CREP
Center for Research in Educational Policy

West Orange Collaborative

STARK Program

2001-2006 Evaluation Report

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December 2006

EXECUTIVE SUMMARY

INTRODUCTION

This report summarizes the results of the Year 5 evaluation study of the Students and Teachers Accessing Real-time Knowledge (STARK) Program in the West Orange Consolidated Independent School District (CSID). The overall purpose of the evaluation was twofold: (a) 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 (b) to provide cumulative evidence of the implementation progress and outcomes of the participant schools as well as identification of exemplary programs**.**

The context for the evaluation consists of eight schools receiving "Foundation" training developed by the Brazos-Sabine Connection and integration training provided by West Orange Collaborative. The Foundation training deals directly with developing skills in using technology in the classroom. The integration training builds on this and emphasizes using technology in the classroom to support student-centered teaching methods that promote higher-level learning outcomes.

The present 2005-2006 (Year 5) evaluation data were collected from eight schools over the academic year. The data were compared to the 2001-2002 (Year 1) baseline conditions to gauge program implementation progress.

RESEARCH QUESTIONS

The STARK Program evaluation was again structured around five 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.

1. To what degree and how is technology integrated with classroom instruction a) by teachers who have received Foundation and/or integration training through the Enhanced Learning Academy, and b) do differences exist between novice and experienced teachers?
2. To what degree do integration-trained teachers use methodologies that, consistent with STARK Program goals, stress higher-order learning and student-centered learning activities?
3. To what degree have teachers acquired the technology skills specified in the Texas Essential Knowledge and Skills (TEKS) Technology Applications?
4. What are school outcomes in school climate and teacher uses of and attitudes toward technology? To what extents do these variables (a) reflect Foundation training and STARK Program goals, and (b) correlate with one another and with implementation success?
5. What factors appear most instrumental in determining schools' success at achieving the goals and overall implementation of the STARK Program?

DESIGN

The evaluation was based on both quantitative and qualitative data collected from classroom observations and teacher surveys. Participating schools were the eight schools receiving "Foundation" training developed by the Brazos-Sabine Connection and integration training provided by West Orange Collaborative.

INSTRUMENTATION

Six instruments were used to collect the evaluation data: three classroom observation measures and three teacher surveys. These instruments have been fully developed and validated. They are as follows:

Classroom Observation Measures

Observations were made of targeted classes (scheduled visits) using three instruments.

- *School Observation Measure (SOM)*: Examines frequency of usage of 24 instructional strategies.
- *Survey of Computer Use (SCU)*: Examines availability and student use of technology and software applications.
- *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, student independent inquiry/research, student discussion, and students as producers of knowledge using technology.

Surveys

- *Teacher Technology Questionnaire (TTQ)*: Collects teacher perceptions of computers and technology.
- *School Climate Inventory (SCI)*: Assesses school staff perceptions of school climate on seven dimensions: Order, Leadership, Environment, Involvement, Instruction, Expectations, and Collaboration.
- *Technology Skills Assessment (TSA)*: Assesses the perceived technological abilities of the teachers in these areas: Computer Basics, Software Basics, Multimedia Basics, Internet Basics, Advanced Skills, Using Technology for Learning, and Policy and Ethics.

PROCEDURE

Data for this evaluation study were collected in spring 2006. The SOM, SCU and RSCA were completed for the targeted observations. These consisted of prearranged one-hour sessions in which teachers who participated in the program's technology training demonstrated a prepared lesson using technology. Observation forms were completed for each 15 minutes of the lesson. A total of 58 classroom visits were completed. The teacher surveys (TTQ, SCI, and TSA) were administered in spring 2006 during faculty meetings at each school.

RESULTS

Below is a brief summary of the results grouped by Classroom Observation Results and Survey Results.

Classroom Observation Results

The data for 58 classroom observations were collected with SOMs, SCUs, and RSCAs during prearranged sessions in which teachers implemented a lesson using technology. Results from each measure are described in the section below. Data were also compared on the basis of teacher experience with the STARK program: novice (n = 28) vs. experienced (n = 30).

School Observation Measure (SOM©)

The greatest significant differences between Year 1 and Year 5 were increased use of "technology as a learning tool", "computer for instructional delivery" and the "use of higher level questioning". Year 5 results also revealed a greater use of "higher-level questioning strategies" and "integration of subject areas" during classroom instruction. Overall data suggest that the STARK program has had a positive impact on increasing the teacher's integration of technology into instruction and demonstration of higher levels of academically focused class time and student attention. When examining the data by experience level, the novice teachers used higher-level questioning strategies significantly more often than the experienced teachers.

Survey of Computer Use (SCU©)

The SCU results suggest that some significant progress was made between Year 1 and Year 5 with regard to technology integration efforts. Specifically, in Year 5 students more frequently used the Internet for research (Year 1 = 0%; Year 5 = 15.5%). In addition, the Year 5 data show that teachers were more capable of integrating student use of computers into their instruction in meaningful ways at a tenfold increase from Year 1 (1.9%) to Year 5 (19%). There were no significant SCU differences between Novice and Experienced teachers.

Rubric for Student-Centered Activities (RSCA)

The RSCA results revealed a positive trend in the quality of strategy implementation in that no strategy showed any decrease from Year 1 to Year 5. . "Cooperative learning" (32.8%) and "project-based learning" (31%) were assessed as the most meaningful strategies followed by "experiential, hands-on learning" (27.6%) and "independent inquiry" (25.9%). The most striking RSCA result is the increased usage of technology to support higher-level questioning. Also noteworthy is the higher quality with which teachers implemented cooperative and project-based learning after five years as compared to the first year of program participation. These results suggest that the STARK Program is successfully preparing teachers to implement above average student-centered activities. There were no significant differences between Year 1 and Year 5 or between Novice and Experienced teachers.

Survey Results

Three surveys (SCI, TTQ, and TSA) were administered to the teachers during faculty meetings held at each school in spring 2006. The Year 1 responses were compared with the Year 5 responses. The results of these comparisons are summarized below.

Teacher Technology Questionnaire (TTQ)

Teachers in Year 5 had significantly higher levels of agreement for each of the five dimensions than did teachers in Year 1: impact on classroom instruction (*ES*=+.58), impact on students (*ES*=+.37), teacher readiness to integrate technology (*ES*=+.83), overall support for technology in the school (*ES*=+.45), and technical support (*ES*=+.51).These results provide further evidence supporting the positive impact of the STARK Program.

School Climate Inventory (SCI)

For the comparison between Year 1 and Year 5, significant differences were found for two SCI-R dimensions: "instruction" (*ES* = +.30) and "expectations" (*ES* = +.27) . In both dimensions, year 5 scores were significantly higher than year 1 scores. Two dimensions demonstrated significant differences between the norms and year 5: expectation (*ES* = +.27) and involvement (*ES* = +.27).

Technology Skills Assessment (TSA)

A significantly higher level of skills among teachers was demonstrated for Year 5 when each was compared to the Year 1 baseline in six areas: "computer basics"; "software basics"; "internet basics"; "multimedia basics"; "advanced skills"; and "using technology".

Conclusions

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

To what degree and how is technology integrated with classroom instruction a) by teachers who have received Foundation and/or integration training through the Enhanced Learning Academy, and b) do differences exist between novice and experienced teachers?

The observation data revealed significant Year 1 to Year 5 increases in student use of computers as a learning tool (*ES* = +1.08) and use of computers for instructional delivery (*ES* = +0.88). Specifically, in almost three-quarters (72.5%) of the observations, technology was used as a means of delivering instruction through the use of educational software.

Results also suggest that some significant progress was made between Year 1 and Year 5 with regard to technology integration efforts. Student use of technology as a tool to enhance learning was observed in nearly two-thirds (63.8%) of the researchers' visits. Specifically, in Year 5, students more frequently used the Internet for research (Year 1 = 0%; Year 5 = 15.5%). In addition, the Year 5 data show that teachers were more capable of integrating student use of computers into their instruction in meaningful ways at a tenfold increase from Year 1 (1.9%) to Year 5 (19%). When examining the results by level of experience, only one significant difference was revealed during the classroom observations. The novice teachers more frequently used higher-level questioning strategies than the experienced teachers. This finding perhaps reflects refinement of the professional development that the novice teachers received.

These results overall suggest that the STARK Program has had a positive effect on the technology integration efforts of the trained teachers. Continuing professional development efforts should expand teacher ability to increasingly augment the learning environment by engaging students with the use of technology tools.

To what degree do integration-trained teachers use methodologies that, consistent with STARK Program goals, stress higher-order learning and student-centered learning activities?

The data indicate that integration-trained teachers were better able to create classroom environments that engaged students in higher-order thinking and learning. Student use of technology as a tool to enhance learning was observed in nearly two-thirds (63.8%) of the researchers' visits. RSCA data revealed that Year 5 teachers more frequently supported student-centered activities with technology. In a marked increase when compared to the first year of the STARK program, in over 30% of the observations, technology was used to support "higher level questioning strategies" (Year 1 = 1.9%; Year 5 = 37.9%), the use of "cooperative learning" (Year 1 = 3.7%; Year 5 = 32.8%) and "project-based learning" (Year 1 = 9.3%; Year 5 = 31%). Teachers also increasingly used technology to support "hands-on learning" (27.6%) and "independent inquiry" (25.9%). While technology was used slightly less frequently in conjunction with "student discussion", this use still reflects a significant Year 1 (1.9%) to Year 5 (20.7%) increase.

Continued professional development efforts should focus on better preparing teachers to increase the quality and frequency with which technology is utilized to enhance the development of higher-order thinking in students.

To what degree have teachers acquired the technology skills specified in the Texas State standards?

Impressive Year 5 TSA results showed that teacher confidence on all seven categories of technology skills continued to significantly increase as compared to Year 1. The greatest difference (*ES* = +0.66) was seen in teacher confidence in using the Internet, both from a technical and informational vantage point. This strategy increased from 24.5% to nearly half (45.2%) of the teachers. Importantly to STARK program goals, the second largest increase between Year 1 and Year 5 was the percentage of teachers who felt they could "very easily" implement "using technology for learning" - from 11.3% in Year 1 to 25.2% in Year 5, more than doubling.. A majority of the teachers surveyed (79.8%) also expressed confidence that they could complete basic computer and software tasks "very easily", and nearly half felt very confident when using the Internet and multimedia software. The percent of teachers who indicated they could very easily complete advanced tasks increased to nearly the same degree as those who could use technology for learning (Year 1 = 11.8%; Year 5 = 30.0%). These results are a strong indication of successful teacher training through the STARK Program.

What are school outcomes in school climate and teacher uses of and attitudes toward technology? To what extents do these variables (a) reflect Foundation training and STARK Program goals, and (b) correlate with one another and with implementation success?

Results from the Year 5 School Climate Inventory were somewhat mixed, with five mean scores being higher than Year 1 and two being lower, however not to a significant degree. Even with lower SCI ratings, the environment of the participating schools was still positive enough to support significant improvements in school-wide technology integration efforts. This was evidenced in the significant increases in frequency of classroom use of technology and teacher ability to create and implement meaningful computer activities. Positive teacher attitudes were also reflected in the TTQ results, which showed significantly higher teacher readiness to integrate technology and more confidence to conduct classes that have students use technology. Additionally, there was nearly unanimous teacher agreement that their district/schools provided necessary technical and overall support for the technology program. These findings suggest that although slight shifts may occur in school climate, the district is supportive of the technology initiative and the STARK Program had a positive impact on teacher readiness to integrate technology and teacher belief that technology has a positive impact on classroom instruction.

What factors appear most instrumental in determining schools' success at achieving the goals and overall implementation of the STARK Program?

Below is a list of key factors from the Year 5 study that appeared to have influenced the progress being made toward achievement of the STARK Program implementation goals. As seen, the factors address key elements that are critical for program success:

Significant differences in instructional practices
- Increased use of technology as a learning tool
- Increased use of computers for instructional delivery
- Increased use of student-centered learning that enhances higher-order learning

Significant differences in the quality of instructional practices
- Increased use of meaningful computer activities

Significant differences in teacher attitudes and beliefs regarding technology integration
- The majority of teachers felt ready to integrate technology
- The majority of teachers believed technology positively impacts classroom instruction
- The majority of teachers agreed technology efforts were well-supported

Significant differences in teacher computer skills
- The majority of teachers reported confidence with using technology and integrating it with their teaching

Overall, the Year 5 results reflect impressive progress toward achieving the STARK Program goals. Specifically, the Year 5 data revealed significant changes from Year 1 in that teachers were more technologically competent, more frequently integrated technology into their instruction, and more frequently engaged students in meaningful technology-supported activities. Even though significant strides have been made, the scope of technology integration was somewhat limited with regard to the variety of software used and the overall degree of computer use. In order to enhance student experiences and maximize opportunities for improved learning, program expansion is recommended. Suggested areas of expansion include: (1) purchasing more computers to equalize distribution of access to all students; (2) implementing a computer maintenance and upgrade program to ensure up-to-date computers are available for student use; (3) continuing and expanding current professional development to build teacher capacity to fully utilize technology resources.

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STARK PROGRAM

EVALUATION REPORT

This report summarizes the results of the 2001-2006 evaluation study for the Students and Teachers Accessing Real-time Knowledge (STARK) Program in West Orange Consolidated Independent School District (CSID). The overall purpose of the evaluation was twofold: (a) 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 (b) to provide cumulative evidence of the implementation progress and outcomes of the participant schools as well as identification of exemplary practices.

The context for the evaluation consisted of eight schools receiving two levels of educational technology training. For the first level, teachers completed the online “Foundation” training modules designed by the Brazos-Sabine Connection to develop skills in using technology in the classroom. The second level involved teachers completing integration training provided during Saturday training sessions and through an online course offered by the University of Texas at Brownsville and designed by Karon Tarver of West Orange Collaborative. The integration training built upon the foundation skills and emphasized employing technology in the classroom to support student-centered teaching methods that promote higher-level learning outcomes.

The present (Year 5) evaluation concentrated on the program implementation progress of the eight schools in achieving STARK Program goals during the 2005-2006 academic year as compared to the 2001-2002 (Year 1) baseline conditions. Suggestions for improvement are offered on the basis of the findings. Specific evaluation questions that guided the methodology, data collection, and reporting are listed in the next section.

RESEARCH QUESTIONS

The STARK Program evaluation was structured around five primary research questions that focused on classroom practices, degree and type of technology use, academically focused time, student engagement, and school climate. Also of interest were teacher ability with, use of, and attitudes toward technology. The detailed questions are listed below:

- To what degree and how is technology integrated with classroom instruction a) by teachers who have received Foundation and/or integration training through the Enhanced Learning Academy, and b) do differences exist between novice and experienced teachers?
- To what degree do integration-trained teachers use methodologies that, consistent with STARK Program goals, stress higher-order learning and student-centered learning activities?
- To what degree have teachers acquired the technology skills specified in the Texas Essential Knowledge and Skills (TEKS) Technology Applications?
- What are school outcomes in school climate and teacher uses of and attitudes toward technology? To what extent do these variables (a) reflect Foundation training and STARK Program goals, and (b) correlate with one another and with implementation success?
- What factors appear most instrumental in determining schools' success at achieving the goals and overall implementation of the STARK Program?

EVALUATION DESIGN AND MEASURES

The evaluation was conducted during the spring semester of the 2005-2006 academic year. The evaluation design for Year 5 reflected those of the Year 1 baseline study to enable comparative analyses between the years. The Year 5 design also included analysis of observation data by year(s) of teacher participation in the STARK Program: Novice – 1 to 2 years of experience; Experienced – 4 to 5 years of experience. Both quantitative and qualitative data were collected at each of the eight schools by trained observers (*e.g.*, retired teachers, district staff). The observers spent the major part of their time visiting classrooms (using three instruments to be described below), but also administered surveys to teachers. A description of the instruments and data collection procedures is presented below.

Instrumentation

Six instruments were used to collect the evaluation data: three classroom observation measures and three teacher surveys. These instruments have been fully developed and validated. They are as follows:

Classroom Observation Measures

Trained observers conducted classroom visits to collect frequency data regarding observed instructional practices. The visits were targeted or scheduled in advance with teachers randomly selected from those who participated in the program's technology training. Selected teachers were instructed to deliver a lesson that integrates the use of technology. The data collection instruments were 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 was used to collect data regarding student use of computers, and the RSCA was used to capture more detailed information about student-centered activities observed during the targeted visits. These 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 or during a targeted lesson (Ross, Smith, & Alberg, 1999). During this evaluation, it was used to record observations of classroom instruction during prearranged one-hour sessions in which randomly selected teachers demonstrated a prepared lesson for which they were asked to use technology. The observers recorded classroom events and activities descriptively, not judgmentally. Notes forms were completed every 15 minutes of the lesson to record the use or nonuse of 24 target strategies and the degree to which a high level of academically focused class time and a high level of student attention/interest was observed. At the conclusion of the one-hour lesson, which typically lasted from 45 to 60 minutes, the observer used a SOM Data Summary Form to summarize the frequency with which each of the strategies was observed. The frequency was recorded via a 5-point rubric that ranges from (0) Not Observed to (4) Extensively.

To ensure the reliability of data, observers received a manual providing definition 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, predominately student-centered methods associated with educational reforms (*e.g.*, cooperative learning, project-based learning, inquiry, discussion, using technology as a learning tool). The strategies were identified through surveys and discussions involving policy makers, researchers, administrators, and teachers as those most useful in providing indicators of schools' instructional

[*]Expanded Rubric (ER) in Yr.1 (Lowther, Ross, & Plants, 2000)

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 classroom-based practice exercises to ensure that his/her data are comparable with those of experienced observers. In a reliability study (Lewis, Ross, & Alberg, 1999), 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. Further results establishing the reliability and validity of *SOM*© are provided in the Lewis *et al.* (1999) report.

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 during which 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, in its first section, 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 (*i.e.*, easily used software features/menus, saved or printed documents) and the number of students who easily use the keyboard to enter text or numerical information.

The next section of the *SCU* records: the types of student computer activities, and the subject areas of those activities. The computer activities are divided into four groups based on broad categories of software used: production tools, Internet/research tools, educational software, and testing software. Within each category, more specific types of software are identified. In the Production Tools category, the software types include: word processing, databases, spreadsheets, draw/paint/graphics, presentation (*e.g.*, PowerPoint ™), authoring (*e.g.*, KidPix ™), concept mapping (*e.g.*, Inspiration), and planning (*e.g.*, MS Project ™). In the Internet/research tools category, the software include: Internet browser, CD reference materials, and communications (*e.g.*, email, listservs, chat rooms). In the Educational Software category, the software types include: drill/practice/tutorial, problem-solving (*e.g.*, Riverdeep ™) and process tools (*e.g.*, Author's Toolkit ™). The Testing Software types include individualized/tracked (e.g. Accelerated

Reader) and generic. 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, 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. The frequency with which the computer activities and software were observed in use was summarized and recorded using a five-point rubric that ranges from (0) Not Observed to (4) Extensively observed. The subject area of each computer activity was categorized as: language arts, mathematics, science, social studies, other, or none.

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.

RSCA. The Rubric for Student-Centered Activities was developed by CREP (Lowther &Ross , 2001) as an extension to SOM and SCU. The RSCA was used by observers to more closely evaluate the strength of application for seven selected areas considered fundamental to the goals 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 and whether or not technology was utilized as a component of the strategy. Such 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 "5" 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 use. The RSCA was completed during the SOM/SCU observation periods.

Teacher Surveys

Three surveys were used to collect impressions of the STARK Program: the Teacher Technology Questionnaire (TTQ), the School Climate Inventory (SCI), and the Technology Skills Assessment (TSA). Each of the participating schools administered the surveys at a faculty meeting conducted in May 2006. The surveys are described below.

TTQ. The Teacher Technology Questionnaire is a two-part instrument used to collect teacher perceptions of computers and technology (Lowther, Ross, & Alberg, 2000). 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. The next asks teachers to indicate whether they have a home computer, and if they do, whether they use the home computer to access instructional materials on the Internet and/or to prepare classroom materials.

SCI. Researchers at the CREP developed the School Climate Inventory in 1989 (Butler & Alberg, 1991). 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 from 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=.8394	The extent to which the environment is ordered and appropriate student behaviors are present
Leadership	α=.8345	The extent to which the administration provides instructional leadership
Environment	α=.8094	The extent to which positive learning environments exist
Involvement	α=.7582	The extent to which parents and the community are involved in the school
Instruction	α=.7453	The extent to which the instructional program is well developed and implemented
Expectations	α=.7275	The extent to which students are expected to learn and be responsible
Collaboration	α=.7417	The extent to which the administration, faculty, and students cooperate and participate in problem solving

TSA. The Technology Skills Assessment (TSA) is a 56-item survey that includes 50 three-point Likert-type questions (Marvin & Lowther, 2001). The three-point questions are designed to assess the perceived technological abilities of the participants. 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) and the Texas Essential Knowledge and Skills (TEKS) Technology Applications for Grades 3-5 (see Appendix A). The categories are: Computer Basics, Software Basics, Multimedia Basics, Internet Basics, Advanced Skills, Using Technology for Learning, and Policy and Ethics.

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DATA COLLECTION

Table 1 reflects summary information regarding the types of instruments described in the previous section.

Table 1

Data Collection Summary

Type of Measure	Instrument	Number Collected	Timeline	Description
Classroom Observations	SOM	58	Spring 2006	• Prearranged one-hour sessions in which teachers demonstrated a prepared lesson using technology - Notes forms were completed every 15 minutes of the lesson.
	SCU	58		
	RSCA	58		
Surveys	SCI	315	Spring 2006	• Administered during faculty meetings held at each of the eight schools during May 2006.
	TTQ	235		
	TSA	235		

RESULTS

Classroom Observation Results

The data for 58 classroom observations were collected with SOMs, SCUs, and RSCAs during prearranged sessions in which teachers were asked to implement a lesson using technology. Results from each measure are described in the section below.

School Observation Measure (SOM©)

As indicated in the description of SOM, the observation procedure focused on 24 instructional strategies using a five-point rubric (0 = not observed, 1 = rarely, 2 = occasionally, 3 = frequently, and 4 = extensively). In an initial analysis, we computed the percentage of times a strategy was not observed (rubric category = 0) vs. observed (categories 1-4 combined). These Year 5 results were then compared with the Year 1 baseline data.

As shown in Table 2, "direct instruction" remained the most frequently observed strategy (81%) during the Year 5 demonstrating a slight decrease (6.1 percentage points) in use as compared to Year 1. The second most frequently observed strategy was "teacher as a coach/facilitator" occurring in nearly eighty percent of the Year 5 observations (79.3%) demonstrating an increase of 21.8 percentage points over Year 1. The third most frequently observed strategy was "computer for instructional delivery" (72.4%) demonstrating an impressive increase of 42.7 percentage points over Year 1. The following four strategies were seen in less than 10% of the Year 5 visits: "student self-assessment" (8.5%); "parent/community involvement" (6.9%); "sustained writing/composition" (5.1%); and "sustained reading" (3.4%).

Table 2

School Observation Measure (SOM) Proportion of not observed (0) vs. observed (1-4) strategies

Year 1 (2001-2002) N = 54
Year 2 (2002-2003) N = 52
Year 3 (2003-2004) N = 54
Year 5 (2005-2006) N = 58

	Not Observed				Observed			
Strategies	**01-02**	**02-03**	**03-04**	**05-06**	**01-02**	**02-03**	**03-04**	**05-06**
Direct instruction	13.0	19.2	18.5	19.0	87.1	78.8	81.5	81.0
Teacher as coach/facilitator	40.7	25.0	31.5	20.7	57.5	71.2	68.5	79.3
Computer for instructional delivery***	68.5	30.8	27.8	27.6	29.7	67.3	72.2	72.4
Technology as a learning tool***	81.5	32.7	38.9	36.2	16.8	65.4	61.1	63.8
Use of higher level questioning**	64.8	40.4	40.7	41.4	33.4	53.8	59.3	58.6
Higher level instructional feedback	38.9	40.4	48.1	41.4	59.3	55.8	51.9	58.6
Independent seatwork	42.6	48.1	57.4	55.2	55.5	51.9	42.6	44.8
Experiential, hands on learning	57.4	42.3	55.6	56.9	42.6	57.7	44.4	43.0
Student discussion	70.4	59.6	61.1	58.6	29.7	38.5	38.9	41.3
Ability groups	72.2	53.8	70.4	60.3	27.8	42.3	29.6	39.7
Cooperative/collaborative learning	72.2	59.6	74.1	63.8	27.9	36.5	25.9	36.2
Integration of subject areas**	85.2	53.8	59.3	65.5	13.0	44.2	40.7	34.5
Project-based learning	70.4	50.0	75.9	70.7	27.8	46.2	24.1	29.3
Independent inquiry/research	88.9	75.0	88.9	70.7	11.2	25.0	11.1	29.2
Work centers	74.1	65.4	59.3	70.7	26.0	34.6	40.7	27.6
Individual tutoring	85.2	61.5	81.5	75.9	11.3	32.7	18.5	24.1
Multi-age grouping	81.5	78.8	87.0	77.6	18.5	21.2	13.0	22.4
Team teaching	83.3	76.9	88.9	81.0	16.8	17.3	11.1	18.9
Performance assessment	81.5	84.6	87.0	82.8	14.9	13.5	13.0	17.3
Systematic individual instruction***	100.0	76.9	92.6	82.8	0.0	23.1	7.4	17.2
Student self-assessment	90.7	92.3	88.9	91.4	7.5	5.8	11.1	8.5
Parent/community involvement	90.7	88.5	94.4	93.1	7.5	7.7	5.6	6.9
Sustained writing/composition	85.2	78.8	90.7	94.8	14.9	19.2	9.3	5.1
Sustained reading	81.5	80.8	88.9	96.6	16.8	17.3	11.1	3.4

**p<.05, **p<.01, ***p<.001*

Note. Sorted from highest to lowest proportion of 2005-2006 observed.

Sorted from highest to lowest proportion of 2005-2006 Observed results, Table 3 presents the summary of the five-category breakdown for the Year 1 - Year 5 SOM results. When examining the strategies that were demonstrated frequently to extensively in excess of 30% of observations, Year 1 data revealed six activities and Year 5 data revealed 12 activities. Of the 12 activities for Year 5, three were observed in over 70% of visits: direct instruction (81%); teacher as a coach/facilitator (79.3%); and computer for instructional delivery (72.4%). Additionally, three strategies were observed during over 50% of visits: technology as a learning tool or resource (63.8%); use of higher-level questioning (58.6%); and higher level instructional feedback (58.6%).

Table 3

School Observation Measure (SOM) Data Summary

Year 1 (2001-2002) N = 54
Year 2 (2002-2003) N = 52
Year 3 (2003-2004) N = 54
Year 5 (2005-2006) N = 58

The extent to which each of the following was used or present in the classroom.	Year	Percent None	Percent Rarely	Percent Occasionally	Percent Frequently	Percent Extensively
Instructional Orientation						
Direct instruction (lecture)	01-02	13.0	16.7	22.2	9.3	38.9
	02-03	19.2	3.8	5.8	38.5	30.8
	03-04	18.5	5.6	14.8	27.8	33.3
	05-06	19.0	22.4	8.6	24.1	25.9
Team teaching	01-02	83.3	1.9	1.9	1.9	11.1
	02-03	76.9	0.0	1.9	9.6	5.8
	03-04	88.9	1.9	0.0	7.4	1.9
	05-06	81.0	0.0	1.7	8.6	8.6
Cooperative/collaborative learning	01-02	72.2	1.9	5.6	11.1	9.3
	02-03	59.6	1.9	7.7	11.5	15.4
	03-04	74.1	5.6	3.7	9.3	7.4
	05-06	63.8	5.2	5.2	15.5	10.3
Individual tutoring (teacher, peer, aide, adult volunteer)	01-02	85.2	5.6	1.9	1.9	1.9
	02-03	61.5	7.7	9.6	11.5	3.8
	03-04	81.5	5.6	5.6	3.7	3.7
	05-06	75.9	1.7	6.9	12.1	3.4
Classroom Organization						
Ability groups	01-02	72.2	0.0	0.0	1.9	25.9
	02-03	53.8	0.0	0.0	1.9	40.4
	03-04	70.4	3.7	0.0	1.9	22.2
	05-06	60.3	5.2	1.7	6.9	25.9
Multi-age grouping	01-02	81.5	0.0	0.0	0.0	18.5
	02-03	78.8	0.0	0.0	0.0	21.2
	03-04	87.0	0.0	0.0	3.7	9.3
	05-06	77.6	6.9	0.0	1.7	13.8
Work centers (for individuals or groups)	01-02	74.1	1.9	0.0	3.7	20.4
	02-03	65.4	1.9	3.8	11.5	17.3
	03-04	59.3	3.7	5.6	16.7	13.0
	05-06	70.7	1.7	1.7	12.1	12.1
Instructional Strategies						
Higher level instructional feedback (written or verbal) to enhance student learning	01-02	38.9	25.9	13.0	13.0	7.4
	02-03	40.4	7.7	11.5	23.1	13.5
	03-04	48.1	11.1	14.8	13.0	13.0
	05-06	41.4	12.1	15.5	17.2	13.8
Integration of subject areas (interdisciplinary/thematic units)	01-02	85.2	3.7	1.9	3.7	3.7
	02-03	53.8	11.5	7.7	13.5	11.5
	03-04	59.3	5.6	11.1	7.4	16.7
	05-06	65.5	3.4	12.1	6.9	12.1
Project-based learning	01-02	70.4	0.0	3.7	1.9	22.2
	02-03	50.0	0.0	5.8	9.6	30.8
	03-04	75.9	1.9	5.6	5.6	11.1
	05-06	70.7	3.4	0.0	12.1	13.8

Table 3 continued

The extent to which each of the following was used or present in the classroom.	Year	Percent None	Percent Rarely	Percent Occasionally	Percent Frequently	Percent Extensively
Use of higher-level questioning strategies	01-02	64.8	11.1	9.3	9.3	3.7
	02-03	40.4	5.8	9.6	23.1	15.4
	03-04	40.7	14.8	16.7	13.0	13.0
	05-06	41.4	15.5	13.8	15.5	13.8
Teacher acting as a coach/facilitator	01-02	40.7	9.3	5.6	25.9	16.7
	02-03	25.0	5.8	7.7	34.6	23.1
	03-04	31.5	7.4	18.5	18.5	22.2
	05-06	20.7	12.1	6.9	31.0	29.3
Parent/community involvement in learning activities	01-02	90.7	0.0	0.0	1.9	5.6
	02-03	88.5	1.9	1.9	0.0	3.8
	03-04	94.4	1.9	0.0	1.9	0.0
	05-06	93.1	0.0	1.7	0.0	5.2
Student Activities						
Independent seatwork (self-paced worksheets, individual assignments)	01-02	42.6	11.1	14.8	11.1	18.5
	02-03	48.1	1.9	11.5	21.2	17.3
	03-04	57.4	11.1	13.0	5.6	13.0
	05-06	55.2	10.3	15.5	13.8	5.2
Experiential, hands-on learning	01-02	57.4	3.7	3.7	9.3	25.9
	02-03	42.3	1.9	7.7	23.1	25.0
	03-04	55.6	9.3	3.7	14.8	16.7
	05-06	56.9	3.4	1.7	24.1	13.8
Systematic individual instruction (differential assignments geared to individual needs)	01-02	100.0	0.0	0.0	0.0	0.0
	02-03	76.9	3.8	3.8	7.7	7.7
	03-04	92.6	1.9	1.9	3.7	0.0
	05-06	82.8	3.4	1.7	6.9	5.2
Sustained writing/composition (self-selected or teacher-generated topics)	01-02	85.2	1.9	3.7	5.6	3.7
	02-03	78.8	0.0	3.8	3.8	11.5
	03-04	90.7	0.0	3.7	3.7	1.9
	05-06	94.8	1.7	1.7	0.0	1.7
Sustained reading	01-02	81.5	5.6	5.6	5.6	0.0
	02-03	80.0	0.0	5.8	3.8	7.7
	03-04	88.9	3.7	3.7	1.9	1.9
	05-06	96.6	3.4	0.0	0.0	0.0
Independent inquiry/research on the part of students	01-02	88.9	5.6	0.0	1.9	3.7
	02-03	75.0	1.9	5.8	9.6	7.7
	03-04	88.9	1.9	1.9	3.7	3.7
	05-06	70.7	6.9	3.4	3.4	15.5
Student discussion	01-02	70.4	5.6	9.3	11.1	3.7
	02-03	59.6	5.8	9.6	23.1	0.0
	03-04	61.1	9.3	11.1	13.0	5.6
	05-06	58.6	17.2	13.8	6.9	3.4
Technology Use						
Computer for instructional delivery (*e.g.* CAI, drill & practice)	01-02	68.5	3.7	11.1	5.6	9.3
	02-03	30.8	1.9	11.5	21.2	32.7
	03-04	27.8	7.4	9.3	24.1	29.6
	05-06	27.6	8.6	15.5	20.7	27.6
Technology as a learning tool or resource (*e.g.* Internet research, spreadsheet or database creation, multi-media, CD ROM, Laser disk)	01-02	81.5	5.6	3.7	1.9	5.6
	02-03	32.7	3.8	9.6	13.5	38.5
	03-04	38.9	5.6	11.1	18.5	25.9
	05-06	36.2	10.3	5.2	13.8	34.5

Table 3 continued

The extent to which each of the following was used or present in the classroom.	Year	Percent None	Percent Rarely	Percent Occasionally	Percent Frequently	Percent Extensively
Assessment						
Performance assessment strategies	01-02	81.5	0.0	7.4	1.9	5.6
	02-03	84.6	0.0	5.8	3.8	3.8
	03-04	87.0	3.7	0.0	7.4	1.9
	05-06	82.8	5.2	1.7	5.2	5.2
Student self-assessment (portfolios, individual record books)	01-02	90.7	1.9	1.9	0.0	3.7
	02-03	92.3	0.0	3.8	0.0	1.9
	03-04	88.9	0.0	0.0	7.4	3.7
	05-06	91.4	1.7	3.4	3.4	0.0
Summary Items				Low	Moderate	High
Academically focused class time	01-02			0.0	29.6	64.8
	02-03			3.8	7.7	76.9
	03-04			1.9	20.4	77.8
	05-06			13.7	8.6	77.6
Level of student attention/ Interest/engagement	01-02			1.9	35.2	59.3
	02-03			3.8	15.4	69.2
	03-04			3.7	22.2	74.1
	05-06			15.5	12.1	72.4

Data from the final section of the SOM shows a steady increase in the frequency with which a high level of student attention, interest, and/or engagement was observed from Year 1 (59.3%) to Year 5 (72.4%). Similarly, the frequency with which a high level of academically focused time was observed increased over nearly 13 percentage points from Year 1 (64.8%) to Year 5 (77.6%).

Inferential results: Year 1 vs. Year 5. To determine whether significant overall changes occurred between Years 1 and 5, a series of inferential analyses (ANOVA tests for independent samples) were conducted on the multiple items of the SOM. As shown in Table 4 and Figure 1, there was a significantly higher frequency of occurrence of five strategies observed during the Year 5 classroom visits. The Effect Sizes for the five items ranged from +0.50 to +1.08. The two items revealing the greatest increases between Year 1 and Year 5 were “technology as a learning tool” and “computer for instructional delivery” – both key goals of the STARK program.

Table 4

A Summary of SOM Items Showing Significant Differences between Year 1 and Year 5

SOM Items	2001-2002 (*N* = 54)		2005-2006 (*N* = 58)		Yr 1 vs. Yr 5
	M	*SD*	*M*	*SD*	*ES*
Technology as learning tool or resource	0.42	1.06	2.00	1.77	+1.08
Computer for instructional delivery	0.81	1.37	2.12	1.59	+0.88
Systematic individual instruction	0	0	0.48	1.16	+0.59
Use of higher-level questioning strategies	0.74	1.20	1.45	1.5	+0.52
Integration of subject areas	0.34	0.98	0.97	1.47	+0.50

Scale: 0 = Not Observed; 4 = Extensively Observed

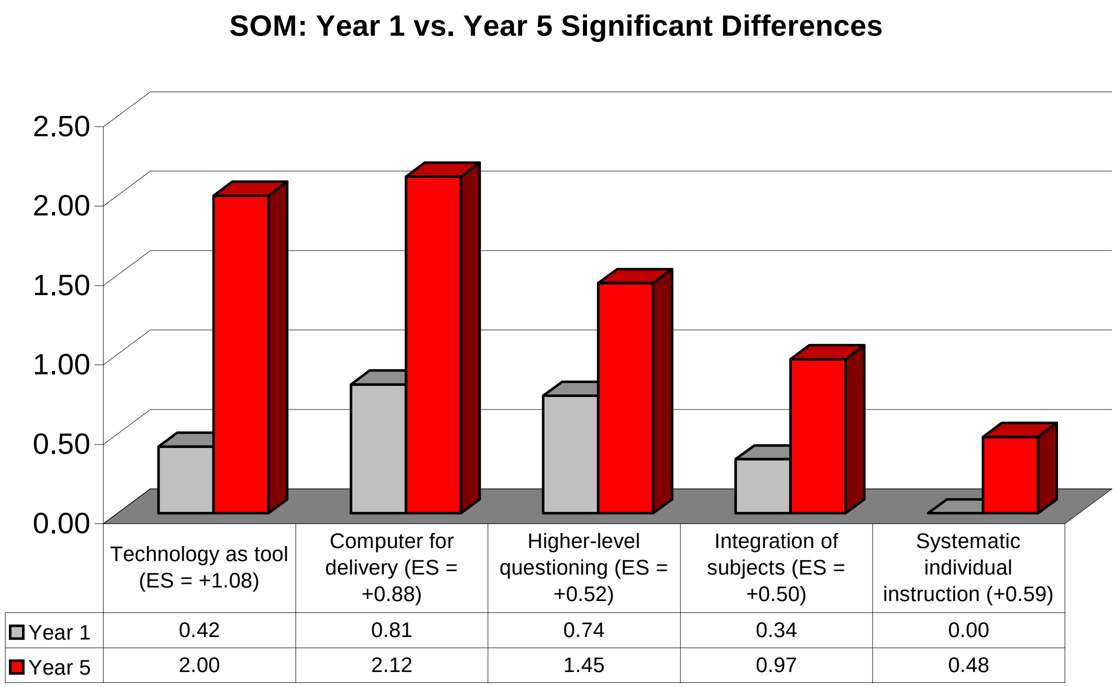


Figure 1

Summary. The greatest significant differences between Year 1 and Year 5 were increased observed use of “technology as a learning tool”, “computer for instructional delivery” and the “use of higher level questioning”. Year 5 results also revealed significantly greater use of ”higher-order questioning strategies” and “integration of subject areas” during classroom instruction. Overall data suggest that the STARK program has had a positive impact on increasing the teacher’s integration of technology into instruction and demonstration of higher levels of academically focused class time and student attention.

Rubric for Student-Centered Activities (RSCA)

As with the SOM and the SCU, data from the RSCA were collected during prescheduled lessons in which teachers were asked to use technology. Results address the quality/depth of observed strategy applications and the percentage of sessions in which technology was used with the observed strategy. Because the RSCA was used in targeted observations of lessons that were to include the use of technology to support learning, computer use was expected to be viewed at sometime during the lesson.

Ratings. The analyses examined the rubric rating (1 to 4) for each of the strategies, when the given strategy was observed. If the strategy was not seen, the associated rating of “0” was excluded from the analysis because it would negatively bias the overall computation of quality/effectiveness. The rubric ratings by percentage observed for each of the strategies for Years 1, 2, 3 and 5 are presented in Table 5. As shown, the percentages of teaching strategies that used technology for Year 5 ranged from 20.7% (student discussion) to 37.9% (higher-level questioning strategies), which continue to indicate moderate to moderately high levels of quality/effectiveness. “Cooperative learning” (32.8%) and “project-based learning” (31%) were assessed as the other most meaningful strategies followed by “experiential, hands-on learning” (27.6%) and “independent inquiry” (25.9%). No strategy showed any decrease from Year 1 to Year 5.

Inferential results: Year 1 vs. Year 5. All RSCA items remained the same for Year 1 and Year 5. Each of seven instructional strategies linked to the goal of increasing student-centered learning activities was assessed using two rating scales: level of application, and whether technology was used in the delivery of the strategy. Analyses pertaining to the level of application for each of the seven dimensions are done only for those instances where a given strategy is observed. Therefore, ratings of “Not Observed” are not included. To determine whether significant overall changes occurred between Years 1 and 5, a series of ANOVAs were conducted on the RSCA strategies pertaining to student-centered activities to compare rubric ratings between Year 1 (n=53) and Year 5 (n=58). By using the Bonferroni adjustment, the alpha was lowed to p<.007. Effect sizes ranged from -.28 to .68. No significant differences were revealed.

A series of logistic regressions were used to examine whether the use of technology was influenced by year. Figure 2 provides a graphical perspective on the dimensions assessed by the RSCA.

Table 5

Rubric for Student Centered Activities (RSCA) Item Ratings by Percentage Observed

Year 1 (2001-2002) N = 52
Year 2 (2002-2003) N = 54
Year 3 (2003-2004) N = 54
Year 4 (2005-2006) N = 58

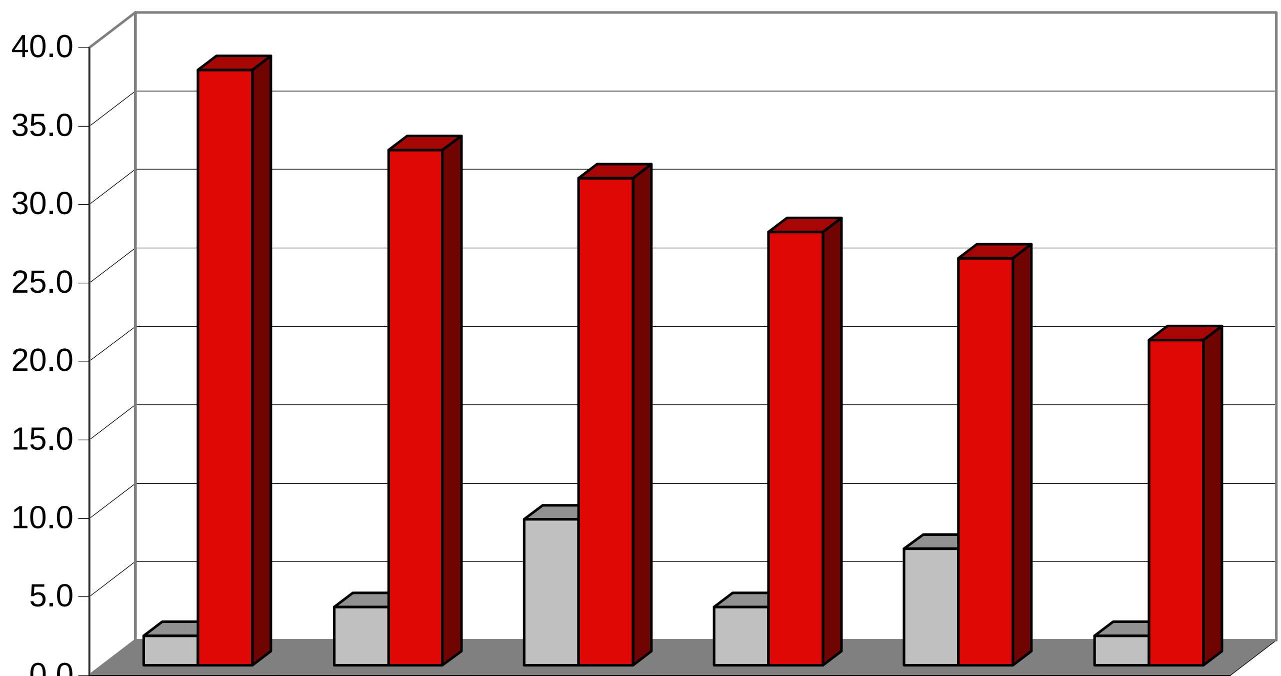
Items	Year	% Observed	Rubric Rating* - Percentage Observed				Percent that used Technology
			1	2	3	4	
Cooperative Learning	01-02	29.6	1.9	11.1	9.3	7.4	3.7
	02-03	47.1	15.1	11.3	7.5	13.2	39.6
	03-04	27.8	5.6	3.7	9.3	9.3	18.5
	05-06	48.3	5.2	12.1	17.2	13.8	32.8
Project-Based Learning	01-02	27.8	3.7	5.6	5.6	13.0	9.3
	02-03	47.2	1.9	13.2	13.2	18.9	45.3
	03-04	25.9	1.9	9.3	1.9	13.0	24.1
	05-06	34.6	5.2	5.2	19.0	19.0	31.0
Higher-Level Questioning Strategies	01-02	53.7	18.5	14.8	9.3	7.4	1.9
	02-03	56.6	11.3	17.0	13.2	15.1	39.6
	03-04	61.1	9.3	20.4	16.7	14.8	38.9
	05-06	70.6	10.3	17.2	24.1	19.0	37.9
Experiential, Hands-On Learning	01-02	38.9	1.9	9.3	3.7	24.1	3.7
	02-03	58.5	3.8	13.2	17.0	24.5	45.3
	03-04	48.1	3.7	7.4	16.7	20.4	31.5
	05-06	43.1	0.0	10.3	12.1	20.7	27.6
Independent Inquiry / Research	01-02	16.7	7.4	0.0	1.9	7.4	7.4
	02-03	35.9	13.2	3.8	3.8	15.1	28.3
	03-04	14.8	0.0	5.6	1.9	7.4	13.0
	05-06	32.8	5.2	10.3	5.2	12.1	25.9
Student Discussion	01-02	33.3	18.5	0.0	5.6	9.3	1.9
	02-03	45.2	9.4	7.5	20.8	7.5	28.3
	03-04	42.6	9.3	9.3	11.1	13.0	20.4
	05-06	41.3	10.3	13.8	13.8	13.8	20.7
Students as Producers of Knowledge	01-02	24.1	16.7	0.0	1.9	5.6	**
	02-03	43.4	7.5	15.1	5.7	15.1	**
	03-04	37.0	14.8	3.7	5.6	13.0	**
	05-06	46.6	12.1	1.7	20.7	12.1	**

**** Rating scale:* 1 =** *limited application;* **2 =** *somewhat limited application;* **3 =** *somewhat strong application;* **4 =** *strong application.*
*** Students as Producers of Knowledge" is not included because use of technology was not a required component.*

Technology use. As can be seen in Figure 2, technology was used to support RSCA strategies to a far greater extent in Year 5 as compared to Year 1. In over 30% of the observations, technology was used to support “higher level questioning strategies” (37.9%), the use of “cooperative learning” (32.8%) and “project-based learning” (31%). Teachers also used technology to support “hands-on learning” (27.6%) and “independent inquiry” (25.9%) during more than one-fourth of the observations.

Technology was used slightly less frequently in conjunction with “student discussion”, as these uses were observed in 20.7% of the visits, still reflecting significant increase from Year 1.

Year 1 vs. Year 5: Percent of RSCA Activities* that Used Technology



	Higher-Level Questions	Cooperative Learning	Project-based Learning	Hands-on Learning	Independent Inquiry	Student Discussion
Year 1	1.9	3.7	9.3	3.7	7.4	1.9
Year 5	37.9	32.8	31.0	27.6	25.9	20.7

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

Figure 2

Summary. The RSCA results revealed a positive trend in the quality of strategy implementation. The scores for the seven RSCA strategies were directionally higher than the first year indicating continued growth toward teacher competency with non-traditional instructional strategies. The most striking RSCA result is the increased usage of technology to support higher-level questioning. Also noteworthy is the higher quality with which teachers implemented cooperative and project-based learning after five years as compared to the first year of program participation. These results suggest that the STARK Program is successfully preparing teachers to implement above average student-centered activities.

Survey of Computer Use (SCU)

As with the SOM and RSCA, data from the SCU were collected during prescheduled lessons in which teachers were asked to use technology. A summary of the observation results for all years is provided in Table 6. Data for the 2001-2002 Computer Configuration, Testing Software, and Computers/Digital Tools Used by Students are not listed in the table as the reporting format changed from Year 1 to Year 5, thus comparisons are made between Years 2 and 5 for these categories.

Computer Configuration. Year 5 SCU data showed similar results to Year 2 in that the majority of the classrooms (over 80%) had two or more computers that were typically considered to be up-to-date (91.4%) and connected to the Internet (91.4%). Desktop and laptop computers were the most prevalent type of technology used in the classroom (51.7%, 41.4% respectively).

Student Computer Use. The percent of visits in which students displayed a high level of computer literacy skills increased significantly (Year 2 = 19.6%; Year 5 = 43.1%), while there was only a slight increase in students demonstrating “very good” keyboarding skills (Year 2 = 25.5%; Year 5 = 31%).

Student Computer Activities by Software used. The Year 5 as compared to Year 1 SCU results show a greater variety of software applications being used by the students. During Year 1, only 6 of the 14 (excluding Testing software) listed software tools were seen in use, whereas 11 of 14 were observed to some degree during the Year 5 classroom visits. Brief descriptions of the different software uses, related subject area content of the activities, and noted significant differences derived from Analysis of Variance are presented below.

Production tools used by students. The Year 5 data show students used each type of production tool. Three applications, however, were more frequently used than the others (Table 6). Word processing was the most frequently observed software, as students were seen using this tool in 13.8% of the class visits, draw/graphic was seen in 10.3%, while presentation software was seen in 8.6% of the visits. With regard to subject area, production tools were typically used for language arts (19%), followed by mathematics (17.2%) and science (8.6%) activities. The Year 1 to Year 5 result comparisons are presented in Table 6. Of the production tools, students used draw/graphic tools ($p = 0.02$) and presentation software ($p < .01$) significantly more during Year 5 as compared to Year 1. However, as noted earlier, the extent of use was limited in that draw/graphic software was frequently or extensively seen in only 8.6% of the classroom observations and presentation software was only seen to that degree in 5.2%.

Internet/research tools used by students. There was a significant Year 1 to Year 5 increase in the percent of observations in which students were using the Internet (Year 1 = 7.4%; Year 5 = 25.9%). Frequent-to-extensive use of the Internet was seen in 18.9% of the visits. This increase is likely the result of the district's increased access to online resources and available bandwidth.

Educational software use by students. There was a significant increase in the use of educational software from Year 1 (20.4%) to Year 5 (36.2%). The majority of the educational software activities were focused on language arts (22.4%).

Testing software use by students. Since testing software was not available for Year 1, not observed in Year 2, and only observed in 1.7% of theYear 5 classroom visits, a comparative analysis was not conducted.

Table 6

Survey of Computer Use (SCU) Data Summary

Year 1 (2001-2002) N = 54
Year 2 (2002-2003) N = 51
Year 3 (2003-2004) N = 53
Year 4 (2005-2006) N = 58

Computer Configuration	**2001-2002**	**2002-2003**	**2003-2004**	**2005-2006**
Classrooms most frequently had the following number of computers or digital tools.				
None	.	2.0	0.0	1.7
One	.	17.6	20.8	15.5
2 – 4	.	51.0	45.3	27.6
5 – 10	.	5.9	30.2	32.8
11 or more	.	23.5	3.8	22.4
Classroom computers were most frequently				
Up-to-date	.	64.7	71.7	91.4
Aging, but adequate	.	29.4	26.4	6.9
Outdated/limited capacity	.	2.0	1.9	0.0
No computers were observed	.	2.0	0.0	1.7
Classroom computers were most frequently				
Connected to the Internet	.	84.3	84.9	91.4
Not connected to the Internet	.	13.7	13.2	6.9
No computers were observed	.	2.0	0.0	1.7
Student Computer Use				
Classroom Computers or digital tools were most frequently used by:				
Few (less than 10%) students	.	27.5	22.6	17.2
Some (about 10-50%) students	.	13.7	20.8	17.2
Most (about 51-90%) students	.	2.0	9.4	10.3
Nearly all (91-100%) students	.	35.3	26.4	39.7
Students did not use computers	.	17.6	20.8	15.5
Students most frequently worked with computers or digital tools:				
Alone	.	45.1	49.1	55.2
In pairs	.	7.8	15.1	13.8
In small groups	.	15.7	7.5	5.2
Students did not use computers	.	27.5	24.5	25.9
Student computer literacy skills were most frequently:				
Poor	.	7.8	7.5	1.7
Moderate	.	27.5	20.8	27.6
Very good	.	19.6	20.8	43.1
Not observed	.	41.2	45.3	27.6
Student keyboarding skills were most frequently:				
Poor	.	9.8	9.4	3.4
Moderate	.	5.9	11.3	15.5
Very good	.	25.5	9.4	31.0
Not observed	.	54.9	64.2	50.0

Note. Results marked as "." are not listed as they were reported in a different format or not collected in 2001-2002.

Table 6 continued

Computers/Digital Tools Used by Students (2002–2003, 2003-2004 and 2005-2006 only)	Year	Not Observed	Rarely	Occasionally	Frequently	Extensively
Desktop Computers	2002-2003	47.1	2.0	5.9	11.8	25.5
	2003-2004	49.1	9.4	9.4	17.0	13.2
	2005-2006	48.3	10.3	1.7	17.2	22.4
Laptop Computers	2002-2003	52.9	7.8	9.8	9.8	13.7
	2003-2004	52.8	5.7	7.5	18.9	11.3
	2005-2006	58.6	8.6	8.6	6.9	17.2
Personal Data Assistants (PDA)	2002-2003	88.2	0.0	0.0	0.0	2.0
	2003-2004	96.2	0.0	0.0	0.0	0.0
	2005-2006	98.3	0.0	0.0	0.0	1.7
Graphing Calculator	2002-2003	88.2	0.0	0.0	0.0	2.0
	2003-2004	92.5	0.0	0.0	0.0	3.8
	2005-2006	100.0	0.0	0.0	0.0	0.0
Information Processor (*e.g.*, Alphaboard)	2002-2003	90.2	0.0	0.0	0.0	0.0
	2003-2004	94.3	0.0	0.0	1.9	1.9
	2005-2006	100.0	0.0	0.0	0.0	0.0
Digital Accessories (*e.g.*, camera, scanner, probes)	2002-2003	78.4	0.0	5.9	0.0	5.9
	2003-2004	88.7	3.8	0.0	1.9	1.9
	2005-2006	89.7	0.0	1.7	1.7	6.9

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

Student Computer Activities by Software Used	Year	Not Observed	Rarely	Occasionally	Frequently	Extensively
Production Tools						
Word Processing	2001-2002	88.9	0.0	5.6	1.9	3.7
	2002-2003	76.5	3.9	3.9	0.0	11.8
	2003-2004	83.0	1.9	1.9	7.5	3.8
	2005-2006	86.2	1.7	5.2	1.7	5.2
Database	2001-2002	100.0	0.0	0.0	0.0	0.0
	2002-2003	100.0	0.0	0.0	0.0	0.0
	2003-2004	96.2	0.0	0.0	0.0	1.9
	2005-2006	100.0	0.0	0.0	0.0	0.0
Spreadsheet	2001-2002	100.0	0.0	0.0	0.0	0.0
	2002-2003	90.2	0.0	0.0	2.0	3.9
	2003-2004	90.6	0.0	1.9	1.9	3.8
	2005-2006	100.0	0.0	0.0	0.0	0.0
Draw/Paint/Graphics	2001-2002	98.1	1.9	0.0	0.0	0.0
	2002-2003	80.4	3.9	2.0	2.0	5.9
	2003-2004	83.0	1.9	0.0	3.8	9.4
	2005-2006	89.7	0.0	1.7	5.2	3.4
Presentation (*e.g.*, MS PowerPoint)**	2001-2002	100.0	0.0	0.0	0.0	0.0
	2002-2003	74.5	2.0	0.0	5.9	9.8
	2003-2004	88.7	1.9	1.9	1.9	3.8
	2005-2006	91.4	1.7	1.7	0.0	5.2
Authoring (*e.g.*, HyperStudio)	2001-2002	100.0	0.0	0.0	0.0	0.0
	2002-2003	100.0	0.0	0.0	0.0	0.0
	2003-2004	94.3	0.0	0.0	1.9	0.0
	2005-2006	100.0	0.0	0.0	0.0	0.0
Concept Mapping (*e.g.*, Inspiration)	2001-2002	100.0	0.0	0.0	0.0	0.0
	2002-2003	90.2	0.0	0.0	0.0	3.9
	2003-2004	94.3	0.0	0.0	1.9	0.0
	2005-2006	98.3	1.7	0.0	0.0	0.0

Table 6 continued

Student Computer Activities by Software Used	Year	Not Observed	Rarely	Occasionally	Frequently	Extensively
Planning (*e.g.*, MS Project)	2001-2002	100.0	0.0	0.0	0.0	0.0
	2002-2003	90.2	0.0	0.0	2.0	0.0
	2003-2004	96.2	0.0	0.0	0.0	0.0
	2005-2006	100.0	0.0	0.0	0.0	0.0
Internet/Research Tools						
Internet Browser (*e.g.*, Netscape)**	2001-2002	92.6	7.4	0.0	0.0	0.0
	2002-2003	74.5	0.0	2.0	3.9	11.8
	2003-2004	84.9	5.7	0.0	3.8	3.8
	2005-2006	74.1	3.4	3.4	3.4	15.5
CD Reference (encyclopedias, etc.)	2001-2002	100.0	0.0	0.0	0.0	0.0
	2002-2003	86.3	0.0	0.0	3.9	0.0
	2003-2004	96.2	1.9	0.0	0.0	0.0
	2005-2006	100.0	0.0	0.0	0.0	0.0
Communications	2001-2002	100.0	0.0	0.0	0.0	0.0
	2002-2003	100.0	0.0	0.0	0.0	0.0
	2003-2004	96.2	0.0	0.0	0.0	0.0
	2005-2006	100.0	0.0	0.0	0.0	0.0
Educational Software						
Drill/Practice/Tutorial	2001-2002	83.3	3.7	1.9	0.0	11.1
	2002-2003	78.4	0.0	2.0	5.9	9.8
	2003-2004	73.6	5.7	5.7	3.8	5.7
	2005-2006	69.0	1.7	1.7	10.3	17.2
Problem Solving (*e.g.*, SimCity)	2001-2002	98.1	0.0	0.0	0.0	0.0
	2002-2003	90.2	0.0	0.0	0.0	2.0
	2003-2004	94.3	0.0	0.0	1.9	0.0
	2005-2006	89.7	3.4	3.4	1.7	1.7
Process Tools (Geometer's Sketchpad, etc.)	2001-2002	94.4	0.0	0.0	0.0	3.7
	2002-2003	90.2	0.0	0.0	2.0	2.0
	2003-2004	92.5	0.0	0.0	1.9	0.0
	2005-2006	98.3	0.0	0.0	0.0	1.7
Testing Software						
Individualized/Tracked (*e.g.*, Accelerated Reader)	2001-2002	.	.	.	.	.
	2002-2003	88.2	0.0	0.0	0.0	0.0
	2003-2004	83.0	0.0	3.8	0.0	1.9
	2005-2006	98.3	0.0	1.7	0.0	0.0
Generic	2001-2002	.	.	.	.	.
	2002-2003	86.3	0.0	0.0	0.0	0.0
	2003-2004	86.8	0.0	0.0	0.0	0.0
	2005-2006	98.3	0.0	0.0	0.0	1.7

$^{**}p<.01$

Table 6 continued

Subject Areas of Computer Activities	Year	None	Other	Language	Mathematics	Science	S. Studies
Production Tools	2001-2002	90.7	5.6	1.9	0.0	0.0	1.9
	2002-2003	27.5	11.8	37.3	11.8	7.8	13.7
	2003-2004	45.3	5.7	22.6	15.1	15.1	11.3
	2005-2006	55.2	8.6	19.0	17.2	8.6	6.9
Internet/Research Tools	2001-2002	88.9	7.4	1.9	0.0	1.9	0.0
	2002-2003	52.9	3.9	17.6	5.9	3.9	5.9
	2003-2004	75.5	0.0	3.8	5.7	9.4	9.4
	2005-2006	67.2	6.9	10.3	10.3	5.2	6.9
Educational Software	2001-2002	79.6	5.6	1.9	11.1	5.6	1.9
	2002-2003	52.9	5.9	21.6	9.8	5.9	0.0
	2003-2004	56.6	3.8	17.0	7.5	1.9	3.8
	2005-2006	63.8	3.4	22.4	19.0	6.9	6.9
Testing Software	2001-2002	.	.	.	.	.	.
	2002-2003	68.6	3.9	5.9	2.0	2.0	2.0
	2003-2004	71.7	0.0	3.8	3.8	0.0	1.9
	2005-2006	91.4	1.7	1.7	1.7	1.7	1.7

Notes. 1) Results marked as "." are not listed as they were reported in a different format or not collected in 2001-2002.
2) Item percentages may not total 100% because of missing data.

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 was "very meaningful use" of computers observed. As can be seen in Table 7 and Figure 3, significant differences between Year 1 and Year 5 observations were found on two levels of the rating scale. The direction of the data shows significant progress towards more meaningful applications during Year 5. Specifically, "meaningful use" was frequently to extensively observed in 19.0% of the Year 5 visits but in only 1.9% of the Year 1 visits (p = .001). Encouragingly, "very meaningful" usage was observed frequently to extensively in 10.3% of the Year 5 visits as compared to only 3.7% in Year 1 (p = .03).

Table 7

SCU: Overall Meaningfulness of Computer Activities

Year 1 (2001-2002) N = 54
Year 2 (2002-2003) N = 51
Year 3 (2003-2004) N = 53
Year 5 (2005-2006) N = 58

Overall meaningful use of computers	Year	Not Observed	Rarely	Occasionally	Frequently	Extensively
Low level use of computers	2001-2002	74.1	1.9	0.0	0.0	24.1
	2002-2003	68.6	3.9	3.9	3.9	5.9
	2003-2004	66.0	9.4	9.4	7.5	3.8
	2005-2006	79.3	10.3	0.0	5.2	5.2
Somewhat meaningful use of computers	2001-2002	81.5	7.4	3.7	0.0	3.7
	2002-2003	54.9	7.8	5.9	9.8	9.8
	2003-2004	73.6	1.9	3.8	5.7	9.4
	2005-2006	77.6	3.4	5.2	8.6	5.2
Meaningful use of computers	2001-2002	94.4	0.0	1.9	0.0	1.9
	2002-2003	45.1	2.0	11.8	9.8	19.6
	2003-2004	73.6	3.8	1.9	11.3	5.7
	2005-2006	53.4	3.4	5.2	17.2	19.0
Very meaningful use of computers	2001-2002	94.4	0.0	0.0	0.0	3.7
	2002-2003	66.7	3.9	3.9	0.0	11.8
	2003-2004	77.4	1.9	0.0	1.9	11.3
	2005-2006	69.0	3.4	3.4	13.8	10.3

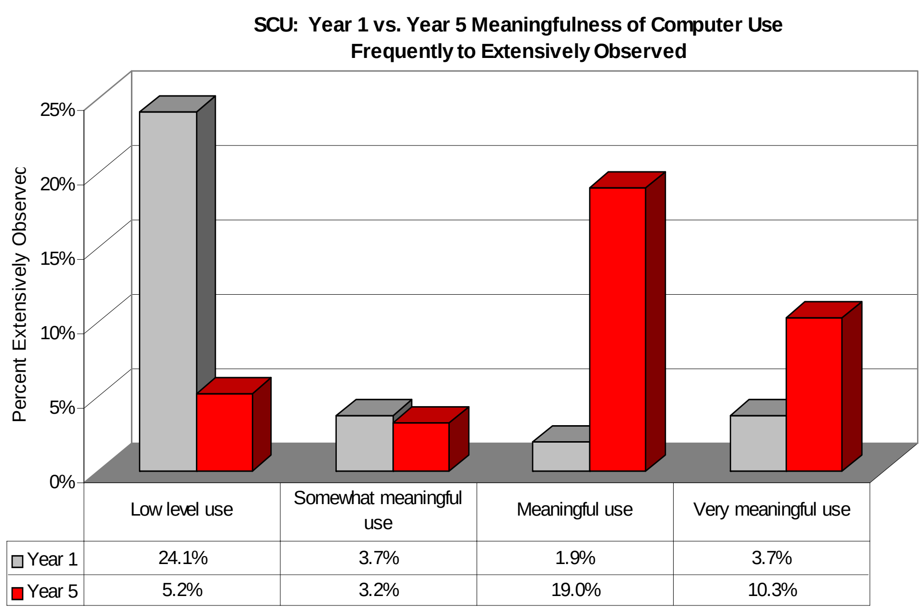


Figure 3

Summary. The SCU results suggest that some significant progress was made between Year 1 and Year 5 with regard to technology integration efforts. Specifically, in Year 5 students more frequently used the Internet for research (Year 1 = 0%; Year 5 = 15.5%). In addition, the Year 5 data show that teachers were more capable of integrating student use of computers into their instruction in meaningful ways at a tenfold increase from Year 1 = 1.9% to Year 5 = 19%.

SURVEY RESULTS

Three surveys (TTQ, SCI, and TSA) were administered to the teachers during a faculty meeting held at each school in late May 2006. Results for the three instruments were examined for differences between Year 1 and Year 5.

School Climate Inventory (SCI)

The SCI responses from teachers remained positive across all years with a slight Year 1 to Year 5 decrease on two of the seven overall dimension mean scores and the overall mean (see Table 8). Examining the results by individual items, teachers reported the highest level of agreement for: "teachers use a variety of teaching strategies or models" (93.7%), " low achieving students are given opportunity in this school" (91.7%),, "parents are treated courteously when they call or visit the school" (91.7%), and, importantly, "the administration communicates the belief that all students can learn" (91.1%). The items with the lowest level of agreement were "students participate in solving the problems of the school" (35.6%), "community businesses are active in this school" (44.8%), and "parents are involved in home and school support network" (45.4%). As seen in Table 9, when comparing the Year 5 findings to national norms, the data shows favorable increases on six of the seven dimensions, but slightly lower on one.

Table 8

School Climate Inventory Results

Year 1 (2001-2002) N = 297
Year 2 (2002-2003) N = 276
Year 3 (2003-2004) N = 312
Year 4 (2005-2006) N = 315

Section 1 - SCI Items by Scale: Percent strongly agree and agree	**% Strongly Agree and Agree**			
	01-02	**02-03**	**03-04**	**05-06**
COLLABORATION Items				
1. The faculty and staff share a sense of commitment to the school goals.	88.9	93.1	86.5	87.9
6. Students are encouraged to help others with problems.	74.4	79.0	70.5	72.1
16. Teachers are encouraged to communicate concerns, questions, and constructive ideas.	79.1	85.5	72.1	75.2
26. Students participate in solving the problems of the school.	25.9	29.3	30.1	35.6
28. Faculty and staff cooperate a great deal in trying to achieve school goals.	84.2	89.5	79.8	83.2
31. Teachers do not participate enough in decision making.**	34.0	27.5	33.0	57.1
40. Most problems facing this school can be solved by the principal and faculty.	68.4	65.6	65.4	67.6
ENVIRONMENT Items				
7. Faculty and staff feel that they make important contributions in this school.	83.2	86.6	76.9	81.3
9. Varied learning environments are provided to accommodate diverse teaching and learning styles.	81.5	83.7	79.8	82.5
10. The school building is neat, bright, clean, and comfortable.	80.5	72.1	72.1	72.7
14. School employees and students show respect for each other's individual differences.	69.0	67.8	58.0	68.9
29. An atmosphere of trust exists among the administration, faculty, staff, students, and parents.	57.6	62.3	48.1	56.5
38. Teachers are proud of this school and its students.	85.5	84.1	70.2	80.0
49. People in this school really care about each other.	73.4	78.3	66.7	73.3
EXPECTATIONS Items				
2. Low achieving students are given opportunity for success in this school.	90.6	94.6	86.5	91.7
3. School rules and expectations are clearly defined, stated, and communicated.	81.5	87.0	82.1	82.9
17. Students share the responsibility for keeping the school environment attractive and clean.	58.2	54.7	51.0	51.7
21. Students are held responsible for their actions.	66.0	63.0	65.7	68.3
22. Many students in this school are not expected to master basic skills at each grade level.**	21.2	19.9	16.0	90.8
27. Many students do not participate in classroom activities because of their sex, race, religion, socioeconomic status, or academic ability.**	14.1	9.8	8.7	93.3
43. Teachers have high expectations for all students.	81.1	86.6	82.4	80.0
INSTRUCTION Items				
4. Teachers use a variety of teaching strategies or models.	86.9	94.2	88.5	93.7
15. Teachers sequence learning activities so that students can experience success at each step.	85.2	87.7	83.7	86.7
24. Teachers provide opportunities for students to develop higher-order skills.	83.5	90.6	84.3	85.7
33. Curriculum guides ensure that teachers cover similar subject content within each grade level.	79.8	86.2	76.6	86.7
35. Teachers use appropriate evaluation methods to determine student achievement.	87.5	91.7	79.8	89.2
41. Pullout programs often disrupt and interfere with basic skills instruction.**	26.9	23.2	21.8	58.1
48. Teachers use a wide range of teaching materials and media.	83.5	92.0	86.5	85.4

**Items are negatively worded, therefore a lower score = a more positive result.

Table 8 continued

Section 1 - continued SCI Items by Scale: Percent strongly agree and agree	% Strongly Agree and Agree			
	01-02	02-03	03-04	05-06
INVOLVEMENT Items				
5. Community businesses are active in this school.	55.2	54.0	50.0	44.8
11. Parents are involved in a home and school support network.	40.1	41.3	42.9	45.4
12. Parents are treated courteously when they call or visit the school.	92.6	96.7	89.1	91.7
18. Parents are invited to serve on school advisory committees.	77.1	80.4	79.8	80.0
19. Parent volunteers are used wherever possible.	72.7	81.2	72.4	69.5
32. Information about school activities is communicated to parents on a consistent basis.	78.5	89.1	80.4	82.9
37. Parents are often invited to visit classrooms.	57.6	67.4	63.1	66.0
LEADERSHIP Items				
8. The administration communicates the belief that all students can learn.	89.9	92.8	88.8	91.1
20. The administration encourages teachers to be creative and to try new methods.	82.5	87.3	81.7	80.6
34. The administration provides useful feedback on staff performance.	76.4	87.0	72.1	70.5
36. The administrative staff does not do enough to protect instructional time.**	17.8	19.2	19.9	76.2
42. The principal is an effective instructional leader.	74.1	85.9	74.4	71.1
45. The goals of this school are reviewed and updated regularly.	76.4	77.2	73.1	74.6
47. The principal is highly visible throughout the school.	74.7	83.7	81.1	73.3
ORDER Items				
13. Rules for student behavior are consistently enforced.	57.6	65.2	56.1	60.6
23. Student discipline is administered fairly and appropriately.	60.9	57.2	57.4	60.6
25. Student misbehavior in this school interferes with the teaching.**	54.5	57.2	67.9	35.2
30. Student tardiness and absence from school is a major problem.**	37.4	38.4	43.3	29.5
39. The school is a safe and secure place in which to work.	80.1	78.6	72.4	75.9
44. Teachers, administrators, and parents assume joint responsibility for student discipline.	52.5	51.8	43.3	48.9
46. Student behavior is generally positive in this school.	62.6	60.1	51.0	51.7

** Items are negatively worded, therefore a lower score = a more positive result.

Table 9

SCI Section 2 - Dimensions by Overall Means and National Norms

Dimension	Year 1	Year 2	Year 3	Year 5	National Norm
Instruction	3.99	4.08	4.03	4.18	3.75
Expectations	3.88	3.90	3.91	4.04	3.78
Leadership	3.96	4.08	3.97	4.03	3.85
Environment	3.94	3.87	3.78	3.88	4.12
Involvement	3.78	3.93	3.82	3.82	3.71
Collaboration	3.71	3.79	3.67	3.79	3.98
Order	3.35	3.27	3.17	3.24	3.31
OVERALL	3.80	3.85	3.76	3.85	3.78

Inferential Analysis*. Although 7 out of 49 SCI items were phrased differently in the School Client Inventory-Revised (SCI-R) questionnaire used in 2005-06 when compared to the version used in 2001-02, the forms of the instrument have been equated. Therefore, the questionnaire's resulting dimensions were equivalent across the years. A multivariate analysis of variance (MANOVA) was conducted for the 7 SCI-R dimensions for comparing year 5 (2005-06, n = 315) with year 1 (2001-02, n = 297) and with the questionnaire national norms (N = 5313), as seen in Table 10 and Figure 4. At the multivariate level, there* *was a statistically significant difference ($p < .001$) between years and the norms. Multivariate pair-wise contrasts indicated that there was a significant difference in the SCIR items between Year 1 and Year 5 ($p < .001$) and also between Year 5 and the norms ($p < .001$). The alpha level was reduced to $p<.007$ by applying a Bonferroni adjustment for univariate level contrasts. For the comparison between year 1 and year 5, significant differences were found for two SCI-R dimensions: "expectations" ($p < .003$; ES = +.30) and "instruction" ($p < .001$; ES = +.27). In both dimensions, Year 5 scores were significantly higher than Year 1 scores. Two dimensions demonstrated significant differences between the norms and year 5: expectation ($p<.001$, ES=+.27) and involvement ($p=.003$, ES=+.27). Year 5 scores were higher than were the national norms for both of these dimensions. Means, standard deviations and the associated effect sizes are provided in Table 10.*

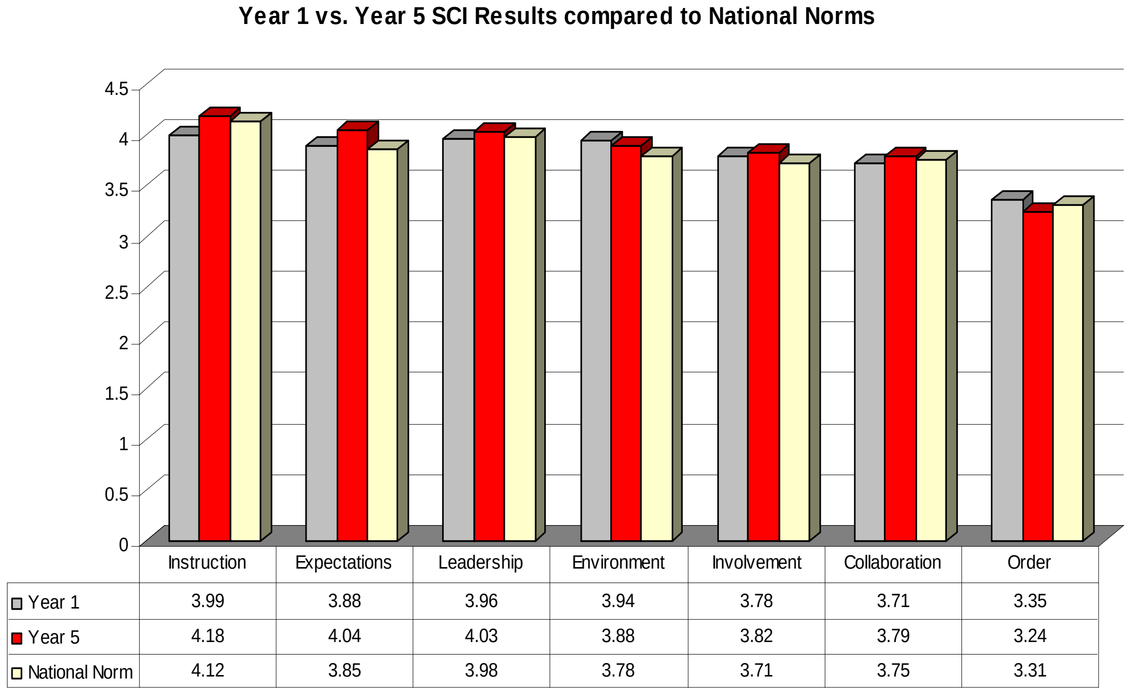
Table 10

SCI-R Dimension Means, Standard Deviations, and Effect Sizes for Year 1 (2001-2002),Year 5(2005-06) and National Norms

Scale: (1 = Strongly Disagree to 5 = Strongly Agree)

SCI-R DIMENSIONS	***Year 2001-02 (n = 297)***			***Year 2005-06 (n = 315)***			**ES**
	n	***M***	***SD***	**n**	***M***	***SD***	
Collaboration	270	3.71	0.58	298	3.79	0.75	+.12
Environment	281	3.94	0.63	281	3.88	0.77	-.09
Expectation**	275	3.88	0.60	288	4.04	0.66	+.25
Instruction**	274	3.99	0.48	286	4.18	0.56	+.36
Involvement	280	3.78	0.60	289	3.82	0.63	+.07
Leadership	282	3.96	0.65	286	4.03	0.83	+.09
Order	280	3.35	0.79	284	3.24	1.03	-.12
SCI-R DIMENSIONS	***National Norm (n = 5313)***			***Year 2005-06 (n = 315)***			**ES**
	n	***M***	***SD***	***n***	***M***	***SD***	
Collaboration	5312	3.75	0.70	298	3.79	0.75	+.06
Environment	5313	3.78	0.74	281	3.88	0.77	+.13
Expectation**	5312	3.85	0.66	288	4.04	0.66	+.29
Instruction	5311	4.12	0.57	286	4.18	0.56	+.11
Involvement**	5312	3.71	0.71	289	3.82	0.63	+.16
Leadership	5312	3.98	0.75	286	4.03	0.83	+.06
Order	5313	3.31	0.90	284	3.24	1.03	-.07

**p<.007



	Instruction	Expectations	Leadership	Environment	Involvement	Collaboration	Order
Year 1	3.99	3.88	3.96	3.94	3.78	3.71	3.35
Year 5	4.18	4.04	4.03	3.88	3.82	3.79	3.24
National Norm	4.12	3.85	3.98	3.78	3.71	3.75	3.31

Figure 4

Summary: The School Climate Inventory results revealed that the teachers had an overall positive perception regarding the school climate at the eight participating schools. Of particular interest is the significant Year 1 to Year 5 increase in teacher perceptions instruction and expectations. Also of note is the significantly more positive perceptions of the teachers regarding expectations and involvement as compared to teachers represented in the national norms.

Teacher Technology Questionnaire (TTQ)

The Teacher Technology Questionnaire (TTQ) was designed to capture teacher perceptions regarding five areas: (1) impact of technology on classroom instruction, (2) impact of technology on students, (3) teacher readiness to integrate technology, (4) overall support for technology, and (5) technical support.

There were 243 surveys for teachers in Year 1 and 235 in Year 5. The questions that composed each of the dimensions were the same for both years under investigation. As seen Table 11, Year 5 as compared to Year 1 and 2 results show an increase in the overall percentage of teachers agreeing or strongly agreeing with items. The greatest Year 1 to Year 5 change (30.9 percentage points) was for "teacher readiness to integrate technology" (Year 1 = 49.4%; Year 5 = 80.3%). Also noteworthy was a

23.5% increase in the number of teachers who were in agreement with the “impact on classroom instruction” items (Year 1 = 44%; Year 5 = 67.5%). In addition, Year 5 responses indicated 70% or more overall agreement in teacher responses for all but one area (impact on classroom instruction).

The most highly rated items on the survey were “teacher readiness to integrate technology” and the availability of “technical support”. A significant majority of the teachers (90.2%) agreed that “most of the school computers are kept in good working condition” and that “most of the students can capably use computers at an age-appropriate level” (85.1%). The lowest levels of agreement for all years was for “my teaching is more interactive when technology is integrated into the lessons” (Year 1 = 35.8%; Year 5 = 64.3%) and “I routinely integrate the use of technology in my instruction” (Year 1 = 39.5%; Year 5 = 63.4%). Yet, even these lowest levels of reported agreement indicate a significant increase during the years of the STARK program implementation.

Table 11

Teacher Technology Questionnaire (TTQ)

Year 1 (2001-2002) N = 243
Year 2 (2002-2003) N = 268
Year 3 (2003-2004) N = 207
Year 5 (2005-2006) N = 235

Section 1 Category and Related TTQ Items	Disagree & Strongly Disagree				Neutral				Strongly Agree & Agree			
Impact on Classroom Instruction	01-02	02-03	03-04	05-06	01-02	02-03	03-04	05-06	01-02	02-03	03-04	05-06
My teaching is more student-centered when technology is integrated into the lessons.	14.0	14.9	13.0	7.7	49.0	32.5	22.7	26.0	35.8	51.1	63.3	65.5
I routinely integrate the use of technology into my instruction.	30.0	18.7	17.4	12.3	28.8	29.1	20.8	23.8	39.5	50.4	60.9	63.4
Technology integration efforts have changed classroom learning activities in a very positive way.	9.9	6.0	3.4	3.4	28.8	25.0	22.2	18.3	60.9	67.2	73.4	76.6
My teaching is more interactive when technology is integrated into the lessons.	14.8	18.3	15.9	10.2	44.4	29.1	22.7	24.7	39.9	50.7	59.4	64.3
Overall	***17.2***	***14.5***	***12.4***	***8.4***	***37.8***	***28.9***	***22.1***	***23.2***	***44.0***	***54.9***	***64.3***	***67.5***
Impact on Students												
The use of computers has increased the level of student interaction and/or collaboration.	9.9	10.8	4.3	6.4	26.3	20.1	16.9	15.7	63.4	67.9	76.8	77.0
The integration of technology has positively impacted student learning and achievement.	9.1	7.1	8.7	3.0	24.3	19.4	11.1	15.7	65.0	71.6	79.2	80.9
Most of my students can capably use computers at an age-appropriate level.	7.0	7.5	6.8	6.0	18.5	15.7	6.8	8.5	73.7	75.7	85.5	85.1
The use of technology has improved the quality of student work.	11.9	11.9	11.1	6.8	30.0	32.5	29.5	30.2	58.0	53.7	58.5	61.7
Overall	**9.5**	**9.3**	**7.7**	**5.6**	**24.8**	**21.9**	**16.1**	**17.5**	**65.0**	**67.2**	**75.0**	**76.2**
Teacher Readiness to Integrate Technology												
I know how to meaningfully integrate technology into lessons.	17.3	9.0	10.1	3.0	31.7	17.9	7.2	12.3	50.2	71.6	81.2	84.7
I am able to align technology use with my district's standards-based curriculum.	14.0	9.3	9.2	4.7	38.3	22.8	20.3	21.3	46.1	65.7	68.6	72.8
I have received adequate training to incorporate technology into my instruction.	25.5	10.1	10.1	5.5	27.6	16.4	11.6	13.2	46.1	72.8	77.8	80.0
My computer skills are adequate to conduct classes that have students using technology.	18.5	9.7	9.7	3.8	25.5	13.1	8.2	11.5	55.1	75.7	81.2	83.8
Overall	***18.8***	***9.5***	***9.8***	***4.3***	***30.8***	***17.6***	***11.8***	***14.6***	***49.4***	***71.5***	***77.2***	***80.3***

Table 11 continued

Overall Support for Technology in the School												
Parents and community members support our school's emphasis on technology.	6.2	6.3	1.4	6.8	29.2	30.2	27.5	26.0	64.2	61.2	70.0	66.4
Teachers receive adequate administrative support to integrate technology into classroom practices.	14.0	6.0	6.3	2.1	28.4	15.7	13.5	14.9	57.2	76.9	79.7	81.3
Our school has a well-developed technology plan that guides all technology integration efforts.	17.3	11.9	9.7	6.0	33.3	33.2	27.1	26.0	49.0	52.6	62.8	66.8
Teachers in this school are generally supportive of technology integration efforts.	7.4	6.3	4.3	2.6	19.3	17.9	14.0	13.6	72.8	75.0	80.2	82.1
Overall	***11.2***	***7.6***	***5.4***	***4.4***	***27.6***	***24.3***	***20.5***	***20.1***	***60.8***	***66.4***	***73.2***	***74.2***
Technical Support												
Most of our school computers are kept in good working condition.	9.1	9.3	7.2	3.4	9.9	10.4	6.8	6.0	80.2	79.5	85.0	90.2
I can readily obtain answers to technology-related questions.	12.8	6.3	7.7	4.7	14.8	11.6	10.1	11.9	71.6	81.0	81.2	83.0
My students have adequate access to up-to-date technology resources.	19.8	17.2	14.5	7.7	24.7	17.5	15.9	14.5	52.7	62.3	69.1	77.4
Materials (*e.g.*, software, printer supplies) for classroom use of computers are readily available.	23.0	22.0	23.2	15.7	21.4	14.9	14.0	17.4	55.6	61.2	62.3	66.4
Overall	***16.2***	***13.7***	***13.2***	***7.9***	***17.7***	***13.6***	***11.7***	***12.5***	***65.0***	***71.0***	***74.4***	***79.3***

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

TTQ Section 2: Participant Information

Percentages by Categories

Item		01-02	02-03	03-04	05-06
How would you rate your level of computer ability?	Very Good	16.9	16.4	18.8	27.7
	Good	25.5	41.4	51.7	38.7
	Moderate	45.7	34.7	26.1	30.2
	Poor	11.5	6.3	1.4	2.6
	No Ability	0.0	0.0	0.0	0.0
Do you own a home computer?	Yes	89.7	89.2	92.8	91.1
	No	9.1	10.1	5.3	8.9
If yes, do you use your home computer to access instructional materials on the Internet?	Yes	71.6	72.8	80.7	87.9
	No	26.1	19.7	15.6	13.1
If yes, do you use your home computer to prepare instructional materials?	Yes	66.1	69.5	81.3	84.6
	No	30.3	21.8	14.1	15.4

Note: Percentages may not total 100% because of missing input from some respondents.

Inferential results: Year 1 vs Year 5. To determine if significant differences existed between Years 1 and 5 TTQ results, A MANOVA and follow-up univariate analyses were conducted to compare the two sets of data. Table 12 and Figure 5 present a summary of the results, which reveal a significant multivariate effect ($p < .001$). A significantly higher level of agreement among teachers was demonstrated for Year 5 when compared to the Year 1 baseline for each of the five dimensions: impact on classroom instruction ($p < .001$, $ES = +.58$), impact on students ($p < .001$, $ES = +.37$), teacher readiness to integrate technology ($p < .001$, $ES = +.83$), overall support for technology in the school ($p < .001$, $ES = +.45$), and technical support ($p < .001$, $ES = +.51$).

Table 12

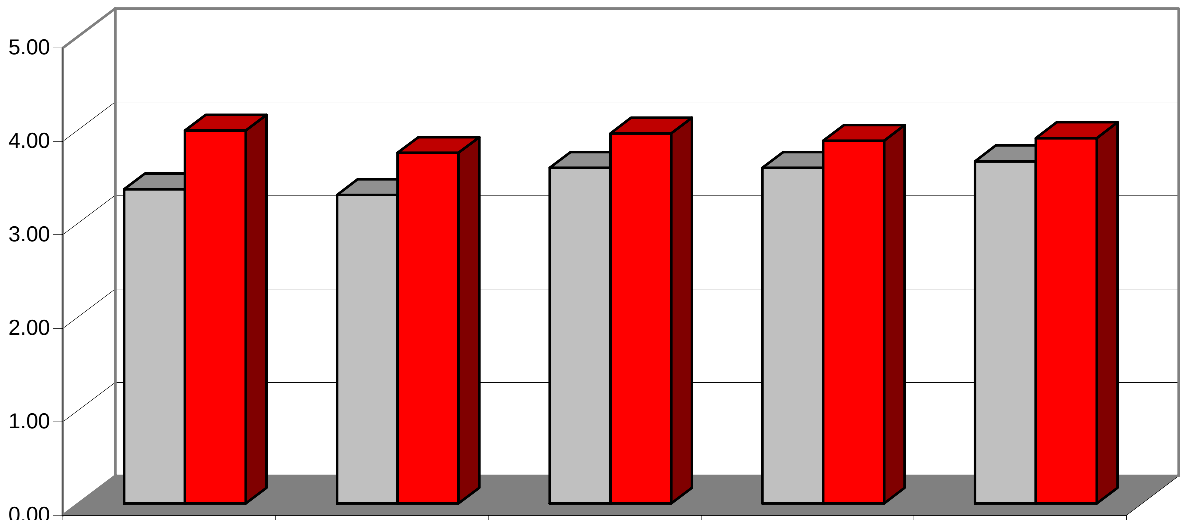
TTQ: Significant Differences Between Year 1 and Year 5

Scale: (1 = Strongly Disagree to 5 = Strongly Agree)

	Year 2001-02			***Year 2005-06***			**ES**
	n	***M***	***SD***	***n***	***M***	***SD***	
Impact on Classroom Instruction**	243	3.3	0.78	235	3.75	0.76	0.58
Impact on Students**	243	3.66	0.68	235	3.91	0.68	0.37
Teacher Readiness to Integrate Technology**	243	3.36	0.84	235	3.99	0.66	0.83
Overall Support for Technology in the School **	243	3.59	0.62	235	3.88	0.66	0.45
Technical Support**	243	3.59	0.77	235	3.96	0.67	0.51

**p<.001

TTQ: Year 1 and Year 5 Results



	Readiness to Integrate Tech (ES +0.83)	Impact on Instruction (ES +0.58)	Technical Support (ES +0.51)	Overall Support for Tech (ES +0.45)	Impact on Students (ES +0.37)
Year 1	3.36	3.30	3.59	3.59	3.66
Year 5	3.99	3.75	3.96	3.88	3.91

Figure 5

Summary: The TTQ results reflect very positive Year 1 to Year 5 changes in teacher attitudes. Specifically, there were significant increases in teacher readiness to integrate technology into their instruction, belief that technology had a positive impact on instruction and student learning, and belief that their schools had adequate technology support and that there was overall support for classroom use of technology.

Technology Skills Assessment (TSA)

The primary purpose for the TSA was to assess teacher perceptions of their technology ability with regard to completing tasks stated in the TEKS Technology Applications for grade 3-5 students. The survey begins by asking the teachers to rate “How easily…” (Not at all, Somewhat, Very easily) they could use or complete 47 computer-related tasks divided into six basic areas: (1) computers, (2) software, (3) multimedia, (4) Internet, (5) advanced skills, and (6) 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 is presented in Table 13.

Year 5 results showed positive increases in teacher confidence in completing technology-related tasks, specifically related to “Internet basics” (Year 1 = 24.5%; Year 5 = 45.2%), “software basics” (Year 1 = 45.2%; Year 5 = 64.8%), and “using technology for learning” (Year 1 = 11.3%; Year 5 = 25.2%). Only one area showed a slight Year 1 to Year 5 decrease (2 percentage points) in teacher confidence, “multimedia basics” (Year 1 = 48.4%; Year 5 = 44.4%).

Year 5 results also show that a majority of the teachers feel they can easily complete basic “computer” (79.8%) tasks, and over two-thirds expressed confidence that they can easily complete basic “software” (64.8%) tasks and have a clear understanding of basic technology-related “policy and ethics” (65.2%) issues. Little more than one-quarter of the teachers felt confident in being able to “very easily” complete “advanced” (25.2%) tasks and use “ technology for learning” (25.2%).

Table 13

Technology Skills Assessment Data Summary

Section 1 Category and Related TSA Items	Percent of Teacher Agreement											
	Not at All				Somewhat				Very Easily			
Computer Basics ***How easily can you …***	01-02	02-03	03-04	05-06	01-02	02-03	03-04	05-06	01-02	02-03	03-04	05-06
Use a spell check tool.	5.6	2.9	0.5	1.3	14.0	8.1	4.3	12.8	80.0	88.6	94.7	85.5
Create basic computer documents (word processed) in a timely manner.	6.0	3.3	0.0	2.1	23.9	14.0	10.6	12.8	69.5	82.0	88.9	84.3
Use help menus for software programs.	6.3	3.3	2.4	2.6	38.6	21.7	16.9	21.7	53.7	74.3	77.8	74.5
Use basic computer terms like mouse, keyboard, hard drive, CD-ROM, and monitor.	1.8	0.0	0.0	2.1	15.8	7.7	4.8	7.2	81.4	91.9	92.8	88.5
Save documents so they can be opened on both a Macintosh and PC.	20.7	11.4	4.8	7.2	29.1	25.4	22.7	26.8	49.1	62.1	71.0	64.7
Create folders on a hard drive or disk.	16.1	7.4	3.4	3.0	35.1	18.8	21.3	20.4	47.4	73.2	74.9	75.3
Save files to specific folders.	13.3	4.8	1.0	3.0	33.0	22.1	18.4	18.7	52.6	73.2	80.2	77.0
Locate and delete unwanted files.	7.7	2.6	1.0	3.0	25.6	19.1	13.0	16.6	65.3	77.2	85.5	77.9
Use keyboard commands to cut, copy, or delete text.	11.2	5.5	3.9	1.7	28.8	20.2	14.5	22.1	59.6	74.3	79.7	74.5
Proficiently use a mouse and keyboard.	1.4	0.0	0.0	0.0	15.8	8.5	8.7	11.5	81.8	91.5	91.3	86.4
Print a document using "Print" from the File menu and/or the toolbar icon.	2.1	1.1	0.5	0.9	9.1	4.4	3.4	8.1	88.1	93.4	95.7	88.9
Computer Basics: Overall	***8.4***	***3.8***	***1.6***	***2.4***	***24.4***	***15.5***	***12.6***	***16.2***	***66.2***	***80.2***	***84.8***	***79.8***
Software Basics												
Use software preview features to check work.	17.2	7.7	4.3	4.7	30.5	22.8	21.7	23.8	51.6	68.8	72.5	70.6
Open and use software programs that are installed on your computer.	3.5	1.5	1.0	2.6	29.5	18.4	10.6	16.6	66.0	79.4	87.4	80.0
Work with and move between two open programs (*e.g.*, Internet and database) to create a product.	30.9	11.8	7.2	4.7	30.9	31.6	27.1	26.8	38.2	56.3	65.2	67.2
Describe the difference between downloading and installing software.	21.4	10.3	6.3	6.8	36.1	30.5	31.4	26.0	42.1	58.5	61.8	64.7
Save documents so they can be opened in a different program (*e.g.*, from Word to Word Perfect).	33.7	14.7	10.1	12.8	32.6	34.6	31.4	35.3	33.0	49.6	57.0	51.1
Install software.	26.3	14.7	7.7	11.9	30.2	26.8	30.4	28.1	40.0	53.7	55.1	54.9
Software Basics: Overall	***22.2***	***10.1***	***6.1***	***7.3***	***31.6***	***27.5***	***25.4***	***26.1***	***45.2***	***61.1***	***66.5***	***64.8***
Multimedia Basics												
Import digital video from a camera to a computer.	62.1	47.4	37.7	30.6	21.1	26.1	30.4	31.1	16.5	25.7	30.4	34.9
Record and save your voice onto a computer.	72.6	57.7	48.3	46.0	18.9	22.8	25.6	29.4	8.1	19.5	24.2	22.6
Use a scanner to import a photo or document into a computer.	49.8	39.7	31.4	27.2	25.6	23.9	20.8	28.9	23.9	35.7	45.9	42.1
Play a music CD on the computer.	11.2	7.4	3.9	3.8	22.1	13.6	10.6	16.2	66.0	78.7	85.0	77.9
Multimedia Basics: Overall	***24.7***	***38.1***	***30.3***	***26.9***	***26.1***	***21.6***	***21.9***	***26.4***	***48.4***	***39.9***	***46.4***	***44.4***
Internet Basics												
Connect to the Internet with a modem (phone, cable).	18.2	11.8	7.2	8.9	24.2	11.8	8.2	16.6	57.2	76.1	83.6	71.9
Use Boolean strategies for Internet searches.	62.1	39.0	23.2	31.9	20.0	21.7	26.1	28.5	15.8	37.1	47.3	37.9
Use appropriate software and the Internet to find audio, video, and graphics for lesson plans.	38.2	16.5	11.6	8.5	36.5	37.5	35.7	38.7	24.6	44.9	52.2	49.4
Use the Internet to find help when you have a computer problem.	43.9	26.5	20.3	21.7	33.7	35.7	33.8	33.6	22.1	36.4	44.0	41.7
Determine if information you find on the Internet is accurate and valid.	40.0	23.9	15.9	14.0	41.1	39.7	44.9	42.1	18.9	35.7	37.7	39.6
Evaluate Internet search strategies to determine those that are most efficient.	41.4	24.3	15.0	14.5	38.2	35.3	37.7	41.3	20.4	39.3	46.4	40.9
Determine the usefulness and appropriateness of digital information.	54.7	33.8	25.1	22.6	32.3	33.1	36.2	36.6	12.3	32.0	37.7	35.3
Internet Basics: Overall	***42.6***	***25.1***	***16.9***	***17.4***	***32.3***	***30.7***	***31.8***	***33.9***	***24.5***	***43.1***	***49.8***	***45.2***

Table 13 continued

Advanced Skills												
Use more advanced computer terms like megahertz, gigabytes, and RAM.	53.0	38.6	30.0	30.2	31.2	39.3	41.1	47.2	14.4	21.0	26.1	18.7
Access information on local area networks (LANs) and wide area networks (WANs).	60.0	39.0	33.3	32.8	26.3	34.2	35.7	38.7	11.6	26.1	27.1	23.8
Use appropriate digital layout and design to meet the needs of defined audiences.	68.1	47.8	38.6	37.0	20.7	32.0	31.9	41.3	8.4	18.8	25.6	17.4
Use appropriate digital layout and design for the selected media (*e.g.*, multimedia, web, print).	67.0	45.6	33.8	35.7	22.8	32.0	38.6	42.1	8.4	21.3	23.7	18.7
Publish information in a variety of media (*e.g.*, printed, monitor display, web-based, video).	61.1	38.6	29.0	31.9	28.1	35.3	41.1	40.9	8.4	23.9	25.6	23.4
Connect a computer to a local server to share files.	67.0	47.1	37.2	40.4	23.9	26.8	34.8	33.6	7.7	24.6	22.7	20.4
Determine if a software program works with an operating system.	64.9	48.5	38.2	38.3	23.5	26.5	30.9	36.6	9.1	23.2	25.1	19.6
Print to a specific printer when connected to a network that has more than one printer.	46.0	28.7	19.3	16.2	28.8	26.1	24.6	31.9	23.5	44.1	52.7	49.4
Use presentation software to share information with specific audiences.	58.6	30.1	21.7	23.8	24.6	32.0	32.9	36.6	14.4	34.9	41.1	35.3
Advanced Skills: Overall	***60.6***	***40.4***	***31.2***	***31.8***	***25.5***	***31.6***	***34.6***	***38.8***	***11.8***	***26.4***	***30.0***	***25.2***
Using Technology for Learning												
Use multimedia software to enhance learning experiences.	42.8	18.8	13.5	13.2	38.6	42.6	42.5	46.4	16.5	36.4	40.6	37.4
Use appropriate software (*e.g.*, word processing, graphics, databases, spreadsheets, simulations, and multimedia) to express ideas and solve problems.	38.2	16.5	10.1	10.2	36.8	43.8	40.6	46.8	22.8	38.2	45.9	40.4
Use text and graphics to create and modify solutions to problems.	52.6	26.1	20.3	20.0	28.8	41.9	39.6	43.0	16.8	30.9	37.7	33.6
Use digital audio and video to create and modify solutions to problems.	70.2	44.1	35.3	34.9	21.8	37.9	38.2	39.1	6.3	16.5	22.2	20.9
Use communication tools to participate in group projects.	60.0	33.5	25.1	23.8	24.9	39.0	39.6	45.1	11.9	25.4	31.4	26.8
Manipulate information in interactive digital environments (*e.g.*, simulations, virtual labs, field trips).	71.6	50.4	44.4	47.7	20.0	30.5	30.9	33.2	6.0	17.6	20.3	14.5
Participate in a listserv, chat, and bulletin board session.	62.1	41.2	27.5	33.6	23.9	25.4	33.8	34.9	11.9	32.0	34.8	24.7
Create an electronic teaching portfolio to evaluate your work.	74.7	52.2	41.1	46.8	17.9	29.8	37.2	34.5	5.3	16.2	18.8	12.3
Evaluate electronic portfolio products.	74.7	52.2	44.4	50.2	18.9	30.9	35.3	31.1	3.5	14.7	17.4	12.3
Create technology tools to assess student work (*e.g.*, checklists, timelines, rubrics).	58.9	31.3	27.5	25.1	26.3	37.9	33.3	40.9	11.6	28.7	35.3	28.9
Using Technology for Learning: Overall	**60.6**	**36.6**	**28.9**	**30.6**	**25.8**	**36.0**	**28.8**	**39.5**	**11.3**	**25.7**	**30.4**	**25.2**
Policy and Ethics												
My school's acceptable use policy.	6.0	1.8	1.9	0.9	25.3	18.0	14.5	20.0	64.6	76.8	81.2	77.4
The concept of a school site license for software.	9.5	5.9	1.4	3.0	30.2	24.3	26.1	25.1	56.5	66.2	69.6	67.2
How to determine if it is legal to copy a software program or another individual's electronic work.	18.6	9.9	4.8	5.5	38.2	34.2	35.3	40.0	38.6	52.2	57.0	51.1
Policy and Ethics: Overall	***11.4***	***5.9***	***2.7***	***3.1***	***31.2***	***25.5***	***25.3***	***28.4***	***53.2***	***65.1***	***69.3***	***65.2***

Inferential results Year 1 vs Year 5. To determine if significant differences existed between Years 1 and 5, A MANOVA and follow-up univariate analyses were conducted to compare the two sets of data. Table 14 provides a summary of the results. The outcomes revealed that at the multivariate level, there was a significant difference between year 1 and year 5 ($p < .001$). Univariate outcomes indicated that technology skills assessed in all six dimensions were significantly greater in Year 5:

computer basics ($p < .001$, $ES = +.40$), software basics ($p < .001$, $ES = +.56$), multimedia basics ($p < .001$, $ES = +.56$), internet basics ($p < .001$, $ES = +.66$), advanced skills ($p < .001$, $ES = +.59$), and using technology for learning ($p < .001$, $ES = +.63$).

Summary: The TSA results also show positive Year 1 to Year 5 impacts of the STARK Program on teacher technology skills. As seen in the Effect Sizes, the greatest changes occurred in teacher confidence to use technology for learning and to complete advanced skills.

Table 14

TSA: Significant Differences Between Year 1 and Year 5

	Year 2001-02			***Year 2005-06***			**ES**
	n	***M***	***SD***	**n**	***M***	***SD***	
Internet Basics**	285	1.81	0.6	235	2.21	0.62	+0.66
Using Technology for Learning**	285	1.46	0.57	235	1.85	0.67	+0.63
Advanced Skills**	285	1.47	0.6	235	1.85	0.68	+0.59
Software Basics**	285	2.21	0.62	235	2.54	0.55	+0.56
Multimedia Basics**	285	1.79	0.56	235	2.13	0.65	+0.56
Computer Basics **	285	2.56	0.46	235	2.74	0.43	+0.40

**Sorted from highest to lowest Effect Size*
***p<.001*

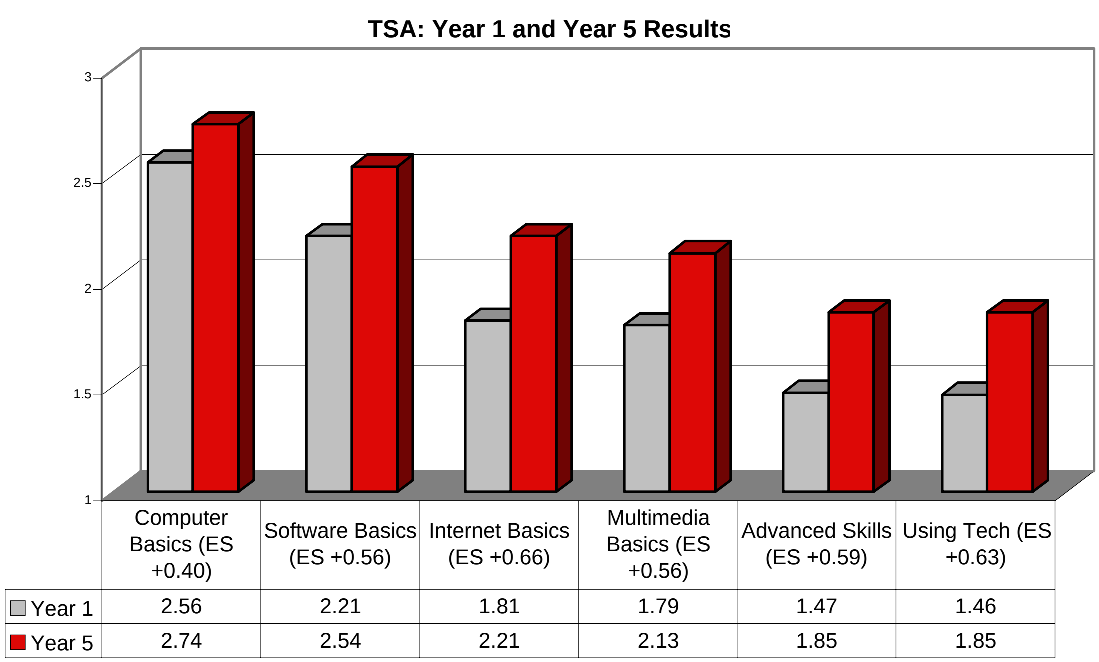


Figure 6

Conclusions

The conclusions of the study will be presented in association with each of the major research questions in the respective sections below.

To what degree and how is technology integrated with classroom instruction: a) by teachers who have received Foundation and/or integration training through the Enhanced Learning Academy, and b) do differences exist between novice and experienced teachers?

The observation data revealed the greatest significant Year 1 to Year 5 increase was teacher integration of student use of computers as a learning tool (*ES* = +1.08), which is in direct alignment with STARK program goals. Also impressive was the significant increase in classroom use of computers for instructional delivery (*ES* = +0.88). Specifically, in over three-quarters (79.3%) of the observations, technology was used as a means of delivering instruction through the use of educational software.

Results also suggest that some significant progress was made between Year 1 and Year 5 with regard to technology integration efforts. Student use of technology as a tool to enhance learning was observed in nearly two-thirds (63.8%) of the researchers' visits. Specifically, in Year 5, students more frequently used the Internet for research (Year 1 = 0%; Year 5 = 15.5%). In addition, the Year 5 data show that teachers were more capable of integrating student use of computers into their instruction in meaningful ways at a tenfold increase from Year 1 = 1.9% to Year 5 = 19%.

When examining the results by level of experience, only one significant difference was revealed during the classroom observations. The novice teachers more frequently used higher-level questioning strategies than the experienced teachers. This finding perhaps reflects refinement of the professional development that the novice teachers received.

These results overall suggest that the STARK Program has had a positive effect on the technology integration efforts of the trained teachers. Continuing professional development efforts should expand teacher ability to increasingly augment the learning environment by engaging students with the use of technology tools.

To what degree do integration-trained teachers use methodologies that, consistent with STARK Program goals, stress higher-order learning and student-centered learning activities?

The data indicate that integration-trained teachers were better able to create classroom environments that engaged students in higher-order thinking and learning. Student use of technology as a tool to enhance learning was observed in nearly two-thirds (63.8%) of the researchers' visits. RSCA data revealed that Year 5 teachers more frequently supported student-centered activities with technology. In a marked increase when compared to the first year of the STARK program, in over 30% of the observations, technology was used to support “higher level questioning strategies” (Year 1 = 1.9%; Year 5 = 37.9%), the use of “cooperative learning” (Year 1 = 3.7%; Year 5 = 32.8%) and “project-based learning” (Year 1 = 9.3%; Year 5 = 31%). Teachers also increasingly used technology to support “hands-on learning” (27.6%) and “independent inquiry” (25.9%). While technology was used slightly less frequently in conjunction with “student discussion”, this use still reflects a significant increase Year 1 (1.9%) to Year 5 (20.7%).

Continued professional development efforts should focus on better preparing teachers to increase the quality and frequency with which technology is utilized to enhance the development of higher-order thinking is students.

To what degree have teachers acquired the technology skills specified in the Texas Essential Knowledge and Skills (TEKS) Technology Applications ?

Impressive Year 5 TSA results showed that teacher confidence on all seven categories of technology skills continued to significantly increase as compared to Year 1. The greatest difference (*ES* = +0.66) was seen in teacher confidence in using the Internet, both from a technical and informational vantage point. This strategy increased from 24.5% to nearly half (45.2%) of the teachers. Importantly to STARK program goals, the second largest increase between Year 1 and Year 5 was the percentage of teachers who felt they could “very easily” implement “using technology for learning” - from 11.3% in Year 1 to 25.2% in Year 5, more than doubling. A majority of the teachers surveyed (79.8%) also expressed confidence that they could complete basic computer and software tasks “very easily”, and nearly half felt very confident when using the Internet and multimedia software. The percent of teachers who indicated they could very easily complete advanced tasks increased to nearly the same degree as those who could use technology for learning (Year 1 = 11.8%; Year 5 = 30.0%). These results are a strong indication of successful teacher training through the STARK Program.

What are school outcomes in school climate and teacher uses of and attitudes toward technology? To what extents do these variables (a) reflect Foundation training and STARK Program goals, and (b) correlate with one another and with implementation success?

Results from the Year 5 School Climate Inventory were somewhat mixed, with five mean scores being higher than Year 1 and two being lower, however not to a significant degree. Even with lower SCI ratings, the environment of the participating schools was still positive enough to support significant improvements in school-wide technology integration efforts. This was evidenced in the significant increases in frequency of classroom use of technology and teacher ability to create and implement meaningful computer activities. Positive teacher attitudes were also reflected in the TTQ results, which showed significantly higher teacher readiness to integrate technology and more confidence to conduct classes that have students use technology. Additionally, there was nearly unanimous teacher agreement that their district/schools provided necessary technical and overall support for the technology program. These findings suggest that although slight shifts may occur in school climate, the district is supportive of the technology initiative and the STARK Program had a positive impact on teacher readiness to integrate technology and teacher belief that technology has a positive impact on classroom instruction.

What factors appear most instrumental in determining schools' success at achieving the goals and overall implementation of the STARK Program?

Below is a list of key factors from the Year 5 study that appeared to have influenced the progress being made toward achievement of the STARK Program implementation goals. As seen, the factors address key elements that are critical for program success:

Significant differences in instructional practices

- Increased use of technology as a learning tool
- Increased use of computers for instructional delivery
- Increased use of student-centered learning that enhances higher-order thinking

Significant differences in the quality of instructional practices

- Increased use of meaningful computer activities

Significant differences in teacher attitudes and beliefs regarding technology integration

- The majority of teachers felt ready to integrate technology
- The majority of teachers believed technology positively impacts classroom instruction
- The majority of teachers agreed technology efforts were well-supported

Significant differences in teacher computer skills

- The majority of teachers reported confidence with using technology and integrating it with their teaching

Overall, the Year 5 results reflect impressive progress toward achieving the STARK Program goals. Specifically, the Year 5 data revealed significant changes from Year 1 in that teachers were more technologically competent, more frequently integrated technology into their instruction, and more frequently engaged students in meaningful technology-supported activities. Even though significant strides have been made, the scope of technology integration was somewhat limited with regard to the variety of software used and the overall degree of computer use. In order to enhance student experiences and maximize opportunities for improved learning, program expansion is recommended. Suggested areas of expansion include: (1) purchasing more computers to equalize distribution of access to all students; (2) implementing a computer maintenance and upgrade program to ensure up-to-date computers are available for student use; (3) continuing and expanding current professional development to build teacher capacity to fully utilize technology resources.

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Appendix A

Alignment of Technology Skills Assessment with NETS and TEKS

Alignment of Technology Skills Assessment with NETS and TEKS

NETS for Teachers

I. TECHNOLOGY OPERATIONS AND CONCEPTS: Teachers demonstrate a sound understanding of technology operations and concepts. Teachers:

A. demonstrate introductory knowledge, skills, and understanding of concepts related to technology (as described in the ISTE National Education Technology Standards for Students).

NETS for Students Technology Foundation Standards for All Students	NETS for Students Grades 3-5	TEKS Technology Applications Grades 3-5	Technology Skills Assessment
http://cnets.iste.org/index2.html	http://cnets.iste.org/index2.html	http://www.tea.state.tx.us/rules/tac/ch126.html#s1263	
1) Basic operations and concepts • Students demonstrate a sound understanding of the nature and operation of technology systems. • Students are proficient in the use of technology.	1. Use keyboards and other common input and output devices (including adaptive devices when necessary) efficiently and effectively. (1) 2. Discuss common uses of technology in daily life and the advantages and disadvantages those uses provide. (1, 2)	1. Foundations. The student demonstrates knowledge and appropriate use of hardware components, software programs, and their connections. The student is expected to:	
		1. use technology terminology appropriate to the task;	4. use basic computer terms like mouse, keyboard, hard drive, CD-ROM and monitor. 29. use more advanced computer terms like megahertz, gigabytes, and RAM. 55. If you were asked to describe the size of a hard drive, which measure would be most appropriate to use in your description?
		2. save and delete files, uses menu options and commands, and work with more than one software application;	7. save files to specific folders. 8. locate and delete unwanted files. 9. use keyboard commands to cut, copy or delete text. 11. print a document using “Print” from the File menu and/or the toolbar icon. 13. open and use software programs that are installed on my computer. 14. work with and move between two open programs (e.g. internet and database) to create a product. 51. Under which menu item is the “New” document option typically found? 53. Which of the following is a format used to save graphics? (see also 1-C)

		3. identify and describe the characteristics of digital input, processing, and output;	6. create folders on a hard drive or disk (see also 2-A) 15. describe the difference between downloading and installing software. 18. import digital video from a camera to a computer. (see also 2-A) 20. use a scanner to import a photo or document into a computer. (see also 2-A) 53. Which of the following is a format used to save graphics? (see also 1-C)
		4. delineate and make necessary adjustments regarding compatibility issues including, but not limited to, digital file formats and cross platform connectivity; and	5. save documents so they can be opened on both a Macintosh and PC. 16. save documents so they can be opened in a different program (e.g. from Word to Word Perfect). 35. determine if a software program works with an operating system. 52. How should a Macintosh-created word processed document be named so it can be opened on a PC?
		5. access remote equipment on a network such as a printer or other peripherals.	34. connect a computer to a local server to share files. 36. print to a specific printer when connected to a network that has more than one printer.
		2. Foundations. The student uses data input skills appropriate to the task. The student is expected to:	
		2. use a variety of input devices such as mouse, keyboard, disk drive, modem, voice/sound recorder, scanner, digital video, CD-ROM, or touch screen;	6. create folders on a hard drive or disk (see also 1-C) 10. proficiently use a mouse and keyboard. (see also 2-B, 2-C, 2-D) 17. install software. 18. import digital video from a camera to a computer. (see also 1-C) 19. record and save my voice onto a computer. 20. use a scanner to import a photo or document into a computer. (see also 1-C) 21. play a music CD on my computer. 22. connect to the Internet with a modem (phone, cable).

		3. use proper keyboarding techniques such as correct hand and body positions and smooth and rhythmic keystroke patterns;	10. proficiently use a mouse and keyboard. (see also 2-A, 2-C, 2-D)
		4. demonstrate touch keyboarding techniques for operating the alphabetic, numeric, punctuation, and symbol keys as grade-level appropriate;	10. proficiently use a mouse and keyboard. (see also 2-A, 2-B, 2-D)
		5. produce documents at the keyboard, proofread, and correct errors;	1. use a spell check tool. (see also 2-E) 2. create basic computer documents (word processed) in a timely manner. (see also 2-F) 10. proficiently use a mouse and keyboard. (see also 2-A, 2-B, 2-C)
		6. use language skills including capitalization, punctuation, spelling, word division, and use of numbers and symbols as grade-level appropriate; and	1. use a spell check tool. (see also 2-D)
		7. demonstrate an appropriate speed on short timed exercises depending upon the grade level and hours of instruction	2. create basic computer documents (word processed) in a timely manner. (see also 2-D)
2) Social, ethical, and human issues • Students understand the ethical, cultural, and societal issues related to technology. • Students practice responsible use of technology systems, information, and software. • Students develop positive attitudes toward technology uses that support lifelong learning, collaboration, personal pursuits, and productivity.	2. Discuss common uses of technology in daily life and the advantages and disadvantages those uses provide. (1, 2) 3. Discuss basic issues related to responsible use of technology and information and describe personal consequences of inappropriate use. (2)	3. Foundations. The student complies with the laws and examines the issues regarding the use of technology in society. The student is expected to:	
		A) follow acceptable use policies when using computers; and	48. my school's acceptable use policy.
		B) model respect of intellectual property by not illegally copying software or another individual's electronic work.	49. the concept of a school site license for software. 50. how to determine if it is legal to copy a software program or another individual's electronic work.

3) Technology productivity tools • Students use technology tools to enhance learning, increase productivity, and promote creativity. • Students use productivity tools to collaborate in constructing technology-enhanced models, prepare publications, and produce other creative works.	4. Use general purpose productivity tools and peripherals to support personal productivity, remediate skill deficits, and facilitate learning throughout the curriculum. (3) 5. Use technology tools (e.g., multimedia authoring, presentation, Web tools, digital cameras, scanners) for individual and collaborative writing, communication, and publishing activities to create knowledge products for audiences inside and outside the classroom. (3, 4)	7. Solving problems. The student uses appropriate computer-based productivity tools to create and modify solutions to problems. The student is expected to:	
		A) use software programs with audio, video, and graphics to enhance learning experiences;	38. use multimedia software to enhance learning experiences.
		B) use appropriate software to express ideas and solve problems including the use of word processing, graphics, databases, spreadsheets, simulations, and multimedia; and	39. use appropriate software (e.g. word processing, graphics, databases, spreadsheets, simulations, and multimedia) to express ideas and solve problems.
		C) use a variety of data types including text, graphics, digital audio, and video.	40. use text and graphics to create and modify solutions to problems. 41. use digital audio and video to create and modify solutions to problems.
4) Technology communications tools • Students use telecommunications to collaborate, publish, and interact with peers, experts, and other audiences. • Students use a variety of media and formats to communicate information and ideas effectively to multiple audiences.	5. Use technology tools (e.g., multimedia authoring, presentation, Web tools, digital cameras, scanners) for individual and collaborative writing, communication, and publishing activities to create knowledge products for audiences inside and outside the classroom. (3, 4) 6. Use telecommunications efficiently to access remote information, communicate with others in support of direct and independent learning, and pursue personal interests. (4) 7. Use telecommunications and online resources (e.g., e-mail, online discussions, Web environments) to participate in collaborative problem-solving activities for the purpose of developing solutions or products for audiences inside and outside the classroom. (4, 5)	10. Communication. The student formats digital information for appropriate and effective communication. The student is expected to:	
		A) use font attributes, color, white space, and graphics to ensure that products are appropriate for the defined audience;	31. use appropriate digital layout and design to meet the needs of defined audiences.
		B) use font attributes, color, white space, and graphics to ensure that products are appropriate for the communication media including multimedia screen displays, Internet documents, and printed materials; and	32. use appropriate digital layout and design for the selected media (e.g. multimedia, web, print).
		C) use appropriate applications including, but not limited to, spreadsheets and databases to develop charts and graphs by using data from various sources.	56. You have decided to have your students determine which of three cities has the greatest rainfall during the month of February, and provide the results in the form of a graph. Which of the following would be the best type of software for the students to use?
		11. Communication. The student delivers the product electronically in a variety of media, with appropriate supervision. The student is expected to:	
		A) publish information in a variety of media including, but not limited to, printed copy, monitor display, Internet documents, and video; and	33. publish information in a variety of media (e.g. printed, monitor display, web-based, video).

		B) use presentation software to communicate with specific audiences.	37. use presentation software to share information with specific audiences.
		12. Communication. The student uses technology applications to facilitate evaluation of communication, both process and product. The student is expected to:	
		A) select representative products to be collected and stored in an electronic evaluation tool;	45. create an electronic teaching portfolio to evaluate my work. (see also 12-B and 12-C)
		B) evaluate the product for relevance to the assignment or task; and	45. create an electronic teaching portfolio to evaluate my work. (see also 12-A and 12-C) 46. evaluate electronic portfolio products.
		C) create technology assessment tools to monitor progress of project such as checklists, timelines, or rubrics.	45. create an electronic teaching portfolio to evaluate my work. (see also 12-A and 12-B) 47. create technology tools to assess student work (e.g., checklists, timelines, rubrics).
5) Technology research tools • Students use technology to locate, evaluate, and collect information from a variety of sources. • Students use technology tools to process data and report results. • Students evaluate and select new information resources and technological innovations based on the appropriateness for specific tasks.	7. Use telecommunications and online resources (e.g., e-mail, online discussions, Web environments) to participate in collaborative problem-solving activities for the purpose of developing solutions or products for audiences inside and outside the classroom. (4, 5) 8. Use technology resources (e.g., calculators, data collection probes, videos, educational software) for problem solving, self-directed learning, and extended learning activities. (5, 6) 9. Determine which technology is useful and select the appropriate tool(s) and technology resources to address a variety of tasks and problems. (5, 6)	4. Information acquisition. The student uses a variety of strategies to acquire information from electronic resources, with appropriate supervision. The student is expected to:	
		A) apply appropriate electronic search strategies in the acquisition of information including keyword and Boolean search strategies; and	23. use Boolean strategies for Internet searches.
		B) select appropriate strategies to navigate and access information on local area networks (LANs) and wide area networks (WANs), including the Internet and intranet, for research and resource sharing.	30. access information on local area networks (LANs) and wide area networks (WANs). 54. Which of the following is a well- known Internet search browser?
		5. Information acquisition. The student acquires electronic information in a variety of formats, with appropriate supervision. The student is expected to:	
		A) acquire information including text, audio, video, and graphics; and	24. use appropriate software and the Internet to find audio, video and graphics for lesson plans.
		B) use on-line help and documentation.	25. use the Internet to find help when I have a computer problem.

		6. Information acquisition. The student evaluates the acquired electronic information. The student is expected to:	
		A) apply critical analysis to resolve information conflicts and validate information;	26. determine if information I find on the Internet is accurate and valid.
		B) determine the success of strategies used to acquire electronic information; and	27. evaluate Internet search strategies to determine those that are most efficient.
		C) determine the usefulness and appropriateness of digital information.	28. determine the usefulness and appropriateness of digital information.
6) Technology problem-solving and decision-making tools • Students use technology resources for solving problems and making informed decisions. • Students employ technology in the development of strategies for solving problems in the real world.	8. Use technology resources (e.g., calculators, data collection probes, videos, educational software) for problem solving, self-directed learning, and extended learning activities. (5, 6) 9. Determine which technology is useful and select the appropriate tool(s) and technology resources to address a variety of tasks and problems. (5, 6) 10. Evaluate the accuracy, relevance, appropriateness, comprehensiveness, and bias of electronic information sources. (6)	8. Solving problems. The student uses research skills and electronic communication, with appropriate supervision, to create new knowledge. The student is expected to:	
		A) use communication tools to participate in group projects; and	42. use communication tools to participate in group projects.
		B) use electronic tools and research skills to build a knowledge base regarding a topic, task, or assignment.	43. manipulate information in interactive digital environments (e.g. simulations, virtual labs, field trips).
		C) Participate with electronic communities as a learner, initiator, contributor, or mentor.	44. participate in a listserv, chat, and bulletin board session.
		9. Solving problems. The student uses technology applications to facilitate evaluation of work, both process and product. The student is expected to:	
		A) use software features, such as on-line help, to evaluate work progress; and	3. use help menus for software programs.
		B) use software features, such as slide show previews, to evaluate final product.	12. use software preview features to check work.