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ABSTRACT

Educational research has shown that technology can enhance student acquisition of discrete skills through drill and practice. This document describes the research design of a study that examined whether technology could provide significant support for constructivist, project-based teaching and learning approaches. The study also identified the elements necessary for effective implementation of technology within an educational reform context. Data were derived from case studies that were conducted at nine sites that emphasized education reform and provided authentic activities for students from economically disadvantaged backgrounds. The sites, 8 individual schools and 1 network of 462 schools, were selected on the basis of the following criteria: (1) the strength of the site's education reform agenda over technological use for its own sake; (2) the involvement of large numbers of students from economically disadvantaged backgrounds, representing a variety of cultures, ethnic groups, and linguistic experiences; and (3) the use of network and other distance-learning technologies. Data were collected through observation; document review; and interviews with school technology coordinators, principals, teachers, students, and district personnel. The volume describes procedures for sample selection, data collection and analysis, and coding for the software program, Ethnograph. It also contains sample interview guides and copies of the school- and classroom-level debriefing forms. Five exhibits, one figure, and two tables are included.) (LMI)

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ED 397 561

SRI International

June 1995

TECHNOLOGY AND EDUCATION REFORM: TECHNICAL RESEARCH REPORT

VOLUME 3: TECHNICAL APPENDIX

PRELIMINARY DRAFT
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1. RESEARCH DESIGN

The central methodology of this study was a set of nine case studies of schools or other sites where technology was being used as a tool to support education reform. The case study approach is well-suited for building understandings about how a factor, such as the introduction of technology, affects a broader agenda of educational reform. We employed a multiple case method (see Greene & David, 1984), which:

- Provides the researchers enough flexibility to adapt their questions and strategies for each site, while providing sufficiently comparable data for cross-site analysis.
- Provides the researchers adequate exposure to sites for richly detailed descriptions of reform efforts involving technology at various levels that are useful for both practitioners and policy-makers.
- Allows researchers to explore linkages between observed practice and potential explanatory factors, to develop tentative hypotheses about causal factors, and to specify the conditions under which the observed relationships appear to hold true.

The case studies focused on collecting information to answer the research questions displayed in Table 1. These questions were organized into the following topics:

- *General Context.* Political/fiscal/demographic setting for the technology application within the context of the state, district, school, and classroom.
- *Reform Context.* Status of the site with respect to education reform initiatives (e.g., restructuring activities, curriculum reform, new ways of teaching and measuring student progress) and the role of the technology application in the site's overall agenda for educational reform.
- *Design of the Technology Application.* Development of the technology application, including incentives for the reform, the role of research in the design phase, involvement of teachers with software developers, the purpose of the technology application, and key characteristics of the approach.
- *Classroom Uses of Technology.* Particular technology-supported activities or projects, at multiple grade levels and in multiple content areas, that illustrate the kind of student-centered instruction in our conceptual framework.
- *Implementation of the Technology Application.* Factors that contributed or hindered the success of the application, role of policies and regulations at various levels of the system, resources needed (human and fiscal) to support the application, the integration of the technology application in teaching and learning, and the role of research in implementation.
- *Impact of the Technology Application.* Evaluation strategies used to measure outcomes and the role of research in this process, demonstrated impact of the application on students and student learning, on teacher attitudes and behaviors, and other outcomes, including unanticipated benefits and costs.

Table 1

RESEARCH QUESTIONS FOR TECHNOLOGY IN EDUCATION REFORM PROJECT

Classroom Teaching and Learning Questions

1. What examples does the classroom offer of using technology to support long-term, student-centered projects?
2. What does the technology add to the project that would not be there without it?
3. What does the teacher see as the effects of the technology on students? On his or her own behavior and attitudes? On classroom dynamics?
4. What do students perceive to be the pros and cons of using technology in the classroom?
5. What observable evidence is available regarding the level of student achievement with technology, the degree to which technology prompts cooperation, and the effect of technology on the students' level of motivation?
6. What technologies were used in the classroom and how much access does each individual student have in the average week?
7. What are the dominant uses of technology in the classroom—would they be characterized as tutorial, exploratory, tool, or communication uses?
8. What support does the teacher have for developing ideas for instructional use of technology and refining his or her skills in using technology? To what extent has lack of support been a barrier?
9. What kind of technical assistance is available? To what extent has lack of technical assistance been a barrier?

School-Level Implementation Questions

10. What factors led to the initiation of reform efforts? What role was played by (a) federal, state, or local school district policies, (b) producers of hardware, software, or other courseware, (c) business partnerships, and (d) research?
11. What were the goals of the reform? How was it intended to differ from traditional or previous practice in terms of (a) curriculum, (b) instructional methods, (c) student motivation and self-concept, and (d) student and teacher roles?
12. What resources were required to design, develop, and implement the reform? If extra funds were required, how were they obtained? What were per student costs?
13. What factors and circumstances affected the design, implementation, and sustenance of the reform? What role was played by (a) federal, state, or local education agencies, (b) producers of hardware, software, or other courseware, and (c) business, foundation, or research partners?
14. What was the actual impact of the reform on (a) curriculum, (b) instructional practices, (c) student motivation and self-concept, (d) student and teacher roles, and (e) student performance?
15. How were outcomes measured? To what extent can the influence of the technology be separated from that of other portions of the reform?
16. What features cut across successful programs? Why are these features important? What features are associated with less successful outcomes?
17. To what extent have successful models been replicated in other classrooms, schools, or districts? What factors support or impede dissemination?

2. METHODOLOGY

Sample Selection

The data collection portion of this project consisted of nine case studies of schools using technology as part of their education reform efforts. The nine sites were chosen with an eye to representing the diversity of American schools and students and the very different paths to implementation that technology-supported innovations may take. At the same time, we sought sites whose use of technology was not for its own sake, but rather as a support for the kinds of instructional activities stressed in our conceptual model of educational reform.

We collected ideas for potential case study sites through a review of the literature, discussions with practitioners and education technology experts at a national conference, from our project advisors, and from our own network of school and technology contacts. We conducted telephone interviews with over 30 potential sites to collect information regarding the criteria described below:

- *Potential for providing general lessons about the role of technology in educational reform.* We looked for sites that could generate rich information about the design, implementation, and impact of technology applications in the context of educational reform. We gave priority to sites that appeared to be engaged in a cohesive effort directed at improving education for all students.

- *Illustration of the roles of various players in education reform.* To understand the roles of states, districts, and schools as well as those of the business community, parents, and foundations, we tried to obtain a set of sites that represented variation in the set of major "players" involved in bringing about education reform.

- *Student population affected.* Technology implementations aimed at promoting learning among economically disadvantaged students, and students of diverse ethnic and cultural backgrounds, were targeted. Technology is often used with disadvantaged students in ways that accentuate the differences between the instruction given the "haves" and the "have nots." Although many of the more constructivist uses of technology we were interested in have occurred most typically in schools serving relatively affluent populations, we sought out schools using technology in programs that challenge all students, including those whose backgrounds might have been regarded as putting them "at risk" of school failure in more traditional programs.

- *Stage of technology implementation.* Design and implementation issues can best be addressed by studying sites in various stages of implementation. Although we wanted sites with enough experience to be able to draw some conclusions about what was and was not working, we arranged for variation in the schools' length and intensity of interaction with technology.

- *Grade level focus.* Since grade level affects the design, implementation, and impact of technology applications (reform has proved much more difficult at the secondary

school level), we made an effort to include middle and secondary settings as well as elementary schools within the site sample.

Applying these criteria to the potential sites for which we had conducted phone interviews, we made recommendations to OERI and negotiated a final case study sample, described in Table 2. (The school names appearing in the table and throughout this report are pseudonyms.)

Data Collection

Preparation for Case Studies

Preparation for the site visits entails several related procedures: notifying the sites that were approved for case study, obtaining and reviewing pertinent background information about these sites, developing sets of interview guides and debriefing forms, specifying codes to be used in preparing the data for qualitative analysis, and training data collectors.

Notification of Sites. After obtaining OERI approval for the candidate sites, we informed the schools that they had been selected for study. Through our telephone interviews, we had already identified a point of contact for each site. The contact persons was asked to provide information on the process for obtaining permission to perform research in their school. We provided our contact with a written description of the purpose of the study and the nature of the participation required of participating schools. We followed the schools' individual procedures for obtaining permission to videotape students and teachers in selected classrooms (in some cases, schools had already obtained blanket permission for videotaping students in technology-using classes). Exhibit 1 contains a sample permission letter sent to parents.

During the pre-visit phone discussions, we questioned our informant concerning the individuals outside the school (e.g., school district administrators, district technology coordinators, state agency representatives, union representatives, school board members, parents, consultants) who had a significant role in the reform effort and secured their help in setting up interviews with these individuals.

Interview Guides. Interviews were one of the central methods of data collection for the site visits. We developed a set of interview guides to structure interviews with various types of respondents at each level for the site (district, school, and classroom) and to see that key data were collected from each (the guides appear at the end of this volume). These guides list the key topics that should be covered in each type of interview. We developed separate interview guides for school technology coordinators, school principals, teachers, students, and district personnel.

Table 2
Case Study Sites

Site	Level	Student Body	Setting	Region
Bay Vista Elementary	E	25% free/reduced lunch; 89% minority; 25% ESL	Suburban	West
TeacherNet (Network of 462 Schools)	All	Varies across schools	Rural/Urban/ Suburban	Midwest
South Creek Middle	M	65% free/reduced lunch; 60% Hispanic	Suburban	Southwest
Nathaniel Elementary	E	85% free/reduced lunch; 95% minority; 59% LEP	Urban	West
Progressive	E	23% free/reduced lunch; wide SES range; 61% minority	Urban	West
John Wesley Elementary	E	100% free/reduced lunch; 86% Hispanic; 64% LEP	Suburban	West
School of the Future	M	80% free/reduced lunch; 67% male	Urban	North Central
East City High (School-Within-a-School)	S	40% free/reduced lunch; 35% African American	Urban	Midwest
Maynard (School-Within-a-School)	M 4-6	77% free/reduced lunch; 71% African American; 27% Hispanic	Urban	Northeast

Exhibit 1

October 20, 1993

Dear Parents,

SRI International, a private non-profit research institute, has been funded by the Office of Educational Research to conduct a descriptive study of schools across the country that have used technology to support teaching and learning in innovative ways. Due to its strong commitment to and work within this area, [redacted] has been selected for inclusion in this project.

During the week of December 6th, visitors from SRI will be observing classrooms and conducting informal interviews with teachers and students. The purpose of the observations is to learn how technology is used as a tool to support learning at [redacted] The purpose of the interviews is to gain a better understanding of how a technology-supported curriculum "looks and works," through the eyes of teachers and students. Student interviews will be conducted in small groups, will last between twenty and thirty minutes, and participation will be voluntary. In addition to these observations and interviews, SRI visitors will be videotaping several classroom activities. The purpose of these videotapes is to demonstrate the kinds of classroom learning events that are made possible when teaching skill and technology are combined. The information gained through each of these data collection activities will be shared with others (e.g., researchers, educators, policy makers) who are interested in learning more about how technology can be used to support teaching and learning within schools.

We are pleased to be able to include [redacted] in a demonstration project which features exemplary educational programs. If you have any questions or concerns about the project, or about your child's participation in any of the data collection activities, please feel free to contact [redacted] at the school office ([redacted]).

Sincerely,

Kerry Olson
Research Social Scientist
SRI International

[redacted] Project Coordinator

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Although many of the same topics are covered in more than one guide, we anticipated correctly that the particular topics that would be appropriate to pursue and also the specific questions asked under each topic would vary from site to site, depending on the nature of the innovation and the organizational structure of the project. In cases were judgments were collected (e.g., the effects of technology on student attitudes and learning), we covered the same topic with multiple informants in order to get multiple perspectives. For more objective information (e.g., number of students in the school or project), we covered a given section of the interview guide with the most appropriate individuals and deleted them when interviewing others.

Debriefing Forms and Preliminary Specification of Codes for Qualitative Analyses. The purpose of a debriefing form is to provide a standardized framework for writing a case study report. This is especially important when multiple sites and multiple researchers are involved. We used two debriefing forms for our study, one for schools and one for classrooms. The school-level debriefing form took a broad view that included a review of the educational context of the site; demographic information; educational indicators; history of educational reform at the site; levels of involvement at the district, state, and federal levels; history of technology applications, including incentives for use, when and how the applications started, technologies used, target grades and curricula, key school players, and key outside players; overview of the way the technology is used by students and teachers; implementation details, including problems encountered, strategies for overcoming barriers, and facilitators and costs; impact of the technology use on students, teachers, and the school climate and processes; the way the technology use is evaluated; and respondents' reflections and advice.

The classroom debriefing form was similar in scope but focused on what was observed in the classroom during the site visit. Site visitors were prompted to write about the classroom context, features of reform that they observed, the classroom activities that took place, the technologies involved (e.g., microcomputers, wide area networks, hypermedia, animation, simulation), how the technologies were used by students and teachers, and intended and actual benefits of the technology use from the perspective of students and teachers. The debriefing forms for our schools and classrooms are presented at the end of this volume.

A special feature of our cross-case synthesis plan involved the use of software for qualitative data analysis, in our case, *Ethnograph*. The software facilitates the analysis process by searching for and retrieving data marked by code words or combinations of code words. It prints out text organized by the code or codes specified in a search procedure. The printout then can be

assembled in a way that allows the researcher to read all the text pertaining to a particular topic, concept, or variable across all sites or a subset of sites.

A critical step in using such software is the generation of a set of codes for labeling segments of text. We began the process of developing codes concurrently with designing the interview guides and debriefing forms. Figure 1 illustrates the way in which our predetermined set of codes ran through the interview guides, debriefing forms, and subsequent analysis printouts. The debriefing forms parallel the interview guides in topic, prompting site visitors to synthesize and interpret their field notes along similar lines. This allows for smooth cross-site analysis.

Site Visitor Training. The initial site visits, conducted during 1992-93 by the Project Director and Deputy Director, provided an opportunity to test out the realism of the proposed schedule, the ease of use of the data collection instruments, and the technical requirements for collecting video records on site.

After refining interview guides and debriefing forms to facilitate the flow of interviews, these researchers set up and conducted training for the four additional researchers involved in on-site data collection. A day-long training session for site visitors was conducted in the fall of 1993. This training familiarized all site visitors with the purposes of the study and its conceptual framework, the interview guides and debriefing forms, the planned cross-case analysis and codes embedded in the debriefing forms, and the procedures to be used on site. Exhibit 2 contains the agenda for the training session.

A video consultant was hired to instruct team members in the use of the Hi-8 video camera used on site and the special problems entailed in trying to capture shots of computer screens and to work under the highly variable lighting conditions of classrooms.

Site Visits

Review of Background Information. Before the site visits, site visitors reviewed the telephone interview record and all available materials pertaining to the design, implementation, and impact of the site's technology and education reform activities. Documents included program descriptions, staff rosters, project proposals and budgets, brochures, videos, and evaluation reports. This review provided site visitors with a preliminary framework for organizing the site visits and understanding the case. It also reduced burden on the sites by familiarizing site visitors with basic information. Valuable time on-site can then be spent verifying information, exploring key issues, and following up important leads.

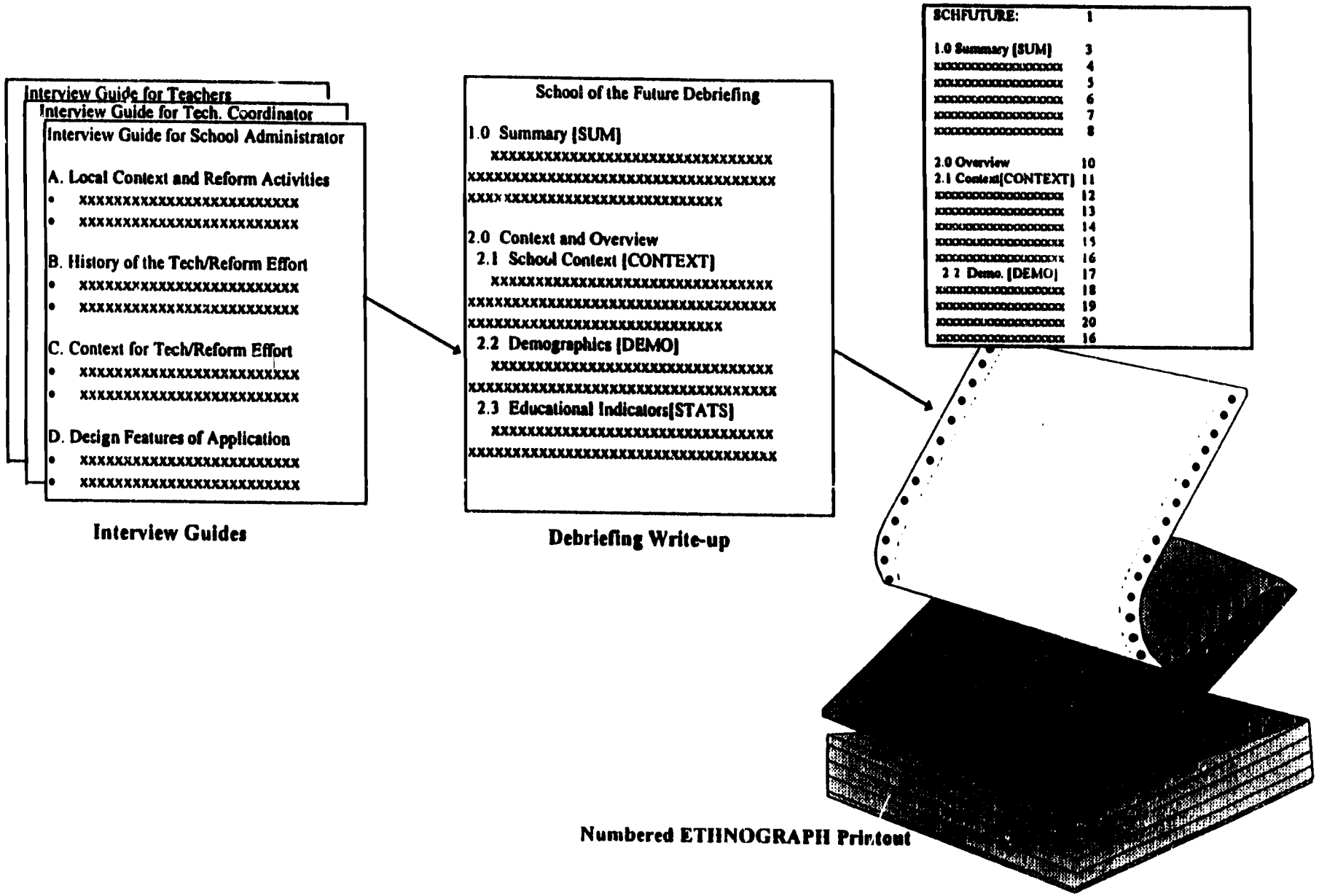

Figure 1 Relationship between Interview Guides, Debriefing Form, and ETHNOGRAPH Printout

Exhibit 2

Technology and Education Reform

Site Visitor Training

November 1, 1993

Agenda

9:00 - 9:30	Orientation to the Project Site Visit Schedule *(distribute partial schedule)*	Barbara
9:30 - 10:15	Site Visit Arrangements, Logistics & Sample Visit Schedule - Regular Visit - Repeat Visit	Kerry
10:15 - 10:30	Equipment Checklist	Kerry
10:30 - 12:00 and 12:45 - 2:00	Interview Guides - District Administrator - School Administrator - School Tech Coordtr - District Tech Coordtr - Student Groups - Teachers *(show selected tapes)*	Barbara & Kerry
2:00 - 2:30	Video Logs & Dissemination Products *(show AERA tape)*	Kerry
2:30 - 3:30	Videocam Training	Consultant & Kerry
3:30 - 4:30	Case Study Reports & Analysis - School Debriefing Form - Classroom Debriefing Form *(electronic templates to be distributed at a later time)*	Barbara
4:30 - 5:00	Introduction to *Ethnograph* & Draft of Codes for Analyzing Data *(distribute code sheets)*	Joan & Barbara

Site Visit Procedures. Each site visit was conducted by a two-person research team. The team approach has several advantages. From a methods perspective, it is desirable to have two researchers on-site so that one can take the lead role in interacting with respondents while the other plays a support role, in many cases operating the video equipment. This frees up the lead researcher to conduct interviews in a less structured and more personal manner, thus improving the quality of data collected. The presence of a second researcher also enables reliability checks and preliminary on-site analysis of the data as the researchers share their reactions and discuss tentative findings. Having two researchers available also lends flexibility to the scheduling process on-site; in some cases it was necessary for the researchers to split up in order to adhere to a pre-arranged interview schedule but still capture important classroom activities, the timing of which could not be anticipated in advance.

The primary modes of data collection were observations and personal interviews. We interviewed administrators, teachers, students, parents, and other persons key to the design, implementation, or impact of the technology application, using the interview guides included at the end of this volume.

We interviewed students in small groups to help them relax and bounce ideas off one another. After the first few visits, we developed found that useful insights could be gained also by interviewing individual students or student pairs as they demonstrated the technology on which they were working. These videotaped demonstrations gave us an opportunity to see student products and to probe for what they had learned from their interactions with the technology.

At each site, we did initial brief observations of a broad range of classrooms in order to pick two classrooms for more intensive observation and videotaping.[1] Our criteria for choosing these classrooms were a combination of the theoretical and the pragmatic—from the early discussions with administrators and teachers we tried to select classrooms that were using technology in tool-like ways to support complex, student-centered activities. At the same time, we were constrained by schedules, trying to select classrooms that would be doing something interesting on their technology-supported projects on the particular days we would be present to observe them. These more intensively studied classrooms were typically observed over repeated days, sometimes on multiple visits. More extensive interviews were conducted with the teacher or teachers, and typically, one of our two student focus groups was conducted with students drawn from this class. In addition, as our data collection proceeded, we found it useful to interview

[1] The single exception was the "site" that was actually a network of over 50 schools. For this site, we visited four schools and selected a single electronic research class for more detailed observation and description. Hence, there were 17 classroom activities in our final sample of detailed vignettes.

individual students or small groups as they developed or exhibited their technology-based work or demonstrated how they use particular pieces of software. We observed and videotaped classes, school activities, teacher meetings and training, and other key events related to technology use in these classrooms.

In addition to the classroom-based data collection, we interviewed a wide range of other school respondents, including principals, project coordinators, and school technology coordinators. Moving out from the school, we then interviewed representatives of other institutions that were pivotal in the school's opinion. These might include district personnel, researchers, representatives from business partners, leaders from parent groups, or education consultants. Our final selection of respondents depended on the school's particular implementation history and its perception of the key players within it. For individual sites, we also interviewed a school board member, a union leader, and a state administrator.

Throughout the site visit, the research team collected documents and other materials that supported our understanding of the technology application or the broader context of the site (e.g., videotapes, student achievement data).

Schedule for Site Visits. We planned for an average of a week on site, but with the option to study more complex sites with more intensity, while still addressing key issues at all sites. Our methods were tested out in three initial site visits, conducted during the 1992-93 school year. Return visits to these three schools and the remainder of our site visits were conducted in the fall and spring of the 1993-94 school year. Exhibit 3 shows the schedule of activities for the initial visit to one site. We staggered the site visits over the period (avoiding December and the end of the school year, when a site visit would be more disruptive and school staff would be less available) to allow for an iterative process of data collection–synthesis–data collection–synthesis.

Data Analysis

Within-Site Analyses

As mentioned above, preliminary analyses actually began on-site. The site visit team informally shared their perceptions with one another and began to relate and interpret information as they collected it. The two site visitors took responsibility as lead author on different sections of the debriefing form. After lead authors produced first draft case reports for their assigned sections; the site visitors exchanged sections to review, critique, and augment each others work. This process was facilitated by access to the video and audiotape records of

Exhibit 3

OERI Technology and Reform in Education Project
[redacted] Site Visit
May 18-21

Overview of Activities

Tuesday, May 18
- Tour of school and overview of program 8:30 - 9:30
- Teacher interviews 9:30 - 2:30
  - [redacted] (Algebra) 9:30
  - [redacted] (Arch & Design) 10:30
  - [redacted] (8th Grade Research) 12:30
  - [redacted] (Animation) 1:30
- Interview with [redacted] (former lead teacher) 3:00pm at [redacted]

Wednesday, May 19
- Overview of Personal Growth Plan software 7:45
- Classroom observations and videotaping 9:30m - 3:30
  - Animation 9:30
  - ILS Lab 10:30
  - Algebra 12:30
  - 8th Grade Research 1:30
  - Arch & Design 2:30
- Interview with [redacted] (Director) 3:00pm at Saturn
- Interview with [redacted] (restructuring consultant) 4:30 at [redacted] office ([redacted])
- Dinner with [redacted] (former Teacher Federation President) 6:15 at [redacted] restaurant in [redacted]

Thursday, May 20
- Student interviews 9:30 - 2:30
  - Animation students 9:30
  - Arch & Design students 10:30
  - Algebra students 12:30
  - 8th Grade Research students 1:30
- Interview with [redacted] (Principal) 2:30
- Parent interview 2:30

Friday, May 21
- Classroom observations and videotaping 9:30 -2:30
  - Animation 9:30
  - ILS Lab 10:30
  - Algebra 12:30
  - Video class 1:30
- Interview with [redacted] (formative evaluator) 2:30 at [redacted] ride to airport

A telephone interview has been scheduled with [redacted] (Assistant Superintendent of Teaching [redacted]) at 8:30 am on June 3.

interviews and classroom activities. Selected interviews with key informants were transcribed to support the inclusion of direct quotation in the case study records.

Use of Qualitative Analysis Software

Developing Theme Codes. After the majority of write-ups were completed, the research team members read one another's write-ups and met as a group for a full day to share impressions and begin the process of interpreting the findings from a cross-site perspective. We began by focusing on individual cases and then worked across cases. Our shared conceptual framework, exemplified by the debriefing form, helped to structure the discussion, but by this time, we were thinking beyond the debriefing framework to look for higher-order patterns and issues that we had not recognized when the debriefing forms were designed. We focused especially on successful sites and what made them so, and the apparent reasons some supposedly "exemplary" sites hadn't turned out to be so exemplary after all. As we generated observations about our sites, we began to identify potential cross-site themes and corresponding theme codes. Exhibit 4 contains a full listing of theme codes as well as the heading codes from the debriefing forms.

Data Coding. Once the debriefing forms were converted to ASCII files, the next step was the insertion of codes. Embedded heading codes were inserted on-line by clerical staff; theme coding and other more complicated coding was inserted by researchers on hard copy printouts and then inserted into the *Ethnograph* files by clerical staff. Exhibit 5 contains a section of a hand-coded text file.

Once all the codes were inserted, searches were run. A search pulls out all segments of text that are coded with the code word being searched. (Exhibit 6 shows a sample search output.) As noted earlier, multiple code searches can be done on all files or a subset of files, so that researchers have limitless ways to explore the data.

The search output then was organized in six major categories:

- Technology Implementation
- Technology Climate
- Curriculum Content and Technology Uses
- Reform Features of Technology Use

Exhibit 4

THEME CODES

Code	Use
	Planning/Implementation Issues
CORE	Assimilation of technology into the core instructional program, tool technologies, communication includes statements that tech is used primarily as a tool; integrated acr curriculum, etc.
GRASROOT	Teachers have been/are involved in tech planning and implementation; site based management
POLITICS	Political climate of classroom, school, district that affect tech program in some way
LEADER	Presence of Leadership
DICTATE	Top down approach; tech imposed from above (hierarchy)
EDGOALS	Plans for tech are built around education goals; includes ex. of tech not being selected (e.g., ILS) because it doesn't fit with goals
MIS-MATCH	Mismatch between tech and education goals
FORETHOT	Thoughtful plan for equipment purchase/maintenance/upgrade
HEADSTART	Staff hired in advance to allow for careful planning (in new programs)
PR	Attention to community outreach, public awareness
PEER-LESS	Needs of program are not due to the fact that school is ahead of others in tech use/reform
BAKESALE	Creative fundraising/grant writing
NO-FUNDS	Lack of funds to support implementation
SUGAR	Dependence on external factors
NEW-ONLY	Seed money mentality, no one pays for what is not new
CHANGE	Lack of continuity in tech, leadership, facility; teacher turnover
LINK	Increased linkages with other institutions; resources
MAGNET	Increased role as magnet school
GREEN	Envy/jealousy on the part of other sites
	Curriculum Content
CONTENT	Curriculum content is addressed
RESEARCH	Research skills
WRITE	Writing
SCIENCE	Science
MATH	Mathematics
SOCSTUD	Social Studies
LANGART	Reading/language arts other than composition
SPEAK	Language (English, Spanish)

Exhibit 4 (Continued)

	Tech Uses
HYPERMED	Hypermedia
WRITE	Word processing
NETWORK	Network applications; plans for network installation
VIDEO	Video: videodisk
SIMULATION	Simulation
TUTOR	Tutorial
SEXPLORE	Exploratory software (e.g., Simulations, CD research tools)
SCOMM	Telecommunications
STOOL	Tool uses (word processing, database, graphics)
KIDUSE	Other
	Tech Climate
MASS	Critical mass of teachers or administrators or others who are excited about/are using technology counter ex: few teachers excited about and using tech
MISER	Reluctance to share tech or access
NORMS	Informal or formal rules that govern the way the technology is used
PARENT	Parent support of tech use; uses of tech by parents (e.g., take home computer program parent involvement
	Reform Features
MULTIAGE	Multiage groupings
REAL	Authentic projects; tech uses that mirror tech uses in the real world
INTERD	Interdisciplinary projects (also grasroot, assess, guide, duration, kidteach)
	Student Outcomes
MINDSON	Students understand the instructional concepts that are involved in their technology us (similar to **higher** but does not necessarily involve critical thinking skills)
DISTRACT	Focus on surface features of tech (e.g., changing fonts rather that writing content
KIDTEACH	Students teach the teacher; students teach students
SCOLLAB	Student collaboration
SELFREG	Self regulation
OUTINFO	Access to outside information sources
HIGHER	Critical thinking skills
CANDO	More complex tasks
THISTASK	Ability to accomplish certain tasks (usually related to content areas)
CREATE	Creativity
FRIENDLY	Attention to audience
MOTIV	Motivation
SSELF	Self esteem
BEHAVE	Time on task; fewer discipline issues
SHACKSKL	Technology skills
PRODQUAL	Quality of product
QUALS	Better prepared for life/jobs in 21st century/future jobs, schooling (often stated as reas for tech use)
FOLLOW	Lack of follow-up opportunities to use tech when student leaves school

Exhibit 4 (Continued)

	Assessment
ASSESS	Examples of or plans for authentic assessment (e.g., portfolio); tech use to support authentic assess
REFEVAL	Any efforts to evaluate the reform and/or tech implementation (e.g., formative evaluation; surveys)
NO-SHOW	Failure to show expected results (e.g., drop in test scores) Also in Debriefing: Stats, Account, Eval
	Access Issues
OPFORALL	Structure that gives all children a full range of technology experience; examples in whi tech is planned for use with disadvantaged kids, gender balance. [Counter ex: tech use with boys only, with few students.]
ACCESS	Students are able to easily access technology for use on a regular basis (related to location).
LOCATION	Distribution/location of tech to support access (e.g., lab/classroom/combination; # of computers avail)
SCHED	Blocks of time for students to work on technology, flexible scheduling
DURATION	Duration of student projects; extended versus short-term
	Teacher Outcomes
OWN	Teachers internalize the technology, adapt for own use, make it theirs
WANTMORE	Want more tech, more training, eagerness to use tech
THCKSKLS	Teacher's tech skills
GUIDE	Teacher as facilitator
NEWTEACH	New instructional strategies; ways of teaching
HARDTASK	Assign more complex tasks
TCOLLAB	Teacher collaboration, joint planning, teaching, training (Counter x: lack of collaboration, staff arrangements that pose barriers to working together)
TIMEUSE	Use of time
TSELF	Teacher's self esteem
STAR	Opportunities for professional recognition (related to tself)
	Teacher Tech Training
SITETECH	Technical resource person available on site
NOHACK	Lack of on site tech support
TIME	Time to learn tech; time to plan tech use
NOTIME	Lack of time for training; planning of tech use
TPACE	Teachers are allowed to progress at own pace (can also be a negative)
TRAINING	training provided (descriptions of training; may be specified as useta and techta)
TECHTA	Training on tech
USETA	Training focusing on use of tech in curriculum; support for tech integration with conte
HAVESKL	previous skills/knowledge/attitudes that support tech use
BLOCK	Lack of familiarity/training/resistance to tech use
ONGOING	Ongoing teacher training, follow-up, continued support of some type
MATURE	Lack of ongoing follow-up-up support
PERSONAL	Opportunity for teachers to take computer home for personal/professional use

Exhibit 4 (Concluded)

	Teacher Uses of Tech
TCOMM	Telecommunications
TTOOL	Tool (word processing, database)
PRESENT	Presentation (delivery of instruction)
MGT	Management (grading, monitoring student progress, attendance)
TCHUSE	Other
	Barriers to Tech Selection/Purchase/Maintenance
PICK	Difficulties selecting hardware/software
GET	Difficulties obtaining software/hardware (includes lack of appropriate software)
WORK	Difficulties maintaining hardware/software
CRIME	Vandalism (includes students destroying files on network)

Exhibit 5

and a video monitor to display in-school broadcasts, VCR, or videodisc presentations.

The availability and range of equipment at [redacted] has been experienced by the faculty as a challenge that, while broadening teaching and learning opportunities, is sometimes overwhelming and has not been utilized at its full potential. Teachers were not on board when decisions regarding specific hardware and software choices were made. (The original plan to hire the lead teaching staff well in advance, providing the needed time to plan the program and to become familiar with the technology, did not occur due to hiring limitations [the requirements for the positions restricted the number of applicants], as well as other factors [e.g., the lack of a facility, equipment delays].)

In the words of one teacher, "this forced [the teaching staff] to have, use, and struggle with a technology that they might not have selected." Many of the teachers working at [redacted] came to the school initially with little or no technological experience. Hired only six weeks prior to the opening of the school, the lead teaching staff was faced with a long list of priorities, such as developing the curriculum, organizing the schedule, and designing new approaches to monitoring and evaluating student progress. These critical issues, coupled with the daily responsibilities associated with teaching once the school was in session, took precedence over learning to use and integrate a variety of unfamiliar technologies.

As in many other schools, the mere presence of technology at [redacted] did not ensure its immediate adoption and integrated use. [redacted] teachers learned to use technology gradually, alongside their students. Additional technical training was provided through vendor-sponsored inservices,

BLOCK

DICTATE

BLOCK

HEADSTART

VSETA

TRAINING

[redacted] [redacted] +5.2 Strategies

Exhibit 6

SC: TRAINING

#-TRAINING $-TIME				
: District Demonstration School funds	1772	-#	-$	
: provide for ten extra staff	1773	#	|	
%-ASSESS				
: development days. Sessions have	1774	#	-$	-%
: focused on a range of issues,	1775	#		|
: including technology use,	1776	#		|
: collaborative learning, and authentic	1777	#		|
: assessment. Teachers participating in	1778	#		-%
: [redacted] and [redacted] have been	1779	#		
: provided with training within the	1780	#		
$-TIME				
: context of these projects. The school	1781	#	-$	
: has lengthened school days in order to	1782	#	|	
: end classes early every Wednesday for	1783	#	|	
: teacher planning and meeting time.	1784	#	|	
: The time is used for "circuit"	1785	#	|	
: meetings (to share and coordinate	1786	#	|	
: activities across grade levels),	1787	#	|	
: parent conferencing, and special	1788	#	|	
: projects planning sessions [redacted]	1789	#	|	
: [redacted], [redacted].	1790	#	|	
:	1791	#	|	
%-TCOLLAB				
: [redacted] (teacher): One of the things	1792	#	|	-%
: we have at [redacted] that I really	1793	#	|	|
: treasure as a new teacher is	1794	#	|	|
: collaborative planning time that's set	1795	#	|	|
: aside for us. We have minimum days	1796	#	|	|
: every Wed...the first and the third	1797	#	|	|
: Wednesday we split up into groups that	1798	#	|	|
: are working on different projects	1799	#	|	|
: ([redacted], [redacted]) and we all get to	1800	#	|	|
: collaborate with teachers who are	1801	#	|	|
: doing things in their classroom that	1802	#	|	|
: are similar to ours. And the second	1803	#	|	|
: Wednesday we meet together as a	1804	#	|	|
: circuit group, so the 4 5 6 grade	1805	#	|	|
: teachers all meet together. And the	1806	#	|	|
: fourth Wednesday we have time to work	1807	#	|	|
: in our classrooms and to have parent	1808	#	|	|
: conferences. This is the only school	1809	#	|	|
: where I've worked, but I've talked to	1810	#	|	|
: friends of mine who got their	1811	#	|	|
: credentials with me who are completely	1812	#	|	|
: isolated in their classrooms. As new	1813	#	-$	|
: teachers they don't have anyone to	1814	#		|
: talk to about what should I do about	1815	#		|
: this...or I want to teach a unit about	1816	#		|

Continued on next page)

- Teacher Training and Outcomes
- Student Outcomes.

The search output filled four large notebooks. Within each notebook, the printout was further organized by code word. For example, the Technology Implementation notebooks encompassed 29 codes beginning with HISTORY. Text coded with HISTORY was organized by site, after which the next set of printout would appear. This way of organizing the printout was selected because it enabled the researcher to read across sites while staying focused on a particular aspect of the technology application, in this case the history of each application.

Cross-Site Analysis

Cross-site analysis was begun informally at the interim debriefing when researchers shared their observations and initial inferences about each site. The final debriefing provided a context for more focused sharing, comparing and contrasting of findings, and discussion of cross-site themes.

A senior researcher was assigned as principal author for each major topic to be addressed in the cross-site analysis. Her analysis was assisted by the output of the code searches by the *Ethnograph* qualitative analysis software, in the manner described above. Each researcher–author was able to conduct searches across the master database, focused on her specific issue.

In addition to facilitating the consideration and elaboration of themes across the sites, *Ethnograph* also facilitated quick counts and status checks regarding the occurrence of selected variables within each of the sites. This provided an additional means for the researchers to verify and summarize their findings. For example, the researchers were quickly able to assess the number of classrooms within and across sites that reported specific intended benefits (e.g., higher-order thinking skills) and teacher-observed effects (e.g., increased student motivation, greater collaboration) in relation to the integration of technology. Using software to assist in text analyses has several advantages (Ruskus, 1991):

- The methodology provides a means of organizing voluminous qualitative data and conducting the analyses in a more systematic manner than would otherwise be possible.
- The methodology accommodates the use of a highly detailed coding scheme that can be applied across sites and used by all site visit teams. This capability promotes consistent and uniform coding of the qualitative data.

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- The methodology enables us easily to reconfigure the qualitative data for different audiences—local practitioners and state/federal policy-makers.
- The record-keeping aspect of the methodology enables us to document qualitative themes with specific quotes or sets of quotes that are easily retrievable from the database.

Interview Guides

7/31/93

INTERVIEW GUIDE FOR SCHOOL ADMINISTRATOR

A. Local Context and Overview of Reform Activities

- School grades, size, demographic composition, % subsidized or free lunch, % LEP or NEP, % sp. ed., urbanicity, age of facility (if h.s., drop out rate & college entrance rate)
- Education reform efforts underway and planned
- Role of technology in school's reform efforts

B. History of the Technology/Reform Effort

- Most important technology applications in this school
- How did application get started? (who, did what, when)
- Incentives for the technology application

C. Context for the Technology/Reform Effort

- Involvement of district
- Involvement of state
- Involvement of business, consultants, parents, foundations
- Other influences, including research

D. Design Features of the Technology/Reform Application

- Instructional goals & key features of approach
- Target student population(s)
- Target grade levels, curricula
- Classes/teachers most affected

E. Implementation Details

- Integration into instruction
- Sources of technical support
- Impact of state and federal policies & regulations
- Problems encountered in implementing the application
- Strategies for overcoming barriers
- Facilitators for implementing the application
- Inservice training/release time provided as part of the implementation
- Cost estimate & resources involved (e.g., hardware, software, maintenance)

F. Impacts of Technology/Reform Effort

- Student/teacher roles
- Instructional practices
- Curriculum
- Classroom management
- Student learning
- Student motivation
- Teachers' professional development
- Impact on administrator's role
- Impact on school climate & schoolwide processes
- Unanticipated benefits & costs
- Any objective measures collected
- External measures (i.e., district, state) & their influence on implementation

G. Reflection & Dissemination

- Other schools that have been helped to adopt this model
- Advice for other schools
- Future goals & directions

8/14/93

INTERVIEW GUIDE FOR SCHOOL TECH COORDINATOR

A. Background and Role
- Teaching & technology experience (self taught v. formal training)
- Functions of the tech coordinator position

B. Local Context and Overview of Reform Activities
- Education reform efforts underway and planned
- Role of technology in school's reform efforts

C. History of the Technology/Reform Effort
- Most important technology applications in this school
- How did application get started? (who, did what, when)
- Incentives for the technology application

D. Context for the Technology/Reform Effort
- Involvement of district
- Involvement of state
- Involvement of business, consultants, parents, foundations
- Other influences, including research

E. Design Features of the Technology/Reform Application
- Instructional goals & key features of approach
- Target student population(s)
- Target grade levels, curricula
- Classes/teachers most affected

F. Implementation Details
- Integration into instruction
- Technical support
- Problems encountered in implementing the application
- Strategies for overcoming barriers
- Facilitators for implementing the application
- Inservice training/release time provided as part of the implementation
- Cost estimate & resources involved (e.g., hardware, software, maintenance)

G. Impacts of Technology/Reform Effort
- Student/teacher roles
- Instructional practices
- Curriculum
- Classroom management
- Student learning
- Student motivation
- Teachers' professional development
- Impact on administrator's role
- Impact on school climate & schoolwide processes
- Unanticipated benefits & costs
- Any objective measures collected
- External measures (i.e., district, state) & their influence on implementation

H. Reflection & Dissemination
- Other schools that have been helped to adopt this model
- Advice for other schools
- Future goals & directions

8/14/93

INTERVIEW GUIDE FOR TEACHERS

A. Background
- Specialization (grade, subject area)
- Years at school & prior teaching experience
- Previous experience with technology

B. History of the Technology/Reform Effort
- Description of development & Implementation at school level
- Teacher's role in initiating, planning, & implementing
- Perceptions regarding district, school, community support
- Factors supporting implementation at school level
- Factors hindering implementation at school level

C. Implementation at Classroom Level
- Overview of instructional environment before technology
- Incentive for involving technology; instructional goal
- Description of technology use
- Student access; level of use
- How technology use is managed & monitored

D. Implementation Support
- Participation in & perceived value of training related to technology use
- Participation in & perceived value of training related to instructional uses of technology
- Access to rescurces (e.g., equipment, software, time)
- Opportunities for collegial support, feedback
- Technical assistance and support
- Recommendations for teacher development at other sites

E. Impact of Reform & Technology Use on Instructional Practice
- Instructional approach
- Roles of teacher & students
- Curriculum
- Classroom management
- Student assessment

F. Impact of Technology/Reform on Teacher Beliefs & Attitudes
- How students learn
- How & what teachers should teach
- Value of communicating with other teachers
- Self concept and status within teaching community
- Unanticipated effects

G. Impacts of Technology/Reform on Students
- Student learning processes
- Student skills & achievement
- Motivation
- Self concept
- Social skills
- Unanticipated effects

H. Reflection & Dissemination
- Current reform goals & tech. role in supporting them
- Lessons learned regarding classroom implementation

8/14/93

INTERVIEW GUIDE FOR STUDENT GROUPS

A. Background
- First names, grade levels, ages (ethnicity)
- Previous experience with technology; tech exposure in home
- Special technology interests

B. Overview of Technology Use
- Types of technology used in classroom
- How each technology is used in classroom
- Level of student access & participation
- Observed differences in technology access/intersts (e.g., gender)
- Technology training & support

C. Technology's Role & Value as a Tool to Support Learning

Within specific subject area (writing, reading, science, math, art)
- How is technology used?
- How does it compare with paper-and-pencil or textbook-based activities?
- Advantages and disadvantages
- Individual preferences

INTERVIEW GUIDE FOR DISTRICT ADMINISTRATOR

A. Local Context and Overview of Reform Activities
   - Political, fiscal, and demographic description of district (no. & level of schools in district; district enrollment; no. or % eligible for free or reduced lunch; no. or % LEP or NEP; no. or % special ed., ethnic composition of student body)
   - Status of school within the district
   - Education reform efforts underway and planned
   - District policies and plans for educational technology
   - Role of technology in reform efforts

B. History of the Technology/Reform Effort
   - How district got involved in the technology/reform effort
   - Overview of the development process
   - Incentives for the technology application

C. Context for the Technology/Reform Effort
   - Involvement of state
   - Involvement of business, consultants, parents, foundations
   - Other influences, including research

D. Design Features of the Technology/Reform Effort
   - Key features of the approach
   - Target student population(s)
   - Target curricula, grade levels, schools

E. Implementation Details
   - Sources of technical support
   - Role of district actions, policies and regulations in implementation
   - Impact of state and federal actions, policies and regulations
   - Problems encountered in implementing the application
   - Strategies for overcoming barriers
   - Facilitators for implementing the application
   - Inservice training/release time provided as part of the implementation
   - Cost estimate & resources involved (e.g., hardware, software, maintenance)

F. Impact of Technology/Reform Effort
- District role in measuring impact
- Measures used
- Role of outside researchers or agencies in measuring impact
- Impact on students (learning, motivation)
- Impact on teachers (teaching styles, professional development)
- Impact on school's status within the district
- Impact on district climate & policies
- Unanticipated benefits & costs
- External measures (i.e., state) & their influence on implementation

G. Reflections & Dissemination
- Other schools/districts that you have helped to adopt this model
- Advice for other districts
- Future goals & directions

INTERVIEW GUIDE FOR DISTRICT TECH COORDINATOR

A. Local Context and Overview of Reform Activities
- District-supported education reform efforts underway and planned
- District policies and plans for educational technology
- Role of technology in reform efforts

B. History of the Technology/Reform Effort
- How district got involved in the technology/reform effort
- Overview of the development process
- Incentives for the technology application

C. Context for the Technology/Reform Effort
- Involvement of state
- Involvement of business, consultants, parents, foundations
- Other influences, including research

D. Design Features of the Technology/Reform Effort
- Instructional goals & key features of approach
- Target student population(s)
- Target curricula, grade levels, schools

E. Implementation Details
- District role in technology planning & purchase
- District role in in-service training
- District role in providing technical support
- Problems encountered in implementing the application
- Strategies for overcoming barriers
- Facilitators for implementing the application
- Cost estimate & resources involved (e.g., hardware, software, maintenance)

F. Impact of Technology/Reform Effort
- District role in measuring impact
- Measures used
- Role of outside researchers or agencies in measuring impact
- Impact on students (learning, motivation)
- Impact on teachers (teaching styles, professional development)
- Unanticipated benefits & costs
- External measures (i.e., state) & their influence on implementation

G. Reflections & Dissemination
- Other schools/districts that you have helped to adopt this model
- Advice for other districts
- Future goals & directions

Debriefing Forms

10/28/93

SCHOOL-LEVEL DEBRIEFING FORM

[Note, ethnograph codes appear in bold italics for each section]

Site:

Address:

Point of Contact:

1.0 Summary [*sum*]

Concise overview of the type of project and the main features of technology's contribution to education reform. Implementation issues illustrated by the case study should be highlighted.

2.0 Context and Reform Overview

2.1 Educational Context. [*context*] *Overview of the school including:*

- Setting *(e.g., urban, rural, suburban)*
- Grade levels

2.2 Demographic Information [*demo*]

Circle applicable unit: School Class Project District Other:

Number of certified teachers (FTE):

Enrollment as of 9/93:

Number or percent free or reduced lunch:

Number or percent LEP or NEP:

Number or percent special education:

Ethnic Composition *(Number or percent in each category)*

African American	Hispanic	Caucasian, Non-Hispanic
Native American	Asian/Pacific Islander	Other

Estimated percent students w/ computers in home:

2.3 Education Indicators [*stats*]

Summary of facts and statistics reflecting on how well the school is functioning. Examples would include test scores, wait lists for entrance, dropout rates.

2.4 Reform History [*reform*]. *Summary of efforts toward restructuring or school reform, including a description of:*

- Nature and when started [*history*]
- Reform Features [*feature*] (circle all that apply)

Nongraded groupings Extended periods Schoolwide themes

Teacher professionalization Authentic assessment Use of outside resources

- Key Individuals [*key*]
- Funding sources for reform [*funds*]
- District involvement/support [*localref*]
- State/federal involvement/support [*stateref*]
- Role of tech in reform efforts [*techref*] *(classify and describe)*:

Part of initial reform concept Emerging part of reform efforts Parallel effort

3.0 History of Tech Applications

3.1 Incentive for Technology Use [*why*] *(what expected to accomplish)*

3.2 When & How Application Started [*how*]

3.3 Technologies Used [*types*] *(give numbers for hardware)*

- Microcomputers
- ILS
- Other LANs
- WANs
- CDROM
- Interactive videodisc
- Videocams and editing equipment
- Other
- Word processing
- Spreadsheet
- Hypermedia
- Animation
- Simulation

3.4 Target Grades & Curricula [*levels, curric*]

3.5 Key School Players [*infield*]

(Provide names, titles, and a description of roles)

3.6 Outside Players in Technology Application [*outfield*]

Discuss important players outside the school including:

- District involvement ***[distr]***
- State involvement ***[state]***
- Business involvement ***[bus]***
- Foundation involvement ***[foundtn]***
- Parent involvement ***[parent]***
- Other outside influences, including research

4.0 Overview of Tech Uses

4.1 Student Uses [*kiduse*]. *Describe main ways in which students are using technology and classify uses as follows:*

- Tutorial
- Exploratory
- Communication
- Tool

4.2 Teacher Uses [*tchuse*]. *Describe ways in which tech supports teacher functions and classify as follows:*

- Communication
- Presentation
- Instructional Management

5.0 Implementation Details

5.1 Problems Encountered [*probs*]. *Describe problem areas including any of the following that were issues according to teachers, tech coordinator, or administrators:*

- Difficulties in selecting hardware/software **[*pick*]**
- Difficulties obtaining hardware/software **[*get*]**
- Difficulties maintaining systems **[*work***
- Theft/vandalism **[*crime*]**
- Teacher lack of knowledge/fear **[*block*]**
- Lack of time for learning to use technology or developing technology-related curriculum units **[*notime*]**
- Disappointing results from using technology **[*letdown*]**
- Poor alignment of technology w/ instructional goals **[*mismatch*]**
- Lack of funds **[*nofunds*]**
- Resentment from nonparticipating classes/schools **[*green*]**
- Lack of technical support **[*nohack*]**
- Failure to see fast positive effects on test scores **[*noshow*]**
- Other **[*bug*]**

5.2 Strategies for Overcoming Barriers [*solve*]. *Describe the steps taken to deal with the problems. Include any of the following:*

- Inservice training/release time
- Involvement of outside experts
- Creative fund raising
- Other

5.3 Facilitators [*facil*]. *Describe factors that helped this project, including:*

- Technical support on hardware/software ***[techta]***
- Teaching skills (nontechnology) ***[haveskl]***
- Technical assistance on integrating technology into instruction ***[instrta]***
- Supported time for teachers to develop skills ***[timesupp]***
- Other

5.4 Costs [*costs*] *(Estimates in dollars or person months)*

6.0 Impacts [*impact*] *(Record objective and subjective reports from administrators, teachers, students, and parents.)*

6.1 Effects on Students [*kidout*]. *Include areas such as:*

- Motivation **[motiv]**
- Self esteem **[kidestm]**
- Attendance, retention, disciplinary rates **[kidbehav]**
- Technology skills **[hackskl]**

6.2 Effects on Teachers [*tchout*]. *Include areas such as:*

- Inclination to assign complex tasks ***[hardtask]***
- New instructional strategies ***[tchstrat]***
- Self esteem and sense of professionalism ***[tchach]***
- Communication with other teachers ***[tchtalk]***
- Use of their time ***[timeuse]***

6.3 Effects on School Climate & Processes [*schout*]

- Increased linkages with outside organizations, resources ***[link]***
- Enhanced role as magnet ***[magnet]***

6.4 External Accountability Measures & Their Influence [*account*]

6.5 Evaluation [*eval*] (*Describe any objective measures of effectiveness, any formal evaluation reports, and unanticipated costs & benefits.)*

- Test scores
- Retention rates
- Attendance
- Discipline rates
- Teacher turnover

7.0 Reflection and Advice

7.1 Dissemination [*spread*] *(Has this model or the teachers' expertise been transferred to any other sites?)*

7.2 Plans [*plans*] *(Where does the school plan to go from here with its technology and reform efforts?)*

7.3 Advice [*advice*] *(What advice would be offered to others contemplating similar efforts?)*

CLASSROOM-LEVEL DEBRIEFING FORM

Short Title: *(Provide a short descriptive label for this use of technology)*

Teacher:

Site:

1.0 Summary [*sum*]

Concise overview of this use of technology including what technology used, grade level of students, and subject matter involved.

2.0 Classroom Context [*context*]

Brief description of the classroom including anything striking about the physical layout, the number and grade level of students involved, the number teaching and support staff, teacher's background, and the way the instruction is organized (e.g., independent work, small groups, whole class).

3.0 Reform Features [*feature*] *(Classification of reform features illustrated.)*

Interdisciplinary Project-based Collaborative Learning Mixed Age

Extended Activity Part of Core Program Teacher as Coach

4.0 Description of Activity [*activity*] *(Extended description of the purpose of the activity, subject areas involved, how it relates to curriculum goals, what teachers and students were doing, the length of both observed activities and other activities that are part of the same project and unit, and how technology was used.)*

5.0 Technologies Involved [*types*]: *Check off technologies used.*

- Microcomputers
- ILS
- Other LANs
- WANs
- CDROM
- Interactive videodisc
- Videocams and editing equipment
- Other
- Word processing
- Spreadsheet
- Hypermedia
- Animation
- Simulation

6.0 Technology Use *Classification and description of how technologies were used.*

- Student Uses **[*kiduse*]**
  - Tutorial ***[tutor]***
  - Exploratory ***[explore]***
  - Communication ***[commtn]***
  - Tool ***[tool]***
- Teacher Uses **[*tchuse*]**
  - Communication
  - Presentation
  - Instructional Management

7.0 Intended Benefits of Technology Use [*bene*] *Include any of the following:*

- Peer-to-peer collaboration
- Independent exploration
- Access to outside information resources
- Support for higher-level thinking
- Creativity
- Technology skills

8.0 Realized Benefits of Technology [*kidout*] *Include any of the following:*

- Motivation ***[motiv]***
- Attendance, time on task, discipline ***[kidbehav]***
- Amount of collaboration & cooperative learning skills ***[coopig]***
- Ability to manage own learning ***[selfreg]***
- Access to outside information resources ***[outinfo]***
- Support for higher-level thinking ***[higher]***
- Complexity of task students can accomplish ***[taskacc]***
- Learning on specific tasks ***[kidlearn]***
- Creativity ***[create]***
- Greater attention to how a product will be understood by others ***[audience]***
- Technology skills ***[hackskl]***

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