U.S. DEPARTMENT OF COMMERCE
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Evaluation of the
Telecommunications and Information Infrastructure Assistance Program

Case Study Report

The University of California at Berkeley
Interactive University (IU) Project
96071

Berkeley, California

Site Visitors:	Gary Silverstein and Nicole Bartfai
Dates of Visit:	May 10-11, 1999

PREFACE

The following case study report is being issued as part of TIIAP's ongoing evaluation initiatives designed to learn about the effects of TIIAP funded projects. This report is one in a series of twelve based on in-depth case studies conducted in 1999 to study three subjects: (1) issues particular to rural communities (2) issues particular to urban communities, and (3) challenges in sustaining information technology-based projects. The case study reports give us evidence about the special challenges that each project faced and provide information for a better understanding of factors that can facilitate the success of such projects.

In addition to being urban or rural, the case study projects were selected because they involved distressed communities, represented innovative models for services, and affected measurable community outcomes. The case studies, conducted under contract by Westat, an independent research firm, consisted of extensive review of project files and records, interviews with project staff, representatives of partner organizations, and project end users. In addition to the 12 individual reports, a summary of findings across the projects is also available on the NTIA website.

NTIA wishes to thank the case study participants for their time and their willingness to share not only successes but also difficulties. Most of all, we applaud your pioneering efforts to bring the benefits of advanced telecommunications and information technologies to communities in need. We are excited about the case studies and the lessons they contain. We believe that these projects provide a unique insight into the variety of ways to eliminate "the digital divide" which exists in our nation. It is through the dissemination of these lessons that we can extend the dividends of TIIAP funded projects nationwide.

We hope you find this case study report valuable. You may obtain other case study reports, a summary of findings of the collected case studies, and other TIIAP publications through the NTIA website (www.ntia.doc.gov) or by calling the TIIAP office at (202) 482-2048. We also are interested in your feedback. If you have comments on this, or other reports, or suggestions on how TIIAP can better provide information on the results and lesson of its grants, please contact Francine E. Jefferson, Ph.D., at (202) 482-2048 or by email at fjefferson@ntia.doc.gov.

Stephen J. Downs, Director

Telecommunications and Information Infrastructure Assistance Program

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Project Name	The University of California at Berkeley Interactive University (IU) Project
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OEAM Number	96071
Application Area	Education, Culture, and Lifelong Learning
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Dates of Site Visit	May 10-11, 1999
Site Visitor(s)	Nicole Bartfai, Gary Silverstein
Abstract	The University of California at Berkeley's Interactive University (IU) was developed as an outreach program aimed at promoting educational opportunities for K-12 students from disadvantaged and diverse neighborhoods in the San Francisco Bay Area. The IU was established to promote K-12 and university collaboration through integrating Internet outreach models into the classroom. IU issued a request for proposal, and 20 of the proposed pilot projects—located in 10 high schools, 10 middle schools, and 6 elementary schools in the Oakland, San Francisco, and Berkeley School Districts—were funded. Outcomes were documented at the school, district, and university level. An increased level of communication and collaboration was witnessed between all partners. Student-level outcomes included more interest in particular content areas, an increase in technology-related knowledge, and more interest in college. Teachers also experienced an increase in knowledge related to technology and an increased sense of professionalism as a result of participating in the IU project. Several difficulties were experienced while implementing the project. The lack of a technology infrastructure in some of the participating schools proved to be one of the most challenging aspects. Implementation was also impeded by differences between the K-12 and university cultures. IU staff applied the lessons learned (e.g., the need for more district involvement, extended period in which to implement the project) to a second phase of the project. Phase 2, which began after the TIIAP grant ended, funded 11 projects—7 "core" projects and 4 "planning" projects. The success of the pilot phase—and the continued operation of the IU—demonstrates that the IU prototype can indeed serve as a model for other communities.

A. Background

Community Characteristics

The Interactive University (IU) project focused on improving educational opportunities for students attending schools in predominantly poor, inner-city areas of San Francisco and Oakland. These schools are part of a University of California at Berkeley (UCB) initiative to improve K-12 public education in disadvantaged communities in the Bay Area. The schools initially targeted shared some general characteristics, e.g., a high percentage of minority students from low-income families. Sixty to 90 percent of families in the targeted schools receive Aid to Families with Dependent Children (AFDC). Poverty rates in these areas exceed citywide averages (e.g., in West Oakland, poverty rates for families are 55.3 percent, while the citywide average is only 16.7 percent). Unemployment is also significantly above citywide averages (e.g., in West Oakland, unemployment rates exceed 20 percent, compared to citywide averages of 9.5 percent). Crime is prevalent in these areas, and drug- and gang-related incidents are reported daily. In addition to the high unemployment rates, most of the adult population has not graduated from high school (e.g., in Bayview Hunter Point, Southeast San Francisco, only 28 percent of the adult population has graduated from high school). These statistics illustrate the poverty and overall lack of opportunities available for many of these students (TIIAP grant proposal, 1996).

Project Overview

Problems/Disparities the Project Was Designed to Address. In 1995, the then Chancellor of the University of California at Berkeley initiated the "Berkeley Pledge"—an outreach campaign aimed at promoting educational opportunities for K-12 students from disadvantaged and diverse neighborhoods in the San Francisco Bay Area. In an effort to achieve this goal, four Bay Area school districts were invited to "meet with campus outreach programs in February 1996 to discuss the barriers to student achievement in the schools and to identify and select a 'pipeline' of feeder schools from among the elementary, middle and high schools to be adopted by the Pledge."—Berkeley pipeline schools. According to a UCB website:

> The Berkeley Pledge is designed to fulfill the university's historic promise to maintain diversity while preserving excellence and to provide the best education to all of California's diverse student populations, particularly those whose opportunities are limited because they are financially or educationally disadvantaged.

The website identifies five goals for the Berkeley Pledge, including (1) helping to strengthen K-12 schools, (2) enhancing campus recruitment efforts through a new campus Recruitment Corps, (3) keeping Berkeley affordable for all students, (4) enhancing campus academic support services for Berkeley undergraduate and graduate students, and (5) providing an environment that encourages promising undergraduates to pursue graduate and professional studies.

Before the Berkeley Pledge, the idea for the Interactive University Project was underway. In early 1995, a team of UCB faculty and staff met in response to a campus-wide initiative to determine how information infrastructure could effectively be used as a tool to promote community outreach. Before the IU, there were no formal mechanisms in place to facilitate educational outreach and collaboration with local K-12 schools—especially in disadvantaged and diverse urban neighborhoods. In addition, distance, a lack of internal incentives, and competing professional demands prevented many faculty members from contributing their time to local service activities. The IU anticipated that the development of a formal mechanism and internal incentives to work with K-12 schools would serve to encourage participation in Internet-related technology initiatives aimed at promoting educational opportunities for students in disadvantaged communities. The IU and the Berkeley Pledge joined forces, with the IU as the technology partner to the Berkeley Pledge.

The IU was also designed to help UCB faculty collaborate with colleagues from other UCB disciplines and departments. Barriers to collaboration included the limited time of UCB faculty, a lack of incentives to engage in interdisciplinary ventures, and a general lack of coordination among ongoing K-12 projects. An important aspect of the IU was to serve as a mechanism where different departments could collaborate in an area of mutual interest, while also serving the community.

Technical Approach. IU staff recognized that information infrastructure could serve as a mechanism for breaking down the barriers that exist between schools, the UCB campus, and local community-based organizations (CBOs). If properly deployed and applied, information technology could increase interaction between institutions, enhance teachers' access to resources, link schools with campus departments/organizations and CBOs, and allow participating entities to share information more readily. IU identified five major areas of focus for the TIIAP-supported pilot projects:

1. Supporting teachers and cultivating innovative teaching strategies.
2. Engaging students in learning.
3. Involving and supporting families in learning.
4. Recognizing diverse communities in education.
5. Linking K-12 students to the community, civic activities, and the workplace.

With these five goals in mind, IU issued a request for proposals (RFP) to the entire UCB campus. Departments submitting proposals were to consider the following guidelines: (1) work collaboratively with other campus units, (2) work with any of the 10 Berkeley Pledge pipeline schools in the southeast section of San Francisco and the 7 Pledge schools in West Oakland, (3) explore innovative ways to use the Internet for K-12 outreach, and (4) increase K-12 student achievement. Thirty-four proposals were received. The team of reviewers, which included UCB and school district personnel, decided which projects were most aligned with IU's goals and objectives. As a result of the review process, several of the campus departments that submitted proposals were asked to work with other departments with similar disciplinary approaches (e.g., the History of Art Department was asked to collaborate with Cal Performance and the Berkeley Art Museum). This approach increased involvement of campus departments while limiting the number of projects to 20.

Pilot Projects. Pilot projects took place in 10 high schools, 10 middle schools, and 6 elementary schools across the San Francisco, Oakland, and Berkeley school districts. They were carried out across the core (e.g., English, math) and supplementary (e.g., art, music) K-12 curriculum. These projects explored methods of outreach through technology. The site visit focused on 4 of the 20 pilot projects (see Appendix A for a description of all 20 pilot projects):

- **Reading Through Science and Technology "Project FIRST"** was developed through a partnership between the Center for Science Education at the Space Sciences Laboratory and the Graduate School of Education in order to benefit from their rich expertise in the areas of literacy, science, technology, and curriculum development. The goal of Project FIRST was to increase the literacy development and proficiency of Oakland elementary school students through a model program that integrates inquiry-based science curricula, Internet technology, and a mentored learning environment.

- **Integrating Science, Teaching, and Technology (ISTAT)** was a collaborative effort by the Berkeley Seismological Laboratory, the Center for Particle Astrophysics, the Center for Science Education at the Space Sciences Laboratory, and the UC Museum of Paleontology. The ISTAT team worked with 6th to 12th grade teachers in San Francisco to create a suite of inquiry-based digital science curriculum materials.

- **The Interactive University California Heritage Pilot Project** explored how the Bancroft Library's California Heritage Collection, an online archive of over 28,000 images of California history and other related primary source materials, was used to support local, California, and U.S. history curriculum standards in San Francisco and Oakland schools.

- **Connecting Students to the World** used online conversations with digital curriculum to link Berkeley faculty and distinguished visitors to San Francisco high schools and Oakland middle schools. This partnership with the Institute of International Studies enhanced the U.S. history and civics curriculum.

Soon after selecting the projects, liaisons between districts, schools, and the university were hired. The liaisons played a pivotal role in setting up collaborative frameworks from which schools and university staff could operate. Responsibilities included planning and conducting technology and project training activities, establishing technology infrastructures in the participating schools, managing district budget requirements, and, most importantly, enhancing collaboration between school and university personnel.

After the 20 projects were selected, teachers in the San Francisco and Oakland Unified School Districts were invited to an open house that included presentations by representatives from each IU project (separate events were held in each of the two districts). Teachers received a letter/flyer via fax from the Associate Superintendent explaining the opportunity, and the district liaison traveled to a sample of schools—including all Berkeley Pledge schools—to promote the IU project. Approximately 100 teachers (35 percent of whom represented Berkeley Pledge schools) attended the open house. Teachers listened to a 10-minute presentation on each project and then applied for a specific project they found interesting. The review committee, consisting of university and school district personnel, reviewed each teacher's application. When selecting the teachers, the committee took into consideration (1) whether the candidate would fit with the proposed project, (2) diversity in grade span and content area across the 20 projects, and (3) the committee's overall perception of the quality of teachers and the

schools in which they taught. It was important for schools to have technology in place or in the process of being established in order to base a project there.

As the selection process progressed, it was apparent that school selection could not be limited to Berkeley Pledge schools because some of the schools did not have the capabilities to house a technology-dependent project and other Berkeley Pledge schools did not have teachers interested in such a project. IU staff decided that most schools in San Francisco and Oakland fit the demographics of disadvantaged, and project staff did not hesitate to include schools that were not Berkeley Pledge schools. As such, it is important to note that the communities that were initially targeted by IU altered during project implementation. In the final evaluation report, the IU staff described the population in both school districts as follows: "A large proportion of students from Bay Area school districts consistently score below the national average in standardized tests (http://star.cde.ca.gov.) and perform at low levels of academic achievement (1998)." Given the increasing need in most communities of San Francisco and Oakland, IU decided to work with any school that met other established criteria (e.g., information infrastructure installed, interested teachers).

By the time the campus departments and teachers had been selected, projects had been assigned a coordinator. Due to the variation in projects and individual personalities, the project coordinators assumed different roles. In general, responsibilities included team building, increasing or enhancing communication between UCB and the school, coordinating work to meet project goals, handling administrative tasks, and coordinating/facilitating the evaluation of the project. During the site visit, one of the project coordinators explained the scope and diversity associated with coordinating her project—operating in both districts and in six different schools with all grade levels included. The scope and diversity across grades for this particular project was the extreme. The majority of projects were conducted in one or two schools and involved a few teachers.

Anticipated Outcomes. In the application to TIIAP, project staff described how their approach could potentially serve as a model: "This project's ultimate goal is to build a model that can be used by other universities and colleges and their community partners to far more effectively and innovatively link students, families, and CBOs to university resources." While working to create an overall model for university K-12 outreach, IU hoped to encourage minority students to enroll in the UC system or college in general. By working with disadvantaged urban schools, more minority students would have/gain access to information on college.

The IU staff anticipated that the project would bring together the resources and people at UCB to promote new opportunities for students and ultimately affect achievement. Project staff stated that they hope this project will "act as seed money for the creation of sustainable outreach programs and/or methods, and that these programs will particularly enable greater faculty participation in public service and large scale participation of students and staff" (TIIAP application, 1996). IU staff were hopeful that this project would build new relationships between the schools and the university and strengthen community relationships. UCB could provide a plethora of resources and expertise that would be beneficial for improving K-12 education. Overall, project staff had several goals when initiating this project, including (1) foster collaboration between the campus and schools, (2) promote the integration of teaching, research, and community service, (3) enhance student achievement, and (4) identify effective, scaleable, and sustainable Internet outreach methods.

During the site visit, district partners discussed what they considered important objectives for the project. The district level personnel shared many of the same goals and objectives as UCB, such as to work more effectively with partners. They also had their own unique objectives for the project, including building staff capacity for Internet-based technology. District staff expressed the importance of investing time and resources in a project that was likely to improve the curriculum, increase technology use in the schools, and ultimately impact student achievement scores.

Project Status at the Time of the Site Visit

As a result of their experiences with the Phase 1 (TIIAP-funded) projects, project staff indicated that they recognized the need to "push harder on the issue of scale" so as to increase the number of K-12 and UCB partners who could work together in a mutually beneficial manner. To accomplish this, the IU took steps to integrate five fundamental elements into its ongoing activities: the development of learning community projects, the development of after-school/community technology projects, the continued use of evaluation to assess the implementation and impact of the IU, the development of Nexus collaborative space—to enable an even greater number of K-12 teachers to make use of IU-sponsored educational materials and resources, and leadership training to develop a cadre of "teacher leaders."

The IU was able to infuse these five elements into the 11 projects that were funded as part of its second round of awards. Seven of these "Phase 2" initiatives were "core" projects;

that is, they were funded for a 3-year period to implement a specific approach in a sample of Oakland and San Francisco schools. The remaining four initiatives were "planning" projects; that is, they were funded for 9 months to lay the foundation for implementing a full-scale IU project. The primary purpose of these planning projects was to assess the feasibility of the proposed approach (e.g., assuring that the existing technology infrastructure would support the proposed approach) and enhance the level of collaboration between the UCB project team and district/school personnel. Activities to be undertaken by these planning projects included (1) strengthening relationships between project staff at UCB and the participating districts/schools, (2) delineating the curriculum standards that would be addressed by a full-scale IU project, (3) identifying the student achievement objectives and assessment methods that the full-scale IU project would be designed to achieve, (4) identifying a project coordinator and having preliminary discussions with school partners (e.g., key teacher leaders, principals, and technical support staff), and (5) developing a revised project plan.

This distinction between "core" and "planning" projects—and the resulting two-phase approach—represents a significant (and at times subtle) modification of the approach that was adopted during the TIIAP-supported pilot phase. Specifically:

- The IU was funding a smaller number of projects. This reflected a decision by key stakeholders that it would be beneficial to provide a greater amount of money and technical support to a smaller number of projects.

- The core projects were receiving an increased amount of money ($105,000) and time (3 years) to achieve their objectives.

- Although only implemented in a small number of schools, the Phase 2 projects were designed to be scaled up to a greater number of schools, teachers, and K-12 students.

- The bulk of funding for these Phase 2 projects came from the Oakland and San Francisco school districts through their state and federal Technology Challenge Grants.

- The Oakland and San Francisco school districts were driving the content of the IU-funded projects. This reflected a decision that the IU should support K-12 initiatives that were aligned with local, national, and California content and performance standards.

- Each of the IU projects is required to develop digital learning materials (e.g., lesson plans, units, and courses) that can eventually be customized and/or used by a greater number of K-12 teachers and students. These digital learning materials are to be based on relevant curriculum content

and performance standards in the following areas: science, social science, language arts, and technology literacy.

- Representatives from the Oakland and San Francisco school districts (e.g., curriculum specialists, teachers) have a greater role in selecting the projects that receive IU funding. In addition, the RFP that defined the scope of the Phase 2 projects was developed as a collaborative effort between IU and district staff (the Phase 1 RFP was developed by the IU and then reviewed by district staff). These actions reflect a decision that the Phase 2 core and planning projects should emulate the priorities of participating districts and schools.

- The process for selecting participating schools has also changed. School district personnel have a larger role in identifying schools ready to make a positive contribution to the project. Project staff indicated that districts are generally looking for schools that (1) already have the necessary technology infrastructure, and (2) have a principal who is likely to enthusiastically support the project.

- The process for selecting participating teachers has also changed. Districts are generally looking for teachers who can ultimately serve as teacher leaders in a successful and supportive school environment. This reflects another important Phase 2 goal, that is, cultivating good teachers—who might otherwise leave the Oakland/San Francisco school systems—to attain the skills needed to serve as master or mentor teachers, and perhaps eventually become curriculum specialists and principals.

- In addition to cultivating teacher leaders, the IU is looking to use Phase 2 to "cultivate a cadre of collaborative leaders in the schools, University, and community—professionals skilled in Internet technologies who are leading their own institutions and know how to work with other institutions." According to the IU, these leaders will "serve as a nucleus of trained and experienced personnel around which a larger organization can be built, expanded, and sustained."

- In Phase 2, the IU is placing a greater emphasis on creating and supporting safe places—at schools and in community-based organizations—where both students and family members can congregate during non-school hours to "learn, explore, and interact using technology."

- The Phase 2 projects are being used to collect more sophisticated data that can be used to assess the impact of technology on K-12 students. In addition, greater emphasis is being placed on developing evaluation/assessment methods that can be incorporated directly into the curriculum. Under Phase 2, IU and district staff will provide consultation for both planning and core projects in how to conduct an effective and seamless evaluation.

The planning projects are scheduled to end in late 1999. At that time, it will be decided whether any of these planning projects should be awarded core project status. The seven existing core projects are scheduled to run through 2001.

B. Community Involvement

Characteristics of the Grant Recipient Organization

The University of California at Berkeley is a land-grant institution that is dedicated to working with the community to better prepare K-12 students for college, a career, and lifelong learning. Berkeley's Interactive University project is a campus-wide consortium of 20 academic departments and outreach programs that collaborate to use information technology for community service. IU began in 1995, before receiving TIIAP funding, with the idea that technology could be used to facilitate K-12 outreach and that more collaboration was needed between UCB departments. The campus departments provide expertise in numerous arenas, including technical experts, experienced evaluators, and researchers and content specialists.

The project director of the IU also served as project director for the TIIAP grant. The Executive Vice Chancellor (who is also the Provost and chief academic officer) sponsored the project and acted as principal investigator as well as being the leader of the Berkeley Pledge. Additional staff included a project manager, evaluation specialists, technical support, and administrative support staff. At the time of the site visit, IU had 12 full-time equivalent employees, including UC staff from Nexus (a project designed to provide interactive learning and discussion via the Internet for all nine UC campuses and K-12 schools. For a full description, see page 23). Each of the individual pilot projects was staffed with representatives from the collaborating departments, and many projects used graduate and undergraduate students to act as evaluators, mentors, trainers, and/or support staff.

According to the RFPs that were used to delineate project roles, IU staff were responsible for the following tasks:

- Establishing relationships with participating school districts at all levels (students, teachers, technical support, curriculum experts, and administrators).
- Providing guidance on project evaluation.

- Providing technology training for students, teachers, and parents.
- Providing guidance and technical support in a variety of areas.
- Facilitating an exchange of information on the development and delivery of digital curriculum materials, instructional design, online access to experts, electronic mentoring, and other outreach/technology modalities.
- Disseminating project results through the IU website and UC Nexus websites.
- Promoting campus, community, and national visibility.
- Facilitating a structure for collaboration with a large number of interested and multi-disciplinary campus groups.

IU staff responsibilities have remained consistent through Phases 1 and 2 of the project, with the exception of *providing technology training for students, teachers, and parents*. This aspect was not included in the 1998 RFP because districts were assuming responsibility for training and professional development activities for teachers.

Partnerships

Inter-campus Departments. Each campus department working on a pilot project was considered a partner of IU. Besides working in collaboration with IU, campus departments were expected to work with other departments, the school districts, and the individual school/principal/teacher. Along with a grant received from IU, campus departments were responsible for funding half the individual pilot projects.

Oakland Unified School District. The Oakland Unified School District implemented a district-wide technology plan several years ago. It called for "every student to have ready access to a computer capable of electronic communications and to appropriate software" (TIIAP application, 1995). The district was also working with parents, community organizations, educational institutions, and business partners to coordinate an overall technology plan that would include building the network infrastructure throughout the school district. One of the corporate partners involved in this effort was AT&T. During the first quarter of project implementation, AT&T donated $50,000 for the 1997 calendar year to assist in using technology to support teachers and parents at middle schools in Oakland.

Schools in the Oakland Unified School District that participated in the TIIAP project ranged from elementary to high school level and across all socioeconomic locations in the city. The original focus of the grant was solely on the Enterprise Community of West Oakland, but the IU project included schools outside this community.

San Francisco Unified School District. Prior to the TIIAP project, the district received funding from a variety of corporate partners:

- Pacific Bell contributed a substantial amount of money that allowed schools in San Francisco to upgrade their wide area connection to T1 speeds. They also helped support community-based organizations in the area.
- IBM committed $2 million dollars to "reinvent education through the use of new technology." This grant provided hardware and software for schools and it helped create new software to assist with assessment and ongoing case management for special education students.

Other key projects funded through the district included a home computer program, development of academic alternative schools with a technological focus, and funding to hardwire and equip schools with the newest technology.

Community Outreach

Involving Community Stakeholders. Early in the project, IU established a faculty advisory committee and a steering committee. The faculty committee was composed of 12 UCB faculty and was chaired by the Executive Vice Chancellor. The committee was responsible for providing guidance to faculty involved with the pilot projects and making recommendations to the Executive Vice Chancellor on how to appropriately integrate technology with community service. Meetings were held on a quarterly basis. The steering committee, chaired by the Executive Vice Chancellor, was composed of representatives from schools, local governments, and corporate partners, and meetings were held every 6 months.

Monthly meetings took place with key school personnel, including superintendents, principals, and teachers. Coordinators for the individual projects also met on an ongoing basis. The bimonthly pilot project coordinators meetings served to update IU staff about the individual projects and provided the coordinators with an opportunity to discuss issues as they arose. The IU

strategic planning team held regular meetings to discuss such issues as common challenges and possible solutions for pilot projects, how UC Nexus would relate to IU, future directions for IU, and fundraising opportunities.

Project Outreach. UCB made a tremendous effort to inform the entire campus community of the IU project. At the start of the project, IU staff held press conferences, submitted newspaper articles, and began a biannual newsletter. Project staff also informed the campus community in other ways:

- "CyberSemester" seminar, a course taught by the IU director and the project evaluator, explored the use of the Internet for public service as part of a campus-wide technology awareness effort.

- Internet instruction and outreach was also discussed at a computer colloquium held for campus staff and area teachers. Overall, 120 attended the session. Other presentations included seminars where staff from each pilot project were provided an opportunity to discuss their project and receive comments and suggestions from others in attendance.

- The IU website (http://iu.berkeley.edu:7017/pages/home.html) was a valuable outreach tool. Included on the website are project-related materials, evaluation material, schedules for training sessions, and links to individual project websites.

- The IU Seminar Series was held during the 1997-98 academic year and featured the progress of the pilot projects. In attendance were teachers from the Oakland and San Francisco school districts.

- A 1997-98 Kick-Off Event, held at the UCB campus, brought together approximately 200 participants in the project. The purpose was to bring together school, district, and UCB staff to share information and ensure that projects were ready to get started.

Individual pilot projects also contributed to project outreach by including parents and others in the community in activities. Several projects involved volunteer organizations such as AmericaReads and Americorps to further promote project outreach.

Training

Training occurred at regular intervals throughout the project—both project-wide and within each district. A project-wide training was held for all school and UCB personnel during the summer preceding project implementation. The training covered topics such as e-mail, web browsing, and web authoring.

Both districts provided training for teachers. Once projects were staffed, each district held a retreat for teachers, UCB faculty/staff, and project coordinators during the summer of 1996. Both retreats dealt with similar issues and provided time for project staff to plan and collaborate. Each project was asked to assemble a "work to action plan." This included a timeline, goals, expectations, an evaluation plan, training, a budget, etc. The retreat also included a presentation and discussion of the IU project and the overall evaluation plan. Participants were provided an opportunity to meet with other projects with similar approaches or disciplinary areas, as well as participate in large group sessions to discuss potential challenges and how to possibly solve them. With the approaching school year, pilot projects began developing and implementing their individualized approaches.

After projects were underway, ongoing professional development training was held within each district. Both districts provided district-wide IU workshops on specific issues surrounding the use of technology (i.e., effective classroom management strategies while using technology in the classroom). These all-day events were attended by up to 75 participants. After a considerable amount of training on how to use the tools, the emphasis for training shifted to providing strategies to integrate the technology into the classroom.

Training also occurred at the pilot project level. Several projects trained students on how to use the Internet, create web pages, use e-mail, and use other applications and computer programs. One example was MLK MOO: Using Internet-Mediated Communication for Literacy Development Project. Tutors were provided training on reading strategies and higher order questioning, and they were introduced to the MOO (multi-user object oriented) Literacy environment (real-time computer-mediated tutoring to help foster the development of literacy skills for middle school students). The first training session was 2½ hours, and additional training occurred on an ongoing basis primarily via one-on-one e-mail. Also, students involved in this project received training on how to operate the Macintosh computers at the school computer lab and were introduced to MOO and the basic commands

needed to operate the program. Each pilot project included various levels of training activities for both teachers and students.

C. Evaluation and Dissemination

Evaluation

Phase 1. During Phase 1, the IU project employed a "tiered" evaluation approach designed to obtain information at both the micro- (project-specific data) and macro- (common data across all 20 projects) levels. The micro- and macro-level evaluations relied on a variety of data collection techniques, including pre/post questionnaires,[1] journals, grades/authentic assessments, portfolios, observations, interviews, and focus groups. The IU evaluation component was overseen by faculty from the Graduate School of Education and the Center for Science Education at Space Sciences Laboratory.

As part of the micro-level evaluation, each Phase 1 pilot project was responsible for collecting its own data on key issues associated with student achievement and the consequences of using technology-based outreach methods. Of particular interest was developing measures that could be used to assess project-specific improvements in a given subject area, e.g., increased knowledge of earth and space science, increased knowledge of college admission requirements, and enhanced student attitudes about a specific content area. IU evaluation staff were responsible for helping each of the 20 pilot projects develop evaluation instruments and develop strategies for compiling the necessary data.

The macro-level evaluation addressed a number of project-wide issues, including collaboration between UCB faculty and district/school personnel, project sustainability, and project scale. The IU evaluation team relied on a variety of data collection activities, including written surveys, interviews, and focus groups. The purpose was to collect and analyze common data from all 20 pilot projects on the following types of topics:

- What did projects learn as a result of their participation in the IU initiative?
- What obstacles did Phase 1 projects encounter? How were these obstacles overcome?

[1] The pre/post questionnaires for all target audiences were placed on the Web and tied to a back-end database.

- What effective strategies were uncovered? For example, what made an impact on student achievement (and why)? Which Phase 1 strategies were sustainable? Which Phase 1 strategies could be scaled up to a greater number of teachers and students? What were the unintended consequences of using technology to augment classroom practices?

- What recommendations did participants have for future IU activities?

The resulting evaluation report used micro- and macro-level data to address six principal issues, including (1) the impact of Internet technology on student achievement and teacher practices, (2) the role of Internet technology in building and sustaining collaboration, (3) the role of Internet technology in integrating teaching, research, and service, (4) key issues related to technology implementation and use for education, (5) key issues related to the administration of the IU project, and (6) issues related to IU projects' potential to be scaled and sustained.

During the site visit, IU project staff identified a series of lessons learned as a result of the Phase 1 evaluation process. Specifically:

- **Individual projects require considerable assistance in carrying out their micro-level evaluation activities.** While project staff endorsed the tiered approach, they also indicated that considerable effort is required to help individual projects develop and employ appropriate data collection procedures. They therefore recommended that organizations looking to implement a similar approach appoint a staff member (e.g., a graduate student) to oversee and work with each project (this was not done during the Phase 1 because there were too many projects and too few staff). These staff could then meet on a periodic basis to assure that common procedures are being applied across the range of funded projects.

- **District and school personnel should be involved in the planning phase of the evaluation.** Project staff emphasized that the evaluations need to be viewed as collaborative efforts, i.e., faculty, teachers, and district staff need to be equal partners in deciding what is evaluated. This approach can maximize the likelihood that teachers will have a vested interest in the outcome—which leads to higher response rates and grading reliability.

- **Take steps to minimize response burden.** Project staff suggested that whenever possible, evaluation questions should be embedded in the actual content/curriculum. Using authentic assessment tools that are developed as part of the project can alleviate the burden of having to use valuable class time to collect evaluation data. It can also maximize the

likelihood that any evaluation data that are collected will be aligned with the actual curriculum (which, in turn, is aligned with district and state standards).

- **Inform projects ahead of time about any data collection and evaluation requirements.** Project staff emphasized the value of delineating evaluation procedures in the RFP. This forces prospective participants to demonstrate their understanding of and support for the evaluation component as a condition of their acceptance of funding.

- **Use multiple data collection strategies to assess a project's implementation and impact.** For the macro-level evaluation component, project staff emphasized the need to rely on both quantitative (e.g., pre/post surveys) and qualitative (e.g., focus groups, interviews) data collection activities. The use of focus groups and other qualitative activities was viewed as enabling participants to reflect back on their project-related activities and accomplishments.

Phase 2. The Phase 2 evaluation activities are designed to build upon the lessons learned during Phase 1. To facilitate the micro-level evaluations, research professionals and graduate students have been assigned to help each project collect the necessary data. A new and challenging aspect of the Phase 2 micro-level evaluations is the requirement that each project develop student assessment tools that can be embedded into its digital curriculum materials. These student assessment tools may include pre/post tests, as well as alternative methodologies that take advantage of technology (e.g., electronic portfolios). If possible, projects are encouraged to use the Internet to collect and analyze their assessment data.

As part of the macro-level evaluation component, Phase 2 project participants will be required to participate in a variety of evaluation activities, including completion of online pre/post questionnaires and participation in focus group or individual interviews. Project staff indicated that they intend to streamline the surveys used to conduct the Phase 2 macro-level evaluation. In keeping with the decision to include stakeholders in the evaluation process, these streamlined data collection protocols will be reviewed by a steering committee comprising project directors, teachers, and curriculum specialists.

Dissemination

IU project staff attended numerous conferences to discuss the overall project and how it utilized Internet technologies to enhance K-12 outreach. The IU project director attended the University of California systemwide conference on teaching and learning technologies. Presentations were also made to several groups of foreign visitors interested in understanding research and implementation projects, using Internet technology for outreach efforts, at UCB. Other presentations given by IU staff included a UCB America Reads conference, EDUCOM meetings, and the UCB Graduate School of Education “Excellence in Collaboration and Outreach” conference. Individual IU projects also gave presentations on IU work at educational technology and content-specific conferences.

D. Problems Encountered

IU experienced several difficulties while implementing the project. The lack of a technology infrastructure in some of the participating schools proved to be one of the most

challenging aspects. Implementation was also impeded by differences between the K-12 and university cultures. IU staff were able to learn from many of the issues and apply the lessons to Phase 2 of the project. Listed below are several of the key issues that unfolded during Phase 1.

School-Level Problems. It was difficult to implement a technology project without an information infrastructure and computers in place at the schools. According to the project evaluation report, "Internet connectivity and computer access by teachers and students has generally not been in place to the level required for the pilot projects to proceed on their original timelines." Schools were selected based on the teachers who applied to the project, without fully understanding how the school was equipped to implement a technology-related project. One project that was scheduled to begin in September 1997 did not become operational until January 1998 because wiring was not installed. The lack of technology not only hindered implementation, but also hampered communication (via e-mail) between the teachers and the UCB partners. As stated in the project evaluation report, "The availability of technology in schools was a constant challenge, which in turn created problems of teacher access to e-mail for communication with partners." Employing staff to maintain the equipment was also problematic, especially given that many schools were on limited budgets and did not have full- or part-time staff to assist with technical difficulties.

Other problems at the school level were that several of the schools selected for pilot projects lacked administrative support and also had other non-technology related issues (e.g., truancy, high crime rates, teacher stability problems due to transfer or illness). Despite the fact that teachers applied to the individual projects, pilot projects experienced problems with teacher involvement and retention. Several teachers became uninterested in the individual projects, but more of a problem was the level of teacher turnover experienced by both districts.

Teachers also had a difficult time learning/incorporating isolated project activities into the classroom. Teachers found it difficult to spend time with add-on activities rather than projects that enhanced or were embedded in the curriculum. It became obvious to the districts that project activities should be incorporated into the standard-driven, district/state level curriculum in order to be fully implemented by teachers in the classroom.

Distinct Cultures in K-12 Schools and the University. Two distinct cultures exist within the IU project—the K-12 culture and the university culture. Problems surfaced because there was a lack of a common language, different goals, and different day-to-day activities between teachers at the elementary/secondary school level and the university level. For example:

- When teaching a subject, UC faculty will spend an entire semester covering a single topic, whereas high school teachers may have only 5 days to examine the highlights of that same topic.
- Several UC faculty became frustrated when unable to reach K-12 teachers via phone or e-mail, but many UCB staff did not recognize the inflexible schedules that exist in elementary and secondary schools.

Another difference between the K-12 environment and the university environment was the difference in the technological infrastructure of the institutions and how partners used technology. In the final evaluation report, IU staff describe how teachers felt about the use of technology:

> Teachers commented that they wished coordinators would simply call instead of sending lengthy e-mail messages that they may check on a weekly instead of daily basis. Classroom teachers did not have the opportunity or access to computers as part of their typical day to check their e-mail regularly as compared to individuals at the university, where technology is part of the culture. University personnel needed to understand the different type of restrictions that are placed upon teachers and find alternative means of communication with K-12 partners, such as phone calls and more site visits.

Without time early in the project to communicate and discuss expectations, personnel from both institutions did not understand each other's needs or expectations for the pilot projects. Several projects were able to effectively work through problems and attributed the projects' level of success to ongoing communication. For example, a teacher in one project reported in the evaluation report that "[the] project went well because we had a really...dedicated person at the university who was very good in terms of frequent communication." Other projects experienced continual difficulties in trying to effectively communicate, and project staff understand how this problem can eventually affect the success of the project.

Difficulties Encountered with Project Administration, Planning, and Evaluation. Overall, IU had a difficult time balancing the demand to involve the large number of campus departments and K-12 partners with the limited resources available and time necessary to manage the project. Without the resources and staff necessary to implement a project of this magnitude, several aspects of the project were problematic:

- **Insufficient time to successfully implement a project.** In the final evaluation report, IU commented: "Given the scope of what the IU project was planning to achieve in the course of one and a half school years, it is not surprising that adequate time and a realistic timeframe were identified by teachers, coordinators, administrators, and faculty as necessary to build and sustain a collaboration" (1998). A project of this scope required more time than the 2-year timeframe that was provided in the grant application. More start-up time was required to train teachers and get technology in place prior to project implementation. It would have also been beneficial for pilot project staff to have more time to collaborate and work together.

- **Lack of assistance for pilot projects.** Most of the pilot projects did not have support for many administrative tasks and/or evaluation activities. The use of graduate students helped some pilot programs, but not all the campus departments had that level of funding for these projects.

- **Difficulties in measuring the impact.** UCB faculty and some individual pilot project staff had difficulties in determining how to assess the impact and achievement of students. The multi-tiered evaluation plan anticipated that individual projects would conduct a micro-level evaluation. Training for this evaluation was provided on a one-on-one basis when requested by the pilot project coordinators.

UCB Faculty Preferred to Work with Upper-Grade Classrooms. At the onset of the project, respondents indicated that it was difficult for some UCB faculty to design projects that worked with elementary school students. UCB faculty had few similarities with elementary school teachers (e.g., self-contained classrooms vs. departmentalized classrooms), and this contributed to the UCB faculty's preference for working with older students. Compounding this fact was that any impact would not be witnessed for several years and was more difficult to measure in elementary students. IU staff and district staff worked to promote more elementary school projects, but most projects remained at the high school level. Ironically, projects designed for the elementary level tended to be more successful because teachers had more flexibility in their schedules than high school teachers. This trepidation was never fully overcome by all UCB

faculty, but many of the projects once intended for secondary school students were altered to fit elementary school students.

E. Project Outcomes

School-Level Outcomes

Teachers Learned How to Use the Technology and How to Integrate the Technology Effectively. Each teacher involved with an IU project participated in training activities to increase his or her knowledge of technology and learn how to use the different tools (e.g., Internet, e-mail). On the post questionnaires, 25 percent of teachers indicated that the Internet had enhanced academic achievement in their students through research, e-mail, and project presentations. Participants were also able to apply their acquired knowledge to classroom lessons/activities, therefore integrating technology into their lessons. The more successful projects/teachers were able to fit their new technology-related knowledge into their current curriculum requirements. By making technology a natural part of current classroom teaching, teachers reduced the difficulty associated with adding content to an already full curriculum.

Teachers Felt an Increased Sense of Professionalism. Teachers interviewed felt that their participation in the project afforded them an opportunity to engage in ongoing professional development. The professional development activities came in several forms, including training sessions and collaboration with university personnel. Teachers were provided release time and a stipend. One of the pilot projects reported that "having teachers paid for their time to meet the needs of the project was a real boost to morale, providing an increased feeling of respect." This treatment of teachers as professionals illustrated to teachers the importance attached to their knowledge of schools, classrooms, and students.

Students' Interest in and Exposure to Specific Content Areas Increased. Each project had a different disciplinary focus. Examples included science, reading, world religion, history, and the arts. Through these projects, a more in-depth presentation of material was provided to students, and for many students the non-traditional format—the Internet—heightened their interest in the subject. For example, Project FIRST reported that students' attitudes toward astronomy and technology were more positive after the intervention. Project staff made the content more interactive and enjoyable by using computer technology, and the students displayed "enthusiasm and eagerness" while doing their work. Another example was the California Heritage

Project where students gained access to a collection of over 28,000 pictures and writings done as digital images. Students in one school completed HyperStudio projects on their family history. This collection served to educate students about their own heritage and the diversity throughout California. The final report stated that there was a "consistent agreement from all data sources that students demonstrated an increase in attitude toward subject matter." Evidence provided was greater pride in their work and an increased interest in the Internet and college. Fifteen percent of teachers reported that students demonstrated an increased knowledge of subject matter. The areas affected were critical thinking, increased interest in subject matter, and computer skills.

Students Learned to Use Technology Effectively. The IU project encouraged students to use the Internet and other technology-related tools with the intended purpose of enhancing their education. For some students, this was their first exposure to technology; for others, they might have worked with the Internet/e-mail but not often for specific project-related activities. Any additional exposure to technology—which was an integral part of the classroom activities—allowed students to learn to use the technology more effectively. For example, students learned how to find valuable information on the Web or to have discussions via e-mail with teachers or university personnel. According to the final evaluation report, "There was a 7 percent increase in the number of students who perceive that Internet technology makes work easier." These types of opportunities increase students' knowledge of technology and how to use it effectively.

Students Had Opportunities That Were Engaging and Empowering. Most of the students involved in the pilot projects were provided opportunities not commonly found in the traditional classroom. Some of these opportunities included more one-on-one attention, hands-on activities, and access to new resources. The new opportunities created through IU resulted in students' increased involvement in school and an increased sense of responsibility for their learning. In one project's final report, evaluators noted that "many of the students who were traditionally non-participators showed evidence of learning…either in active and effective debate performances or in grades on the written post test." This same project also found that during these activities students were more likely to submit homework assignments and performed better on tests. Another project resulted in first grade students learning to use e-mail, and through this experience and other similar experiences, e-mail has become a part of their vocabulary. The teacher involved with this project commented, "Students take away with them the connections to life—now e-mail is part of their vocabulary." She also felt it was important that students took these experiences home to their parents/guardians so that the adults can learn through their children's experiences.

Another way students benefited was from the increased exposure to the university and college setting. A 15 percent increase in students' gathering information on college was reported in the project's final report to TIIAP. Students who had not previously considered attending college were now considering that a possibility. Even elementary students had an opportunity to visit the UCB campus. One teacher reported how her students returned home after visiting UCB and asked their parents to put money aside for college. Visiting a college campus made a substantial impact on these students, especially considering that they might otherwise never know or hear about college.

Impact on UCB Faculty and Staff

Most faculty members involved in the project began collaborating with school-level personnel to implement the project. This was accomplished at the school/university and the teacher/faculty levels. Through joint planning and site visits, UCB faculty gained an increased level of understanding and became more aware of the process of schooling. One project reported that "UCB partners learned a great deal about the level of literacy and learning at the school sites and went away with a greater appreciation for the difficulties facing teachers." UCB staff had the opportunity to participate in curriculum development and work closely with teachers to improve teaching methods with respect to the discipline area.

The IU project also facilitated collaborations among UCB faculty. For example, according to *Overview and Lessons Learned: A Preliminary Report: "*Without the Interactive University structure, it would have been difficult for the majority of...groups to become aware of other similar projects and to establish collaborations. Interactive University Project activities provide a forum for continued communication and sharing among these groups."[2] Examples cited in the report included:

- The efforts of the History of Art Department, Berkeley Art Museum, and Cal Performances were linked into one larger project.
- The American Indian Cultural Restoration Project and the Hearst Museum of Anthropology California Indians Project consulted with each other and shared electronic outreach strategies.
- In the area of recruitment and advising, the Berkeley Recruitment Corps, Academic Achievement Division, College of Engineering,

[2] Greenbaum, David, and Isabel Hawkins. *Overview and Lessons Learned: A Preliminary Report*. The UC Berkeley Interactive University Project. January 22, 1998.

and Early Academic Outreach Program worked together with high school and community college teachers and counselors to explore electronic recruitment.

- The Graduate School of Education's Literacy Project (which focuses on middle schools) joined forces with the Space Sciences Laboratory's Foundations in Reading Through Science and Technology Project (which focuses on elementary schools) to share assessment, training, and tutoring methodologies.

- The Electrical Engineering and Computer Science Department, the Lawrence Hall of Science, MESA (Mathematics, Science, and Engineering Achievement Program), and Materials Sciences agreed to collaborate with one another.

Impact on Other Beneficiaries

Other beneficiaries ranged from the community-based organizations involved in individual pilot projects to graduate students at UCB. One of the projects visited was working to improve literacy through science and technology. With the help of an America Reads grant, university students were able to come to the elementary school and provide one-on-one tutoring to students. The impact on the tutors was tremendous. Not only did the university undergraduate students learn about K-12 schools, they developed lasting relationships with young students. Undergraduate students reported an increased interest in becoming K-12 teachers as a result of their participation in the IU project. Other projects had similar volunteers who gained real-life experience in helping students and the community.

Impact on Project Partners

The school districts involved in this project were able to utilize the expertise of the UCB faculty, students, and staff to support the curriculum and further curriculum development in the schools. The partnerships that were established as a result of this project provided new options and resources for teachers. District personnel working directly with teachers on curriculum development and on creating standards benefited from the UCB perspective. Several of the projects generated innovative lessons/procedures that are now being shared via the Internet with other teachers. The ability of teachers, with the assistance of district and university personnel, to

create useful and meaningful teaching exercises that can be beneficial to the greater teaching community is a tremendous outcome for these districts.

Impact on the Grant Recipient

The Interactive University has been able to gather additional funding and overall support for its efforts. Project staff indicated that without TIIAP support, the scale of the IU project would have been approximately less than one-tenth of the current scale. The grant also helped leverage resources throughout the campus community that assisted the entire Berkeley Pledge initiative.

By Phase 2, the University of California Office of the President had created a new system-wide initiative, UC Nexus, to further the use of instructional technology for University of California/K-12 collaboration. Based in part on its experiences implementing the TIIAP initiative, the IU was selected to design the sophisticated, interactive website to be used by UC Nexus to support K-12 teachers, students, and their families in collaboration with UC students, faculty, and staff across the state. According to program documentation:

> The UC Nexus site will consist of several Web-based applications, as well as a complex database of user profiles and educational materials. The custom tools will include Web-based e-mail, chat and threaded discussion tools, a file-sharing utility, a Web page creation tool for end users, and a "library" management system for uploading, storing, reviewing and publishing digital learning materials. In addition, the Nexus Website will feature best practices, research, and news about UC/K-12 Internet mediated partnerships.

F. Sustainability and Project Expansion

Sustainability

As discussed in Section A, the IU project had undergone a major transformation by the time the TIIAP grant period had expired. Reflecting a need to increase the number of K-12 and UCB partners who might eventually benefit from IU-sponsored activities, the project took steps to promote the development of learning community projects (the transformed pilot projects from Phase 1), the development of after-school/community technology projects, the continued use

of evaluation to assess the implementation and impact of the IU, the use of Nexus collaborative space—to enable K-12 teachers to make use of IU-sponsored educational materials and resources and to communicate with other educators, and leadership training to develop a cadre of "teacher leaders."

This transformation also affected the scope and format of the projects that the IU decided to fund during its next round of grant awards. Specifically, IU decided to distinguish between two types of projects: (1) "core" projects that were to be funded for a 3-year period to implement a specific approach in a sample of Oakland and San Francisco schools, and (2) "planning" projects that were to be funded for 9 months to lay the foundation for implementing a full-scale IU project. The core projects also received an increased amount of money ($105,000) and time (3 years) to achieve their objectives. In addition, unlike the Phase 1 projects (which were viewed as contained activities that affect a limited number of students), the Phase 2 projects are required to incorporate plans for scaling up to a greater number of schools, teachers, and K-12 students. As part of this strategy, each of the core projects is required to develop digital learning materials (e.g., lesson plans, units, courses) that can eventually be customized and/or used by a greater number of K-12 teachers and students.

Another important distinction between Phase 1 and Phase 2 is the increased role that curriculum specialists and other key personnel from the Oakland and San Francisco school districts are playing in the design and implementation of individual IU projects. For example, representatives from the Oakland and San Francisco school districts have had a significantly greater role in developing the Phase 2 RFP and selecting the Phase 2 projects that receive IU funding. In addition, the curriculum and classroom needs of the Oakland and San Francisco school districts are driving the content of the IU-funded projects. As stated in the Phase 2 RFP:

> We are looking for collaborative proposals that respond to key needs in Oakland and San Francisco schools. OUSD's [Oakland Unified School District's] curricular priorities include middle school social studies and language arts, while SFUSD's [San Francisco Unified School District's] needs are in the areas of elementary, middle, and high school language arts, mathematics, science, and social studies. Both districts have identified enhancing basic literacy as a key priority for all students, particularly those with limited English proficiency. We encourage proposers to respond to the stated curricular priorities, however, this will not preclude strong projects in other core curricular areas from being considered.

The enhanced prominence of the Oakland and San Francisco school districts in Phase 2 reflects several factors. First, a lesson of Phase 1 was that IU-supported projects need to fit into the existing curriculum and structure of the participating K-12 schools. As such, the Phase 2 projects are required to support K-12 initiatives that are aligned with local, national, and California content and performance standards. In addition, the IU has placed considerable emphasis on integrating its efforts with major school district initiatives (according to project staff, this has been critical to the success of the IU's partnership with the Oakland and San Francisco school districts). Second, a significant proportion of Phase 2 activities are being supported through grants received by the two participating school districts.[3] This shift in grant recipient status—from UCB to the two participating school districts—represents an important opportunity for obtaining the ongoing funding required to sustain the IU. It also provides the IU with a natural incentive to fund projects that are more closely aligned with the curriculum needs of the Oakland and San Francisco school districts (in the Phase 2 RFP, proposers were encouraged to "leverage funds" by designing their projects to coordinate with existing district-level programs). These funding sources and district-level programs, described below, provide a sense of the types of subject areas, learning strategies, and educational objectives that the Phase 2 projects are required to address:[4]

Oakland Unified School District

- **California Department of Education Technology Literacy Challenge Grant—Core Values Project.** The Core Values Project, a 4-year effort that is funded by the State of California, is designed to improve middle school student academic performance in social studies, language arts, and literacy. By integrating new technologies into classroom practice, the project is designed to address four needs: (1) thinking critically and historically, (2) becoming proficient readers, writers, and speakers, (3) having opportunities to work within a constructivist approach to learning, and (4) working systematically with technology tools to support academic progress. As part of the project, teachers are collaborating with UCB and the Oakland Museum to create online resources to address specific needs in the language arts and social studies curriculum. Teachers will have "just-in-time" onsite technical assistance. The primary indicator of the project's success will be improved student language arts and social studies achievement, as measured by curriculum-embedded assessments, standardized tests, grade point average, and graduation rates.

[3] In addition to the grants received by the Oakland and San Francisco school districts, the IU is receiving financial support through the Berkeley Pledge, the UC Office of the President Nexus Project, and Sun Microsystems.

[4] These descriptions are adapted from the RFP that was used to inform potential bidders about the scope and content of the Phase 2 IU projects. They reflect the principal funding sources that were in place at the time of the site visit.

- **National Science Foundation Grant—Achieving Systemic Change in Math and Science.** This 5-year systemic reform project, funded in the Oakland School District by the National Science Foundation, focuses on science, engineering, and mathematics (SEM). The goals of the project include making significant and quantifiable increases in the number of minority students enrolling in algebra, college preparatory courses, and advanced placement classes, as well as significantly improving student math scores in standardized tests. These goals will be addressed through the following activities: (1) create an infrastructure to ensure that teachers gain in-depth experience in inquiry-based instruction through meaningful in-service activities coupled with in-classroom support and timely access to appropriate, standards-based materials, (2) build in-house expertise in SEM content, pedagogy, and mentoring, and (3) train a critical mass of teachers to implement SEM curriculum.

- **Oracle's Promise Initiative.** Oracle Corporation is partnering with elementary schools in the Oakland School District to install 50 networked computers in each school across the district. The initiative provides computers, printers, and professional development for teachers and technical staff.

San Francisco Unified School District

- **Technology Literacy Grant–LINKS^2 Project.** LINKS (Literacy Improvement Through Networking Knowledge, Standards and Support) is a Technology Literacy Challenge Grant project funded through the State of California to implement standards-based curriculum and improve academic achievement for all students in the San Francisco school district. LINKS has been designed to enable SFUSD to integrate the use of technology into all classroom operations and ensure that the lessons learned are disseminated through a network of learning communities through the nation. The LINKS project comprises interlinked components focused upon improving the quality of instruction for students in grades K-12, with a special emphasis upon improving outcomes for linguistically, educationally, and socioeconomically challenged youth.

- **Digital High School Initiative.** The California Digital High School program funds significant investments in technology—computers, Internet access, and software—for all California high schools. Each year it provides schools with one-quarter of the high school student population (selected by lottery) with (1) a one-time grant of $300 per student, matched by local school districts, to install a comprehensive computer network, and (2) permanent, annual funding of $45 per student, matched by local school districts, for maintenance of the networks and money for professional development of teachers. Both Oakland and San Francisco districts have schools that are participating in this initiative. In the next 3 years, all California high schools, including all those in San Francisco and Oakland, are expected to become digital high schools.

- **K-5 Multimedia Project.** The K-5 Multimedia Project is envisioned as an interactive tool that will create a website to help San Francisco's teachers manage the demands of implementing a standards-based instructional and assessment system while individualizing instruction to meet specific student needs and capacities. The website features (1) curricular standards, adopted curriculum, and example assessment strategies, (2) exemplary teaching practices through video segments of effective classroom instruction, (3) digital lesson plans and sample student work, and (4) planning tools for teachers. The K-5 Multimedia resource is currently under development, but the intention is to extend capabilities to include all grade levels.

Project Expansion

As the preceding discussion suggests, the scope and purpose of the IU has expanded beyond what was originally funded by TIIAP. This expansion reflects an important transformation that has occurred within the Oakland and San Francisco school districts. Specifically, the Phase 1 pilot projects were funded when district and state educational standards were being revised. By the end of the TIIAP grant period, these standards were in place and had become the driving force for determining the types of activities that would be funded in Phase 2. This expansion also reflects the fact that the TIIAP-supported pilot phase was designed to build partnerships and assess the feasibility of using technology to improve student learning opportunities. Having accomplished these objectives, the focus of Phase 2 has been expanded to assure that IU-supported learning technologies (1) are aligned with curriculum standards, (2) can be seamlessly integrated into classroom activities, and (3) can ultimately be scaled up to increase learning and achievement among all students in the Oakland and San Francisco school districts. As such, project staff identified two significant challenges for the Phase 2 projects, i.e., developing products that can be scaled up to a greater number of teachers and students, and devising reliable methods for assessing the extent to which IU-supported activities lead to improvements in student learning and achievement.

Perhaps the most important feature in Phase 2 project expansion is the emphasis on funding activities and learning technologies that can be scaled up to all K-12 students at a given grade level. The Phase 2 RFP identified numerous strategies for achieving scale, including (1) a hub of activity and coordination at UCB that could be deployed to other departments and units, (2) the development of modular curriculum materials, (3) the development of materials that are aligned with national, state, and district curricular standards, (4) participation by district curriculum

and literacy specialists, and (5) an approach that facilitates large-scale sharing and peer training among district teachers. In addition, Phase 2 projects are required to develop digital curriculum materials with embedded student assessment tools that can eventually be used by large numbers of K-12 teachers and students. According to the IU's award conditions for Phase 2 core projects (IU, January 25, 1999):

> Digital learning materials should be based on relevant curricular standards (content/performance, language arts, and technology literacy). The scope of development can range from full curriculum to lesson plans, to activities that utilize unique digital images, text, scientific simulations, etc. Ideally, the materials developed will be flexible enough to adapt to individual teaching environments (e.g., one approach could be to develop instructional "modules"), accommodate teacher creativity, and be used by a large number of teachers.

In addition to developing materials that can be shared with a large number of teachers, the emphasis on digital deliverables is designed to assess best practices for using the Internet to "enhance and extend key district and other teaching strategies." It is anticipated that the IU-supported digital learning materials will eventually be added to the UC Nexus website.

Another Phase 2 expansion is the emphasis on activities that extend beyond the classroom. Specifically, in Phase 2, the IU is being used to support the creation of after-school programs—at schools and in community-based organizations—where both students and family members can congregate during non-school hours to "learn, explore, and interact using technology."

G. Lessons Learned and Recommendations for Other Communities

In its final report, the evaluation team identified a series of recommendations that had been a result of the IU project.[5] These recommendations, summarized below, were intended to inform the direction of the Phase 2 IU projects.

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[5] Kala, Lisa, and Isabel Hawkins. *The UC Berkeley Interactive University Project: K-12 Project Evaluation Report.* The University of California Regents, December 17, 1998.

Funders

- Support various types of evaluations, e.g., alternative assessments, portfolios, etc.

- Fund personnel to provide schools with sorely needed onsite technology support—seed funding to be able to demonstrate the value of such personnel to school district and state education leaders.

- Allow sufficient planning time, particularly to be able to collect baseline assessment data.

- Fund more professional development covering more than just technology, but also how to establish shared goals and well-defined outcomes. Also, provide training in evaluation and documentation.

- Fund ongoing technology training.

Universities

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- Design projects that increase K-12 student knowledge of college application procedures, college entrance requirements, etc., particularly at middle and high school levels.

- Ensure a careful balance and coordination of tools, people, and resources to carry out student assessment.

- Increase emphasis on long-term faculty involvement in the project.

- Tap resources from districts' research offices for evaluation purposes.

- Establish rewards and incentive structures to facilitate faculty participation in outreach activities.

Universities and K-12

- Conduct formative evaluation to assess projects as they proceed and improve their design and implementation. Assess classroom impact through curriculum embedded assessments. Train teachers to keep careful documentation, through tools such as online journals, to determine best practices.

- Raise the awareness of K-12 and university personnel who were not involved during the first round of IU, i.e., principals, curriculum specialists, deans, and department chairs.

- Carry out more in-depth planning on such topics as school selection, clarification of goals, and infrastructure readiness.

- Sustain projects that demonstrate positive impact on teaching and learning.

- Think of ways to inculcate good outreach, teaching, and learning practices in both K-12 and university personnel.

- Conduct ongoing technology professional development in a "co-training" model where both university and K-12 personnel are trained together in such topics as technology, pedagogy, assessment, integration of technology into the curriculum, and classroom management using technology.

- Structure activities for the purpose of "merging" university and K-12 identities, i.e., university identity should include being an outreach participant and K-12 identity should include being a reflective practitioner.

- Think about how an institutional unit that has a pipeline of relationships with outreach components—as well as graduate, postgraduate, and undergraduate work—could be the host of IU-like projects.

K-12

- Pay immediate attention to technical support needs at the school sites.

- Involve school district administration in school readiness issues.

- Establish a baseline level of readiness for teachers to participate in technology-based projects. One option is to have two tiers of readiness: (1) for teachers participating intensively in the partnership and developing curriculum resources—teacher leaders, and (2) for teachers participating less intensively who may only field test resources.

- Give K-12 administrators (principals) responsibility for assessing how well teachers integrate technology and curriculum.

During the site visit, it was apparent that IU and district-level staff have continued their learning process. Respondents described a range of recommendations that they would pass on to other communities seeking to adapt the IU approach. On a broad scale, IU staff

recommended the following strategies. First, employ a model of technology that supports a relationship between UC and K-12 participants. University and K-12 participants can expand and strengthen their relationship by using Internet technology to promote ongoing communication and the sharing of expertise. Second, establish an approach that balances face-to-face instruction with Internet-mediated instruction. IU staff commented that technology can be impersonal and therefore is not a replacement for face-to-face communication. Third, develop an approach that is the appropriate mix of Internet modalities. As stated in the draft final report (July 7, 1999), IU determined that, "In general, projects that combined several Internet modalities, e.g., chat, e-mail, and the Web, yielded more positive results." Another strategy critical for project success is to involve teachers in projects that allow them to create Web-based curriculum—this will allow for more integration of technology into the curriculum. Each of these items has significantly influenced how IU continues to implement the various aspects of the IU project. Other lessons are summarized below.

Ensure that Communities Interested in Adapting the IU Approach Have the Appropriate Staff and Technology Infrastructures in Place. From the very beginning, the IU was envisioned as a model that could be replicated by other postsecondary institutions that wanted to establish similar collaborative relationships with their local school districts. The success of the pilot phase—and the continued operation of the IU—demonstrates that the IU prototype can indeed serve as a model for other communities. However, during the site visit, respondents were quick to point out that stakeholders—districts, schools, and sponsoring postsecondary institutions—need to have the necessary infrastructures in place before adapting the IU approach.

Infrastructure needed for this type of project to succeed at the district level. Project staff indicated that, at the district level, it is essential that the overall approach receive strong support and commitment from the superintendent. This can be demonstrated through attendance at kick-off meetings and participation on advisory boards. In addition:

- District personnel—from the superintendent on down—need to have a clear and realistic vision as to how technology can be used to enhance classroom activities.
- The district needs to have technology coordinators on site who can handle computer problems as they arise.
- The district needs to have a liaison who can facilitate communications between the university and individual schools, lead workshops and training, and assist in obtaining equipment and materials.

- The district also needs a curriculum specialist who can ensure that the online applications are standards-driven.

Infrastructure needed for this type of project to succeed at the school level. Project staff indicated that, at the school level, it is essential that the building have a technology infrastructure that can support a variety of online activities. In addition,

- The initiative needs to have the strong and visible support of the school's principal.
- The project has to reflect the school's curriculum and district standards.
- The school should have access to technical staff who can provide timely onsite support.
- K-12 schools with high truancy rates and high teacher turnover should be avoided. High truancy and turnover rates can serve as indicators that the school is experiencing a crisis—and may not be ready to handle a project that requires intensive and stable collaboration between teachers and university personnel. IU and district staff indicated that schools in crisis will likely require more basic services (e.g., getting basic access to the Internet) before they are ready for an intensive technology collaboration with a postsecondary institution.

Infrastructure needed for this type of project to succeed at the teacher level. Project staff indicated that a technology collaboration between a K-12 school and a postsecondary institution is most likely to succeed if the participating teachers are (1) interested and willing to take on the extra work (it cannot be forced on them), (2) flexible and willing to attend meetings, (3) experienced (e.g., have completed their probationary period), (4) not afraid of new technologies, and (5) already using instructional practices that promote student collaboration. In addition, respondents suggested that it would be useful to have at least two participating teachers at a given school, so that they can network and support one another. From a district's point of view, too, there is a need in terms of scale for teachers to be willing to assume some sort of a leadership role.

Infrastructure needed for this type of project to succeed at the university level. Respondents indicated that, at the postsecondary level, the IU approach is most likely to succeed if university participants (1) are willing to focus on district/classroom content and priorities, (2) understand the school's culture and are sympathetic to the problems that classrooms often

experience, (3) recognize K-12 teachers as "colleagues and professionals," and (4) are willing to attend meetings. In addition, respondents indicated that it is helpful if faculty are willing to work with all grade levels, that is, K-12 as opposed to 8-12. For example, if a faculty member wants to develop an online history project that is geared toward eighth graders and the district indicates it needs to stress fourth grade history, the faculty must be willing to adapt and develop an approach that is geared toward fourth graders. Finally, respondents emphasized the value of having a university-based team—like the IU—that functions as a neutral entity that can keep faculty, districts, and schools on a strict schedule.

Focus on Fewer, More In-Depth Projects. Some respondents indicated that, in hindsight, it would have been beneficial to focus on a smaller number of projects during Phase 1. This approach would have enabled IU and district staff to refine their overall approach and provide more focused, project-specific technical assistance in such key areas as aligning expectations, defining outcomes, and collecting student achievement data. As discussed previously, the IU decided to use Phase 2 to provide larger amounts of funding to a smaller number of projects (i.e., 7 core and 4 planning).

Provide Projects with Ample Time to Implement Their Approach and Achieve Their Outcomes. Project staff indicated that designing and implementing a large collaboration like the IU requires a considerable amount of time. In addition, they expressed concern that 2 years does not allow enough time to measure the full impact of a K-12 technology project, e.g., on student attitudes or achievement. As such, they recommended that communities allow themselves at least 3 years to design, develop, and implement a similar process.

Rely on a Written Document That Delineates the Roles and Responsibilities of All Project Partners. An important lesson of the IU project is the value of having a clearly written document that specifies the role of all participating parties. The project used a detailed RFP and subsequent Awards Conditions Document to spell out the specific responsibilities of each IU grant recipient. This document served to increase the likelihood that stakeholders would be familiar with (and agree to) the projects' goals and objectives. It also provided all stakeholders with a mutually agreed-to delineation of roles, responsibilities, and timeframes.

Ensure Buy-In of Top-Level Administrators. IU and district staff emphasized that the use of technology to enhance K-12 learning can only succeed if stakeholders at all levels buy into the proposed goals and approach. Further, top-level management needs to do more than offer visible support for the initiative. As stated in *Overview and Lessons Learned: A Preliminary Report:*[6]

> Support from leadership at all levels is essential to (a) leverage resources, (b) validate a culture of service and outreach, (c) ensure substantial commitment and in-kind support from partners, and (d) put in place supportive policies and incentive/promotion strategies to encourage participation in educational outreach.

At the university level, respondents indicated that it was helpful to have top-level administrators (e.g., the Executive Vice Chancellor) so closely aligned with the project. Respondents also suggested that university leaders could demonstrate their support by developing incentives (e.g., bonus incentive packages, release time, building outreach into the university's tenure and reward system) for faculty to engage in community service. At the district and school levels, respondents indicated that superintendents and principals can demonstrate the importance of technology initiatives by participating in the process of setting implementation and student achievement goals, streamlining the process for purchasing and installing equipment, and

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[6] Greenbaum, David, and Isabel Hawkins. *Overview and Lessons Learned: A Preliminary Report*. The UC Berkeley Interactive University Project. January 22, 1998.

developing procedures that enable teachers to obtain professional development (e.g., paying for substitute teachers).

Involve Districts and Schools in the Design, Development, Implementation, and Evaluation of Individual Technology Projects. Respondents—at all levels—emphasized the importance of having district and school-level staff serve as equal partners in the planning and implementation of IU projects. In Phase 1, some of the IU projects came to be viewed as add-ons, that is, they did not fit into teachers' existing classroom activities. To some extent, this was because district personnel were not directly involved in making key policy decisions (e.g., how many projects to fund) or selecting projects (IU had final say as to which applications would be funded). By the end of Phase 1, project staff had come to realize that, in order for IU activities to be relevant and utilized by an ever increasing number of K-12 teachers, the content and subject matter of funded projects had to reflect teachers' needs and interests. By Phase 2, district and school personnel were taking a much more active role in shaping the projects' direction, e.g., identifying the specific curriculum needs that applicants would need to address in their proposals, having veto power over which projects should be funded. As stated in the final evaluation report, "It was important for K-12 teachers to have input in curriculum design so that their students' needs could best be served."

Align the Content of K-12 Technology Initiatives with Relevant Curricular Standards and Classroom Practices. A lesson of Phase 1 is that the scope and content of technology projects cannot be divorced from the participating schools' curriculum. Respondents emphasized that if a technology application is viewed as a stand-alone component, it will likely be underutilized by teachers (who will have to find the time to fit the activity into their already full classroom schedule). Thus, participating districts and schools need to be clear about their curricular needs. They also need to be able to identify those subject areas where the integration of technology into the classroom would be most useful. In Phase 2, this was accomplished by using the RFP to provide proposers with considerable information about the curricular standards for the Oakland and San Francisco school districts (proposers were also instructed to develop technology projects that pertained to these standards). In addition, the RFP contained the names of individuals whom proposers could contact to obtain information on the technology needs and status of participating schools.

Ensure that Stakeholders Have Common Expectations About Their K-12 Technology Initiative. Given the busy environments within which faculty and K-12 teachers generally operate, it is critical that collaborations between universities and K-12 schools be based on goals and expectations that are shared and valued by both parties. As stated in the project's final evaluation report:

> A shared goal is important in a collaboration because both parties need to be working toward a vision of what they want to achieve. If both sides potentially benefit, there is a greater interest and motivation to work toward that shared goal. Through comments on surveys and in focus groups, teachers reported that there needs to be a clear understanding of what the goals are, the goals need to be realistic, as well as long-term, and most importantly, the project should fill a need on both sides.… For teachers and classrooms where there was not a shared goal and vision of what they wanted to achieve, teachers felt that the project was less useful and less of a priority. Teachers had their own curricular agendas to fulfill, and given limited classroom teaching time, they needed to maximize that time covering material that is relevant to the classroom, school, and district goals.

Employ a Stringent Teacher Selection Process. During Phase 1, teachers were selected to participate in the IU almost solely on the basis of the interest that they expressed in the project. As such, no coordinated effort was made to determine teachers' level of expertise in their respective subject areas, their familiarity with computers and the Internet, the extent to which they engaged in collaborative teaching styles, their level of long-term commitment to participating in a collaborative technology initiative, the extent to which their school buildings were equipped with an acceptable technology infrastructure, and the extent to which teachers' supervisors would be willing to support the goals of the IU. Respondents indicated that, in hindsight, it would have been beneficial to invest more time and resources into interviewing teacher candidates and visiting participating school buildings. In Phase 2, these additional selection procedures are being used to maximize the likelihood that the eventual pool of participating teachers is in a position to further the goals and objectives of the IU.

Fund Projects That Utilize Faculty and Resources from Multiple Disciplines and Departments. During the site visit, project staff suggested that, the expertise needed to bring about meaningful classroom changes rarely resides in a single academic discipline. As such, respondents emphasized the value of using the IU to promote collaborations across the campus's academic departments. They also suggested that districts and schools are in need of initiatives that can serve as a single point of contact for several academic disciplines or topics (e.g., astronomy, paleontology, biology, and physics) for teachers and students. Finally, respondents indicated that interdisciplinary efforts enhance the likelihood that projects will be able to leverage additional staff and financial resources.

Embed Data Collection and Assessment Activities Into the Curriculum. As discussed previously, project staff suggested that, whenever possible, student assessment questions should be embedded in the actual content/curriculum. Using authentic assessment tools that are developed as part of the project can alleviate the burden of having to use valuable class time to collect evaluation data. It can also maximize the likelihood that any evaluation data that are collected will be aligned with the actual curriculum (which, in turn, are aligned with district and state standards).

H. Summary and Conclusions

The Interactive University designed and implemented an outreach program aimed at promoting educational opportunities for K-12 students from disadvantaged and diverse neighborhoods in the San Francisco Bay Area. In collaboration with university faculty and school district personnel, IU supported 20 pilot projects, which spanned all grades and academic disciplines, in 26 different schools. Each of the pilot projects was designed to use computer-mediated instruction to assist with student learning. Given the individualized nature of each of the pilot projects, the methods used varied tremendously from project to project, yet many of the problems and outcomes experienced by the individual projects were similar.

As a result of the IU's experiences with the Phase 1 (TIIAP-funded) projects, project staff recognized a need to focus on the issue of scalability so as to increase the number of K-12 and UCB partners who could establish a mutually beneficial relationship. IU took steps to integrate five fundamental elements into the project's ongoing activities and was able to infuse these five elements into the 11 projects that were funded as part of its second round of awards. The second phase of the IU project also brought more involvement from school districts and more integration with district level projects.

Overall, the IU continues to expand through additional grants and projects and has proven to be a successful model for an outreach program. The IU success is due to (1) conscious efforts by project staff to involve university and school district stakeholders—this helped ensure stakeholder investment in the project and it resulted in their continued support; and (2) utilizing evaluation information and lessons learned to inform IU staff and individual pilot projects as to the changes that needed to occur to better reach intended outcomes. The IU model can serve to inform other institutions working to implement an outreach program for hard-to-serve populations, and the lessons learned by the IU (outlined in the previous section) should be of use to other

postsecondary institutions looking to develop collaborative technology partnerships with local K-12 schools.

Appendix A: Summary of Phase 1 Projects

Arts, Education, and the Internet. This project had two components: (1) The Arts: On-site and On-line investigated best practices in the field of technology and the arts. Project staff worked with teachers to encourage and demonstrate the meaningful application of technology into the arts curriculum. (2) Reading, Writing, and Experiencing the Arts developed an arts curriculum to assist students with pre-college writing skills, introduce students to the arts, and provide the critical and analytic foundation needed to understand and enjoy them.

Personal Pathways. This project developed a scalable network of information about academic opportunities. The project focused on Berkeley Pledge high schools and local community college students, counselors, and parents from socioeconomically disadvantaged backgrounds.

Enriching Student Writing Through the Internet. This project was designed to determine effective methods for developing and delivering a technology-enhanced, literacy-based curriculum in order to cultivate students' critical reading and analytical writing skills.

Using Internet-Mediated Communication for Literacy Development. This project used an individual tutorial to match an underachieving student with a member of the business community. The project will utilize Internet-mediated communication to link community members with the selected students.

Electronic Mentoring and Academic Guidance Network (EMAGN). This project targeted 11th grade students in San Francisco. The program was offered through e-mail, electronic chat rooms, and video conferencing, and provided a one-on-one relationship with undergraduate student volunteers who encouraged youth to achieve academic goals and pursue higher education.

The Knowledge Integration Environment (KIE). This project was designed to help pre-college students improve their understanding of science and consider the benefits of obtaining higher education.

Internet Engineering Curriculum, Science Fair, and Admissions. "ACCESS-IT" designed and implemented four core activities and several supporting activities for a local high school and technical school. The main goal was to develop a self-sustaining climate of service to K-12 students from graduate and undergraduate students in the Electrical Engineering Department at the university.

High School Mathematics and Science with the Internet. This project assisted teachers and students to acquire the necessary skills to use Internet technologies and find useful resources on the Internet. The project also experimented with electronic mentoring and video conferencing.

Interactive MESA (Mathematics Engineering Science Achievement). This project developed a World Wide Website for the MESA competitions. The website contains the MESA competition rules, related curricular material, and examples. The site will be annotated for K-12 students to use and understand the mathematical, scientific, and engineering principles behind the competition.

Materials and Earth's Resources Disciplines. This project made available complete information about modern materials and the earth resources disciplines in a timely manner to the K-12 community through the use of Internet technologies and interpersonal contact.

The Living Culture and History of California Indians. This project through the Phoebe Apperson Hearst Museum of Anthropology proposed to evaluate the use of the World Wide Web and the Internet as alternative means to support California curriculum requirements for instruction on California Indian cultures.

Using Technology for Cultural Restoration at the American Indian Charter School. This project used technology to support the restoration of the culture of the Indian community in the Bay Area.

Interactive Approaches to Understanding Islam as a Global Religion. This project developed and tested a model of how information technology can be used in the social science classroom to increase student achievement in the study of Islam.

Exploring Urban Biodiversity "City Bugs." This project generated and disseminated Web-based information on the biodiversity of urban environments, concentrating on insects.

Spanish Speakers' Family History Project. This project brought together UCB undergraduate students in upper-level Spanish classes and middle-school-aged bilingual speakers of Spanish to create family history Web pages.

School-to-Career Programs Using the Internet. This project created two new components: (1) a school-based enterprise providing Internet services to community groups, and (2) a new system of collecting, disseminating, and utilizing information about careers and the labor market.

Reading Through Science and Technology "Project FIRST." This project was developed through a partnership between the Center for Science Education at the Space Sciences Laboratory and the Graduate School of Education in order to benefit from their rich expertise in the areas of literacy, science, technology, and curriculum development. The goal of Project FIRST was to increase the literacy development and proficiency of Oakland elementary school students through a model program that integrates inquiry-based science curricula, Internet technology, and a mentored learning environment.

Integrating Science, Teaching, and Technology (ISTAT). ISTAT was a collaborative effort by the Berkeley Seismological Laboratory, the Center for Particle Astrophysics, the Center for Science Education at the Space Sciences Laboratory, and the UC Museum of Paleontology. The ISTAT team worked with 6^{th} to 12^{th} grade teachers in San Francisco to create a suite of inquiry-based digital science curriculum material.

The Interactive University California Heritage Pilot Project. This project explored how the Bancroft Library's California Heritage Collection, an online archive of over 28,000 images of California history and other related primary source materials, was used to support local, California, and U.S. history curriculum standards in San Francisco and Oakland schools.

Connecting Students to the World. This project used online conversations with digital curriculum to link Berkeley faculty and distinguished visitors to San Francisco high schools and Oakland middle schools. This partnership with the Institute of International Studies enhanced the U.S. history and civics curriculum.

Appendix B: Summary of Phase 2 Projects

A. Core School Projects (1999-2001)

Archaeological Research Facility Project. The Archaeological Research Facility project will use multimedia and Internet technologies, as well as hands-on, experiential activities, to teach archaeology to middle school students in Oakland. UCB graduate and undergraduate students will work directly with teachers and students in classes and after-school programs to enhance students' understanding of archaeology as a practice and to encourage the development of critical thinking skills.

Bay Area Writing Project: Teaching Writing and Technology Project. The Bay Area Writing Project, in collaboration with the Graduate School of Education, will use expository writing in social studies and language arts curriculum to improve students' historical thinking and writing skills in Oakland middle schools.

California Heritage Project. The California Heritage Project will explore how the Bancroft Library's California Heritage Collection, an online archive of over 28,000 images of California history, and other related primary source materials, can best be used to support local, California, and U.S. history curriculum standards in San Francisco and Oakland schools.

Connecting Students to the World. The Institute of International Studies (IIS) will use online conversations and digital curriculum to link Berkeley faculty and distinguished visitors to San Francisco high schools and Oakland middle schools. IIS will use these resources to enhance the U.S. history and civics curriculum.

Office of Resources for International and Area Studies: History Through Literature. The History Through Literature project will work with Oakland teachers to develop Web-based learning materials that will support 6th and 7th grade curriculum units on world history. This project will integrate literature and resources from International and Area Studies and other partners, to help students understand the histories of the Near East, China, India, Africa, Japan, and Western Europe and the spread of Islam.

Integrating Science, Teaching, and Technology. The Berkeley Seismological Laboratory, the Center for Particle Astrophysics, the Center for Science Education at the Space Sciences Laboratory, and the UC Museum of Paleontology have developed a partnership for Integrating Science, Teaching, and Technology (ISTAT). The ISTAT team will work with 6^{th} to 12^{th} grade teachers in San Francisco to create a suite of inquiry-based digital science curriculum materials.

Project First: Foundations in Reading through Science and Technology. The Center for Science Education at the Space Sciences Laboratory will lead a partnership with rich expertise in the areas of literacy, science, technology, and curriculum development. The goal of Project FIRST is to increase the literacy development and proficiency of Oakland elementary school students through a model program that integrates inquiry-based science curricula, Internet technology, and a mentored learning environment.

B. Planning Projects (1998-1999)

Center for Latin American Studies: Exploring Latin America. Exploring Latin America will begin to investigate contemporary and historical aspects of Latin America and its relationship to teachers and students in the Oakland and San Francisco Unified School Districts and the Center for Latin American Studies. The project will plan how to develop a Latin American website that builds on and enhances existing curriculum resources. The Center for Latin American Studies will also meet with teachers to discuss the best approach for setting up conversations with visiting experts on Latin America, UCB faculty and graduate students, and students in Latin America.

College of Natural Resources: City Bugs Project. The Environmental Leadership Program of the College of Natural Resources will plan how to best use a unique Internet-based tool to support science curriculum standards across grade levels in the Oakland and San Francisco Unified School Districts. This tool will enable students to use insects to explore their local ecology, gain an appreciation for biodiversity, learn scientific classification, and integrate science education with technology literacy skills.

Environmental Science at Galileo Academy of Science and Technology. The Environmental Sciences Program and the Department of Ethnic Studies will work with the Galileo Academy of Science and Technology of the San Francisco Unified School District to plan how to develop and implement digital learning materials for an online course in Environmental Science for 11th and 12th grade students. These learning materials will integrate the resources and expertise of the Urban Watershed Project at the Presidio of San Francisco. The project will also explore how to involve Environmental Science and Ethnic Studies students as mentors/tutors through a UCB service learning class.

Institute of East Asian Studies: Cultural Exploration. The Institute of East Asian Studies will build a prototype of an interactive electronic tool that will help San Francisco schools use the resources of the Electronic Cultural Atlas Initiative to support social science standards in world history, culture and geography. With this prototype, students will use archeological digs, tomb excavation, underwater salvage, and other techniques to explore the artifacts of a “virtual island” with a history, culture, and economy similar to that of Japan or Korea.