Telecommunications Infrastructure Fund Board Grant, Evaluation Report 2002-03

Austin Independent School District
Department of Program Evaluation
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Telecommunications Infrastructure Fund Board Grant Evaluation Report 2002-03

EXECUTIVE SUMMARY

The Telecommunications Infrastructure Fund Board Public School Grants (TIF PS10) are funds to assist schools in providing students with advanced technology skills and equipment to meet the challenges of the 21st Century. AISD used funds from the TIF PS10 grant to: 1) improve student access to advanced technology coursework; and, 2) improve student achievement by providing teachers with the knowledge, skills, and equipment necessary to teach courses in advanced technology applications and integrate technology into core content areas. Schools identified to participate were high schools with student populations that were largely economically disadvantaged and were diverse with respect to ethnic or racial groups.

To accomplish these goals, program staff provided teachers with three different kinds of technology professional development, ongoing support for implementation, and computer equipment and peripherals in a moveable computer cart that could be transported to classrooms as needed. The teachers called these carts Computers on Wheels or COWS. Teachers attending professional development agreed (1) to develop a content area unit that integrated technology with a core subject area (Unit of Practice or UOP), (2) to implement the UOP in the classroom, (3) to work with campus staff to write a “Cart Plan” that detailed how the cart would be shared among teachers on the campus, and (4) to teach advanced technology courses.

Major Findings

The evaluation of the TIF PS10 program was based upon (1) observations of professional development sessions, lessons in classrooms where technology was being integrated, and of ongoing support provided to teachers throughout the course of the grant, (2) focus groups and interviews with and surveys of teachers, students, and program staff, and (3) an examination of changes in students’ and teachers’ technology skills. Evaluation results indicated the following:

- Teachers agreed that the professional development provided during the summer months (MAESTRO and advanced technology courses) was useful and of high quality. All participants agreed that they gained valuable technology skills and that the facilitators shared important information about classroom implementation. Some teachers indicated that meeting less often and over the course of many weeks might be more beneficial for learning and processing information.

- Students' and teachers' technology skills in the areas of general computing, using spreadsheet, or presentation software, and Internet skills increased over the course of the year. By the end of the year, a higher percentage of both groups reported that they were proficient in each of the skill areas. Additionally, teachers reported increased proficiency in integrating technology into their classroom practice. By the end of the grant, teachers indicated that they and their students were using technology to creatively solve problems using multiple software packages.

- About one-fourth of the teachers finished and implemented a UOP. UOPs covered all four of the core content areas (i.e., mathematics, language arts, science, and social studies) as well as several elective areas. Some teachers worked in teams to produce a single UOP.

- Teachers trying to implement a UOP felt challenged by: (1) district policies that indicate the time frame during which certain topics should be covered, (called the Instructional Planning Guides or IPGs), (2) the availability of the COWS, and (3) the demands involved in developing the skills necessary to effectively collaborate to produce group projects.

- All five campuses met the goal of teaching at least four advanced technology courses. Four of the five campuses offered more advanced technology classes for the 2003-2004 school year than they did the previous year.

Recommendations

1. *Maximize the number of teachers who implement a complete Unit of Practice by restructuring professional development so that teachers leave with a viable UOP.* A clear challenge to the TIF PS10 and other technology integration programs (Samii-Shore, 2002) is that teachers do not have a finished product

when they leave the MAESTRO training. To create an aligned, uniform curriculum district leaders have created Instructional Planning Guides (IPGs) that designate a Scope and Sequence for each core content area. Because teachers need to implement their UOP during the 9-week time period set out by the IPGs and because they must share the carts, teachers' ability to implement would be greatly improved by restructuring MAESTRO training so that teachers have a viable UOP when they finish, and also by examining the timing of UOPs at each campus so that teachers can have access to computers when they need them.

2. *Create and nurture multiple sources of support for teachers who are implementing UOPs and advanced technology coursework.* Ongoing support for the implementation of UOPs is critical. Past programs have used technology support staff as a source of support and information to teachers with notable success (Samii-Shore, 2002). In the TIF PS10 grant however, teachers appeared to prefer on-campus support provided by either campus technology personnel or colleagues over support from district staff. Support of colleagues who work in close proximity (Batchelder & Christian, 1999) and campus technology support are important elements in implementing new ideas. Thus, promoting multiple conduits for support may be a profitable way to reach and support more teachers.
3. *Provide ongoing professional development that addresses challenges to successful implementation.* A major hurdle for teachers who implemented a UOP was helping students to work effectively in groups. Teachers' and students' existing frameworks for group learning, coupled with the integration of technology, were inadequate. Ongoing support and follow-up sessions that address group learning will strengthen teachers' abilities to provide high quality, challenging material and help students be more prepared for the demands of project-based, collaborative work.
4. *Publicize advanced technology course offerings to ensure that students take advantage of these opportunities to fulfill graduation plan requirements.* Teachers reported that once students were educated about the coursework available to them, they were excited to take advanced technology courses.

Make this information more widely available to make it easier for students to complete their recommended high school plans.

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PREFACE

The purpose of this report is to provide information to program staff, the Telecommunications Infrastructure Fund Board, and other stakeholders about the Telecommunications Infrastructure Fund Board Public School grant (TIF PS10). This information will help decision makers to improve existing and future technology integration programs in the Austin Independent School District.

ACKNOWLEDGEMENTS

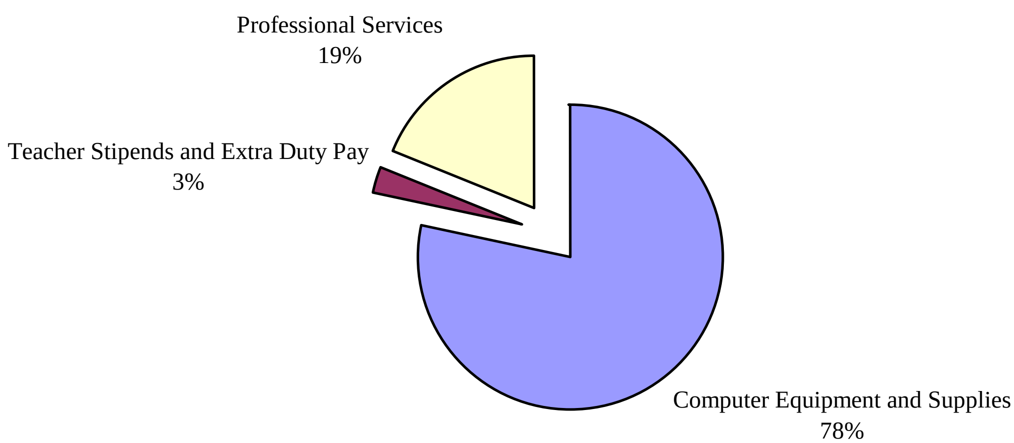
The evaluation team owe thanks to several key people for contributions to this report. First, we wish to thank the TIF PS10 program staff. Input and insights from program staff were invaluable at all stages, including: planning the evaluation; developing measures; introducing key informants; providing feedback on the report; and, keeping evaluators informed at every stage of implementation. Staff from the Division of Accountability and Information Systems provided programming assistance and helpful feedback. Finally, we wish to thank the teachers and students who participated in the TIF PS10 program and taught us about their experiences with the program.

OVERVIEW

The Telecommunications Infrastructure Fund Board Public School Grants (TIF PS10) are funds to assist schools in providing students with advanced technology skills and equipment to meet the challenges of the 21st Century. AISD used funds from the TIF PS10 grant to improve (1) student access to advanced technology coursework and (2) student achievement by providing teachers with the knowledge, skills, and equipment necessary to teach courses in advanced technology applications and integrate technology into core content areas. Schools identified to participate were high schools with student populations that were largely economically disadvantaged and were inclusive of ethnic or racial minorities.

AISD received $499, 405 to implement the program. AISD used the TIF PS10 grant funds for the purchase of mobile wireless carts, computers, video equipment, and software ($391,030), extra pay for teachers to attend sessions ($13,500), and professional services in the form of professional development and support to teachers ($94,875).

Figure 1. TIF PS10 Expenditures, 2002-03



Source: Finance Record of the TIF PS10 Grant, July, 2003

PROGRAM DESCRIPTION

AISD partnered with Apple Computers, Region XIII Education Service Center, and Austin Community College (ACC) to provide equipment and services. High school teachers from five campuses participated in three different kinds of professional development: a four-day session in technology integration (MAESTRO); several three-day sessions in different types of advanced technology coursework (Web Mastering, Digital Video Production, and Digital Animation); and, courses in Technology Applications Certification led by ACC faculty. Teachers who complete the Technology Applications Certification courses in July of 2003 will be certified to teach Technology Applications through Region XIII. Each school sent up to six participants to the four-day sessions, up to three participants to each three-day session, and up to three participants to the certification training. Attendance records indicate that all campuses sent the maximum number allowed to the MAESTRO and Technology Applications Certifications sessions, and most sent the maximum number to each of the advanced technology sessions.

Each campus received a mobile wireless cart (called computers on wheels or COWS) containing laptop and desktop computers, video equipment, mathematics tools (e.g., graphing calculators), and software. COWS were to be shared on campuses by the TIF PS10 teachers. Upon completing MAESTRO, participants were expected to work with campus staff to develop a "Campus Cart Plan" that detailed how the COWS would be made available to teachers.

Teachers who attended MAESTRO were expected to work either alone or in groups to create a Unit of Practice (UOP) that they would implement in their classrooms. UOPs are content area units that incorporate the use of technology in the lessons. The class time to implement a UOP varies between one or two days and up to six weeks. AISD staff created a repository for the UOPs designed by participating teachers. To view the UOPs that TIF PS10 and other AISD teachers have created, go to: http://uop.austin.isd.tenet.edu/

A staff person from the Department of Instructional Technology was assigned to each school to provide technical support and implementation assistance to teachers. Four additional professional development follow-up days were planned: (a) to help support teachers in refining their UOPs; (b) to provide further training in equipment use; and, (c) to discuss successes and challenges related to integrating technology in the classroom.

PROGRAM PARTICIPANTS

A total of 72 participants attended the professional development sessions provided by TIF PS10. Most participants were teachers (*n*=64); however, schools also were allowed to send other staff (e.g., librarians, technology support staff, and instructional coaches) who might benefit from the training and provide support to teachers using the technology. Participants were allowed to attend more than one session. Thirty-four teachers and staff attended MAESTRO technology integration training, 28 completed one or more of the advanced level courses, and 13 teachers currently are attending the Technology Applications Certification training.

Staff were encouraged to choose teachers who were comfortable using technology, especially those participants who attended the advanced technology sessions. Campus staff successfully recruited teachers who already were familiar with technology. Compared to a sample of sixth grade teachers who participated in a similar program (Samii-Shore, 2002), a higher percentage of teachers in the TIF PS10 program reported that they were proficient in almost all areas on a technology skills survey given at the beginning of the MAESTRO training (see Appendix A for a copy of the survey).

RESULTS

The goals of this program were to increase student core content achievement and technology skills by integrating technology into regular classroom activities and by creating increased access to advanced technology courses. This section first examines the impact of the professional development provided to TIF PS10 teachers because teachers' knowledge and ability to implement are critical components of student success. Finally, changes in students' knowledge, skills, and access to advanced courses are explored.

PROFESSIONAL DEVELOPMENT AND CHANGES IN TEACHER LEARNING

The TIF PS10 grant provided funds for three different types of professional development: the MAESTRO summer technology integration institute, three different advanced technology skills sessions, and a technology certification training. This section examines the quality and impact of the first two types of professional development because the Technology Certification training is not yet complete.

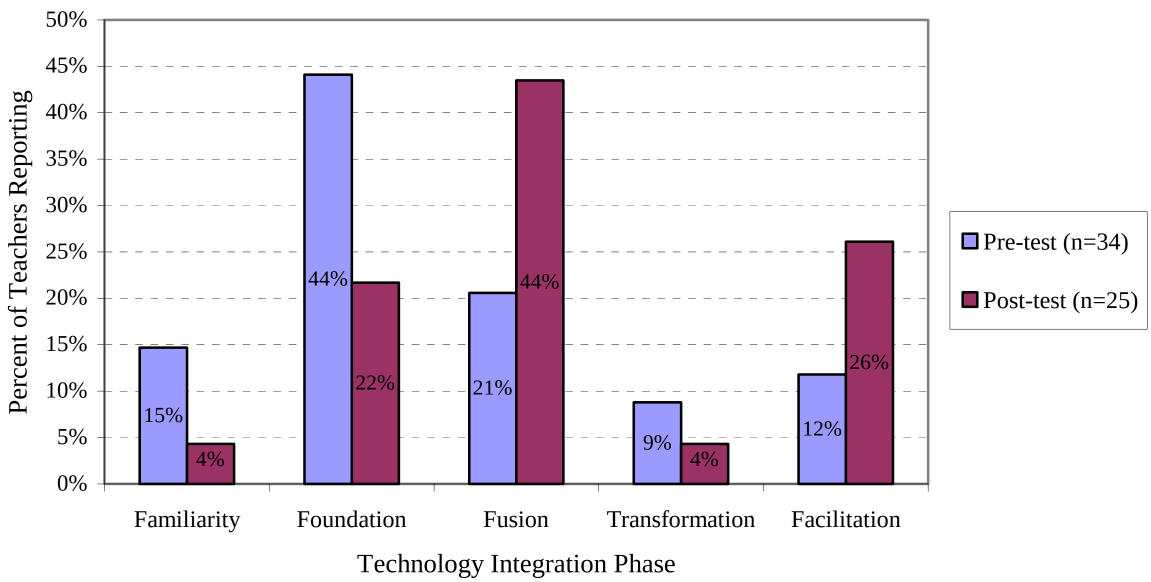
MAESTRO Summer Institute

Data from technology skills surveys completed by teachers before the MAESTRO summer institute began, and again at the end of the program, confirm that teachers acquired new technology skills. More teachers reported that they were proficient in all skill areas (General, Word Processing, Spreadsheet, Presentation Software, and Internet) at the end of the program. Depending upon the skill, anywhere from 3% to 38% more teachers reported that they felt they could either do the skill themselves or do it and show other how to do it as well (see Appendix B for comparisons of technology skills and increases).

Teachers also were asked to rate on 5-point scale, before and after the program how they used technology in the classroom (see Appendix C for the scale and its associated definitions). Higher levels on the scale indicate that teachers are becoming more skilled in integrating technology because they are using technology as a tool to deliver content and using more collaborative approaches to learning. At the most basic stage of integration, *Familiarity*, teachers rarely use technology in class and have only basic skills themselves. The *Foundation* stage indicates that teachers know basic software packages and sometimes require students to use those packages to complete assignments. Teachers in the *Fusion* stage indicate that they and their students regularly use more than one software package to produce content related products. At the *Facilitation* stage teachers report that they and their students use software in unique ways to solve problems and create new knowledge.

As compared to answers on the pre survey, teachers reported on the post-survey that they were using technology in a more integrated and rigorous fashion than they were before the program began. As Table 1 indicates, more teachers reported that they were in Fusion and Facilitation and less in Familiarity and Foundation.

Table 1. Teachers' Reported Phase of Technology Integration



Source: Teachers pre and post-surveys of technology integration, 2002-03.

Teachers' impressions of the summer institute collected during focus groups and from surveys generally were positive. Many cited the facilitators' knowledge of technology and classroom practice as the best elements of the professional development. They also stated that they learned many new technology skills, such as how to create digital movies and how to use presentation software. The most frequent feedback for improvement had to do with time: Teachers thought that the training should be spread out over the course of several weeks rather than all day long on consecutive days. National Staff Development Council standards for teachers' professional development indicate that adequate time to practice and integrate new skills is an integral component of professional development that has a lasting positive effect on teachers practice (NSDC, 1999).

Teachers also attended a two-day follow-up session in late fall and an evening showcase of the work produced by all of the teachers who had attended MAESTRO sessions the previous summer. The fall follow-up was initially designed as a day to brainstorm successes and challenges to implementation and to learn more about the equipment. Facilitators changed the format, however, when they realized that most teachers had not finished writing their UOPs. The follow-up session instead became a workday for teachers to complete their UOP, a discussion of how to write a cart use policy, and information about using the equipment that was included in the cart. These changes, although necessary, meant that teachers did not have time to reflect on the challenges and successes involved in technology integration and were not able to access the facilitators' experience in this area.

The Winter Showcase was developed as a way for teachers involved in several different grants to share their work and experiences with each other, and to help create a vision of what was possible to do with technology in the classroom. Because the Winter Showcase included work from anyone who attended a MAESTRO summer institute in 2002 and implemented a UOP, much of the work that was presented was produced by elementary and middle school teachers. The TIF PS10 grant was for high school teachers only. Technology support staff reported that they had a difficult time finding TIF PS10 teachers who were willing to present their materials. In the end, only one teacher from the TIF PS10 grant was willing and able to present the work done with grant support.

TIF PS10 teachers who attended the showcase reported that they enjoyed seeing the UOPs that were produced, although they learned little that would help them to implement in their own classrooms. Informal observations of the evening and standards for effective professional development add credence to teachers' comments; for professional development to be effective, teachers must have opportunities to critically analyze work, reflect on their own and others' work, and apply it in their own classrooms (NSDC, 1999). The showcase created an opportunity to celebrate work, motivate participants, and create vision, but it was too large and unstructured to create lasting, meaningful learning for most teachers and was less relevant for high school teachers.

Advanced Technology Training

Teachers' self reports of proficiency with the content area collected after the training and after the program show similar patterns for both the Digital Video and Digital Animation trainings. As Tables 2 and 3 indicate, participants reported that they were not very proficient before the training, that the training had increased their proficiency considerably by the end of the program (late May). However, post-program follow-up assessments revealed that with time, the teachers' sense of proficiency diminished somewhat.

Table 2. Participants' Reported Level of Proficiency in Digital Graphics and Animation: Before and After Training, and Post-program

Proficiency Level	Before training (*n*=8)		After training (*n*=8)		Post program (*n*=4)	
	n	**%**	**n**	**%**	**n**	**%**
Low	2	25	1	12	1	25
	4	50	1	12	2	50
Medium	1	12	3	38	0	0
	1	12	2	25	1	25
High	0	0	1	12	0	0

Source: Fall and Spring Teacher Technology Surveys

Table 3. Participants' Reported Level of Proficiency in Digital Video: Before and After Training, and Post-Program

Proficiency Level	Before training (*n*=7)		After training (*n*=7)		Post program (*n*=6)	
	n	**%**	**n**	**%**	**n**	**%**
Low	2	29	1	11	0	0
	3	43	1	0	2	33
Medium	1	14	5	11	3	50
	1	14	0	56	1	17
High	0	0	0	0	0	0

Source: Fall and Spring Teacher Technology Surveys

Because class sizes for the advanced trainings were small (15 maximum per class), the number of surveys collected for each course was limited (*n*=4 to 9 per class). Thus, the survey results and any reasons for the reported changes in proficiency should be interpreted with caution. Interviews with teachers who attended suggested that decreases in teachers' proficiency levels may be due to the lack of follow-up trainings. Many teachers did not teach these classes during the 2002-03 school year and thus had fewer opportunities to improve their skills.

Technology integration professionals, who participated in these workshops and met with the evaluator to describe the quality of the sessions, and teachers who reported their perceptions during focus groups, agreed that the workshops were engaging, and were presented in a way that allowed them to collaborate and to learn by doing. It was suggested by teachers that there should be prerequisites in order to be sure the class was at the right level and that follow-up sessions would be necessary for them to implement these skills in the classroom.

Ongoing Support for Implementation

To provide ongoing support to teachers integrating technology in the classroom, each campus was assigned a technology support staff person from the Office of Instructional Technology. Support staff contacted teachers on each campus, provided ongoing professional development in the form of classroom observations, mentoring, and small group professional development on a variety of topics. Technology support staff reported that teachers seemed reluctant to ask for help, and reluctant to allow staff to observe in classrooms and offer suggestions. Staff provided help when teachers asked, yet the teachers who were implementing were the most likely to ask. Support staff reported that teachers at the elementary campuses, where IT staff provided assistance, were more willing to ask them for help and support.

Although many teachers did not access the support provided by technology support staff, they did find support for implementation in other ways. On some campuses, several teachers worked together in teams to develop one UOP that one or more of them were able to implement. Teachers who worked this way generally taught in the same content area and sometimes worked in close proximity to one another. One campus had an additional technology support person, located on the campus, whom teachers relied on for support and assistance. Teachers at this campus reported that they felt more comfortable accessing the campus support person because the individual was located on the campus and was able to respond more quickly. The campus support person attributed teachers' willingness to rely on the on him/her to the ongoing relationships they were able to build as colleagues rather than being viewed as an expert by teachers.

PROGRAM IMPLEMENTATION AND CHANGES IN STUDENT LEARNING

Student learning depends upon quality implementation. This section explores classroom implementation, student learning, and student access to advanced technology courses.

UOPs and Technology in the Classroom

Nineteen teachers submitted 12 UOPs to the UOP web page. There were more teachers than UOPs because some teachers worked in groups to write a single unit. These UOPs covered the four core content areas (i.e., mathematics, science, language arts, and social studies) as well as photography, French, and journalism. UOPs that teachers developed exposed students to a variety of software packages, made use of the Internet as a research tool, and introduced students to movie making and digital image manipulation.

Of the 34 teachers trained in technology integration, about one-fourth of teachers n=9) reported implementing a UOP. Some teachers reported that they increased their use of technology in the classroom instead of implementing a UOP. Focus group data collected from teachers and technology staff at the end of the year indicated that many teachers had wanted to implement a UOP but felt they were not able to because of the District's Instructional Planning Guides (IPGs) that designate a 9-week period of time (sometimes more than one 9-week period) when teachers may teach certain topics and problems that they encountered scheduling use of the COWS. District leaders confirm that all teachers can substitute a UOP for the suggested lesson plans that are included in the IPGs, but that all teachers need to follow the IPGs and teach the specific topics within the designated 9-week period.

Coordinating classroom implementation of the UOPs was particularly challenging to teachers this year because it was the first time teachers had tried to implement a UOP, the first year for teachers to work with the IPGs, and the first year for teachers to have access to the COWS. Because the COWS must be shared among teachers on the campus, and UOPs have a specific 9-week period in which they need to be implemented, scheduling issues must be worked out well in advance of implementation.

Despite these challenges, several teachers found ways to incorporate technology in the classroom. Some teachers implemented an abbreviated UOP or another teacher's UOP that fit better within the parameters of the District's IPGs. When COWS were inaccessible, teachers used campus computer labs or had student teams rotate to use computers in their own classrooms.

Implementation of UOPs

Evaluators and support staff informally observed several teachers implementing UOPs during the course of the year. Evaluators used a rubric to focus field notes on critical areas of technology integration. Evaluators looked for evidence of: (a) relevant content area and technology TEKS, (b) skilled presentation of the content area, (c) technology that enhanced student learning and supported higher level thinking skills, and (d) relevant assessment materials (see Appendix D for the rubric).

Teachers and students reported that they were excited to have technology in the classroom. One of the staff said, "I love to see the kids getting so into it. They come right in and get right down to work." Classroom observations indicated that students were involved and on task when the technology was engaging and when content related problem solving was at the forefront. In one classroom, the teacher had students explore a diagramming software package by working in groups to create a diagram about each group member. Students were unfamiliar with the software and had to work together to figure out how it worked as well as decide how to work together to make a single presentation.

Challenges arose when teachers created UOPs that demanded lower level processing, such as filling in blanks with bookmarked materials, or when group work was structured in ways that allowed students to work individually. When this happened students who finished early played games on the computer or checked email instead of working with the group to complete the task. Observations indicate that some teachers wrote UOPs that demanded high-level, project-based learning, but in practice teachers seemed to struggle with the dynamics of keeping all students on task and sufficiently challenged while allowing for enough time for students to struggle and experiment with the material. In a study of standards-based mathematics implementation, researchers found similar challenges. Teachers were able to provide and maintain sufficiently challenging tasks when they provided adequate time for students to work through difficult content and when they scaffolded students to a higher understanding, rather than reducing the complexity of the problem (Stein, et al., 2000).

Group Process and Technology Integration

When students were asked what they thought were the benefits of using technology, they stated that it made projects easier to complete, fun, and interesting. Most thought they had learned more about the content because they were able to use the technology to learn content in new ways. Many were discouraged by the limited access they had to computers and by the need to share computers. Although both students and teachers indicated that they would like to have more computers available, collaboration and constructivist practices are enhanced when the ratio of students to computers is 4:1 (Boethel & Dimmock, 2001).

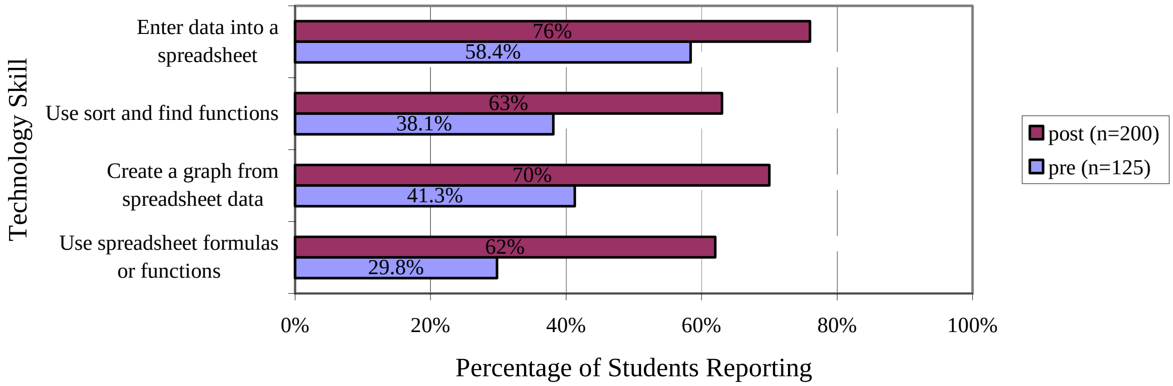
Group dynamics in general were difficult to manage, although some reported effectively functioning teams of students. Many student teams reported that one or two students did most of the work and that they didn't know how to influence their peers to work together. Teams that reported that they enjoyed working together tended to use an "Expertise Model" for getting work done: They assigned parts of the task according to what students already knew how to do. This model was efficient for getting an entire project done and led to less conflict, but did not create opportunities for students to become competent with unfamiliar facets of the technology.

Students stated they were uncomfortable with their teachers' lack of expertise in technology and with the long process of fixing problems. One student described the process of accessing technology support this way: "We would have a problem, the teacher would tell us to look in the manual. She didn't seem to know what to do. Then she would call for help [from tech support], but by the time they got here we had fixed it ourselves." This finding suggests that students are ill at ease when teachers are not the experts. Because implementing UOPs means that teachers will be restructuring their classroom practice in ways that call upon students to work together and share expertise, making information about the process of technology integration and constructivist practice available may be beneficial to both students and teachers.

Changes in Students' Knowledge and Skills

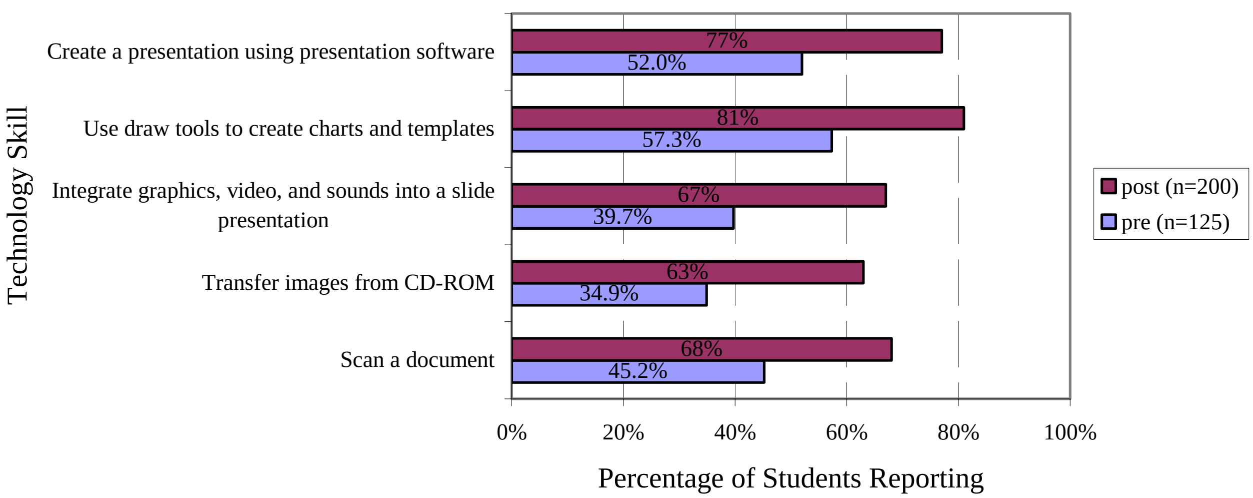
Despite challenges, students' technology skills improved over the course of the year. Students of teachers who participated in TIF PS10 were asked to report how proficient they thought they were on 25 technology tasks (e.g., cutting and pasting text, using the Internet for research, entering data into a spreadsheet) at the beginning of the school year (n=125) and again in May (n=200). As compared to the pre-test, more students reported on the post-test that they were proficient in all tasks but one; increases in proficiency ranged from 4% to 32% more students depending upon the task (see Appendix E for skills and percentages). Not surprisingly, more students reported proficiency in skills in which few students had initially been proficient, that is, spreadsheet and presentation software skills.

Table 4. Percentage of Students Reporting Proficiency on a Technology Skills Survey: Spreadsheet Skills



Source: Fall and Spring Student Technology Surveys

Table 5. Percentage of Students Reporting Proficiency on a Technology Skills Survey: Presentation Software Skills



Source: Fall and Spring Student Technology Surveys

Student Achievement

The impact of teachers' implementing a UOP on student achievement was examined by comparing implementation to student passing rates on the Texas Assessment of Knowledge and Skills (TAKS) subject areas including English Language Arts, Mathematics, and Science. Teachers who participated in TIF professional development were surveyed to determine who implemented UOPs in which classes. Information about implementation was received from 22 teachers. The TAKS passing rates of students in classes of five teachers who implemented UOPs in a subject area and grade level tested on the TAKS were compared to the TAKS passing rates of students in the same teachers' classes in which UOPs were not implemented. Some students were eliminated because they were taking a class but were not tested due to their grade levels (e.g., 12th graders are not tested in any subjects on TAKS and 9th graders who take biology are not tested in science until 10th and 11th grade TAKS). Statistical tests revealed no differences on English and Language Arts TAKS passing rates for 46 students who took the test and either participated in a UOP or did not[1]. Although differences on Mathematics and Science TAKS passing rates occurred with more students who participated in UOPs passing than did students who did not participate in UOPs, the results were confounded by other variables. For example, UOPs were implemented only in AP and Honors mathematics classes and UOPs were implemented in primarily magnet classes.[2] Thus, the impact of implementing UOPs on student content knowledge in core subject areas is uncertain on the basis of this analysis.

To improve the examination of the impact of technology integration on student achievement, future data collection and analysis should include two key elements. First, the quality of implementation of the UOP, including the depth of content covered, needs to be rated to determine the possible impact of technology integration on student learning. Second, for a fine grain analysis of the content area addressed in UOPs and expected student learning, research needs to link the specific content area taught with the correspondent TAKS objective. These improvements in analysis would make conclusions about the impact of UOPs on student learning appropriately drawn.

Furthermore, research suggests that student achievement, as measured by state-level student testing data, is most likely to be affected by technology when the technology is used as a tutor for students to practice basic content area skills. When technology is integrated as one tool of many in the classroom to create project-based, student-centered classroom practice, students show improved critical thinking skills, ability to work and negotiate with peers, and increased job skills in the form of being able to locate and synthesize data (Ringstaff & Kelley, 2002) *and* perform comparably to students in traditional classrooms on tests of student achievement (Penuel, Golan, Means, & Korbak, 2000).

[1] Chi-square = .28, $p < .05$.
[2] For students taking mathematics courses, $n = 52$; for students taking science courses, $n = 32$.

Technology Course Offerings

Another goal of the TIF PS10 grant was to increase the number and type of advanced technology courses offered at each of the five participating schools. As Table 6 indicates, four of the five schools increased the number of advanced technology courses they offered from 2002-2003 and three were able to schedule and teach more classes in 2003-04 than they did in 2002-03. All five of the schools offered more than the required four courses, which was the original goal of the TIF PS10 grant (see Appendix F for exact course offerings by year).

Table 6. Total Number of Courses Offered and Taught at TIF PS10 Schools: 2002-2003 and 2003-2004

School Year	Akins		Crockett		Johnston		LBJ		Travis	
Total Number of Courses	O*	M*	O*	M*	O*	M*	O*	M*	O*	M*
2002-2003	**4**	**4**	**4**	**4**	**7**	**7**	**2**	**2**	**6**	**6**
2003-2004	**6**	**6**	**6**	**5**	**12**	**4**	**6**	**6**	**6**	**6**

*O= course offered, M= course made, S=course stacked into another course so students can receive credit
**Data source: Class Schedule Managers at each campus.*

Teachers suggested that campuses needed to be more organized and make a greater effort to inform students that these classes existed and of the benefits of taking advanced technology coursework. One teacher commented, “My kids love this class and now that they have taken it, they want more.” Teachers believed that if campus faculty and staff would make a commitment to inform students they would see an even greater increase in the number of classes that had enough students registered to be taught.

CONCLUSIONS AND RECOMMENDATIONS

Research indicates that when technology is used as a tool to help students learn core content areas, students gain valuable knowledge and skills. Additionally, when technology is one of many tools for students to use in the classroom, and when that tool is used regularly, the structure of teachers' classroom practice becomes project-based and student-centered (Ringstaff & Kelley, 2002). Although students and teachers in the TIF PS10 program reported frustration with the group processes integral to implementing UOPs, working through these challenges provides students with the skills necessary in the job market: the ability to work collaboratively, to share and find information, and to make use of data to understand complex systems (Secretary's Commission on Achieving Necessary Skills [SCANS], 1991).

Teachers' self reports of the quality of the summer professional development sessions and increases in both teachers' and students' technological proficiency are encouraging and serve as indirect evidence of the quality of the professional development provided. However, for all teachers to be able to implement skillfully so that students will be able to learn to use technology as a tool to learn content in more interesting and challenging ways, we recommend the following:

1. *Maximize the number of teachers who implement a complete Unit of Practice by restructuring professional development so that teachers leave with a viable UOP.* A clear challenge to the TIF PS10 and other technology integration programs (Samii-Shore, 2002) is that teachers do not have a finished product when they leave the MAESTRO training. Because teachers need to implement their UOP during one or more particular 9-week time frames set out by the IPGs and because they must share the carts, teachers' ability to implement would be greatly improved by (1) restructuring MAESTRO training so that teachers have a viable UOP when they finish, and also by (2) examining the timing of UOPs at each campus so that teachers can have access to computers when they need them.
2. *Create and nurture multiple sources of support for teachers who are implementing UOPs and advanced technology coursework.* Ongoing support for the implementation of UOPs is critical. Past programs have used technology support staff as a source of support and information to teachers with notable

success (Samii-Shore, 2002). In the TIF PS10 grant however, teachers appeared to prefer on campus support provided by either campus technology personnel or colleagues over support from district staff. Support of colleagues who work in close proximity (Batchelder & Christian, 1999) and campus technology support are important elements in implementing new ideas. Thus, promoting multiple conduits for support may be a profitable way to reach and support more teachers.

3. *Provide ongoing professional development that addresses challenges to successful implementation.* A major hurdle for teachers who implemented a UOP was helping students to work effectively in groups. Teachers' and students' existing frameworks for group learning, coupled with the integration of technology, were inadequate. Ongoing support and follow-up sessions that address group learning will strengthen teachers' abilities to provide high quality, challenging material and help students be more prepared for the demands of project-based, collaborative work.
4. *Publicize advanced technology course offerings to ensure that students take advantage of these opportunities to fulfill graduation plan requirements.* Teachers reported that once students were educated about the coursework available to them, they were excited to take advanced technology courses. Make this information more widely available to make it easier for students to complete their recommended high school plans.

APPENDICES

APPENDIX A: TEACHER SURVEY OF TECHNOLOGY SKILLS

a - I don't know how to do it. **c - I can do it by myself.**

b - I can do it with a little help. **d - I can show others how to do it.**

	General Skills				
1.	Save, copy and delete files in/from the hard drive	a	b	c	d
2.	Save files to a floppy disk	a	b	c	d
3.	Copy, cut, and paste text	a	b	c	d
4.	Size and move graphics	a	b	c	d
5.	Use drawing tools (e.g. paint, pencil, select tool)	a	b	c	d
	Word Processing Skills				
6.	Create simple documents (e.g., letters, reports)	a	b	c	d
7.	Edit, modify, and spell check documents	a	b	c	d
8.	Create a document with text and graphics	a	b	c	d
9.	Merge documents	a	b	c	d
10.	Use advanced features (tables, headers or footers, macros, etc.)	a	b	c	d
	Spreadsheet Skills				
11.	Enter data into a spreadsheet	a	b	c	d
12.	Use sort and find functions in a spreadsheet	a	b	c	d
13.	Create a graph from spreadsheet data	a	b	c	d
14.	Use formulas or functions in a spreadsheet	a	b	c	d
	Presentations Skills				
11.	Create a presentation using a presentation software program	a	b	c	d
12.	Use drawing tools(e.g. pencil, select tool) to create charts and templates	a	b	c	d
13.	Integrate graphics, video clips and sound into a slide presentation	a	b	c	d
14.	Transfer images from CD-ROMs	a	b	c	d
15.	Scan a document	a	b	c	d
	Internet Skills				
16.	Log on to the Internet	a	b	c	d
17.	Receive/send e-mail and attach documents	a	b	c	d
18.	Create and use bookmarks/favorites	a	b	c	d
19.	Conduct research on the Internet using search engines	a	b	c	d
20.	Download and store documents and files from the Internet	a	b	c	d
21.	Create a web site	a	b	c	d

22. **Please classify yourself into one of the following categories by filling in the appropriate letter on the scantron provided [3].**

a. _____ I know the importance of computers and related technologies. I have some basic skills but do not think I have sufficient expertise to use technology without assistance. I rarely require the use of technology to complete assignments.

b. _____ I know the basics of many software packages and can select the appropriate one for a specific task. My students use a word processor or other basic software packages occasionally to complete assignments.

c. _____ I can use more than one software package in the creation of a single product. I use technology in preparation, instruction and evaluation. My students use a variety of software programs regularly in the construction of curriculum-based products.

d. _____ I often use software to solve specific problems in ways I have not seen others try. My students use not only computers but other related technology equipment in curriculum based projects by analyzing resources and creating new knowledge.

e. _____ I share my knowledge of computers and related technologies through modeling, peer coaching and mentoring. I encourage students and co-workers to experiment with different software and technologies.

23. How many hours of training have you received in implementing the Technology Applications TEKS?

a.	no training	d.	7-10 hours
b.	1-3 hours	e.	11-15 hours
c.	4-6 hours	f.	more than 15 hours

24. How confident are you that you can implement the Technology Applications TEKS without further training?

a	b	c	d	e
Not confident				Very confident

25. Do you currently integrate technology into the curriculum?

a	b	c	d	e
Never	Seldom	Sometimes	Often	Very Often

26. Currently, how many hours per week do you use technology with your students?

a.	Less than 1 hour	d.	3 hours
b.	1 hour	e.	4 hours
c.	2 hours	f.	5 or more hours

[3] Adapted from a measure developed by Kathrine Box. Based loosely on the "TAKE a STEP" Model and on a measure developed by Kathrine Box and Gerald Knezek at TCET.

APPENDIX B: CHANGES IN TEACHERS' SELF-REPORTED PROFICIENCY ON A TECHNOLOGY SKILLS SURVEY

Technology Skill	Percentage of Teachers Reporting Proficiency		
	Pre Test (n=34)	Post Test (n=25)	Percent Change
General Skills			
Save, copy, and delete files from the hard drive	97%	100%	3%
Save files to a floppy	100%	100%	0%
Copy, cut, and paste text	100%	100%	0%
Size and move graphics	76%	92%	16%
Use draw tools	54%	92%	38%
Word Processing Skills			
Create simple documents	100%	100%	0%
Edit, modify, or spell check documents	100%	100%	0%
Create a document with text and graphics	76%	96%	20%
Merge documents	47%	80%	33%
Use advanced features	52%	88%	36%
Spreadsheet Skills			
Enter data into a spreadsheet	82%	100%	18%
Use sort and find functions	56%	84%	28%
Create a graph from spreadsheet data	45%	76%	31%
Use spreadsheet formulas or functions	41%	64%	23%
Presentation Software Skills			
Create a presentation using presentation software	56%	84%	28%
Use draw tools to create charts and templates	33%	68%	35%
Integrate graphics, video, and sounds into a presentation	29%	64%	35%
Transfer images from a CD-ROM	30%	60%	30%
Scan a document	44%	80%	36%
Internet Skills			
Log onto the Internet	100%	100%	0%
Use email and attach documents	97%	100%	3%
Create and use bookmarks	82%	96%	14%
Use a search engine to do Internet research	94%	100%	6%
Download and store files from the Internet	79%	88%	9%
Create a website	46%	56%	10%

Source: Fall and Spring Teacher Technology Surveys

APPENDIX C: DEFINITIONS FOR THE LEVELS OF USE SCALE

Phases of Technology Integration [4].

Familiarity

I know the importance of computers and related technologies. I have some basic skills but do not think I have sufficient expertise to use technology without assistance. I rarely require the use of technology to complete assignments.

Foundation

I know the basics of many software packages and can select the appropriate one for a specific task. My students use a word processor or other basic software packages occasionally to complete assignments.

Fusion

I can use more than one software package in the creation of a single product. I use technology in preparation, instruction and evaluation. My students use a variety of software programs regularly in the construction of curriculum based products.

Transformation

I often use software to solve specific problems in ways I have not seen others try. My students use not only computers but other related technology equipment in curriculum based projects by analyzing resources and creating new knowledge.

Facilitation

I share my knowledge of computers and related technologies through modeling, peer coaching and mentoring. I encourage students and co-workers to experiment with different software and technologies.

[4] Adapted from a measure developed by Kathrine Box. Based loosely on the "TAKE a STEP" Model and on a measure developed by Kathrine Box and Gerald Knezek at TCET

APPENDIX D: RUBRIC FOR ASSESSING CLASSROOM IMPLEMENTATION OF UOPS

	Excellent	Good	Revisit
Integration of Technology	❑ Technology use is engaging, age appropriate, beneficial to student learning, and supportive of higher-level thinking skills. ❑ Technology is integral to the success of the lesson. ❑ A clear relationship between the use of technology and student learning is exhibited by the lesson. ❑ Use of technology enhances the lesson by using the computer as a research tool, a publishing tool, and a communication device.	❑ Technology use is engaging and age appropriate, but it is unclear as to how it enhances student learning. ❑ Technology is important, but not integral, to the lesson. ❑ A limited relationship between the use of technology and student learning is exhibited in the lesson. ❑ Use of technology is limited to using the computer as a research tool, a publishing tool, or a communication device.	❑ Technology is not age appropriate, nor engaging, and does not enhance student learning. ❑ Importance of technology to the lesson is unclear. ❑ No relationship between the use of technology and student learning is exhibited in the lesson. ❑ Lesson does not take advantage of research, publishing, and communication capabilities.
Student Learning	❑ Lesson requires students to interpret, evaluate, theorize and/or synthesize information. ❑ Targeted learning objectives are clearly defined, well articulated, and supported by the Essential and Unit Questions. ❑ Lesson addresses the Unit Questions in a meaningful way. ❑ All learning objectives clearly align with state frameworks, content standards, and benchmarks of the subject area(s). ❑ Lesson has well-defined accommodations to support a diversity of learners.	❑ Lesson requires students to analyze and apply information, solve problems, and/or make conclusions. ❑ Targeted learning objectives are defined and moderately supported by the Essential and Unit Questions. ❑ Lesson moderately addresses the Unit Questions in a meaningful way. ❑ Some learning objectives align with state frameworks, content standards, and benchmarks of the subject area(s). ❑ Lesson offers minimal accommodations to support a diversity of learners.	❑ Lesson requires students to define, identify, describe, and/or summarize. Very little, if any, higher-level thinking required. ❑ Targeted learning objectives are vague and not clearly supported by the Essential and Unit Questions. ❑ Lesson does not address the Unit Questions in a meaningful way. ❑ Relationship between learning objectives and state frameworks, content standards, and benchmarks is unclear. ❑ Lesson does not accommodate a diversity of learners.
Implementation	❑ Lesson provides a well-developed model and guideline for implementation. ❑ Lesson can be easily modified and implemented in a variety of classrooms.	❑ Lesson provides a model for project replication, but the model needs more complete guidelines. ❑ Lesson might be applicable to other classrooms.	❑ Lesson model and guidelines for replication lack clarity. ❑ Lesson is limited to the teacher's own classroom.
Student Assessment and Evaluation	❑ Instrument(s) for authentic assessment and evaluation are included. ❑ A clear relationship is evident between learning objectives and assessment of student learning. ❑ Assessment tools contain topic-specific criteria in order to serve as a helpful scaffold for students.	❑ Instrument(s) for assessment of most targeted objectives are included. ❑ Some relationship is evident between learning objectives and assessment. ❑ Assessment tools contain some topic-specific criteria, but may be unclear to students.	❑ Instruments for assessment of targeted objectives are not included or the assessment does not match the targeted objectives. ❑ Relationship between objectives and assessment tool is unclear. ❑ Assessment tools contain only general criteria.

APPENDIX E: CHANGES IN STUDENTS' SELF-REPORTED PROFICIENCY ON A TECHNOLOGY SKILLS SURVEY

Technology Skill	Percentage of Students Reporting Proficiency		
	Pre Test (n=34)	Post Test (n=25)	Percent Change
General Skills			
Save, copy, and delete files from the hard drive	77%	86%	9%
Save files to a floppy	89%	86%	-3%
Copy, cut, and paste text	73%	92%	19%
Size and move graphics	65%	86%	21%
Use draw tools	85%	91%	6%
Word Processing Skills			
Create simple documents	85%	89%	4%
Edit, modify, or spell check documents	86%	90%	4%
Create a document with text and graphics	60%	81%	21%
Merge documents	37%	67%	30%
Use advanced features	52%	74%	22%
Spreadsheet Skills			
Enter data into a spreadsheet	54%	76%	22%
Use sort and find functions	38%	63%	25%
Create a graph from spreadsheet data	41%	70%	29%
Use spreadsheet formulas or functions	30%	62%	32%
Presentation Software Skills			
Create a presentation using presentation software	52%	77%	25%
Use draw tools to create charts and templates	57%	81%	24%
Integrate graphics, video, and sounds into a presentation	40%	67%	27%
Transfer images from a CD-ROM	35%	63%	28%
Scan a document	45%	68%	23%
Internet Skills			
Log onto the Internet	90%	94%	4%
Use email and attach documents	85%	90%	5%
Create and use bookmarks	60%	81%	21%
Use a search engine to do Internet research	76%	87%	11%
Download and store files from the Internet	73%	87%	14%
Create a website	34%	52%	18%

Source: Fall and Spring Student Technology Surveys

APPENDIX F: TECHNOLOGY COURSE OFFERINGS AT TIF PS10 SCHOOLS 2002-03 AND 2003-04

Technology Course		Akins		Crockett		Johnston		LBJ		Travis	
		O*	M*	O*	M*	O*	M*	O*	M*	O*	M*
Computer Science (I and II)											
	02-03	X	X	X	X	X	X			X	X
	03-04	X	X	X		X		X	X	X	X
Desktop Publishing											
	02-03	X	X	X	X					X	X
	03-04			X	S*	X	X	X	S*		
Digital Graphics & Animation											
	02-03										
	03-04										
Multimedia											
	02-03					X	X				
	03-04	X	X			X	X	X	S*	X	X
Video Technology											
	02-03					X	X	X	X		
	03-04					X		X	X		
Web Mastering											
	02-03										
	03-04			X	X						
BCIS (I and II)											
	02-03	X	X	X	X			X	X	X	X
	03-04	X	X	X	X	X	X			X	X
Computer Programming											
	02-03										
	03-04					X					
Telecommunications and Networking											
	02-03					X	X			X	X
	03-04					X		X	X	X	X
Business Image Management											
	02-03										
	03-04					X					
Computer Applications											
	02-03	X	X	X	X	X	X			X	X
	03-04	X	X	X	X	X		X	X	X	X
Technology Systems											
	02-03					X	X				
	03-04							X	X		
Communications Graphics											
	02-03										
	03-04					X					
Computer Multimedia and Animation											
	02-03					X	X			X	X
	03-04	X	X	X	X	X	X			X	X
Tech Apps Independent Study											
	02-03					X	X				
	03-04	X	X			X					
TOTAL NUMBER OF COURSES		O*	M*	O*	M*	O*	M*	O*	M*	O*	M*
	02-03	4	4	4	4	7	7	2	2	6	6
	03-04	6	6	6	5	12	4	6	6	6	6

*O= course offered, M= course made, S=course stacked into another course so students can receive credit

**Data source: Class Schedule Managers at each campu*

REFERENCE LIST

Batchelder, M. & Christian, C. (1999). Austin Collaborative for Mathematics Education, Case Study, 1998-1999 (OPE Publication 98.08). Austin, TX: Austin Independent School District.

Boethel, M. & Dimock, K.V. (2001). *Constructing knowledge with technology*. Austin, TX: Southwest Educational Development Laboratory.

Box, K. & Gnezek, G. (2002). *"TAKE a STEP"*. Retrieved May 1, 2003, from http://www.sedl.org/work/historical/tap.html

Penuel, W., Golan, S., Means, B., & Korbak, C. (2000). *Silicaon Valley Challenge 2000: Year 4 Report.* Menlo Park, CA: SRI International.

Ringstaff, C. & Kelley, L. (2002). *The learning return on our educational technology investment: A review of findings from research.* San Francisco: WestEd.

Samii-Shore, K. (2002*). Technology Integration in Education, 2001-2002 Report* (OPE Publication 01.A). Austin, TX: Austin Independent School District.

Secretary's Commission on Achieving Necessary Skills. (1991*). What work requires of schools: A SCANS report for America 2000*. Washington, DC: U.S. Department of Labor.

Southwest Educational Development Laboratory Website (2002). *Applying technology to restructuring and learning.* http://www.sedl.org/work/historical/tap.html

Stein, M.K., Scwann Smith, M., Henningsen, M.A., & Silver, E.A. (2000). *Implementing standards-based mathematics instruction: A casebook for professional development*. New York: Teachers College Press.

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