launch**	**Group**	**None**	**Rarely**	**Occasionally**	**Frequently**	**Extensively**
Drill/Practice/Tutorial	L1	Program	47.7	26.2	15.4	6.2	4.6
	L1	Control	64.6	23.1	10.8	1.5	0.0
	L2	Program	37.1	22.9	24.3	14.3	1.4
	L2	Control	42.9	34.3	15.7	4.3	2.9
Problem Solving (e.g., SimCity)	L1	Program	93.8	4.6	0.0	0.0	0.0
	L1	Control	98.5	0.0	1.5	0.0	0.0
	L2	Program	85.7	7.1	4.3	2.9	0.0
	L2	Control	92.9	7.1	0.0	0.0	0.0
Process Tools (Geometer's Sketchpad, etc.)	L1	Program	92.3	4.6	1.5	0.0	0.0
	L1	Control	100.0	0.0	0.0	0.0	0.0
	L2	Program	90.0	0.0	7.1	1.4	0.0
	L2	Control	97.1	2.9	0.0	0.0	0.0
Other	L1	Program	84.6	12.3	0.0	0.0	0.0
	L1	Control	95.4	4.6	0.0	0.0	0.0
	L2	Program	87.1	5.7	4.3	0.0	0.0
	L2	Control	92.9	5.7	0.0	0.0	1.4
Testing Software	**Launch**	**Group**	**None**	**Rarely**	**Occasionally**	**Frequently**	**Extensively**
Individualized/Tracked (e.g., Accelerated Reader)	L1	Program	80.0	6.2	7.7	6.2	0.0
	L1	Control	73.8	15.4	9.2	0.0	1.5
	L2	Program	64.3	20.0	8.6	4.3	1.4
	L2	Control	58.6	22.9	12.9	0.0	5.7
Generic	L1	Program	96.9	3.1	0.0	0.0	0.0
	L1	Control	100.0	0.0	0.0	0.0	0.0
	L2	Program	98.6	0.0	1.4	0.0	0.0
	L2	Control	98.6	1.4	0.0	0.0	0.0
Other	L1	Program	80.0	6.2	7.7	6.2	0.0
	L1	Control	98.5	1.5	0.0	0.0	0.0
	L2	Program	95.7	0.0	1.4	1.4	0.0
	L2	Control	100.0	0.0	0.0	0.0	0.0

Subject Areas of Computer Activities	Launch	Group	Language Arts	Mathematics	Science	S. Studies	Other	Not Observed
Production Tools	L1	Program	58.5	24.6	27.7	13.8	9.2	30.8
	L1	Control	4.6	3.1	3.1	3.1	3.1	81.5
	L2	Program	41.4	11.4	22.9	20.0	8.6	40.0
	L2	Control	15.7	1.4	4.3	10.0	8.6	70.0
Internet Research Tools	L1	Program	43.1	24.6	23.1	26.2	3.1	23.1
	L1	Control	6.2	0.0	6.2	3.1	0.0	87.7
	L2	Program	30.0	11.4	22.9	35.7	1.4	38.6
	L2	Control	20.0	7.1	12.9	15.7	1.4	61.4
Educational Software	L1	Program	44.6	30.8	12.3	4.6	7.7	40.0
	L1	Control	29.2	13.8	4.6	3.1	1.5	63.1
	L2	Program	61.4	32.9	10.0	7.1	7.1	25.7
	L2	Control	35.7	28.6	10.0	8.6	2.9	41.4
Testing Software	L1	Program	18.5	15.4	3.1	1.5	0.0	73.8
	L1	Control	24.6	3.1	0.0	0.0	1.5	72.3
	L2	Program	37.1	1.4	1.4	0.0	0.0	62.9
	L2	Control	38.6	4.3	0.0	0.0	0.0	54.3

* Item percentages may not total 100% because of missing data and use of activities involving more than one subject area.

Below are more specific descriptions of the different software uses, related subject area content of the activities, and noted significant differences for the four computer activity categories: Production Tools, Internet/Research Tools, Educational Software, and Testing Software. To determine whether significant differences occurred between Program and Control data, *t*-tests for independent samples were performed on each item. Bonferroni adjustment reduced the alpha from .05 to .0025 to prevent inflation of overall type 1 error rate. Effect Sizes (*ES*) were also computed using Cohen's *d* formula (Cohen, 1988) to determine the educational importance of differences.

Production tools used by students

When examining Launch 1 results, three of the production tools were used significantly more in Program vs. Control classrooms: word processing (L1 Program *M* = 0.74; L1 Control *M* = 0.08), presentation (L1 Program *M* = 0.55; L1 Control *M* = 0.06), and concept mapping (L1 Program *M* = 0.26; L1 Control *M* = 0.00) (see Table 9). Even though the Effect Sizes ranged from +1.06 to +0.63, indicating that the differences were educationally important, the extent of use was limited in that the mean scores for Program results only ranged from *M* = 0.74 to *M* = 0.26, on a scale where 1 = rarely observed. Launch 2 results revealed one significant difference between student use of concept mapping (L2 Program *M* = 0.20; L2 Control *M* = 0.0; *ES* = +0.54). Again, however, the overall use of presentation software by Program students was very limited. When examining the subject areas for which students used the production tools, language arts activities were the most frequently observed in both the Program and Control classrooms.

Internet/research tools used by students

Launch 1 Program students used Internet browsers more frequently than any other software application and significantly more than the Control students (L1 Program *M* = 1.26; L1 Control *M* = 0.11; *ES* = +01.59). Use of Internet research tools in Program and Control classes occurred across all subject areas, with the greatest uses seen for language arts and social studies.

Educational software use by students

There were no significant differences between Program and Control student use of educational software. Across both groups greatest use of educational software was for language arts and mathematics activities.

Testing software use by students

Testing software was infrequently observed in both Program and Control classes and there were no significant differences between the L1 and L2 groups. The primary subject area for both L1 and L2 Program and Control uses of the testing software was language arts.

TABLE 9: A Summary of SCU Items Showing Significant Differences between Program and Control Whole School Computer Activities

Launch 1

	Program (*n* =65)		Control (*n* =65)				
SCU ITEMS	***M***	***SD***	***M***	***SD***	***t (128)***	***p***	***ES***
COMPUTER ACTIVITIES							
Production Tools							
Word Processing	.74	.83	.08	.32	5.97	.000	1.06
Presentation	.55	.81	.06	.30	4.59	.000	0.81
Concept Mapping	.26	.59	.00	.00	3.55	.001	0.63
Internet/Research Tools							
Internet Browser	1.26	.99	.11	.31	8.97	.000	1.59

* Scale = 0 = Not Observed, 4 = Extensively Observed

Launch 2

	Program (*n* =70)		Control (*n* =69)				
SCU ITEMS	***M***	***SD***	***M***	***SD***	***t (137)***	***p***	***ES***
COMPUTER ACTIVITIES							
Production Tools							
Concept Mapping	.20	.53	0.0	0.00	3.20	.002	.54

* Scale = 0 = Not Observed, 4 = Extensively Observed

Overall meaningful use of computers

The culminating assessment on the SCU was the observer's evaluation of the meaningfulness of the way in which technology was integrated with teaching and learning. To do this, they were asked to indicate how often they observed computer activities at each level of the rubric; e.g., how often did the observers see *very meaningful* use of computers (not observed to extensively) (See Table 10). As can be seen in Table 11, significant differences between L1 Program and Control observations were found on three levels of the rating scale, with fairly strong associated Effect Sizes that ranged from of +0.40 to +1.06. Furthermore, significant differences between L2 Program and Control observations were found on two levels of the rating scale, with

an Effect Size range of .49 to .58. Of note, over 40.0% of the computer activities in Program classes (L1 = 41.5%; L2 = 48.6%) were rated occasionally or more as *meaningful* as compared to approximately 15% of the Control activities (L1 = 06.2%; L2 = 25.7%).

TABLE 10: Whole School SCU: Overall Meaningfulness of Computer Activities

L1 Program *N* = 65 (642 classrooms), L 1 Control *N* = 65 (643 classrooms)
L2 Program *N* = 70 (679 classrooms), L 2 Control *N* = 69 (691 classrooms)

The extent to which each of the following was used or present in the classroom.			Percent Observed				
Level of Meaningful Use	Launch	Group	None	Rarely	Occasionally	Frequently	Extensively
Low level use of computers	L1	Program	60.0	16.9	12.3	10.8	0.0
	L1	Control	76.9	12.3	9.2	0.0	1.5
	L2	Program	52.9	28.6	11.4	2.9	1.4
	L2	Control	60.0	20.0	18.6	1.4	0.0
Somewhat meaningful use of computers	L1	Program	52.3	23.1	15.4	6.2	3.1
	L1	Control	80.0	13.8	4.6	1.5	0.0
	L2	Program	42.9	35.7	15.7	4.3	1.4
	L2	Control	52.9	28.6	12.9	5.7	0.0
Meaningful use of computers	L1	Program	27.7	30.8	16.9	23.1	1.5
	L1	Control	70.8	23.1	3.1	3.1	0.0
	L2	Program	28.6	22.9	20.0	22.9	5.7
	L2	Control	47.1	27.1	11.4	11.4	2.9
Very meaningful use of computers	L1	Program	63.1	20.0	7.7	6.2	3.1
	L1	Control	87.7	6.2	4.6	1.5	0.0
	L2	Program	54.3	21.4	12.9	8.6	2.9
	L2	Control	84.3	8.6	4.3	0.0	2.9

TABLE 11: A Summary of SCU Items Showing Significant Differences Between Program and Control Whole School Meaningful Use of Computers*

Launch 1

	Program (*n* =65)		Control (*n = 65)*				
SCU ITEMS	***M***	***SD***	***M***	***SD***	***t (128)***	***p***	***ES***
MEANINGFULNESS							
Low level use of computers	.74	1.05	.37	.78	2.27	.025	.40
Somewhat meaningful use of computers	.85	1.09	.28	.63	3.65	.000	.65
Meaningful use of computers	1.40	1.17	.38	.70	6.00	.000	1.06
Very meaningful use of computers	.66	1.07	.20	.59	3.06	.003	.54

*Rating scale: 0 = Not observed; 4 = Extensively

Launch 2

	Program (*n* =70)		Control (*n =69)*				
SCU ITEMS	***M***	***SD***	***M***	***SD***	***t (138)***	***p***	***ES***
MEANINGFULNESS							
Meaningful use of computers	1.54	1.28	.96	1.15	2.85	.005	.49
Very meaningful use of computers	.84	1.13	.29	.80	3.38	.001	.58

*Rating scale: 0 = Not observed; 4 = Extensively

Whole School Observation Summary

A total of 269 three-hour whole school observations were conducted for this study. Of these, 135 were completed at Program schools and 134 at Control schools, The 807 hours of observation data were collected with SOMs, SCUs, and RSCAs during15 minute visits to 2,655 randomly selected classrooms (Program = 1,321; Control = 1,334). Results from each measure are described in the section below.

Analysis of data, collected with SOMs, SCUs, and RSCAs during 15-minute visits to each classroom, revealed significant differences in several key areas; with the most notable being Program students' more frequent use of technology. Consistent with program goals, were significant differences in the use of student-centered learning in technology-enhanced environments in Program as compared to Control classrooms. Specifically, there was greater and higher-quality use of computers as a learning tool and for instructional delivery, use of experiential or hands-on learning, independent inquiry, cooperative learning, and more academically focused class time.

Considering that whole school observations were conducted in randomly visited classrooms, the results strongly suggest that systemic change in the directions of greater technology usage and student-centered learning activities are occurring in the Launch 1 and 2 Program schools. Although these findings are quite positive in that Program students used computers significantly more than Control students, the frequency of use was still somewhat limited in that only two software applications were observed occasionally or more in at least 20% of the computer activities. Therefore, the results indicate a need for continued professional development for Program teachers.

Targeted Classroom Observation Results

Three targeted observations were conducted at each Program and Control school, yielding a total of 162 targeted observations (L1 Program = 39, L1 Control = 39, L2 Program = 42, L2 Control = 42). The data were collected with SOMs, RSCAs, and SCUs during prearranged one-hour sessions in which randomly selected teachers were asked to implement a prepared lesson using technology.

School Observation Measure (SOM©)

Table 12 presents the Program vs. Control targeted SOM results. Because teachers were asked to implement a technology lesson during targeted observations, it is not surprising to find that the most frequently or extensively observed strategy in the Program (although not Control) classrooms was student use of

"Technology as a Learning Tool." This strategy was seen frequently to extensively during approximately 70% (L1 Program = 82.1%, L2 Program = 66.7%) of the Program visits as compared to 23.1% of the L1 Control and 23.8% of the L2 Control observations. Conversely, as "Technology as a Learning Tool (student centered activity)" was seen more frequently to extensively in Program schools, "Computer for Instructional Delivery (teacher centered or drill and practice)" was seen more frequently to extensively in Control Schools (L1 Control 56.4% vs. L1 Program 43.6% and L2 Control 52.4% vs. L2 Program 33.4%).

"Teachers acting as Coach Facilitators" was frequently to extensively seen in over 50% of all observations, however, the strategy was observed more frequently in Program vs. Control classes (L1 Program 66.7%, L1 Control 56.4% and L2 Program 71.4%, L2 Control 52.4%). "Direct Instruction" was also seen frequently to extensively approximately 50% of the time or more in Program and Control observations. However, it was seen more prevalently in the Control schools (L1 Control 74.4% versus L1 Program 46.2% and L2 Control 64.3% versus L2 Program 54.8%). "Project Based Learning" was observed frequently to extensively more often in Program versus Control schools (L1 Program 30.7%, L1 Control 12.9% and L2 Program 35.7%, L2 Control 4.8%). Additionally, "Cooperative/Collaborative Learning" by students was frequently to extensively observed more often in Program schools than Control Schools (L1 Program 30.8%. L1 Control 12.8% and L2 Program 31%, L2 Control 19.1%).

TABLE 12: Targeted SOM© Data Summary

L1 Program *N* = 39, L 1 Control *N* = 39
L2 Program *N* = 42, L 2 Control *N* = 42

The extent to which each of the following was used or present in the classroom.			Percent Observed				
	Launch	Group	None	Rarely	Occasionally	Frequently	Extensively
Instructional Orientation							
Direct instruction (lecture)	L1	Program	7.7	12.8	33.3	15.4	30.8
	L1	Control	10.3	10.3	5.1	23.1	51.3
	L2	Program	7.1	23.8	14.3	26.2	28.6
	L2	Control	9.5	16.7	9.5	31.0	33.3
Team teaching	L1	Program	66.7	0.0	5.1	2.6	25.6
	L1	Control	76.9	2.6	2.6	5.1	12.8
	L2	Program	76.2	2.4	2.4	2.4	16.7
	L2	Control	76.2	4.8	4.8	4.8	9.5
Cooperative/collaborative learning	L1	Program	46.2	12.8	10.3	10.3	20.5
	L1	Control	79.5	2.6	5.1	5.1	7.7
	L2	Program	61.9	0.0	7.1	16.7	14.3
	L2	Control	64.3	9.5	7.1	2.4	16.7
Individual tutoring (teacher, peer, aide, adult volunteer)	L1	Program	71.8	0.0	15.4	2.6	10.3
	L1	Control	87.2	2.6	2.6	5.1	2.6
	L2	Program	85.7	0.0	4.8	2.4	7.1
	L2	Control	85.7	4.8	4.8	0.0	4.8
Classroom Organization							
Ability groups	L1	Program	64.1	0.0	5.1	5.1	25.6
	L1	Control	84.6	0.0	5.1	0.0	10.3
	L2	Program	88.1	2.4	0.0	7.1	2.4
	L2	Control	69.0	2.4	11.9	2.4	14.3
Multi-age grouping	L1	Program	89.7	0.0	2.6	0.0	7.7
	L1	Control	94.9	0.0	0.0	0.0	5.1
	L2	Program	97.6	0.0	0.0	0.0	2.4
	L2	Control	83.3	0.0	0.0	0.0	16.7
Work centers (for individuals or groups)	L1	Program	64.1	2.6	7.7	2.6	23.1
	L1	Control	71.8	0.0	5.1	10.3	12.8
	L2	Program	71.4	4.8	2.4	9.5	11.9
	L2	Control	76.2	0.0	2.4	4.8	16.7
Instructional Strategies							
Higher level instructional feedback (written or verbal) to enhance student learning	L1	Program	51.3	7.7	5.1	17.9	17.9
	L1	Control	43.6	2.6	20.5	20.5	12.8
	L2	Program	40.5	11.9	19.0	19.0	9.5
	L2	Control	47.6	9.5	11.9	14.3	16.7
Integration of subject areas (interdisciplinary/thematic units)	L1	Program	82.1	5.1	5.1	2.6	5.1
	L1	Control	92.3	2.6	2.6	0.0	2.6
	L2	Program	76.2	2.4	9.5	11.9	0.0
	L2	Control	73.8	4.8	2.4	4.8	14.3

TABLE 12: Continued

The extent to which each of the following was used or present in the classroom.	Launch	Group	Percent Observed None	Rarely	Occasionally	Frequently	Extensively
Project-based learning	L1	Program	59.0	0.0	10.3	12.8	17.9
	L1	Control	82.1	2.6	0.0	2.6	10.3
	L2	Program	61.9	0.0	2.4	11.9	23.8
	L2	Control	90.5	2.4	2.4	0.0	4.8
Use of higher-level questioning strategies	L1	Program	53.8	2.6	10.3	15.4	17.9
	L1	Control	30.8	10.3	15.4	23.1	20.5
	L2	Program	33.3	16.7	11.9	16.7	21.4
	L2	Control	38.1	9.5	11.9	23.8	16.7
Teacher as a coach/facilitator	L1	Program	10.3	2.6	20.5	23.1	43.6
	L1	Control	15.4	12.8	15.4	20.5	35.9
	L2	Program	14.3	7.1	7.1	19.0	52.4
	L2	Control	14.3	19.0	14.3	21.4	31.0
Parent/community involvement in learning activities	L1	Program	94.9	0.0	5.1	0.0	0.0
	L1	Control	100.0	0.0	0.0	0.0	0.0
	L2	Program	90.5	2.4	0.0	2.4	4.8
	L2	Control	95.2	0.0	0.0	0.0	4.8
Student Activities							
Independent seatwork (self-paced worksheets, individual assignments)	L1	Program	48.7	7.7	707	15.4	20.4
	L1	Control	46.2	10.3	15.4	20.5	7.7
	L2	Program	66.7	7.1	9.5	11.9	4.8
	L2	Control	47.6	7.1	16.7	16.7	11.9
Experiential, hands-on learning	L1	Program	35.9	2.6	10.3	28.2	23.1
	L1	Control	61.5	2.6	2.6	12.8	20.5
	L2	Program	76.2	2.4	7.1	11.9	2.4
	L2	Control	47.6	7.1	14.3	14.3	16.7
Systematic individual instruction (differential assignments geared to individual needs)	L1	Program	89.7	0.0	2.6	2.6	5.1
	L1	Control	97.4	0.0	0.0	0.0	2.6
	L2	Program	97.6	0.0	2.4	0.0	0.0
	L2	Control	97.6	0.0	0.0	0.0	2.4
Sustained writing/composition (self-selected or teacher-generated topics)	L1	Program	82.1	5.1	2.6	7.7	2.6
	L1	Control	84.6	10.3	2.6	2.6	0.0
	L2	Program	85.7	0.0	0.0	7.1	7.1
	L2	Control	88.1	9.5	2.4	0.0	0.0
Sustained reading	L1	Program	82.1	5.1	5.1	2.6	5.1
	L1	Control	89.7	5.1	0.0	2.6	2.6
	L2	Program	85.7	0.0	0.0	14.3	0.0
	L2	Control	83.3	7.1	4.8	4.8	0.0
Independent inquiry/research on the part of students	L1	Program	66.7	10.3	0.0	5.1	17.9
	L1	Control	79.5	0.0	5.1	5.1	10.3
	L2	Program	64.3	2.4	4.8	19.0	9.5
	L2	Control	83.3	2.4	2.4	2.4	9.5
Student discussion	L1	Program	61.5	7.7	5.1	10.3	15.4
	L1	Control	59.0	5.1	12.8	12.8	10.3
	L2	Program	52.4	2.4	16.7	11.9	16.7
	L2	Control	54.8	7.1	4.8	9.5	23.8

TABLE 12: Continued

The extent to which each of the following was used or present in the classroom.	Launch	Group	Percent Observed None	Rarely	Occasionally	Frequently	Extensively
Technology Use							
Computer for instructional delivery (e.g. CAI, drill & practice)	L1	Program	33.3	7.7	15.4	20.5	23.1
	L1	Control	30.8	2.6	10.3	17.9	38.5
	L2	Program	40.5	2.4	23.8	16.7	16.7
	L2	Control	26.2	11.9	9.5	21.4	31.0
Technology as a learning tool or resource (e.g. Internet research, spreadsheet creation)	L1	Program	17.9	0.0	0.0	30.8	51.3
	L1	Control	66.7	5.1	5.1	2.6	20.5
	L2	Program	23.8	2.4	7.1	26.2	40.5
	L2	Control	54.8	9.5	11.9	7.1	16.7
Assessment							
Performance assessment strategies	L1	Program	87.2	0.0	2.6	2.6	7.7
	L1	Control	89.7	2.6	2.6	2.6	2.6
	L2	Program	88.1	0.0	4.8	2.4	4.8
	L2	Control	66.7	7.1	4.8	4.8	16.7
Student self-assessment (portfolios, individual record books)	L1	Program	84.6	2.6	2.6	0.0	10.3
	L1	Control	92.3	2.6	0.0	0.0	5.1
	L2	Program	90.5	0.0	4.8	0.0	4.8
	L2	Control	88.1	2.4	0.0	0.0	9.5
Summary Items							
Academically focused class time	L1	Program	0.0	0.0	5.1	10.3	84.6
	L1	Control	2.6	0.0	10.3	10.3	76.9
	L2	Program	0.0	2.4	7.1	19.0	71.4
	L2	Control	0.0	0.0	14.3	23.8	61.9
Level of student attention/ Interest/engagement	L1	Program	0.0	0.0	5.1	7.7	87.2
	L1	Control	2.6	2.6	10.3	17.9	66.7
	L2	Program	0.0	0.0	11.9	16.7	71.4
	L2	Control	0.0	0.0	14.3	26.2	59.5

Inferential results: Program vs. Control

A series of *t-tests* comparing the L1 and L2 Program and Control mean scores revealed three significant differences, all with effect sizes of high educational importance (see Table 13). Consistent with expectations, the greatest difference occurred between the L1 and L2 Program vs. Control student use of "Technology as a Learning Tool" (L1 *ES* = +0.1.24; L2 *ES* = +0.86). In addition, "Project Based Learning" in the L2 Program was observed more frequently than in the L2 Control classes (L2 *ES* = +0.78).

TABLE 13: A Summary of SOM© Items Showing Significant Differences Between Program and Control Target Observations

Launch 1

	Program (*n* =39)		Control (*n* =39)				
SOM Items	***M***	***SD***	***M***	***SD***	***t (76)***	***p***	***ES***
Technology as a learning tool or resource	2.97	1.48	1.05	1.65	5.416	.000	1.24

* Scale = 0 = Not Observed, 4 = Extensively Observed

Launch 2

	Program (*n* =42)		Control (*n* =42)				
SOM Items	***M***	***SD***	***M***	***SD***	***t (82)***	***p***	***ES***
Project-based learning	1.36	1.79	.26	.91	3.53	.001	.78
Technology as a learning tool or resource	2.57	1.61	1.21	1.57	3.91	.000	.86

* Scale = 0 = Not Observed, 4 = Extensively Observed

Rubric for Student-Centered Activities (RSCA)

One RSCA was completed for each of the targeted (*n* = 162) observations (L1 Program = 39, L1Control = 39; L2 Program = 42, L2 Control = 42). A descriptive summary of the targeted RSCA "application" rating frequencies and mean scores is provided in Table 14. Observations yielded the highest ratings for L1 Control for both "Experiential Hands on Learning" (*M* = 3.14) and "Independent Inquiry" (*M* = 3.12). However, the next highest ratings were for L2 Program for "Experiential Hands on Learning" (*M* = 3.00) and "Project Based Learning" in L1 Program schools (*M* = 3.00). The lowest level of application was seen for "Student Discussion" in L2 Program classrooms (*M* = 2.31).

TABLE 14: Targeted RSCA: Percent of Observed Strategies by Application Strength and Technology Use

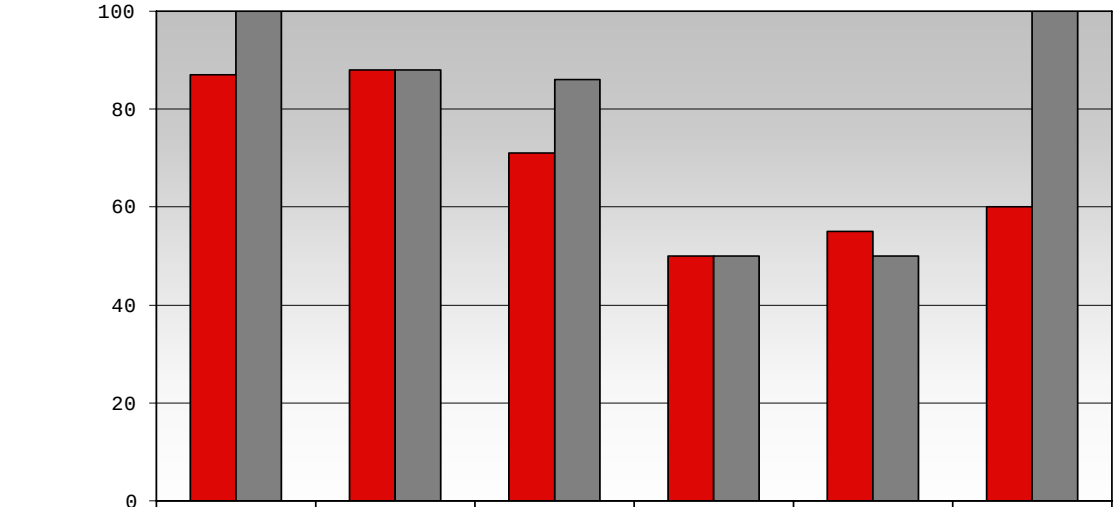
L1 Program *N* = 39, L 1 Control *N* = 39
L2 Program *N* = 42, L 2 Control *N* = 42

Item	Launch	Group	% Observed		Rating 1		Rating 2		Rating 3		Rating 4		Mean	Technology Used	
			n	%	*n*	%	*n*	%	*n*	%	*n*	%		*n*	%
Cooperative Learning	L1	Program	20	51.0	1	4.3	9	39.1	7	30.4	3	13.0	2.60	12	60.0
	L1	Control	7	17.9	0	0.0	2	7.7	4	15.4	1	3.8	2.87	7	100.0
	L2	Program	17	40.4	2	8.0	4	16.0	8	32.0	3	12.0	2.70	13	76.4
	L2	Control	16	38.0	2	8.3	4	16.7	9	37.5	1	4.2	2.56	14	87.5
Project Based Learning	L1	Program	15	38.4	0	0.0	3	13.0	9	39.1	3	13.0	3.00	13	86.7
	L1	Control	6	15.3	0	0.0	2	7.7	3	11.5	1	3.8	2.83	6	100.0
	L2	Program	15	35.7	1	4.0	2	8.0	9	36.0	3	12.0	2.93	14	93.3
	L2	Control	6	14.2	1	4.2	1	4.2	2	8.3	2	8.3	2.83	4	66.7
Higher level Questions	L1	Program	20	51.2	2	8.7	4	17.4	11	47.8	3	13.0	2.75	11	55.0
	L1	Control	26	66.7	2	7.7	8	30.8	11	42.3	5	19.2	2.73	13	50.0
	L2	Program	24	57.1	4	16.0	7	28.0	9	36.0	4	16.0	2.54	16	66.7
	L2	Control	24	57.1	2	8.3	10	41.7	7	29.2	5	20.8	2.62	15	62.5
Experiential Hands On	L1	Program	21	53.8	3	13.0	4	17.4	8	34.8	6	26.1	2.80	15	71.4
	L1	Control	14	35.9	2	7.7	2	7.7	2	7.7	8	30.8	3.14	12	85.7
	L2	Program	12	28.5	1	4.0	2	8.0	5	20.0	4	16.0	3.00	8	66.7
	L2	Control	22	52.3	1	4.2	8	33.3	8	33.3	5	20.8	2.77	16	72.7
Independent Inquiry	L1	Program	16	41.0	3	13.0	4	17.4	8	34.8	6	26.1	2.56	14	87.5
	L1	Control	8	20.5	1	3.8	1	3.8	2	7.7	4	15.4	3.12	7	87.5
	L2	Program	14	33.3	2	8.0	3	12.0	5	20.0	4	16.0	2.78	11	78.6
	L2	Control	8	19.0	2	8.3	3	12.5	3	12.5	0	0.0	2.12	7	87.5
Student Discussion	L1	Program	18	46.0	4	17.4	7	30.4	5	21.7	2	8.7	2.27	9	50.0
	L1	Control	14	35.9	5	19.2	2	7.7	2	7.7	5	19.2	2.50	7	50.0
	L2	Program	19	45.2	5	20.0	5	20.0	7	28.0	2	8.0	2.31	13	68.4
	L2	Control	18	42.8	2	8.3	10	41.7	7	29.2	5	20.8	2.44	14	77.7
Students as Producers	L1	Program	23	59.0	7	30.4	5	21.7	7	30.4	4	17.4	2.34	NA	NA
	L1	Control	7	17.9	2	7.7	1	3.8	3	11.5	1	26.9	2.42	NA	NA
	L2	Program	25	59.5	5	20.0	4	16.0	11	44.0	5	20.0	2.64	NA	NA
	L2	Control	28	66.6	4	14.3	5	17.9	6	21.4	3	10.7	2.44	NA	NA

*Rating scale: 1 = limited application; 4 = Strong application.

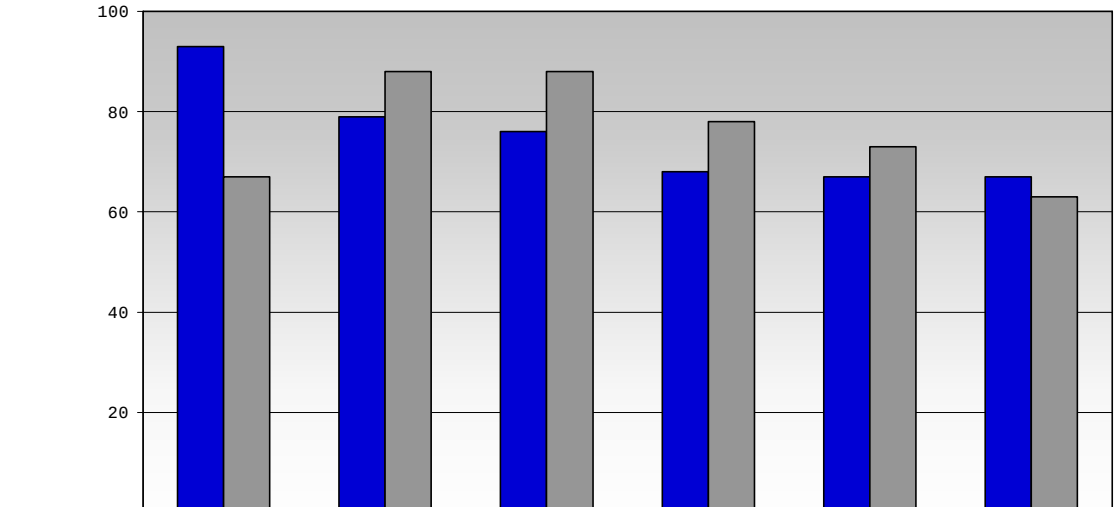
Technology use

The seven strategies measured by the RSCA were more often seen in Program classes (see Table 14). However, when those strategies were observed there was an almost equal degree of technology use seen in Program and Control classrooms (see Figure 3). For example, technology use was seen equally in Program and Control classes when Independent Inquiry was observed in Launch 1 schools (87.5%). Within the same Independent Inquiry category Launch 2 Control classes employed slightly more technology use (L2 Program=78.6%, L2 Control=87.5%).



	Project Based Learning	Independent Inquiry	Experential Hands On	Student Discussion	Higher Level Questions	Cooperative Learning
L1 Program	87	88	71	50	55	60
L1 Control	100	88	86	50	50	100

FIGURE 3. L1 Percent of Targeted RSCA Strategies with Technology Use*



	Project Based Learning	Independent Inquiry	Cooperative Learning	Student Discussion	Experential Hands On	Higher Level Questions
L2 Program	93	79	76	68	67	67
L2 Control	67	88	88	78	73	63

FIGURE 4. L2 Percent of Targeted RSCA Strategies with Technology Use*

*"Students as Producers of Knowledge" is not included because use of technology is a required component.

Inferential Results

A series of t-tests for independent samples were conducted to compare Program vs. Control rubric ratings for the targeted observations. No significant differences were revealed.

Survey of Computer Use (SCU)

The SCU data were collected from 162 "targeted" observations comprised of 81 L1 and L2 Program classrooms and 81 L1 and L2 Control classrooms. A summary of the SCU targeted results is provided below.

Computer Configuration

As with the whole school observations, the targeted Program classrooms had a greater number of computers and newer computers than the Control classrooms. Specifically, 84.6% of the observed L1 and 71.5% of the L2 Program classrooms had 5 or more computers as compared to 35.9% of the L1 and 54.8% of the L2 Control classrooms (see Table 15). Over 75% (L1= 76.9%; L2 = 88.1%) of the Program computers as compared to 53.8% of the L1 and 57.1% of the L2 Control computers were up-to-date. The majority of the Program and Control classrooms had Internet access on their computers.

As shown in Table 15, Program schools engaged more students in computer activities than the Control schools. Specifically, nearly all (90% or more) students in Program classrooms were engaged in computer activities during 74.4% of the L1 and 47.6% of the L2 Program observations compared to only 25.2% of the L1 and 42.9% of the L2 Control observations. Students in Program classes more frequently used computer literacy and keyboarding skills than students in the Control classes. However, students in both groups typically exhibited moderate to very good skills.

The type of technology observed the most frequently in both Program and Control classrooms was desktop computers. Program teachers more frequently had students use laptops, as they were seen occasionally to extensively in 41.0% of L1 and 28.6% of L2 Program classes and only 10.3% of the L1 and 19.1% of L2 Control classes.

TABLE 15: Targeted School SCU Data Summary

L1 Program *N* = 39 classrooms, L 1 Control *N* = 39 classrooms
L2 Program *N* = 42 classrooms, L 2 Control *N* = 42 classrooms

Computer Configuration	Launch	Program	Control
Percentages of classrooms with the following numbers of computers or digital tools.			
None	L1	0.0	10.3
	L2	0.0	2.4
One	L1	2.6	10.3
	L2	7.1	9.5
2 – 4	L1	12.8	43.6
	L2	21.4	33.3
5 – 10	L1	28.2	10.3
	L2	31.0	23.8
11 or more	L1	56.4	25.6
	L2	40.5	31.0
Percentages of classrooms in which the majority of the computers were:			
Up-to-date	L1	76.9	53.8
	L2	88.1	57.1
Aging, but adequate	L1	23.1	30.8
	L2	11.9	40.5
Outdated/limited capacity	L1	0.0	5.1
	L2	0.0	0.0
No computers were observed	L1	0.0	10.3
	L2	0.0	2.4
Percentages of classrooms in which the majority of the computers were:			
Connected to the Internet	L1	100.0	89.7
	L2	100.0	92.9
Not connected to the Internet	L1	0.0	0.0
	L2	0.0	4.8
No computers were observed	L1	0.0	10.3
	L2	0.0	2.4
Student Computer Use			
Percentages of classrooms in which computers or digital tools were used by:			
Few (less than 10%) students	L1	0.0	7.7
	L2	0.0	9.5
Some (about 10-50%) students	L1	20.5	25.6
	L2	23.8	14.3
Most (about 51-90%) students	L1	0.0	2.6
	L2	14.3	0.0
Nearly all (91-100%) students	L1	74.4	28.2
	L2	47.6	42.9
Students did not use computers	L1	5.1	35.9
	L2	14.3	33.3
Percentage of classrooms in which students worked with computers or digital tools			
Alone	L1	76.9	43.6
	L2	57.1	42.9
In pairs	L1	12.8	15.4
	L2	21.4	21.4
In small groups	L1	5.1	5.1
	L2	9.5	4.8
Percentage of classrooms in which student computer literacy skills were:			
Poor	L1	0.0	2.6
	L2	0.0	0.0
Moderate	L1	38.5	10.3
	L2	26.2	28.6
Very good	L1	51.3	30.8
	L2	45.2	26.2
Not observed	L1	10.3	56.4
	L2	28.6	45.2

TABLE 15: Continued

Student Computer Use			
Percentage of classrooms in which student keyboarding skills were:			
Poor	L1	0.0	5.1
	L2	0.0	0.0
Moderate	L1	20.5	5.1
	L2	26.2	11.9
Very good	L1	41.0	28.2
	L2	19.0	19.0
Not observed	L1	38.5	61.5
	L2	54.8	69.0

The extent to which each of the following was used or present in the classroom.			**Percent Observed**				
	Launch	**Group**	**None 0**	**Rarely 1**	**Occasionally 2**	**Frequently 3**	**Extensively 4**
Desktop Computers	L1	Program	41.0	0.0	5.1	12.8	41.0
	L1	Control	43.6	5.1	12.8	5.1	33.3
	L2	Program	42.9	4.8	2.4	23.8	26.2
	L2	Control	54.8	2.4	11.9	9.5	21.4
Laptop Computers	L1	Program	56.4	2.6	0.0	0.0	41.0
	L1	Control	89.7	0.0	2.6	0.0	7.7
	L2	Program	69.0	2.4	4.8	0.0	23.8
	L2	Control	81.0	0.0	2.4	2.4	14.3
Personal Data Assistants (PDA)	L1	Program	97.4	2.6	0.0	0.0	0.0
	L1	Control	97.4	2.6	0.0	0.0	0.0
	L2	Program	100.0	0.0	0.0	0.0	0.0
	L2	Control	97.6	2.4	0.0	0.0	0.0
Graphing Calculator	L1	Program	100.0	0.0	0.0	0.0	0.0
	L1	Control	97.4	0.0	0.0	0.0	2.6
	L2	Program	100.0	0.0	0.0	0.0	0.0
	L2	Control	92.9	0.0	2.4	0.0	4.8
Information Processor (e.g., Alphaboard)	L1	Program	97.4	2.6	0.0	0.0	0.0
	L1	Control	100.0	0.0	0.0	0.0	0.0
	L2	Program	92.9	0.0	0.0	7.1	0.0
	L2	Control	100.0	0.0	0.0	0.0	0.0
Digital Accessories (e.g., camera, scanner, probes)	L1	Program	92.3	0.0	0.0	0.0	7.7
	L1	Control	94.9	0.0	0.0	2.6	2.6
	L2	Program	83.3	0.0	0.0	7.1	9.5
	L2	Control	83.3	2.4	2.4	4.8	7.1

*Note: Item percentages may not total 100% because of missing data.

Student Computer Activities by Software used

Students in both the Program and Control targeted classrooms were observed using a variety of software applications (Program: L1 = 15 of 20, L2 = 14 of 20; Control: L1 = 9 of 20, L2 = 14 of 20). However, as seen in Table 16, only three software applications were observed occasionally or more in at least 20% of the computer activities in Program classes, and two were seen to this degree in Control classes: Internet browser (Program: L1 = 36.0%, L2 = 52.4%; Control: L1 = 30.8%), word processing software (Program: L1 = 20.6%; L2 = 23.8%), and drill/practice educational software (Control: L1 = 25.6%; L2 = 26.2%).

Inferential analyses were conducted via t-tests for independent samples on each item. The specific descriptions of these software uses, related subject area content of the activities, and inferential results are below.

Production tools used by students

The degree to which the production tool applications were used was limited for both groups. For example, word processing software was the most extensively used tool, yet it was only observed occasionally or more in less than 25% of all targeted visits. None of the production tools were used significantly more in Program vs. Control classrooms. With regard to subject focus, production tool activities were typically targeted toward language arts in L1 and 2 Program and L1 Control classrooms.

Internet/research tools used by students

As shown in Tables 16 and 17, L1 and L2 Program and L2 Control students used Internet browsers more frequently than any other software application, and the L2 Program students used it significantly more (p = .001; ES = +0.75) than the L2 Control students (Program M = 1.88, Control M = 0.67). The research activities in both Program and Control classes covered all subject areas. However, the activities were more frequently focused on language arts or science.

Educational software use by students

Although there were no significant differences in Program and Control use of educational software, L1 Control students more frequently used drill and practice applications than any other software during targeted observations (see Table 16). The educational software activities in Program and Control classes were typically focused on language arts.

Testing software use by students

Consistent with whole school SCU results, testing software was once again infrequently observed in both Program and Control classes and there were no significant differences between the two groups.

TABLE 16: Targeted SCU: Frequency of Observed Program vs. Control Computer Activities

L1 Program *N* = 39 classrooms, L 1 Control *N* = 39 classrooms
L2 Program *N* = 42 classrooms, L 2 Control *N* = 42 classrooms

The extent to which each of the following was used or present in the classroom.			**Percent Observed**				
Production Tools	**Launch**	**Group**	**None**	**Rarely**	**Occasionally**	**Frequently**	**Extensively**
Word Processing	L1	Program	76.9	2.6	2.6	10.3	7.7
	L1	Control	94.9	0.0	0.0	0.0	5.1
	L2	Program	76.2	0.0	2.4	11.9	9.5
	L2	Control	90.5	0.0	7.1	0.0	2.4
Database	L1	Program	97.4	2.6	0.0	0.0	0.0
	L1	Control	100.0	0.0	0.0	0.0	0.0
	L2	Program	100.0	0.0	0.0	0.0	0.0
	L2	Control	100.0	0.0	0.0	0.0	0.0
Spreadsheet	L1	Program	97.4	0.0	0.0	0.0	2.6
	L1	Control	100.0	0.0	0.0	0.0	0.0
	L2	Program	97.6	0.0	0.0	0.0	2.4
	L2	Control	95.2	2.4	0.0	0.0	2.4
Draw/Paint/Graphics	L1	Program	92.3	0.0	0.0	5.1	2.6
	L1	Control	97.4	0.0	0.0	0.0	2.6
	L2	Program	95.2	0.0	2.4	2.4	0.0
	L2	Control	95.2	2.4	0.0	0.0	2.4
Presentation (e.g., MS PowerPoint)	L1	Program	89.7	0.0	2.6	2.6	5.1
	L1	Control	100.0	0.0	0.0	0.0	0.0
	L2	Program	95.2	0.0	2.4	2.4	0.0
	L2	Control	92.9	2.4	2.4	0.0	2.4
Authoring (e.g., HyperStudio)	L1	Program	100.0	0.0	0.0	0.0	0.0
	L1	Control	100.0	0.0	0.0	0.0	0.0
	L2	Program	85.7	0.0	0.0	11.9	2.4
	L2	Control	100.0	0.0	0.0	0.0	0.0
Concept Mapping (e.g., Inspiration)	L1	Program	89.7	0.0	5.1	0.0	5.1
	L1	Control	100.0	0.0	0.0	0.0	0.0
	L2	Program	97.6	0.0	0.0	0.0	2.4
	L2	Control	92.9	2.4	2.4	2.4	0.0
Planning (e.g., MS Project)	L1	Program	100.0	0.0	0.0	0.0	0.0
	L1	Control	100.0	0.0	0.0	0.0	0.0
	L2	Program	100.0	0.0	0.0	0.0	0.0
	L2	Control	97.6	0.0	2.4	0.0	0.0
Other	L1	Program	94.9	0.0	2.6	0.0	2.6
	L1	Control	94.9	0.0	0.0	0.0	2.6
	L2	Program	92.9	0.0	2.4	2.4	2.4
	L2	Control	90.5	4.8	2.4	0.0	2.4
Internet/Research Tools	**Launch**	**Group**	**None**	**Rarely**	**Occasionally**	**Frequently**	**Extensively**
Internet Browser (e.g., Netscape)	L1	Program	64.1	0.0	2.6	2.6	30.8
	L1	Control	69.2	0.0	5.1	10.3	15.4
	L2	Program	47.6	0.0	2.4	16.7	33.3
	L2	Control	78.6	2.4	4.8	2.4	11.9
CD Reference (encyclopedias, etc.)	L1	Program	100.0	0.0	0.0	0.0	0.0
	L1	Control	100.0	0.0	0.0	0.0	0.0
	L2	Program	95.2	2.4	2.4	0.0	0.0
	L2	Control	100.0	0.0	0.0	0.0	0.0
Communications	L1	Program	97.4	0.0	0.0	2.6	0.0
	L1	Control	97.4	0.0	0.0	0.0	2.6
	L2	Program	100.0	0.0	0.0	0.0	0.0
	L2	Control	100.0	0.0	0.0	0.0	0.0
Other	L1	Program	97.4	0.0	0.0	0.0	2.6
	L1	Control	97.4	0.0	0.0	0.0	2.6
	L2	Program	95.2	0.0	0.0	2.4	0.0
	L2	Control	100.0	0.0	0.0	0.0	0.0

TABLE 16: continued

Educational Software	Launch	Group	None	Rarely	Occasionally	Frequently	Extensively
Drill/Practice/Tutorial	L1	Program	84.6	0.0	0.0	.7	7.7
	L1	Control	69.2	5.1	5.1	5.1	15.4
	L2	Program	73.8	7.1	7.1	0.0	11.9
	L2	Control	69.0	4.8	2.4	9.5	14.3
Problem Solving (e.g., SimCity)	L1	Program	97.4	0.0	0.0	0.0	2.6
	L1	Control	100.0	0.0	0.0	0.0	0.0
	L2	Program	100.0	0.0	0.0	0.0	0.0
	L2	Control	95.2	4.8	0.0	0.0	0.0
Process Tools (Geometer's Sketchpad, etc.)	L1	Program	97.4	0.0	0.0	0.0	2.6
	L1	Control	100.0	0.0	0.0	0.0	0.0
	L2	Program	97.6	0.0	0.0	2.4	0.0
	L2	Control	97.6	0.0	2.4	0.0	0.0
Other	L1	Program	94.9	0.0	0.0	0.0	5.1
	L1	Control	97.4	0.0	0.0	0.0	0.0
	L2	Program	95.2	0.0	0.0	2.4	2.4
	L2	Control	95.2	2.4	0.0	0.0	0.0
Testing Software							
Individualized/Tracked (e.g., Accelerated Reader)	L1	Program	100.0	0.0	0.0	0.0	0.0
	L1	Control	97.4	2.6	0.0	0.0	0.0
	L2	Program	100.0	0.0	0.0	0.0	0.0
	L2	Control	90.5	4.8	2.4	0.0	2.4
Generic	L1	Program	100.0	0.0	0.0	0.0	0.0
	L1	Control	100.0	0.0	0.0	0.0	0.0
	L2	Program	95.2	0.0	0.0	2.4	2.4
	L2	Control	100.0	0.0	0.0	0.0	0.0
Other	L1	Program	97.4	0.0	2.6	0.0	0.0
	L1	Control	100.0	0.0	0.0	0.0	0.0
	L2	Program	100.0	0.0	0.0	0.0	0.0
	L2	Control	97.6	0.0	0.0	0.0	2.4

Subject Areas of Computer Activities	Launch	Group	Language	Mathematics	Science	S. Studies	Other	Not Observed
Production Tools	L1	Program	28.2	17.9	5.1	7.7	2.6	48.7
	L1	Control	2.6	2.6	0.0	0.0	2.6	92.3
	L2	Program	26.2	2.4	14.3	7.1	0.0	54.8
	L2	Control	19.0	9.5	7.1	7.1	2.4	69.0
Internet Research Tools	L1	Program	23.1	2.6	2.6	12.8	0.0	61.5
	L1	Control	15.4	5.1	.6	17.9	5.1	66.7
	L2	Program	19.0	4.8	14.3	16.7	2.4	47.6
	L2	Control	14.3	7.1	2.4	11.9	0.0	78.6
Educational Software	L1	Program	15.4	12.8	2.6	2.6	0.0	71.8
	L1	Control	23.1	12.8	0.0	0.0	0.0	69.2
	L2	Program	16.7	2.4	2.4	4.8	2.4	71.4
	L2	Control	21.4	26.2	2.4	0.0	0.0	59.5
Testing Software	L1	Program	0.0	0.0	2.6	0.0	2.6	92.3
	L1	Control	2.6	0.0	0.0	0.0	2.6	94.9
	L2	Program	2.4	2.4	4.8	4.8	0.0	85.7
	L2	Control	11.9	0.0	2.4	0.0	0.0	88.1

Item percentages may not total 100% because of missing data

TABLE 17: Targeted SCU: Significant Differences Between Program and Control

Launch 2

SCU Items	Program (*n* =42)		Control (*n* =42)				
	M	***SD***	***M***	***SD***	***t (82)***	***p***	***ES***
Internet Browser	1.88	1.86	.67	1.39	3.38	.001	**.75**

Overall Meaningful Use of Computers

"Meaningful use of computers" was seen "frequently" to "extensively" in nearly half (L1 = 43.6%; L2 = 47.6%) of the Program classes as compared to only 15.4% of the L1 and 11.9% of the L2 Control classes (see Table 18). This difference was found to be highly significant for L1 (*ES* = 0.58) and L2 (*ES* =0.87) (see Table 19). However, observation results from L2 Control schools revealed significantly more "low level use of computers" than Program schools (L2: *p* =.045, *ES* = 0.45).

TABLE 18: Targeted SCU: Overall Meaningfulness of Computer Activities

L1 Program *N* = 39 classrooms, L 1 Control *N* = 39 classrooms
L2 Program *N* = 42 classrooms, L 2 Control *N* = 42 classrooms

The extent to which each of the following was used or present in the classroom.			Percent Observed				
Level of Meaningful Use	**Launch**	**Group**	**None**	**Rarely**	**Occasionally**	**Frequently**	**Extensively**
Low level use of computers	L1	Program	87.2	5.1	2.6	2.6	2.6
	L1	Control	84.6	5.1	0.0	2.6	7.7
	L2	Program	92.9	2.4	0.0	0.0	4.8
	L2	Control	73.8	4.8	4.8	9.5	7.1
Somewhat meaningful use of computers	L1	Program	69.2	7.7	5.1	5.1	12.8
	L1	Control	87.2	0.0	2.6	5.1	5.1
	L2	Program	71.4	11.9	4.8	2.4	9.5
	L2	Control	69.0	0.0	4.8	7.1	19.0
Meaningful use of computers	L1	Program	46.2	2.6	7.7	20.5	23.1
	L1	Control	74.4	2.6	7.7	0.0	15.4
	L2	Program	42.9	2.4	7.1	23.8	23.8
	L2	Control	81.0	2.4	4.8	4.8	7.1
Very meaningful use of computers	L1	Program	69.2	0.0	0.0	10.3	20.5
	L1	Control	79.5	0.0	2.6	10.3	7.7
	L2	Program	69.0	0.0	7.1	11.9	11.9
	L2	Control	81.0	2.4	0.0	4.8	11.9

TABLE 19: Targeted SCU: Significant Differences Between Program and Control

Launch 1

SCU Items	Program (*n* =39)		Control (*n* =39)				
	M	***SD***	***M***	***SD***	***t* (76)**	***p***	***ES***
Meaningful Use of Computers							
Meaningful use of computers	1.72	1.73	.79	1.49	2.52	.014	.58

Launch 2

SCU Items	Program (*n* = 42)		Control (n =42)				
	M	***SD***	***M***	***SD***	***t* (82)**	***p***	***ES***
Meaningful Use of Computers							
Low level use of computers	.21	.87	.71	1.33	2.04	.045	-.45
Meaningful use of computers	1.83	1.72	.55	1.23	3.93	.001	.87

Targeted Observations Summary

Relative to TnETL goals, the most notable SOM results for the targeted observations were significant differences between the L1 and L2 Program vs. Control student use of "Technology as a Learning Tool." In addition, the instructional environment in L2 Program classes was observed to have a high academic focus significantly more than the L2 Control classes. The RSCA results suggest the student-centered activities observed in L1 and L2 Program classes generally reflected average implementation that was not significantly different than L1 and L2 Control classes. The SCU data showed that students in both groups used a variety of software, though only three were seen occasionally or more in at least 20% of the Program classes, and two were seen to this degree in the Control classes. Program students in L2 classes used Internet browsers significantly more than the L2 Control students. Computer activities in L1 and L2 Program classrooms were more frequently rated as being meaningful than those in Control classes, and L2 Control students were engaged in significantly more low-level computer activities.

SURVEY RESULTS

Three surveys (SCI-R, TTQ, and TSA) were administered to the teachers during a faculty meeting held at each school in late May 2006. The three instruments were examined for Program vs. Control differences, and the results for each are described below.

School Climate Inventory - Revised (SCI-R)

Program (L1 *n* = 395; L2 *n* = 421) and Control (L1 *n* = 404; L2 *n* = 430) teacher responses to the SCI-R were fairly positive (see Table 20). Overall mean scores were slightly higher than national norms in all comparisons (see Table 21). The item with the highest degree of agreement for Program schools was "Teachers use a variety of teaching strategies" (L2 Program = 97.4%). "Low achieving students are given opportunity for success in this school" (L1 Program) and "Students participate in classroom activities regardless of race, sex etc." (L2 Program) were both seen at 95.7%. The item with the highest degree of agreement for Control teachers was "Teachers use a variety of teaching strategies" (L2 Control = 95.6%). This was followed by "Students participate in classroom activities regardless of race, sex etc." (L2 Control = 95.3%). The items with the lowest level of teacher agreement were "Student misbehavior in this school does not interfere with teaching" (L1 Control = 39.9%) and "Student tardiness or absence from school is not a major problem" (L1 Program = 39.0%). ***Inferential Analysis.***

To determine whether there were significant differences in school climate among schools by condition (Program versus Control), launch (one versus two), or in combination, two different analyses were run. First, school means on the seven dimensions of the SCI-R (School Climate Inventory-Revised) were analyzed using a two-way MANOVA. Under this procedure, neither multivariate nor univariate differences in group means were observed. This finding is not surprising given that Program and Control schools were strategically matched according to the following criteria: locale, grade levels, number of students, percent qualified for free/reduced lunch, ethnicity, and achievement.

TABLE 20: School Climate Inventory Results

L1 Program *N* = 395, L 1 Control *N* = 404
L2 Program *N* = 421, L 2 Control *N* = 430

SCI Items by Dimension	Group	% Strongly Agree and Agree	
COLLABORATION Items			
	Launch	**1**	**2**
1. The faculty and staff share a sense of commitment to the school goals.	Program	91.9	95.2
	Control	94.8	94.7
6. Students are encouraged to help others with problems.	Program	80.0	84.1
	Control	81.9	87.7
16. Teachers are encouraged to communicate concerns, questions, and constructive ideas.	Program	77.2	80.5
	Control	83.4	84.2
26. Students participate in solving the problems of the school.	Program	40.0	43.2
	Control	40.1	45.1
28. Faculty and staff cooperate a great deal in trying to achieve school goals.	Program	84.8	86.9
	Control	90.3	92.6
31. Teachers are active participants in the decision making at this school.	Program	61.3	62.9
	Control	66.1	65.8
40. Most problems facing this school can be solved by the principal and faculty.	Program	74.2	80.8
	Control	74.5	75.3
ENVIRONMENT Items			
7. Faculty and staff feel that they make important contributions in this school.	Program	83.0	83.1
	Control	85.9	88.6
9. Varied learning environments are provided to accommodate diverse teaching and learning styles.	Program	87.6	90.0
	Control	85.4	87.4
10. The school building is neat, bright, clean, and comfortable.	Program	83.3	87.9
	Control	84.2	77.2
14. School employees and students show respect for each other's individual differences.	Program	75.7	79.3
	Control	77.5	79.5
29. An atmosphere of trust exists among the administration, faculty, staff, students, and parents.	Program	64.6	67.2
	Control	72.5	77.0
38. Teachers are proud of this school and its students.	Program	88.9	94.1
	Control	87.9	91.9
49. People in this school really care about each other.	Program	75.9	82.4
	Control	87.9	88.4
EXPECTATIONS Items			
2. Low achieving students are given opportunity for success in this school.	Program	95.7	93.6
	Control	93.8	93.5
3. School rules and expectations are clearly defined, stated, and communicated.	Program	83.5	87.6
	Control	83.2	86.5
17. Students share the responsibility for keeping the school environment attractive and clean.	Program	61.8	61.0
	Control	61.6	61.6
21. Students are held responsible for their actions.	Program	69.9	71.7
	Control	66.6	75.1
22. All students in this school are expected to master basic skills at each grade level.	Program	86.3	86.9
	Control	88.4	89.5
27. Students participate in classroom activities regardless of their sex, ethnicity, religion, socioeconomic status, or academic ability.	Program	95.4	95.7
	Control	94.3	95.3
43. Teachers have high expectations for all students.	Program	85.3	88.1
	Control	87.9	90.2

TABLE 20: Continued

INSTRUCTION Items			
4. Teachers use a variety of teaching strategies.	Program	93.9	97.4
	Control	93.1	95.6
15. Teachers at each grade (course) level design learning activities to support both curriculum and student needs.	Program	93.2	94.5
	Control	92.6	93.5
24. Teachers provide opportunities for students to develop higher-order skills.	Program	91.1	91.4
	Control	86.4	90.2
33. Teachers use curriculum guides to ensure that similar subject content is covered within each grade.	Program	93.9	94.5
	Control	93.3	95.1
35. Teachers use appropriate evaluation methods to determine student achievement.	Program	92.2	95.2
	Control	91.3	94.2
41. Pull-out programs do *not* interfere with basic skills instruction.	Program	63.3	61.3
	Control	61.9	64.9
48. Teachers use a wide range of teaching materials and media.	Program	92.4	91.2
	Control	88.6	92.3
INVOLVEMENT Items			
5. Community businesses are active in this school.	Program	51.1	63.7
	Control	60.1	63.3
11. Parents actively support school activities.	Program	60.0	68.9
	Control	69.6	71.4
12. Parents are treated courteously when they call or visit the school.	Program	94.7	91.4
	Control	92.3	92.3
18. Parents are invited to serve on school advisory committees.	Program	79.0	80.0
	Control	71.0	80.0
19. Parent volunteers are used wherever possible.	Program	70.1	76.7
	Control	75.2	83.3
32. Information about school activities is communicated to parents on a consistent basis.	Program	83.0	92.9
	Control	85.4	88.8
37. Parents are often invited to visit classrooms.	Program	62.3	60.1
	Control	59.9	63.7
LEADERSHIP Items			
8. The administration communicates the belief that all students can learn.	Program	91.9	94.8
	Control	92.1	94.0
20. The administration encourages teachers to be creative and to try new methods.	Program	87.1	88.1
	Control	87.9	90.0
34. The principal (or administration) provides useful feedback on staff performance.	Program	74.2	78.6
	Control	78.2	80.5
36. The administration does a good job of protecting instructional time.	Program	83.3	81.0
	Control	78.5	84.0
42. The principal is an effective instructional leader.	Program	79.0	74.3
	Control	76.2	77.0
45. The goals of this school are reviewed and updated regularly.	Program	84.8	82.9
	Control	84.4	87.4
47. The principal is highly visible throughout the school.	Program	82.3	78.1
	Control	79.2	80.2

TABLE 20: Continued

ORDER Items		Launch 1 05-06	Launch 2 05-06
13. Rules for student behavior are consistently enforced.	Program	64.3	63.4
	Control	60.1	68.6
23. Student discipline is administered fairly and appropriately.	Program	67.6	66.3
	Control	63.4	73.0
25. Student misbehavior in this school does *not* interfere with the teaching.	Program	43.0	46.3
	Control	39.9	43.3
30. Student tardiness or absence from school is *not* a major problem.	Program	39.0	54.2
	Control	45.3	48.6
39. The school is a safe place in which to work.	Program	89.6	94.3
	Control	92.6	91.4
44. Teachers, administrators, and parents assume joint responsibility for student discipline.	Program	56.7	59.9
	Control	54.5	59.8
46. Student behavior is generally positive in this school.	Program	74.7	80.0
	Control	73.8	77.4

TABLE 21: School Climate Inventory Results: Dimensions by Overall Means and National Norms

Dimensions by Overall Means and National Norms

	Launch 1		Launch 2		
Dimension	**Program**	**Control**	**Program**	**Control**	**National Norm**
Collaboration	3.88	3.96	3.96	4.02	3.74
Environment	4.02	4.11	4.12	4.15	3.79
Expectations	4.08	4.07	4.14	4.18	3.85
Instruction	4.23	4.18	4.29	4.28	4.02
Involvement	3.88	3.91	3.98	4.03	3.77
Leadership	4.11	4.10	4.14	4.19	3.92
Order	3.54	3.54	3.65	3.66	3.22
OVERALL	3.96	3.98	4.04	4.07	3.76

Teacher Technology Questionnaire (TTQ)

The Teacher Technology Questionnaire (TTQ) was designed to capture teacher perceptions regarding their personal beliefs and practices in five areas: impact of technology on classroom instruction, impact of technology on students, teacher readiness to integrate technology, overall support for technology, and technical support. A total of 1,638 Program (L1 *n* = 393; L2 *n* = 418) and Control (L1 *n* = 401; L2 *n* = 426) teachers completed the survey.

TTQ responses from Program teachers were more positive than Control responses on all items (see Table 22). For example, between 68.7% and 93.6% of the Program teachers agreed or strongly agreed with all TTQ items as compared to 42.1% to 86.4% of the Control teachers. Specifically, the Program teachers had the highest overall agreement that their student's could "capably use computers at an age-appropriate level" (L1 Program = 93.6%; L2 Program = 93.1%). The lowest level of agreement for Program teachers was that the use of computers "improved the quality of student work" (L1 Program = 72.0%; L2 Program = 71.3%). When teachers were asked if they "routinely integrate technology into [their] instruction," over three-fourths of the Program teachers (L1 Program = 79.4%; L2 Program = 81.1%) as compared to approximately 60% of the Control teachers (L1 Control = 51.4%; L2 Control = 68.8%) were in agreement.

Responses to the final items on the TTQ indicate that more Program (L1 Program = 74.9%; L2 Program = 75.8%) than Control (L1 Control = 55.9%; L2 Control = 59.6%) teachers rated their computer ability as very good to good. However, there were no notable differences in the percentages of teachers who had home computers, accessed instructional material on the web, or used them to prepare classroom materials.

TABLE 22: Teacher Technology Questionnaire (TTQ)

L1 Program N = 393, L 1 Control N = 401
L2 Program N = 418, L 2 Control N = 426

Items by Category		% Strongly Agree and Agree	
	Launch	Program	Control
Impact on Classroom Instruction			
My teaching is more student-centered when technology is integrated into the lessons.	1	68.7	45.1
	2	71.1	66.2
I routinely integrate the use of technology into my instruction.	1	79.4	51.4
	2	81.1	68.8
Technology integration efforts have changed classroom learning activities in a very positive way.	1	84.7	66.3
	2	86.8	79.1
My teaching is more interactive when technology is integrated into the lessons.	1	74.3	51.6
	2	72.7	68.5
Overall Impact on Classroom Instruction:	**1**	**4.02**	**3.49**
	2	**4.08**	**3.81**
Impact on Students			
The use of computers has increased the level of student interaction and/or collaboration.	1	87.3	63.1
	2	90.0	78.6
The integration of technology has positively impacted student learning and achievement.	1	88.3	69.6
	2	90.7	84.0
Most of my students can capably use computers at an age-appropriate level	1	93.6	79.8
	2	93.1	85.4
The use of technology has improved the quality of student work	1	72.0	53.4
	2	71.3	65.5
Overall Impact on Students	**1**	**4.20**	**3.73**
	2	**4.26**	**3.97**
Teacher Readiness to Integrate Technology			
I know how to meaningfully integrate technology into lessons.	1	93.1	73.1
	2	89.7	78.4
I am able to align technology use with my district's standards-based curriculum.	1	86.8	63.3
	2	88.5	75.8
I have received adequate training to incorporate technology into my instruction.	1	88.8	61.3
	2	87.8	70.2
My computer skills are adequate to conduct classes that have students using technology.	1	89.8	73.1
	2	89.0	80.8
Overall Teacher Readiness to Integrate Technology	**1**	**4.25**	**3.71**
	2	**4.29**	**3.90**
Support for Technology in the School			
Parents and community members support our school's emphasis on technology.	1	75.6	56.9
	2	83.3	73.5
Teachers receive adequate administrative support to integrate technology into classroom practices.	1	86.8	65.3
	2	88.5	78.9
Our school has a well-developed technology plan that guides all technology integration efforts.	1	76.8	42.1
	2	82.8	53.3
Teachers in this school are generally supportive of technology integration efforts.	1	89.1	74.6
	2	92.1	86.4
Overall Support for Technology in the School	**1**	**4.09**	**3.63**
	2	**4.23**	**3.87**
Technical Support			
Most of our school computers are kept in good working condition.	1	81.2	73.3
	2	91.6	71.6
I can readily obtain answers to technology-related questions.	1	82.4	73.1
	2	88.8	75.4
My students have adequate access to up-to-date technology resources.	1	85.5	55.9
	2	89.7	63.4

TABLE 22: Continued

Items by Category		% Strongly Agree and Agree	
	Launch	Program	Control
Materials (e.g., software, printer supplies) for classroom use of computers are readily available.	1	78.1	50.9
	2	82.5	61.0
Overall Technical Support	**1**	**4.05**	**3.56**
	2	**4.24**	**3.66**
Technology Coach Effectiveness			
I have frequently participated in professional development that was planned by or provided by my Technology Coach.	1	84.7	NA
	2	82.8	NA
I **more frequently** integrate technology into my instruction as a result of participating in professional development planned or provided by my Technology Coach	1	78.9	NA
	2	79.4	NA
The **quality** of my technology integration lessons has improved as a result of participating in professional development planned or provided by my Technology Coach	1	80.4	NA
	2	82.8	NA
Overall, my Technology Coach has been a valuable asset to our school's technology integration program.	1	89.1	NA
	2	90.0	NA
Technology Coach Effectiveness Overall	**1**	**4.20**	NA
	2	**4.28**	NA

Section 2: Percent of Response by Rating		Launch 1		Launch 2	
Item	**Ratings**	**Program**	**Control**	**Program**	**Control**
How would you rate your level of computer ability?	Very Good	32.1	19.2	33.0	18.3
	Good	42.8	36.7	42.8	41.3
	Moderate	22.1	34.9	22.7	32.9
	Poor	1.8	7.5	1.2	5.9
	No Ability	0.0	0.5	0.0	0.2
Do you own a home computer?	Yes	93.9	92.3	92.3	93.0
	No	5.9	7.0	6.9	5.4
If yes, do you use your home computer to access instructional materials on the Internet?	Yes	86.4	82.2	89.9	83.6
	No	11.1	14.3	9.1	12.6
If yes, do you use your home computer to prepare instructional materials?	Yes	83.2	77.6	86.5	80.1
	No	14.1	17.0	12.7	14.4

*Note: Item percentages may not total 100% because of missing input from some respondents.

Inferential results: Program vs. Control

The MANOVA, treating the five survey categories (impact on classroom instruction; impact on students; teacher readiness; overall support; and technical support) as dependent measures, was highly significant (see Table 23) for Launch 1 ($F(5, 716) = 43.89$, $p < .001$) and Launch 2 ($F(5, 768) = 39.29$, $p < .001$). Follow-up univariate analyses yielded significance on all five categories (see Table 23); with each being considered educationally important as Effect Sizes ranged from +0.62 to +0.78 for Launch 1 and from +0.37 to +0.77 for Launch 2. Most notable, Program teachers had more confidence (L1 *ES* = +0.78; L2 *ES* = +0.58) than Control teachers that they were ready to integrate technology (L1 Program *M* = *4.25,* Control *M* = 3.71; L2 Program *M* = *4.29,* Control *M* = 3.90), and that use of technology positively impacts

students (L1 Program *M = 4.20,* Control *M* = 3.73, *ES* = +0.76; L2 Program *M = 4.26,* Control *M* = 3.97, *ES* = +0.48*)*.

TABLE 23: A Summary of TTQ Items Showing Significant Differences Between Program and Control Teacher Responses

Launch 1

Overall	Wilks' Lambda	*F*	Hypothesis *df*	Error *df*	Significance
	.765	43.89	5	716	0.000

	Program (n = 393)		**Control (*n = 401)***				
TTQ Items	***M***	***SD***	***M***	***SD***	***F***	***p***	***ES***
Readiness to Integrate Technology	4.25	.59	3.71	.78	35.30	.000	.78
Overall Support	4.09	.62	3.63	.68	18.59	.000	.71
Impact on Classroom Instruction	4.02	.71	3.50	.76	27.34	.000	.71
Impact on Students	4.20	.59	3.73	.65	29.17	.000	.76
Technical Support	4.05	.74	3.56	.83	15.62	.001	.62

Launch 2

Overall	Wilks' Lambda	*F*	Hypothesis *df*	Error *df*	Significance
	.796	39.29	5	768	0.000

	Program (*n* = 392)		**Control (*n = 408)***				
TTQ Items	***M***	***SD***	***M***	***SD***	***F***	***p***	***ES***
Readiness to Integrate Technology	4.29	.63	3.90	.72	18.02	.000	.58
Impact on Students	4.26	.61	3.97	.60	14.00	.001	.48
Impact on Classroom Instruction	4.08	.73	3.81	.73	10.93	.003	.37
Technical Support	4.24	.66	3.66	.83	17.36	.000	.77
Overall Support	4.23	.60	3.87	.59	12.99	.001	.61

Technology Skills Assessment (TSA)

The primary purpose of the TSA was to assess teacher perceptions of their technology ability as indicated in the NETS for Students in grades 3-8. The survey begins by asking the teachers to rate "How easily…" (Not at all, Somewhat, Very easily) they could use software features to complete 47 computer-related tasks. The tasks were divided into six areas: Computer Basics, Software Basics, Multimedia Basics, Internet Basics, Advanced Skills, and Using Technology for Learning. The teachers were also asked to rate "How well" (Not at all, Somewhat, Very well) they understood three technology-related policy and ethics items. A summary of the results from 1,647 (L1 Program *N* = 394, L1 Control *N* = 402; L2 Program *N* = 422, L2 Control *N* = 429) TSA surveys is presented in Table 24.

Teacher confidence was highest for Computer Basics, with over 80% of the Program teachers (L1 Program = 86.48%; L2 Program = 84.37%) and over 75% of the Control teachers (L1 Control = 76.01%; L2 Control = 78.56%) indicating that they could "very easily" complete the tasks. The category with the next highest ratings was Software Basics, on which approximately 67% to 75% of the Program and 60% of Control teachers indicated they could easily execute the tasks. They were most certain that they could open and use software programs on their computers, while indicating less certainty with being able to save documents so they could be opened in different programs, e.g., *Word*® to *Word Perfect*®. For the remainder of the categories, approximately 60% or less of both Program and Control teachers indicated that they could easily do tasks related to: Internet Basics; Multimedia Basics; Using Technology for Learning; and Advanced Skills.

TABLE 24: Technology Skills Assessment (TSA) Data Summary

L1 Program Teachers *N* = 394, L 1 Control Teachers *N* = 402
L2 Program Teachers *N* = 422, L 2 Control Teachers *N* = 429

		Not at All		Somewhat		Very Easily	
TSA Item by Category	**Group**	**L1**	**L2**	**L1**	**L2**	**L1**	**L2**
Computer Basics ~ How easily can you …							
Use a spell check tool.	Program	1.8	1.9	7.1	4.5	91.1	93.4
	Control	5.0	4.2	11.9	9.8	82.8	85.8
Create basic computer documents (word processed) in a timely manner.	Program	0.8	1.9	9.6	7.1	89.3	91.0
	Control	5.5	3.5	12.7	10.7	81.6	85.5
Use help menus for software programs.	Program	1.8	2.6	20.3	21.3	77.7	75.8
	Control	6.2	4.4	27.1	27.3	65.9	67.4
Use basic computer terms like mouse, keyboard, hard drive, CD-ROM, and monitor.	Program	0.8	0.5	4.3	4.0	94.4	95.0
	Control	0.7	0.5	9.2	9.6	89.8	89.7
Save documents so they can be opened on both a Macintosh and PC.	Program	8.9	14.2	23.6	23.5	67.3	62.1
	Control	14.4	12.1	24.4	24.5	60.4	62.9
Create folders on a hard drive or disk.	Program	1.8	4.5	14.2	19.9	84.0	75.4
	Control	10.2	9.6	25.6	24.9	63.4	65.0
Save files to specific folders.	Program	1.0	3.8	10.4	14.9	88.6	80.8
	Control	8.7	6.3	24.1	22.8	66.9	69.9
Locate and delete unwanted files.	Program	1.0	3.1	12.7	13.7	85.8	83.2
	Control	7.2	6.1	18.7	17.9	72.9	75.8
Use keyboard commands to cut, copy, or delete text.	Program	2.3	2.8	15.2	14.5	82.5	82.7
	Control	8.5	6.3	20.4	19.3	70.6	73.9
Proficiently use a mouse and keyboard.	Program	0.3	0.2	4.8	3.8	94.7	96.0
	Control	1.2	0.2	9.5	6.3	88.6	93.0
Print a document using "Print" from the File menu and/or the toolbar icon.	Program	0.3	0.5	3.8	2.4	95.9	97.2
	Control	1.2	1.2	5.2	3.3	93.3	95.3
Computer Basics: Overall	***Program***	***1.89***	***3.27***	***11.45***	***11.78***	***86.48***	***84.37***
	Control	***6.25***	***4.94***	***17.16***	***16.03***	***76.01***	***78.56***
Software Basics ~ How easily can you …							
Use software preview features to check work.	Program	2.3	6.2	22.3	24.4	72.3	69.4
	Control	10.5	12.6	29.1	25.6	59.7	60.4
Open and use software programs that are installed on your computer.	Program	0.8	0.9	10.7	13.0	88.6	86.0
	Control	2.0	2.6	19.2	16.6	78.6	80.7
Work with and move between two open programs (e.g., Internet and database) to create a product.	Program	3.0	5.0	17.3	18.2	79.7	76.5
	Control	14.9	13.5	25.1	22.4	59.2	63.9
Describe the difference between downloading and installing software.	Program	4.8	5.9	22.3	26.5	72.8	67.5
	Control	8.7	8.2	30.1	30.1	60.0	61.1
Save documents so they can be opened in a different program (e.g., from Word to Word Perfect).	Program	9.6	14.0	30.5	34.4	59.9	51.7
	Control	25.1	21.4	30.6	33.1	43.5	45.2
Install software.	Program	3.6	9.2	23.6	30.8	72.6	59.7
	Control	10.7	10.3	33.8	31.0	54.5	58.3
Software Basics: Overall	***Program***	***4.01***	***6.86***	***21.11***	***24.55***	***74.31***	***67.46***
	Control	***11.98***	***11.93***	***27.98***	***26.46***	***59.25***	***61.60***

TABLE 24: Continued

TSA Item by Category	Group	Not at All L1	Not at All L2	Somewhat L1	Somewhat L2	Very Easily L1	Very Easily L2
Multimedia Basics ~ How easily can you …							
Import digital video from a camera to a computer.	Program	22.8	28.0	32.5	33.2	44.4	38.9
	Control	40.5	36.8	29.4	30.3	29.9	32.6
Record and save your voice onto a computer.	Program	37.3	48.3	32.5	29.9	29.9	21.8
	Control	62.7	54.3	21.6	28.2	15.2	17.2
Use a scanner to import a photo or document into a computer.	Program	16.2	21.3	31.5	35.5	52.0	43.1
	Control	32.8	31.7	30.3	32.9	36.1	35.2
Play a music CD on the computer.	Program	3.6	5.0	9.4	15.2	86.3	79.6
	Control	7.0	7.7	18.2	16.6	74.4	75.1
Multimedia Basics: Overall	***Program***	***19.97***	***24.90***	***26.47***	***28.45***	***53.15***	***45.85***
	Control	***35.75***	***32.62***	***24.87***	***27.00***	***38.90***	***40.25***
Internet Basics ~ How easily can you …							
Connect to the Internet with a modem (phone, cable).	Program	5.8	8.1	13.2	17.3	81.0	74.6
	Control	12.2	10.7	12.7	13.5	74.4	75.5
Use Boolean strategies for Internet searches.	Program	27.4	37.4	24.4	21.8	46.7	39.1
	Control	46.0	42.7	23.1	20.0	29.4	36.4
Use appropriate software and the Internet to find audio, video, and graphics for lesson plans.	Program	6.6	6.4	27.4	28.2	65.7	64.9
	Control	15.7	15.9	37.3	32.9	46.5	50.8
Use the Internet to find help when you have a computer problem.	Program	17.0	19.9	32.7	38.6	50.0	41.5
	Control	28.1	27.7	34.3	33.3	37.1	38.7
Determine if information you find on the Internet is accurate and valid.	Program	10.2	10.9	36.3	35.8	53.3	53.3
	Control	14.4	20.0	42.0	37.1	40.3	42.7
Evaluate Internet search strategies to determine those that are most efficient.	Program	9.4	10.9	36.5	34.8	53.8	54.3
	Control	18.4	20.0	39.6	38.0	41.5	41.7
Determine the usefulness and appropriateness of digital information.	Program	15.0	18.0	33.8	36.7	51.0	45.3
	Control	26.9	23.3	37.8	41.3	34.1	34.7
Internet Basics: Overall	***Program***	***13.05***	***15.94***	***29.18***	***30.45***	***57.35***	***53.28***
	Control	***22.92***	***22.9***	***32.4***	***30.87***	***43.32***	***45.78***
Advanced Skills ~ How easily can you …							
Use more advanced computer terms like megahertz, gigabytes, and RAM.	Program	20.8	29.6	55.6	48.1	23.4	45.3
	Control	38.1	36.1	41.3	41.0	19.7	22.6
Access information on local area networks (LANs) and wide area networks (WANs).	Program	30.2	36.5	39.1	36.7	29.4	26.3
	Control	40.5	42.9	35.6	28.2	22.9	28.4
Use appropriate digital layout and design to meet the needs of defined audiences.	Program	28.7	34.8	38.8	36.7	32.2	27.3
	Control	52.0	47.1	29.9	27.0	17.2	25.2
Use appropriate digital layout and design for the selected media (e.g., multimedia, web, print).	Program	27.2	31.3	39.3	37.0	33.2	30.8
	Control	48.0	43.8	34.6	30.1	16.4	25.2
Publish information in a variety of media (e.g., printed, monitor display, web-based, video).	Program	22.3	23.5	40.6	39.8	36.3	36.0
	Control	44.3	38.0	33.8	36.6	20.9	24.5
Connect a computer to a local server to share files.	Program	34.0	37.0	34.8	29.9	30.5	32.7
	Control	53.0	45.5	28.4	28.2	17.4	25.4
Determine if a software program works with an operating system.	Program	27.4	32.7	38.1	36.7	34.0	29.4
	Control	41.0	41.7	36.8	31.9	20.9	25.6
Print to a specific printer when connected to a network that has more than one printer.	Program	14.2	15.9	21.6	22.7	63.7	60.7
	Control	23.4	26.6	30.3	25.4	45.0	47.8
Use presentation software to share information with specific audiences.	Program	14.2	17.8	30.5	32.2	54.6	49.5
	Control	36.8	32.6	31.3	29.4	30.6	37.5
Advanced Skills: Overall	***Program***	***24.33***	***37.01***	***37.6***	***39.07***	***37.47***	***37.55***
	Control	***41.9***	***39.36***	***33.55***	***30.86***	***23.44***	***29.13***

TABLE 24: Continued

TSA Item by Category	Group	Not at All L1	Not at All L2	Somewhat L1	Somewhat L2	Very Easily L1	Very Easily L2
Using Technology for Learning ~ How easily can you …							
Use multimedia software to enhance learning experiences.	Program	6.9	7.6	31.5	33.6	61.7	58.1
	Control	16.9	14.5	46.3	43.6	35.3	41.0
Use appropriate software (e.g., word processing, graphics, databases, spreadsheets, simulations, and multimedia) to express ideas and solve problems.	Program	7.9	9.5	33.0	34.4	58.9	55.7
	Control	18.4	16.1	41.3	41.7	38.6	41.5
Use text and graphics to create and modify solutions to problems.	Program	13.7	17.8	39.1	37.9	47.2	43.4
	Control	33.3	29.6	38.6	40.1	26.9	29.6
Use digital audio and video to create and modify solutions to problems.	Program	26.1	30.3	42.1	41.0	31.0	27.7
	Control	47.3	42.4	33.8	33.1	17.7	23.5
Use communication tools to participate in group projects.	Program	17.0	18.5	35.5	37.4	46.7	42.7
	Control	37.6	31.2	37.3	37.8	22.9	30.3
Manipulate information in interactive digital environments (e.g., simulations, virtual labs, field trips).	Program	27.9	32.5	37.3	36.7	34.0	30.1
	Control	49.8	45.5	32.3	34.5	16.4	19.3
Participate in a listserv, chat, and bulletin board session.	Program	28.9	32.9	36.5	34.8	34.0	31.3
	Control	45.3	48.5	30.6	29.8	21.4	20.5
Create an electronic teaching portfolio to evaluate your work.	Program	31.5	46.4	37.6	30.8	30.2	21.6
	Control	61.7	56.4	25.6	26.1	11.2	16.8
Evaluate electronic portfolio products.	Program	33.2	46.9	35.8	31.0	29.9	21.1
	Control	63.2	59.2	24.1	24.2	10.7	15.6
Create technology tools to assess student work (e.g., checklists, timelines, rubrics).	Program	13.7	16.1	30.5	32.2	55.3	50.9
	Control	37.6	30.3	33.3	33.3	27.6	35.7
Using Technology for Learning: Overall	***Program***	***20.68***	***25.85***	***35.89***	***34.98***	***42.89***	***38.26***
	Control	***41.11***	***37.37***	***34.32***	***34.42***	***22.87***	***55.13***
Policy and Ethics – I understand…							
My school's acceptable use policy.	Program	1.3	2.1	16.2	17.1	81.5	79.1
	Control	2.7	3.5	25.9	25.9	68.9	69.7
The concept of a school site license for software.	Program	4.1	2.6	16.8	22.0	78.4	73.9
	Control	7.2	7.7	26.9	26.1	62.9	65.0
How to determine if it is legal to copy a software program or another individual's electronic work.	Program	6.9	7.8	32.5	35.3	59.9	55.2
	Control	14.9	14.5	36.3	37.5	46.3	47.1
Policy and Ethics: Overall	***Program***	***4.1***	***4.16***	***21.83***	***24.8***	***73.26***	***69.4***
	Control	***8.26***	***8.56***	***29.7***	***29.83***	***59.36***	***60.6***

Inferential results: Program vs. Control

A MANOVA comparing the Program and Control means on the seven TSA categories yielded a highly significant difference (see Table 25) for Launch 1 ($F(7, 679) = 16.26$, $p < .001$) and Launch 2 ($F(7, 755) = 5.54$, $p < .001$). Univariate analysis of variance (ANOVA) with Bonferroni adjustment (alpha was set to be .007) was then separately performed on each category. As shown in Table 25, significant differences, with Effect Sizes ranging from +0.40 to +0.69 for Launch 1, were found for the six of the seven areas. The strongest difference occurred for the category "using technology for learning" (L1 Program $M = 2.23$; L1 Control $M = 1.81$, $ES = +0.69$). Less dramatic differences were seen for Computer Basics (L1 $ES = +0.40$) and Internet basics (L1 $ES = +0.41$). These findings are not surprising considering the widespread use of

computers and the Internet among the general population. Although L2 schools have higher means scores in all categories, none of these differences were found to be significant.

TABLE 25: TSA: Significant Differences Between Program and Control

Launch 1

Overall	Wilks' Lambda	*F*	Hypothesis *df*	Error *df*	Significance
	.856	16.26	7	679	.000

	Program (*n* = 394)		**Control (*n* = 402)**				
TSA Items	***M***	***SD***	***M***	***SD***	***F***	***p***	***ES***
Multimedia Basics	2.34	.57	2.03	.61	24.81	.000	.53
Using Technology for Learning	2.23	.60	1.81	.62	27.99	.000	.69
Software Basics	2.70	.40	2.48	.54	21.74	.000	.46
Computer Basics	2.85	.26	2.71	.42	14.40	.001	.40
Advanced Skills	2.13	.61	1.81	.63	18.03	.000	.52
Internet Basics	2.44	.54	2.20	.62	17.28	.000	.41

Launch 2

Overall	Wilks' Lambda	*F*	Hypothesis *df*	Error *df*	Significance
	.951	5.537	7	755	.000

	Program (*n* = 422)		**Control (*n* = 429)**				
TSA Items	***M***	***SD***	***M***	***SD***	***F***	***p***	***ES***
NONE							

Technology Benchmarks

As previously mentioned, trained representatives from each Program school developed Technology Benchmarks tailored to assess implementation of schools' TnETL programs. The benchmarks underwent a review process that resulted in each school receiving an individualized report of suggested revisions. The schools used the Technology Benchmark's three phase rating scale (Phase I = Beginning (1); II = Intermediate (2); III = Full (3)) to assess implementation progress for curriculum, instruction, and organization prior to implementing the program (September 1 of the beginning year) and at the end (May 15) of each year of implementation.

Mean scores for the Launch 1 Spring 2006 ratings ranged between 2.50 and 2.70, thus suggesting that the TnETL program had reached an Intermediate to Full level of implementation (see Table 26). The most favorable ratings were for "Curriculum" and "Organization" (*M* = 2.70), followed by "Instruction" (*M*=2.50). The "Curriculum" and "Organization" outcomes may be attributed to the Program schools having the benefit of full-time, embedded support provided by a Technology Coach. The "Instruction" finding is also understandable, since integrating technology into classroom teaching often requires teachers to change their instruction from a traditional, teacher-centered approach to a student-centered approach.

With regard Launch 2 Fall 2006 ratings, the schools were also seen to be at a level of Intermediate to Full implementation. The final spring ratings revealed a positive shift towards Full implementation, with "Organization" and "Curriculum" nearly reaching a "Full" implementation phase (*M* = 2.50). A slightly lower rating was seen in the overall mean for "Instruction" (*M* = 2.30).

TABLE 26: Technology Benchmarks for Program School: Mean Scores for Fall and Spring Ratings

Launch 1

Rating Period	Curriculum	Instruction	Organization
2003 Fall	1.11	1.05	1.28
2004 Spring	1.89	1.91	2.02
2005 Spring	2.20	2.04	2.38
2006 Spring	2.70	2.50	2.70

Launch 2

Rating Period	Curriculum	Instruction	Organization
2004 Fall	1.26	1.14	1.23
2005 Spring	1.64	1.42	1.93
2006 Spring	2.50	2.30	2.50

Student Performance-Based Assessment

A Problem-Solving Task and Technology Task were administered to examine the impact of TnETL-1 on student ability to solve problems and/or to generate computer products that reflect problem-solving solutions. Results for each assessment are presented below.

Student Problem-Solving Task

As described earlier, the Student Problem-Solving Task was assessed with a rubric comprised of seven components, each rated on a three-level scale with "3" representing the highest level of response (see Appendix A). L1 participants consisted of 115 eighth grade students, 87 in the Program group and 28 in the Control group and L2 was comprised of 133 eighth grade students, with 72 in the Program and 61 in the Control group. Across both groups, students exhibited the highest ability in demonstrating understanding of the problem (see Table 27), as the mean scores were slightly above average (L1 Program *M* = 2.09; L1 Control *M* = 1.76; L2 Program *M* = 1.66; L2 Control *M* = 1.68). Similar patterns were also seen for L1 Program students with regard to identifying what is known (L1 Program *M* = 1.91) and how data need to be manipulated (L1 Program *M* = 2.12). The lowest level of ability for both groups was seen in student descriptions of how to use technology to solve the problem (L1 Program *M* = 1.31, Control *M* = 1.17 and L2 Program *M*=1.04, L2 Control *M*=1.09)

Inferential results: Program vs. Control

A MANOVA comparing the L1 Program and Control problem solving means (see Table 28) indicated that there was no significant difference ($F(7, 107) = 1.65$, $p = .129$). On the other hand, a marginally significant difference was found when comparing L2 Program and Control results ($F(7, 123) = 2.11$, $p = .048$). However, follow-up analyses showed that there was not any significant difference between groups across the problem solving sub-skills.

TABLE 27: Student* Problem-Solving Assessment: Frequencies and Means

L1 Program Students *N* = 87, L 1 Control Students *N* = 28
L2 Program Students *N* = 72, L 2 Control Students *N* = 61

		0		1		1.5		2		2.5		3		Overall	
	N	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*M*	SD
Understands Problem															
L1 Program	87	0	0	19	21.8	0	0	34	39.1	13	14.9	21	24.1	2.09	0.70
L1 Control	28	0	0	9	32.1	0	0	16	57.1	1	3.6	2	7.1	1.76	0.60
L2 Program	72	0	0	33	45.8	0	0	25	34.7	10	13.9	4	5.6	1.66	0.66
L2 Control	61	0	0	28	45.9	3	4.9	16	26.2	7	11.5	7	11.5	1.68	0.72
Identifies what is known about the problem															
L1 Program	87	0	0	22	25.3	0	0	41	47.1	19	21.8	5	5.7	1.91	0.60
L1 Control	28	0	0	8	28.6	0	0	19	67.9	1	3.6	0	0	1.73	0.48
L2 Program	72	0	0	36	50.0	4	5.6	27	37.5	2	2.8	3	4.2	1.52	0.58
L2 Control	61	0	0	25	45.9	3	4.9	22	36.1	8	13.1	0	0	1.58	0.57
Identifies what needs to be know to solve the problem															
L1 Program	87	0	0	27	31.0	0	0	41	47.1	10	11.5	9	10.3	1.85	0.65
L1 Control	28	0	0	13	46.4	0	0	14	50.0	0	0	1	3.8	1.57	0.57
L2 Program	72	0	0	50	69.4	0	0	20	27.8	0	0	2	2.8	1.33	0.53
L2 Control	61	0	0	29	47.5	2	3.3	22	36.1	8	13.1	0	0	1.57	0.58
Determine how the data needs to be manipulated to solve the problem															
L1 Program	87	0	0	7	8.0	0	0	59	67.8	6	6.9	15	17.2	2.12	0.50
L1 Control	28	0	0	6	21.4	0	0	18	64.3	0	0	4	14.3	1.92	0.60
L2 Program	72	0	0	43	59.7	0	0	26	36.1	0	0	3	4.2	1.44	0.57
L2 Control	61	0	0	27	44.3	2	3.3	26	42.6	3	4.9	3	4.9	1.61	0.60
Describes the use of technology															
L1 Program	87	0	0	65	74.7	1	1.1	15	17.2	1	1.1	5	5.7	1.31	0.58
L1 Control	28	0	0	24	85.7	0	0	3	10.7	0	0	1	3.6	1.17	0.47
L2 Program	72	0	0	70	97.2	0	0	1	1.4	0	0	1	1.4	1.04	0.26
L2 Control	61	0	0	57	93.4	0	0	2	3.3	0	0	2	3.3	1.09	0.39
Describes how to present findings															
L1 Program	87	0	0	49	56.3	0	0	29	33.3	3	3.4	6	6.9	1.52	0.64
L1 Control	28	0	0	16	57.1	0	0	9	32.1	0	0	3	10.7	1.53	0.69
L2 Program	72	0	0	60	83.3	0	0	12	16.7	0	0	0	0	1.16	0.37
L2 Control	61	0	0	55	90.2	0	0	5	8.2	0	0	1	1.6	1.11	0.36
Collaborative Learning															
L1 Program	87	0	0	51	58.6	0	0	34	39.1	1	1.1	1	1.1	1.43	0.52
L1 Control	28	0	0	15	53.6	0	0	12	42.9	0	0	1	3.6	1.50	0.57
L2 Program	72	0	0	41	26.9	0	0	31	43.1	0	0	0	0	1.43	0.49
L2 Control	61	0	0	44	72.1	0	0	16	26.2	0	0	1	1.6	1.29	0.49

*8th Grade students

TABLE 28: Student Problem-Solving Task: Differences Between Program and Control

	Hotellings T	*F*	Hypothesis *df*	Error *df*	Significance
Launch 1	0.108	1.65	7	107	.129
Launch 2	0.120	2.11	7	123	.048

Student Technology Task

A total of 258 eighth-grade students completed the technology task (L1 Program *n* = 79, Control *n* = 54; L2 Program *n* = 64, Control *n* = 61). Program students generally exhibited slight advantages as compared to Control students across the three types of software (see Table 29). However, the degree of proficiency varied somewhat within groups. For example, L1 Program students' mean scores ranged from *M* = 0.79 to 1.80, while L1 Control student scores ranged from a low of *M* = 0.85 to a high of *M* = 1.77. Scores from the L2 Program ranged from *M* = 1.20 to 1.93 and L2 Control from *M* = 0.68 to 1.78. Similar levels of variance were seen in performance within groups for each application: spreadsheets, presentation and Internet.

TABLE 29: Student* Technology Task Frequencies, Percentages, and Means

L1 Program Students *N* = 79, L 1 Control Students *N* = 54
L2 Program Students *N* = 64, L 2 Control Students *N* = 70

		Completion of Technology Task							
	Total	**0 = No**		**1 = Somewhat**		**2 = Yes**		**Overall**	
	N	*n*	%	*n*	%	*n*	%	*M*	SD
SPREADSHEETS									
Enter numerical data into spreadsheet cells?									
L1 Program	79	20	25.3	1	1.3	58	73.4	1.48	0.87
L1 Control	54	4	7.4	5	9.3	45	83.3	1.75	0.58
L2 Program	64	18	28.1	4	6.3	42	65.6	1.37	0.89
L2 Control	70	7	10.0	1	1.4	62	88.6	1.78	0.61
Place column names into correct cells?									
L1 Program	79	21	26.6	0	0	58	73.4	1.46	0.88
L1 Control	54	5	9.3	6	11.1	43	79.6	1.70	0.63
L2 Program	64	18	28.1	12	18.8	34	53.1	1.25	0.87
L2 Control	70	9	12.9	1	1.4	60	85.7	1.72	0.67
Place row names in correct cells?									
L1 Program	79	20	25.3	1	1.3	58	73.4	1.48	0.87
L1 Control	54	5	9.3	2	3.7	47	87.0	1.77	0.60
L2 Program	64	18	28.1	3	4.7	43	67.2	1.39	0.90
L2 Control	70	7	10.0	1	1.4	62	88.6	1.78	0.61
Use a spreadsheet formula to calculate the average of a column of numbers?									
L1 Program	79	29	36.7	3	3.8	47	59.5	1.22	0.96
L1 Control	54	15	27.8	2	3.7	37	68.5	1.40	0.90
L2 Program	64	25	39.1	0	0	39	60.9	1.21	0.98
L2 Control	70	18	25.7	2	2.9	50	71.4	1.45	0.87
Create a chart?									
L1 Program	79	15	19.0	6	7.6	58	73.4	1.54	0.79
L1 Control	54	14	25.9	1	1.9	39	72.2	1.46	0.88
L2 Program	64	11	17.2	4	6.3	49	76.6	1.59	0.77
L2 Control	70	8	11.4	4	5.7	58	82.9	1.71	0.66
Change the color of columns in a column chart?									
L1 Program	79	17	21.5	0	0	62	78.5	1.56	0.82
L1 Control	54	14	25.9	1	1.9	39	72.2	1.46	0.88
L2 Program	64	13	20.3	1	1.6	50	78.1	1.57	0.81
L2 Control	70	11	15.7	0	0	59	84.3	1.68	0.73

TABLE 29: Continued

		Completion of Technology Task							
	Total	**0 = No**		**1 = Somewhat**		**2 = Yes**		**Overall**	
	N	*n*	%	*n*	%	*n*	%	*M*	SD
Add a title to a chart?									
L1 Program	78	14	17.7	1	1.3	63	79.7	1.62	0.77
L1 Control	54	18	33.3	0	0	36	66.7	1.33	0.95
L2 Program	64	7	10.9	0	0	57	89.1	1.78	0.62
L2 Control	70	15	21.4	4	5.7	51	72.9	1.51	0.82
Add a title to a chart axis?									
L1 Program	79	22	27.8	2	2.5	55	69.6	1.41	0.90
L1 Control	54	19	35.2	1	1.9	34	63.0	1.27	0.95
L2 Program	64	19	29.7	1	1.6	44	68.8	1.39	0.91
L2 Control	70	31	44.3	0	0	39	55.7	1.11	1.00
Change the range of the Y-axis scale?									
L1 Program	79	29	36.7	0	0	50	63.3	1.26	0.97
L1 Control	54	20	37.0	2	3.7	32	59.3	1.22	0.96
L2 Program	64	19	29.7	1	1.6	44	68.8	1.39	0.91
L2 Control	70	17	24.3	0	0	53	75.7	1.51	0.86
Change location of the legend?									
L1 Program	79	21	26.6	4	5.1	54	68.4	1.41	0.88
L1 Control	54	17	31.5	0	0	37	68.5	1.37	0.93
L2 Program	64	13	20.3	6	9.4	45	70.3	1.50	0.81
L2 Control	70	20	28.6	3	4.3	47	67.1	1.38	0.90

PRESENTATION									
	Total	**0**		**1**		**2**		**Overall**	
	N	*N*	%	*N*	%	*N*	%	*M*	SD
Add a title to a slide?									
L1 Program	79	10	12.7	0	0	69	87.3	1.74	0.66
L1 Control	54	7	13.0	0	0	47	87.0	1.74	0.67
L2 Program	62	2	3.1	0	0	60	93.8	1.93	0.35
L2 Control	70	13	18.6	0	0	57	81.4	1.62	0.78
Add a slide to a presentation?									
L1 Program	79	8	10.1	0	0	71	89.9	1.79	0.60
L1 Control	54	16	29.6	0	0	38	70.4	1.40	0.92
L2 Program	62	4	6.3	0	0	58	90.6	1.87	0.49
L2 Control	70	14	20.0	0	0	56	80.0	1.60	0.80
Insert a clipart image or photograph to a slide?									
L1 Program	79	14	17.7	0	0	65	82.3	1.64	0.76
L1 Control	54	9	16.7	0	0	45	83.3	1.66	0.75
L2 Program	62	7	10.9	0	0	55	85.9	1.77	0.63
L2 Control	70	15	21.4	0	0	55	78.6	1.57	0.82
Change the font of a text within a presentation?									
L1 Program	79	22	27.8	0	0	57	72.2	1.44	0.90
L1 Control	54	27	50.0	0	0	27	50.0	1.00	1.00
L2 Program	62	21	32.8	0	0	41	64.1	1.32	0.95
L2 Control	70	37	52.9	0	0	33	47.1	0.94	1.00
Change the size of text within a presentation?									
L1 Program	79	28	35.4	0	0	51	64.6	1.29	0.96
L1 Control	54	26	48.1	0	0	28	51.9	1.03	1.00
L2 Program	62	24	37.5	0	0	38	59.4	1.22	0.98
L2 Control	70	35	50.0	0	0	35	50.0	1.00	1.00

TABLE 29: Continued

PRESENTATION	Total	0		1		2		Overall	
	N	*N*	%	*N*	%	*N*	%	*M*	SD
Bold text within a presentation?									
L1 Program	79	17	21.5	0	0	62	78.5	1.56	0.82
L1 Control	54	31	57.4	0	0	23	42.6	0.85	0.99
L2 Program	62	11	17.2	0	0	51	79.7	1.64	0.77
L2 Control	70	19	27.1	0	0	51	72.9	1.45	0.89
Insert a Microsoft Excel spreadsheet chart onto a slide?									
L1 Program	79	22	27.8	3	3.8	54	68.4	1.40	0.89
L1 Control	54	22	40.7	0	0	32	59.3	1.18	0.99
L2 Program	62	8	12.5	9	14.1	45	70.3	1.59	0.71
L2 Control	70	18	25.7	5	7.1	47	67.1	1.41	0.87
Arrange content on a slide as a bullet list?									
L1 Program	79	13	16.5	11	13.9	55	69.6	1.53	0.76
L1 Control	54	17	31.5	7	13.0	30	55.6	1.24	0.90
L2 Program	62	7	10.9	12	18.8	43	67.2	1.58	0.69
L2 Control	70	18	25.7	17	24.3	35	50.0	1.24	0.84
Add a design template to a presentation?									
L1 Program	79	47	59.5	1	1.3	31	39.2	0.79	0.97
L1 Control	54	27	50.0	0	0	27	50.0	1.00	1.00
L2 Program	62	24	37.5	1	1.6	37	57.8	1.20	0.97
L2 Control	70	46	65.7	0	0	24	34.3	0.68	0.95
Select and use relevant images?									
L1 Program	79	10	12.7	1	1.3	68	86.1	1.73	0.67
L1 Control	54	15	27.8	1	1.9	38	70.4	1.42	0.90
L2 Program	62	8	12.5	54	84.4	62	96.9	1.74	0.67
L2 Control	69	14	20.0	1	1.4	54	77.1	1.57	0.81

INTERNET	Total	0		1		2		Overall	
	N	*N*	%	*N*	%	*N*	%	*M*	SD
Navigate to a web site given a specific web address (URL)?									
L1 Program	79	10	12.7	0	0	69	87.3	1.74	0.66
L1 Control	54	17	31.5	0	0	37	68.5	1.37	0.93
L2 Program	62	6	9.4	0	0	56	87.5	1.80	0.59
L2 Control	70	14	20.0	0	0	56	80.0	1.60	0.80
Obtain an image from a website and use it in a document?									
L1 Program	79	8	10.1	0	0	71	89.9	1.79	0.60
L1 Control	54	13	24.1	0	0	41	75.9	1.51	0.86
L2 Program	62	6	9.4	0	0	56	87.5	1.80	0.59
L2 Control	70	14	20.0	0	0	56	80.0	1.60	0.80

* 8th Grade Students

Inferential results: Program vs. Control

A MANOVA comparing the L1 Program and Control student technology task scores did not reveal any significant differences. However, a MANOVA comparing the L2 Program and Control student technology task scores (see Table 30) yielded a highly significant difference (Hotellings T = 0.143, F (3, 128) = 6.10, p = 0.001). Follow-up analyses showed significant advantages for the Program group overall with regard to

completing the presentation task. The effect size was *ES* = +0.49, indicating that the significant difference was strong and educationally meaningful.

TABLE 30: Student Technology Task: Significant Differences between Program and Control

Launch 2

Overall	Hotellings T	*F*	Hypothesis *df*	Error *df*	Significance
	0.143	6.098	3	128	.001

	Program (*n* = 64)		**Control** (*n* = 70)				
Technology Tasks	***M***	***SD***	***M***	***SD***	***F (1, 130)***	***p***	***ES***
Presentation	1.59	.40	1.31	.69	7.67	.006	.49

$p < .01$

Principal Interviews and Teacher Focus Groups

The following section presents a summary of the Program and Control school principal interview results and the Program teacher focus group results. Full summaries are located in an addendum to this report.[1]

Principal Interviews

Interviews were conducted with the 13 L1 and 14 L2 Program and Control principals regarding technology integration efforts at their schools. A summary of their responses is presented below.

Program Principal Impressions

The L1 principals showed that "teachers' overall attitudes toward integrating technology into their instruction" were positive and supportive, and only one expressed that some teachers are still somewhat reluctant. Principals in L1 Treatment schools reported that they are "making headway" and "most teachers have accepted the use of technology, and some teachers use it extensively."

All of the 14 L2 principals reported that teacher attitudes were positive, and 9 principals went on to say that teachers were "enthusiastic." The L1 and L2 principals indicated that the teachers were excited about increased student engagement and improved student achievement. The principals' impressions of teacher

[1] Tennessee Department of Educational: TnETL Evaluation Report Interview/Focus Group Addendum, December 2006.

reluctance were similar for both groups. Overwhelmingly, L1 and L2 principals reported that teachers' reluctance was most often because of "their (teachers) own perceived lack of knowledge and experience." To a lesser extent, principals also reported that lack of teacher time contributed to some reluctance.

There was a high level of agreement between L1 and L2 principals that students were very excited about using computers. Most principals reported that students take pride in their technology-produced work. When asked if students had concerns regarding classroom use of computers, the most common responses were that students wanted to use the technology more frequently in their lessons, and wanted more technology available in the classrooms.

The L1 Principals indicated that they supported the program in a variety of ways. Almost all of them spoke of providing "encouragement and support." Over half of the L1 principals cited "obtaining funds and equipment" as a key component of their support. The L2 principals reported similar support strategies. Fully 50% of the L2 principals said their main support was in the form of obtaining funds and equipment. Many of the L1 and L2 principals also cited their support of professional development activities.

Program sustainability was seen as a concern for 75% of the L1 principals, while 50% of the L2 principals expressed the same concern. Other concerns of L1 and L2 principals were such things as continued equipment maintenance, potential loss of Tech Coach funding, and the constant need for more funding sources.

When asked how they planned to further support technology integration efforts during the next year, 21 of 27 L1 and L2 principals reported that they would continue to focus on obtaining more funds and equipment. Additionally 50% of all L1 and L2 principals said they planned to incorporate more professional development into their technology planning.

Some final comments from the principals were: "Everyone has gained from this grant. It is now common to see technology infused throughout the day, and it is assumed that every class will incorporate technology into lessons plans." "It has changed the culture positively in this school." "This program has put us on the map."

Control Principal Impressions

Interview responses from the 13 L1 and the 14 L2 Control principals are presented in this section. Interview responses from the L1 and L2 Control principals showed that "teachers' overall attitudes toward

integrating technology into their instruction" were fairly positive and seem to be improving. In particular, nearly 50% of the Launch 2 Control principals said teachers were "positive and excited." Student engagement and enthusiasm was cited by Control principals as a primary source of teachers' enthusiasm. Once again Launch 2 Principals stated this more often than their Launch 1 counterparts. Over 50% of Launch 1 Principals and 35% of Launch 2 Principals said that "lack of training" was the biggest reason for teacher reluctance to integrate technology. With regard to students and technology, there was overall agreement between L1 and L2 principals that students are both enthused and enjoy using technology in the classroom.

The L1 Control principals reported that they support classroom use of technology in the following ways: providing teachers with time and professional development, providing additional technology to the classrooms, providing adequate equipment maintenance, and providing additional computer labs. Similar strategies of support were reported by the L2 principals: offering professional development, obtaining additional funds, encouraging teachers and staff, and providing additional planning and collaboration time.

The L1 and L2 principals' primary concerns with regard to classroom use of computers were: appropriate use of the technology, meeting state standards, providing enough professional development, and maintaining teacher skill levels.

Some final comments from the principals were: "Technology has become imperative to instruction." "We need to see more grants for technology." "I think our students will develop better higher order thinking skills that will give them an advantage in school and in life."

Teacher Focus Groups

Responses from 270 Program teachers (L1 = 130; L2 = 140) who participated in teacher focus groups at their schools suggest that teachers' overall attitudes toward integrating technology into their instruction were generally positive. The L1 and L2 teachers reported that although there are still a few teachers reluctant to use technology, overall attitudes are positive and have improved greatly over the life of the program.

Over 50% of all teachers' responses said that students were enthusiastic about the use of technology. Additionally, they stated that students frequently requested more technology-based lessons. Teachers also felt students were more "focused" and behavior problems diminished in technology-driven classrooms. Teachers from both Launch 1 and 2 expressed concerns with not having enough computer availability at home and school. They also were occasionally frustrated by technical malfunctions.

When teachers were asked about the greatest benefits of having a Technology Coach, L1 and L2 responses included: they are always available to assist with problems, help plan lessons, and offer professional development. In contrast, primary L1 and L2 teacher concerns with regard to Technology Coaches were: losing funding and therefore losing the Tech Coach; sharing the Tech Coach with other schools; and the Tech Coaches' time taken up with aging equipment problems. Launch 1 teachers reported that over one-half (7 out of 13) of their schools no longer had funding for a full time Tech Coach.

The L1 and L2 teachers felt the Coaches could have achieved greater success if they had more training themselves initially, had more support from school and district administrations, had more time to perform their duties, and had less time taken away to deal with equipment problems and failures.

There was general agreement among the teachers that Program principals were supportive of the program and the Technology Coach. However, over 70% of L1 teachers and over 50% of L2 teachers stated that the principals' support could have been improved. These attitudes were generally centered on the need for more funding and more time for professional development.

Common responses given by L1 and L2 teachers when asked to share what they thought were the greatest program successes were: students are more actively engaged in learning; students gain a competitive edge; an improved school image; teachers and students having greater access to computer technology; greater collaboration between teachers and students; and improved student performance. The greatest disappointments for L1 and L2 teachers were related to the program not being continued, losing the Tech Coach funding, lack of updated hardware, being overwhelmed by the technology, and maintaining hardware. L1 teacher final comments included: "We feel fortunate that we have been able to have the Technology Grant." "Will the students be at a disadvantage because we do not have continued support?" "We will try to keep up with current trends." L2 teacher comments included: "It has been a big boost to our staff to feel confident using technology and make our teaching day more effective." "It has enriched my teaching and I feel made me a better teacher" "(The school) is concerned that in the future services and benefits of a full time Tech Coach will be lost." "It has enhanced every student's education."

Technology Coach Survey and Interview

A total of 11 L1 and 10 L2 Coaches completed the Technology Coach Survey. A summary of the survey responses is presented below.

Survey

When looking at Technology Coach responsibilities, as reported by the L1 and L2 Coaches, the vast majority (L1 = 100% and L2 = 90%) frequently to extensively worked on troubleshooting classroom or lab computer problems (see Table 31). Additionally, Launch 1 and 2 Tech Coaches reported frequently to extensively assisting teachers with their computer skills (L1 = 90.9% and L2 = 100%). Launch 2 Technology Coaches (L2 = 100%) were found to provide much more one-to-one training for teachers than the L1 Coaches (L1 = 54.5%). Only one Technology Coach reported frequently to extensively assisting parents with computer skills. Survey results are reported in Table 31.

TABLE 31: Technology Coach Responsibilities 2004-2005

Launch 1 *N* = 11 Launch 2 *N* = 10

Percent of responses indicating the frequency with which Technology Coaches reported responsibility for each of the following tasks:		Frequently And Extensively	Occasionally	Not At All and Rarely
Set up and load software on computers	L-1	72.7	27.3	0.0
	L-2	60.0	30.0	10.0
Set up/ maintain networks	L-1	27.3	9.1	63.6
	L-2	30.0	30.0	40.0
Order hardware/ software	L-1	45.5	27.3	27.3
	L-2	50.0	50.0	0.0
Troubleshoot classroom and/or lab computers	L-1	100.0	0.0	0.0
	L-2	90.0	0.0	10.0
Design technology training sessions	L-1	54.5	36.4	9.1
	L-2	80.0	20.0	0.0
Assist teachers with computer skills	L-1	90.9	9.1	0.0
	L-2	100.0	0.0	0.0
Assist students with computer skills	L-1	63.6	27.3	9.1
	L-2	70.0	10.0	20.0
Assist administration with computer skills	L-1	27.3	54.5	9.1
	L-2	70.0	30.0	0.0
Assist school staff with computer skills	L-1	54.5	45.5	0.0
	L-2	70.0	30.0	0.0
Assist parents with computer skills	L-1	0.0	36.4	63.6
	L-2	10.0	50.0	40.0
Model technology integration lessons	L-1	36.4	63.6	0.0
	L-2	50.0	40.0	10.0
Develop technology integration lessons for teachers	L-1	36.4	54.5	9.1
	L-2	50.0	50.0	0.0
Locate web-based tech integration materials for teachers	L-1	81.8	18.2	0.0
	L-2	90.0	10.0	0.0
Review/recommend software to teachers	L-1	36.4	63.6	0.0
	L-2	70.0	30.0	0.0
Visit other schools to observe technology efforts	L-1	9.1	54.5	36.4
	L-2	30.0	40.0	30.0
Invite exemplary teachers to provide workshops	L-1	9.1	45.5	45.5
	L-2	60.0	10.0	30.0
Attend technology training	L-1	18.2	72.7	9.1
	L-2	70.0	30.0	0.0
Provide one-on-one tech training to teachers	L-1	54.5	45.5	0.0
	L-2	100.0	0.0	0.0
Provide small group tech training	L-1	45.5	54.5	0.0
	L-2	70.0	30.0	0.0
Provide whole school and/or large group tech training	L-1	18.2	54.5	27.3
	L-2	50.0	40.0	10.0
Exchange ideas with your school mentor.	L-1	9.1	45.5	45.5
	L-2	50.0	20.0	30.0
Exchange ideas with other EdTech Technology Coaches.	L-1	18.2	36.4	45.5
	L-2	40.0	10.0	50.0
Exchange ideas with non-EdTech educators from different schools or districts.	L-1	18.2	27.3	54.5
	L-2	30.0	30.0	40.0
Maintain web page with current resources for teachers at your school	L-1	45.5	18.2	36.4
	L-2	50.0	0.0	50.0

Interview

The 13 L1 and 14 L2 Technology Coaches participated in a 45 to 60-minute interview conducted by external researchers. A full summary of the interviews is located in an addendum to this report.[2] Overall, the Coaches felt that most teachers had positive attitudes toward integrating technology into their instruction. The Coaches indicated that L1 and L2 teachers were most excited about student enthusiasm in using technology, the pride students had in their computer products, and improvements seen in student learning and achievement. L1 Coaches felt teacher reluctance was attributed to "lack of confidence in their skills," "lack of time," and fear of "equipment or software not working properly." Similar concerns were noted by the L2 Coaches: "taking away time from TCAP preparation," "lack of computer skills", and "technology glitches may mess up the lesson."

When asked what they did to ensure that teachers used technology to improve student learning and achievement, both Coach groups reported similar activities. Both groups stressed the need for continued professional development. Of particular importance to both groups was aligning technology lessons with curriculum standards. The Coaches were in agreement that they could have achieved greater success with more training. Additionally, they cited the need for more and better direction from principals, the district, and the state.

Coach comments with regard to the overall TnETL program, indicate that the greatest successes were that teachers and students had gained confidence in their abilities. Specific L1 statements included: "Students, teachers, and principals have the skills to better prepare students for middle school." "Teaching methods have changed and student learning has changed." "Students would never have had the chance to do what they do now." Citations from L2 Coaches included: "The greatest success has been the positive influence on our students as a result of having available technology to help them in the learning process." "The teachers have finally come up to the level where they are able to meet the children half way and deliver the difficult concepts in a lesson with technology." The biggest disappointments reported by the L1 Coaches included: "The lack of continued funding." "Lack of some teachers to take advantage of the resources available." The disappointments stated by the L2 Coaches included: "The reluctance of some teachers to use technology."

[2] Tennessee Department of Educational: TnETL Evaluation Report Interview/Focus Group Addendum, December 2006.

"Not all the teachers have used the resources available, and not all the students have adhered to policies and procedures."

The most prevalent issue discussed by Launch 1 Coaches was the need to find new and innovative ways to find funding for project sustainability. Over one-third of the L1 Coaches also indicated that their school plans to further support technology integration efforts by adhering to NCLB standards. Seeking additional funding sources was also a common theme stated by L2 Coaches.

Final L1 Coach comments included: "We do not want it to end – it cannot end. A renewed passion now exists." "We are extremely fortunate to have been given the opportunity to be part of Ed Tech." The L2 Coaches offered final comments that included: "The EdTech Launch Program has made a positive difference with student learning, and has created enthusiasm for teachers." "It has been a great ride." "Overall, it was a very positive experience."

Student Achievement

Student achievement analyses were conducted at the fifth and eighth grade levels to compare the mathematics and language performances of Program vs. Control students. Initial pre-TnETL analyses were conducted to determine if differences existed in the groups prior to program implementation. To control for ability, students' preprogram scores were used as a covariate when comparing current year performances.

Launch 1

Fifth Grade (4th grade for 2005, 3rd grade for 2004, and 2nd grade for 2003).

The MANOVA analysis indicated an overall significant difference in students' 2003 NRT Mathematics and Language scores between Program and Control schools favoring Control school students (Wilks' Lambda = .982, $F(2, 523) = 4.85$, $p = .008$). Sample size, means, and standard deviations are presented in Table 32.

The MANCOVA analysis showed that there were significant differences between Program and Control students' 2006 CRT Mathematics and Language scores ((Wilks' Lambda = .982, $F(2,521) = 4.88$, $p = .008$). Follow up ANOVA analysis showed that only 2006 CRT Mathematics scores were significantly different, favoring Program schools ($F(1,522) = 8.62$, $p = .003$). Sample size, adjusted means and standard errors are presented in Table 33.

TABLE 32: Launch 1 – Pre-EdTech

Sample Size, Means, and Standard Deviations for 2003 NRT Mathematics and Language

Test	Group	Sample Size	Mean	Standard Deviation
2003 NRT Mathematics	Program Schools	177	568.61	37.99
	Control Schools	349	579.58*	38.65
2003 NRT Language	Program Schools	177	615.61	36.74
	Control Schools	349	623.68*	35.90

*Control significantly higher (p = .008) than Program

TABLE 33: Launch 1 – End of Year 3

5th Grade: Sample Size, Adjusted Means, and Standard Errors for 2006 CRT Mathematics and Language

Tests	Group	Sample Size	Adjusted Mean	Standard Error
2006 CRT Mathematics	Program Schools	177	519.85*	1.93
	Control Schools	349	512.89	1.37
2006 CRT Language	Program Schools	177	516.75	1.86
	Control Schools	349	515.78	1.32

*Program significantly higher (p = .003) than Control

Eighth Grade (7th grade for 2005, 6th grade for 2004, and 5th grade for 2003)

As MANCOVA assumptions do not meet any inferential conducted on 8th grade student scores. Sample sizes, means, and standard deviations for 2003 NRT and 2006 CRT Mathematics and Language scores are presented in Table 34 and Table 35.

TABLE 34: Launch 1 – Pre-EdTech

8th Grade: Sample Size, Means, and Standard Deviations for 2003 NRT Mathematics and Language

Test	Group	Sample Size	Mean	Standard Deviation
2003 NRT Mathematics	Program Schools	201	649.60	37.63
	Control Schools	207	655.39	37.36
2003 NRT Language	Program Schools	201	652.68	39.35
	Control Schools	207	663.99	39.28

TABLE 35: Launch 1 – End of Year 3

8th Grade: Sample Size, Means, and Standard Deviations for 2006 CRT Mathematics and Language

Tests	Group	Sample Size	Mean*	Standard Deviation
2006 CRT Mathematics	Program Schools	201	548.57	52.16
	Control Schools	207	542.42	43.75
2006 CRT Language	Program Schools	201	540.10	39.41
	Control Schools	207	544.08	29.96

*No Significant Program vs. Control Differences

Launch 2

Fifth Grade (4th grade for 2005 and 3rd grade for 2004)

The MANOVA analysis indicated an overall significant difference in students' 2004 NRT Mathematics and Language scores between Program and Control schools favoring Program school students (Wilks' Lambda = .982, $F(2, 624) = 5.76$, $p = .003$). Sample size, means, and standard deviations are presented in Table 36.

The MANCOVA analysis showed that there was a significant difference in students' 2006 CRT Mathematics and Language scores between Program and Control schools (Wilks' Lambda = .947, $F(2,622) = 17.43$, $p = .001$). Follow up ANOVA analysis showed that both 2006 mathematics ($F(1,623) = 17.19$, $p = .001$) and CRT language scores ($F(1,623) = 32.00$, $p = .001$) were significantly different, favoring Control schools. Sample size, adjusted means and standard errors are presented in Table 37.

TABLE 36: Launch 2 – Pre-EdTech

5th Grade: Sample Size, Means, and Standard Deviations for 2004 NRT Mathematics and Language

Test	Group	Sample Size	Mean	Standard Deviation
2004 NRT Mathematics	Program Schools	264	580.27*	44.48
	Control Schools	363	573.83	36.23
2004 NRT Language	Program Schools	264	632,64*	40.55
	Control Schools	363	622.61	34.11

*Program significantly higher ($p = .003$) than Control

TABLE 37: Launch 2 – At end of Year 2

5th Grade: Sample Size, Adjusted Means, and Standard Errors for 2006 CRT Mathematics and Language

Tests	Group	Sample Size	Adjusted Mean	Standard Error
2006 CRT Mathematics	Program Schools	264	509.83	1.47
	Control Schools	363	517.85*	1.25
2006 CRT Language	Program Schools	264	511.27	1.55
	Control Schools	363	522.85*	1.32

*Control significantly higher (p = .001) than Program

Eighth Grade (7th grade for 2005 and 6th grade for 2004)

The MANOVA analysis indicated an overall significant difference in students' 2004 NRT Mathematics and Language scores between Program and Control schools, favoring the Control schools (Wilks' Lambda = .972, $F(2, 387) = 5.51$, $p = .004$). Sample size, means, and standard deviations are presented in Table 38.

The MANCOVA analysis showed significant differences in students' 2006 CRT Mathematics and Language scores between Program and Control schools (Wilks' Lambda = .962, $F(2,385) = 7.66$, $p = .001$). Follow up ANOVAs showed that both 2006 CRT Mathematics scores ($F(1,386) = 13.33$, $p = .000$) and Language scores ($F(1,386) = 8.07$, $p = .005$) were significantly different, favoring Program schools. Sample size, adjusted means and standard errors are presented in Table 39.

TABLE 38 : Launch 2 – Pre-EdTech

8th Grade: Sample Size, Means, and Standard Deviations for 2004 NRT Mathematics and Language

Test	Group	Sample Size	Mean	Standard Deviation
2004 NRT Mathematics	Program Schools	214	657.98	39.72
	Control Schools	176	660.83	36.35
2004 NRT Language	Program Schools	214	663.03	40.72
	Control Schools	176	673.91*	36.18

*Control significantly higher (p = .004) than Program

TABLE 39 : Launch 2

8th Grade: Sample Size, Adjusted Means, and Standard Errors for 2006 CRT Mathematics and Language

Tests	Group	Sample Size	Adjusted Mean	Standard Error
2006 CRT Mathematics	Program Schools	214	552.15*	1.94
	Control Schools	176	541.54	2.14
2006 CRT Language	Program Schools	214	550.28*	1.73
	Control Schools	176	542.91	1.91

*Program significantly higher (Mathematics: p = .001; Language: p = .005) than Control

Achievement Summary

Student-level achievement analyses at the 5th and 8th grade levels revealed mixed results in L1 and L2 Program and Control schools with regard to student performance in mathematics or language arts (see Table 40). Specifically, L1 5th grade students achieved significantly higher mathematics scores than their Control counterparts; yet, there were no differences with regards to language arts scores. There were no differences between L1 8th grade Program and Control students' performance in mathematics or language arts. The L2 results were also mixed in that the 8th grade Program students out-performed the 8th grade Control students in mathematics and language arts, but the reverse occurred for the 8th grade students.

TABLE 40: Summary of Significant Differences in TCAP Achievement

		Launch 1	Launch 2
5th Grade	Mathematics		
	Language Arts		
8th Grade	Mathematics		
	Language Arts		

Legend	
Program Significantly Higher	
Control Significantly Higher	
No Significant Difference	

Conclusions

The conclusions of the present study will be presented in association with each of the major research questions for the 2005-2006 evaluation in the respective sections below.

Does implementation of the TnETL model raise student achievement in Program schools compared to Control schools?

When examining the findings, a promising trend emerges as the Program students out-performed or performed as well as Control students in all instances except with regard to Launch 2 5th grade mathematics and language arts, yet they also emerge with more experience using technology as a learning tool in meaningful computer activities. Specifically, students in the Program classrooms were significantly more engaged in student-centered learning activities such as experiential, hands-on learning, independent inquiry/research, and cooperative learning. In other words, the Program students were better able than the Control students to demonstrate the application of critical thinking skills, which for some students resulted in superior or comparable TCAP mathematics and language arts performance.

Does implementation of TnETL improve teachers' skill levels in, and attitudes toward, integrating technology with curriculum and state standards?

Teachers who participated in the TnETL1 and 2 Programs revealed more positive attitudes toward technology integration, and teachers who participated in the L1 Program reported significantly more confidence to complete computer tasks than the Control teachers. For example, Program teachers had higher agreement that they knew how to meaningfully integrate technology into lessons, that their computer skills were adequate to conduct classes that have students using technology, and that integration of technology positively impacted student learning. Yet, more importantly, data from the classroom observations suggest positive program effects on improving teachers' skill levels in, and attitudes toward, integrating technology with curriculum and state standards. The Program teachers as compared to Control teachers integrated more intensive and meaningful student use of technology in student-centered environments. However, the scope or variety of software used in Program classes was rather limited, which implies that although Program teachers demonstrated greater skills and attitudes, the need still exists for continued professional development focused on effective use of technology as a learning tool.

Does TnETL foster greater use of research-based teaching practices while increasing academically focused instructional time and student attention and engagement?

Overall, both the randomly conducted whole school and targeted observations revealed that the instructional strategies implemented in TnETL Program schools were more reflective of research-based practices that accommodate technology integration than those observed in Control classes. These practices included greater use of student-centered strategies such as project-based learning, cooperative learning, and independent inquiry and research on the part of students. Of critical importance to this study, the program teachers were better able to integrate greater and higher-quality use of computers as a learning tool and for instructional delivery, as compared to Control teachers. Further, Program teachers reported a significantly higher agreement that the use of technology positively influenced student learning and their use of student-centered practices. The Program classes were more frequently focused on academics than Control classes; however, the difference was only found to be significant for the L2 classes. Similarly, a high level of student attention and interest was more frequently observed in Program classes vs. Control classes. Although these results are positive and reflective of the TnETL goals, continued professional development is needed to better

prepare teachers to increase the frequency and intensity of implementation, which could perhaps yield greater and more consistent improvement in student learning.

(a) Does TnETL improve students' skill levels in, and attitudes toward, using technology as a tool for enhancing learning?

(b) To what degree do students at Program and Control schools specifically demonstrate competency in skills representative of the NETS for Students?

Data from the classroom observations revealed that more Program students as compared to Control students were observed to have "very good" computer literacy skills. Further evidence is seen in the Student Technology Task Performance Assessment, which is directly aligned with the ISTE NETS for Students. The Technology Task results revealed that the L2 Program vs. Control students demonstrated significant advantages over the Control students in their ability to use presentation software to create student products. These skills are directly aligned to ISTE Standard #3) that states students should be able to use productivity tools "… to prepare publications" (Standard #3) (ISTE, 2000, Foundation Standards). Although student attitudes were not directly measured, there was a consensus among teachers, principals, and Technology Coaches that students "loved" using computers, but wanted more computers available for classroom use.

What is the impact of TnETL implementation on school-wide improvement in organization and school climate?

The TnETL 1 and 2 schools developed and utilized Technology Implementation Benchmarks to gauge progress regarding Curriculum, Instruction, and Organization. The data regarding improved organization is shown in Benchmark ratings that shifted from Phase 1 or "Beginning" level (L1 – 1.28; L2 = 1.23) nearly to Phase 3 or "Full" level (L1 = 2.70; L2 = 2.50). Further evidence is seen in teacher, principal, and Technology Coach impressions gained from the interviews, focus groups, and surveys. Collectively, the participants were generally supportive and positive with regard to levels of school organization and climate in the Program schools. In addition, the SCI-R survey results from both Program and Control teachers demonstrated a high level of teacher agreement that school climates were positive. This is substantiated in teacher ratings that were higher than those represented in SCI-R national norms. However, there were no significant differences in Program and Control impressions of their school climates. This lack of difference between the groups may be attributed to the study matching process, which purposefully paired schools that had comparable environmental factors. Therefore, although the results do not indicate that TnETL impacted school-wide improvement in organization and school climate, it can be inferred that the positive environment

better enabled the Program schools to achieve significant differences with regard to technology integration efforts.

What program and school variables (e.g., poverty level, location, size, and school climate) are associated with effective TnETL implementation and improved student achievement?

To date, the TnETL data have been examined on a "Program" level that combines all schools for the L1 and L2 Program vs. Control cohorts. The next phase is to examine the three years of TnETL – 1 data (2003-2004, 2004-2005, and 2005-2006), two years of TnETL – 2 (2004-2005, and 2005-2006), and one year of the ORBIT data (2005-2006) on the basis of the identified variables, rather than using them as matching criteria to pair schools. In other words, the collected data will be used to determine if classroom practices differed at small schools as compared to large schools? Did attitudes of teachers from rural schools differ from those in urban settings, or did poverty level impact access to technology or types of classroom practices that were observed. And, of key importance will be to examine whether or not student achievement, as measured by the TCAP varied on the basis of TnETL school poverty level, location, size, or school climate. These results will be presented in a separate report.

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Appendices

Appendix A

Student Performance-Based Assessment Materials for the Problem-Solving Task and the Technology Task

Student Performance Assessment
Teacher Information Sheet

Thank you for participating in the student performance assessment in which your students will use computers to complete an assigned task. Below is a checklist for administering the assessment.

BEFORE THE STUDY

____ Check Materials to ensure that you have:
  ____ One Parent/Guardian Consent Form per student
  ____ One Student Packet per student
____ Schedule 45-minutes for the assessment sometime prior to *[date]*
____ Send Parent/Guardian Consent Forms home with each participating student.
____ Tell students they will need to bring a book to read after they finish the task.
____ Ensure that one computer is available for each student to individually complete the task.
____ Ensure that each computer has a *working* copy of:
  ____ Microsoft Word
  ____ Microsoft Excel
  ____ Microsoft PowerPoint
  ____ Internet browser.
____ Ensure that each computer can send documents to a working printer.
____ Ensure that each computer can save documents to a floppy disk or server (If using a server, please save all student documents to one disk that is labeled "All student documents" – and return disk with completed materials.)

DAY OF THE STUDY

____ Ensure that enough paper is available to print 3 to 5 pages per student
____ Make sure each student has a book to read if they finish the task early.

DURING THE STUDY

____ Ensure that each student has a signed Parent/Guardian Consent Form
____ Read "Student Instructions" to your class
____ Distribute a packet to each student.
____ Remind students to frequently save their work

AFTER THE STUDY

____ Return all Materials to CREP in the postage-paid envelope – by *[date]*

Questions?? If you have questions, please call Dan Strahl at 1-866-670-6147

Thank you!

Student Problem-Solving Assessment

Teacher Instructions

Teacher:
Read to Students **BEFORE** they open their Student Packet envelopes.

Our class was selected to participate in a study investigating how well 8th grade students can think about and solve common problems in our society. In this task you will use the computer to describe how you would help a city park get people to recycle more soft drink cans.

While working, please:

- Do not talk to other students.
- Do NOT include your name on any of the materials or your computer documents.
- When you finish, please quietly read your book.

I cannot help you with the problem, but can help if you have trouble:

- Finding the software
- Saving your work to the disk
- Printing your work

Please open your packets and carefully follow the step-by-step instructions – It is very important that you do your BEST work.

Student Problem-Solving Task

ID # _____

~ Welcome ~

Hope you enjoy solving the following problem!

OVERVIEW

We are interested in knowing how well 8th grade students can think about and solve common problems that occur in our society. In this task you will tell us how you would solve a problem regarding recycling soft drink cans found in park trash bins. Before beginning the task, please complete the following survey.

SURVEY

Please answer each question by circling the appropriate answer.

Word Processing

How much experience do you have using *Microsoft (MS) Word®*?	None	Some	A lot
How often do you use *MS Word®*?	Never	Once in a while	A lot
What is your skill level with *MS Word®*?	None	Moderate	Excellent

PROBLEM-SOLVING TASK

Follow these steps to complete this task. It is very important that you do your **very best** work.

1. Open *MS Word®*
2. Save the document on your floppy disk using the following name:

   problemID# (e.g., problem1247)
3. Title your paper, "Recycling Cans at the Park"
4. In your word processing document, describe ***how*** you would solve the problem found on Page 2. Remember to carefully read and respond to all of the instructions.
5. Frequently save your work to your floppy disk.
6. When your solution is complete, save the final document and print a copy.
7. Place ALL materials in the envelope: these sheets, your printed copy, and your floppy disk.
8. If you finish early, quietly read your book.

Note: Use only your ID# on your answer. Do NOT add your name to the document.

Thank you!

THE PROBLEM: RECYCLING CANS AT THE PARK

There are several soft drink machines at the city parks. When you buy a drink, it costs 10 cents extra for the can. The 10 cents is for a deposit that you get when you take the can back for recycling. The park managers have found a large number of cans in the parks' trashcans. The City Parks Commission wants to have more people recycle their cans. They have asked you to help them study this problem *all summer.*

How can the parks get people to recycle soft drink cans?

Please tell us *how* you would solve this problem. Describe with details what you would do. Describe the materials and resources you will use. Would you work with others? If so, describe how you would work with them.

Tell us how you will determine:

1. Which park has the largest number of cans in the trash?
2. How much money does the vending company keep from cans that are never turned in for a deposit?
3. What are the benefits of recycling - does it really make a difference in saving natural resources?
4. What might you do to encourage people to recycle the cans rather than putting them in the trash? (List as many ideas as you can.)
5. How could you determine if increasing the deposit amount would increase the return of cans to collect the deposit?
6. How would you present the results to the Parks Commission?

Remember to frequently save your work.

When finished, return to #7 on the Page 1

Student Problem-Solving Rubric

STUDENT ID# _____ **ASSESSED BY:** _____

Directions: Circle the rating that best represents the student's level of performance for each component.

Component/Rating	Level 1	Level 2	Level 3
Understands problem	The overall problem-solving approach demonstrates a very limited understanding of the problem.	The overall problem-solving approach somewhat demonstrates a general understanding of the problem.	The overall problem-solving approach strongly demonstrates clear understanding of the problem.
Identifies what is known about the problem	Response provides a very limited or no description of what is known.	Response provides an incomplete description of what is known	Response provides a complete and detailed list of what is known about problem
Identifies what needs to be known to solve the problem	Response provides no or a very limited relationship between what needs to be known (data) and problem	Response provides some reasoning as to how data or what needs to be known are related to problem-solving	Response provides developed rationale as to how data or what needs to be known are related to solving the problem
Determines how the data needs to be manipulated to solve the problem	Response does not address data manipulation	Response provides indication that data must be manipulated	Response describes specific ways of manipulating data to solve problem
Describes use of technology	Description of technology use is not included or very limited, e.g., the computer will be used to get information.	Response describes specific technology/software that will be used to solve problem, but only provides general tasks to be completed, e.g., the Internet will be used to find information.	Response describes specific technology/software and specific tasks that will be used to solve problem, e.g., the Internet will be used to find information about recycling.
Describes how to present findings	Response provides no or very limited detail as to how results will be presented	Response provides a general description of how results will be presented	Response describes details of how and what results will be presented
Collaborative Learning	Response includes no mention of collaboration.	Response describes limited collaboration, mostly for sharing information or obtaining help	Response describes a collaborative orientation with assigned responsibilities and extensive interactions with partners

Student Technology Assessment

Teacher Instructions

Teacher:
Read to Students **BEFORE** they open their Student Packet envelopes.

Our class was selected to participate in a study investigating how well 8th grade students can use Excel and PowerPoint. The information will help teachers better prepare you and other students to use computers in the workforce.

While working, please:

- Do not talk to other students.
- Do NOT include your name on any of the materials or your computer documents.
- When you finish, please quietly read your book.

I cannot help you with using Excel or PowerPoint, but can help if you have trouble:

- Finding the software
- Saving your work to the disk
- Printing your work

Please open your packets and carefully follow the step-by-step instructions – It is very important that you do your BEST work.

Student Technology Tasks

(Lowther & Marvin, 2004)

ID # _____

~ Welcome ~

Hope you enjoy the following Excel and PowerPoint tasks.

OVERVIEW

We are interested in knowing how well 8th grade students can use Excel and PowerPoint. The information will help teachers better prepare you to use computers for your future jobs. Before beginning these tasks, please complete the following survey.

SURVEY

Please answer each question by circling the appropriate answer.

Excel

How much experience do you have using Excel?	None	Some	A lot
How often do you use Excel software?	Never	Once in a while	A lot
What is your skill level with Excel?	None	Moderate	Excellent

PowerPoint

How much experience do you have using PowerPoint?	None	Some	A lot
How often do you use PowerPoint software?	Never	Once in a while	A lot
What is your skill level with PowerPoint?	None	Moderate	Excellent

TASKS

Follow these steps to complete the tasks. It is important that you do your **very best** work.

EXCEL TASK

- The 1st task uses Excel.
- Please complete as many of the Excel steps as you can.
- If you do not know how to use Excel, please go to the PowerPoint task.

POWERPOINT TASK

- The 2nd task uses PowerPoint.
- Please complete as many of the PowerPoint steps as you can.
- If you do not know how to use PowerPoint, please place all sheets in your envelope and quietly read your book until the others are finished.

Note: Use ONLY your ID# on each document. Do NOT add your name to the documents.

Thank you!

EXCEL TASK

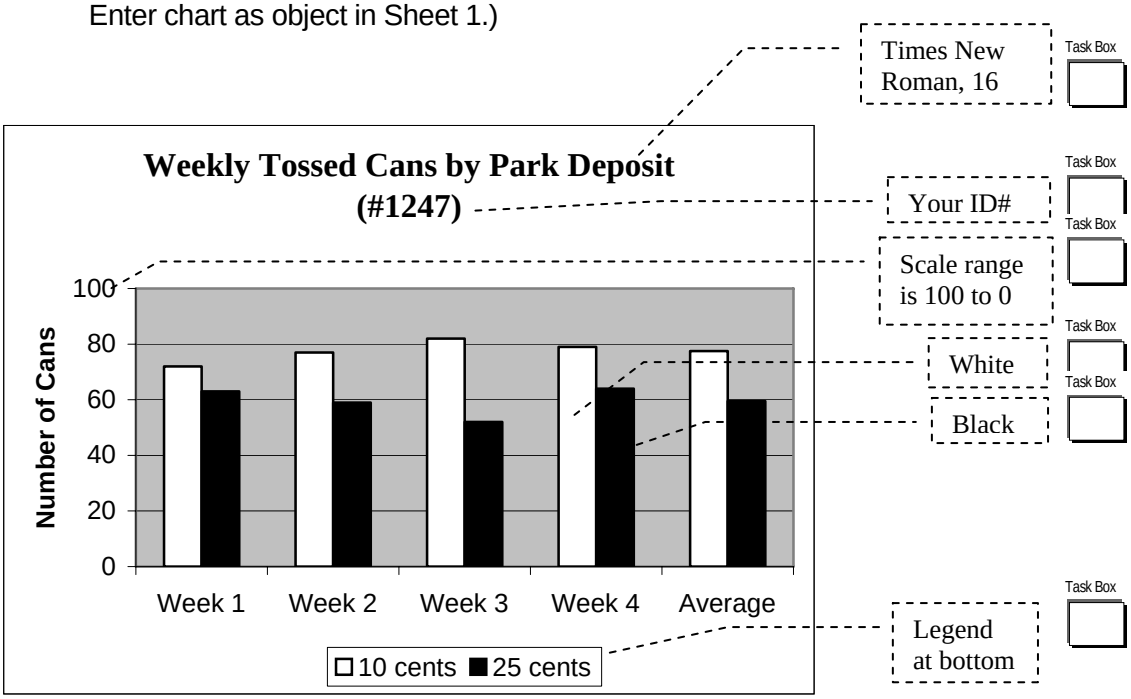
Follow the instructions below to create an Excel spreadsheet and chart to show the number of soda cans in park trash bins by the deposit amount. Park 1 has a 10 cents per can deposit and Park 2 has a 25 cents deposit. Please check the task box as you complete each step. Task Box ☐

1. **Create a Spreadsheet:** Please enter the information provided below into an Excel spreadsheet.

Week	10 cents	25 cents
Week 1	72	63
Week 2	77	59
Week 3	82	52
Week 4	79	64
Average		

2. **Use Formula to Calculate Average:** After you have entered the data into the spreadsheet, enter or select an Excel formula that calculates the average number of cans in the park trash bins. Task Box ☐

3. **Create A Chart:** Use the information to create a chart that is formatted exactly like the one below. Be sure to use the directions inside the boxes. (Note: Enter chart as object in Sheet 1.)



4. **Save work:** Save your work to the floppy disk in your envelope. Use the following format as the file name: ssyourID# (e.g. ss1247). Your ID# is on the front of your envelope. Task Box ☐

5. **Print copy:** Print a copy of your work. Place the printout in your envelope. Task Box ☐

6. **Leave Excel open:** Leave your Excel spreadsheet document **open**. Task Box ☐

NEXT STEP ~

Complete the ***PowerPoint Task*** on the following page.

PowerPoint TASK

Follow the instructions below to create a PowerPoint presentation with 3 slides.

Please check the task box as you complete each step. Task Box ☐

1. **Create 3 slides**: Use PowerPoint to create 3 slides with the following text and graphics. Be sure to use the directions inside the boxes.

SLIDE 1

Task Box ☐ Title – Reasons to Recycle
By [insert your ID number, e.g., 1247]

Task Box ☐ Graphic – [Select and insert a **relevant** clipart image on Slide 1.]

For the Title, use:
Times New Roman, 60 pt, Bold, Italicized

SLIDE 2

Task Box ☐ Title – Reasons to Recycle

Task Box ☐ Text – [Go to http://idt.memphis.edu/recycle.htm Copy and paste the *Reasons to Recycle*, word for word, as a **bulleted** list on Slide 2 (see example)]

Task Box ☐ Graphic – [Go to http://idt.memphis.edu/recycle.htm and obtain the Recycling logo. Paste or insert image onto slide 2.]

Use a bulleted list for the reasons:
- Reason 1
- Reason 2

The logo looks like this:

SLIDE 3

Task Box ☐ Title – Recycling in Our Parks

Task Box ☐ Graphic – [Insert the spreadsheet chart you created in Excel.]

2. **Apply Design**: Apply a design template of your choice that supports the theme of the recycling presentation. Task Box ☐

3. **Save Presentation:** Use the following filename to save your presentation to the floppy disk in your envelope: pptyourID# (e.g. ppt1247) Task Box ☐

4. **Print Handout:** Print a handout of your presentation with **3 slides per page**. Task Box ☐

5. **Place ALL materials in the envelope**: this sheet, your printed copy, and your floppy disk.

6. **If you finish early,** quietly read your book.

Student Technology Skills Rubric

Student ID# _____ Assessed by: _____

SPREADSHEETS: **When creating a Microsoft Excel spreadsheet, did the student**		
1. enter numerical data into spreadsheet cells?		
No (0) – Did not complete task as directed	Somewhat (1) - Partially completed task as directed	Yes (2) – Completed task as directed
Numerical data are NOT entered into spreadsheet cells OR they are too inconsistent with Item 1 to be considered a valid representation of entered spreadsheet data.		Numerical data are entered into spreadsheet cells in a manner that precisely reflect the numbers / arrangement presented in Item 1.
2. place column names in correct cells?		
No (0) – Did not complete task as directed	Somewhat (1) - Partially completed task as directed	Yes (2) – Completed task as directed
The words *Week,10 cents*, and *20 cents* are NOT placed at the top of the spreadsheet columns OR they are too inconsistent with Item 1 to be considered a valid representation of column names.		The words *Week,10 cents*, and *20 cents* are placed at the top of the three respective spreadsheet columns, as reflected in Item 1.
3. place row names in correct cells?		
No (0) – Did not complete task as directed	Somewhat (1) - Partially completed task as directed	Yes (2) – Completed task as directed
The words *Week 1*, *Week 2*, *Week 3*, *Week 4*, and *Average* are NOT placed in correct cells OR they are too inconsistent with Item 1 to be considered a valid representation of row names.		The words *Week 1*, *Week 2*, *Week 3*, *Week 4*, and *Average* are placed at the left-hand side of each respective row of data, as reflected in Item 1.
4. use a spreadsheet formula to calculate the average of a column of numbers?		
No (0) – Did not complete task as directed	Somewhat (1) - Partially completed task as directed	Yes (2) – Completed task as directed
A spreadsheet formula is NOT used to correctly calculate the average of EITHER the 10-cent or 20 cent column.		A spreadsheet formula is used that correctly calculates the average of BOTH 10-cent (77.5) and 20 cent (59.5) columns.
5. create a chart?		
No (0) – Did not complete task as directed	Somewhat (1) - Partially completed task as directed	Yes (2) – Completed task as directed
A chart is NOT created OR the chart is too inconsistent with the spreadsheet data presented in Item 1 and the example chart presented in Item 3 to represent a valid chart.		A column chart is created that represents the spreadsheet data presented in Item 1 and exemplifies the sample chart in Item 3. Specifically, the chart is: a column chart, has 2 series, and has the correct / complete data selected.
6. change the color of columns in a column chart?		
No (0) – Did not complete task as directed	Somewhat (1) - Partially completed task as directed	Yes (2) – Completed task as directed
The colors of the columns in the column chart are NOT changed to Black and White.		One set of columns in the column chart is changed to white and another set is changed to black.
7. add a title to a chart?		
No (0) – Did not complete task as directed	Somewhat (1) - Partially completed task as directed	Yes (2) – Completed task as directed
A chart title is NOT present OR too inconsistent to be considered a valid chart title.		The title *Weekly Tossed Cans by Park Deposit (######)* is present at the top of the created chart.
8. add a title to a chart axis?		
No (0) – Did not complete task as directed	Somewhat (1) - Partially completed task as directed	Yes (2) – Completed task as directed
A title is NOT present on the left-hand side (Y axis) of the chart OR it is too inconsistent to be considered a valid title for the chart axis.		The title *Number of Cans* is present on the left-hand side (Y-axis) of the chart.
9. change the range of the Y-axis scale?		
No (0) – Did not complete task as directed	Somewhat (1) - Partially completed task as directed	Yes (2) – Completed task as directed
The range of the Y axis scale on the chart is NOT changed to 0 to 100 OR it is too inconsistent to be considered a valid change.		The range of the Y axis scale on the chart title is changed to 0 to 100.

10. change the location of the legend?		
No (0) – Did not complete task as directed	Somewhat (1) - Partially completed task as directed	Yes (2) – Completed task as directed
The location of the legend is not changed to the bottom of the chart.		The location of the legend is changed to the bottom of the chart.

PRESENTATION: When creating a Microsoft PowerPoint presentation, did the student . . .		
1. add text to a slide?		
No (0) – Did not complete task as directed	Somewhat (1) - Partially completed task as directed	Yes (2) – Completed task as directed
The words *Reasons to Recycle or Recycling in our Parks* is NOT present on slide 1, 2 or 3.		The words *Reasons to Recycle or Recycling in our Parks* is present on slide 1, 2 or 3.
2. add a slide to a presentation?		
No (0) – Did not complete task as directed	Somewhat (1) - Partially completed task as directed	Yes (2) – Completed task as directed
Only one slide is present in the presentation.		More than one slide is present in the presentation.
3. insert a clipart image or photograph to a slide?		
No (0) – Did not complete task as directed	Somewhat (1) - Partially completed task as directed	Yes (2) – Completed task as directed
A clipart image or photograph is NOT present on slide 1.		A clipart image or photograph is present on slide 1.
4. change the font of text within a presentation?		
No (0) – Did not complete task as directed	Somewhat (1) - Partially completed task as directed	Yes (2) – Completed task as directed
The title of slide 1 *Reasons to Recycle* is NOT changed to Times New Roman.		The title of slide 1 *Reasons to Recycle* is changed to Times New Roman.
5. change the size of text within a presentation?		
No (0) – Did not complete task as directed	Somewhat (1) - Partially completed task as directed	Yes (2) – Completed task as directed
The title of slide 1 is NOT changed to 60pt.		The title of slide 1 is changed to 60pt.
6. bold text within a presentation?		
No (0) – Did not complete task as directed	Somewhat (1) - Partially completed task as directed	Yes (2) – Completed task as directed
The title of slide 1 is NOT bold.		The title of slide 1 is bold.
7. insert a Microsoft Excel spreadsheet chart onto a slide?		
No (0) – Did not complete task as directed	Somewhat (1) - Partially completed task as directed	Yes (2) – Completed task as directed
The user-created Excel chart is NOT inserted on slide 3.		The user-created Excel chart is inserted on slide 3.
8. arrange content on slide as a bullet list		
No (0) – Did not complete task as directed	Somewhat (1) - Partially completed task as directed	Yes (2) – Completed task as directed
Reasons to Recycle are NOT present on slide 2 as a bulleted list		Reasons to Recycle are present on slide 2 as a bulleted list
9. add a design template to a presentation?		
No (0) – Did not complete task as directed	Somewhat (1) - Partially completed task as directed	Yes (2) – Completed task as directed
A design template is NOT added to the presentation.		A design template is added to the presentation.
10. select and use relevant images?		
No (0) – Did not complete task as directed	Somewhat (1) - Partially completed task as directed	Yes (2) – Completed task as directed
The image(s) selected and used on slide 1 are NOT relevant to the presentation.		The image(s) selected and used on slide 1 are relevant to the presentation.
INTERNET: Regarding the Internet, did the student . . .		
1. navigate to a website when given a specific web address (URL)?		
No (0) – Did not complete task as directed	Somewhat (1) - Partially completed task as directed	Yes (2) – Completed task as directed
The Reasons to Recycle and/or recycling logo are NOT present on slide 2.		The Reasons to Recycle and/or recycling logo are present on slide 2.
2. obtain an image from a website and use it in a document?		
No (0) – Did not complete task as directed	Somewhat (1) - Partially completed task as directed	Yes (2) – Completed task as directed
The recycling logo is NOT used in the presentation.		The recycling logo is used in the presentation.