

# Report of Phase 1 Activities – 1996-1998 Plans for Phase 2 - 1999 - 2001

*Prepared for the Berkeley Pledge – September 1, 1999*

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The UC Berkeley  
Interactive  
University  
Project

**Report of Phase 1 Activities – 1996-1998  
Plans for Phase 2 - 1999 - 2001**

*Preliminary DRAFT Prepared for the Berkeley Pledge – September 1, 1999*

## I. Introduction and Abstract

This report discusses the accomplishments and lessons learned from the first two-year phase of the UC Berkeley Interactive University Project (IU), a demonstration technology project funded with substantial assistance by the U.S. Department of Commerce Telecommunications Information Infrastructure Assistance Program. This Phase 1 of the IU ran from 1996-1998. The report also outlines the goals and plans for Phase 2 of the IU, which will run for three years from 1999 - 2001. Phase 2 of the IU builds upon the work and lessons learned from Phase 1 as documented in this report.

In Phase 1, the IU, in partnership with the San Francisco and Oakland Unified School Districts, set out to develop a national model of how the University can best use the Internet to help K-12 students, their families, and teachers in disadvantaged urban communities. Project objectives were to: (1) enhance student achievement; (2) foster collaboration between the campus and schools; (3) promote the integration of teaching, research, and community service; and (4) identify effective, scaleable, and sustainable Internet outreach methods. These objectives corresponded with school district goals to: (1) improve teaching and learning; (2) improve staff, parent and community participation in the educational process; and (3) increase integration of technology into the curriculum.

Twenty pilot projects, led by a wide range of campus academic and outreach programs, were the heart of the Interactive University K-12 effort in this first phase. Teachers, district curriculum specialists, and counselors from Berkeley Pledge pipeline schools in San Francisco and Oakland (and a few schools in Berkeley) were the key school partners in these pilot activities. The pilot projects explored such Internet outreach methods as digital curriculum development, on-line access to campus faculty, access to digital library and museum collections, electronic mentoring and tutoring, digital recruitment, and electronic peer-to-peer networks of teachers and students. Internet tools such as the World Wide Web, e-mail, video-conferencing, MOOs, and chat were employed.

The IU funded departments from all major disciplines on campus to carry out pilot programs in the areas of K-12 core and supplementary curriculum, mentoring, recruitment, and the transition from school to career. Pilot projects took place at 10 high schools, 10 middle schools, and 6 elementary schools.

This first phase of work led to significant project accomplishments in the areas of (1) developing a broad scale collaborative framework with our school partners; (2) impact on students; (3) impact on teaching practices; (4) impact on school districts; (5) impact on UCB; and (6) the production of Internet mediated resources and products. The details of these accomplishments are discussed in section V. of this report. In addition, the IU carried out an extensive evaluation at the macro and micro level of our work. This enabled us to produce a series of detailed lessons learned and recommendations that have served as the foundation for (1) the development of a national model and (2) changes made to the IU in Phase 2. The IU is committed to the continual exploration and development of a model of the how the Berkeley can best use the Internet on a large-scale

to support K-12 education and local communities. The commitment includes making, as necessary, significant changes and enhancements to our basic programs and strategies.

In Phase 2 (1999 – 2001), the IU is building upon lessons learned to lay the foundation for a *large scale, Internet-mediated learning community between the University, schools, and community*. Our focus is to address the issue of scale, using the Internet to amplify and extend effective UC/K-12 relationships. To build this system, the IU has identified five major project components it will develop with school and community partners over the next three years. Each component is designed to support and reinforce the others and to serve as the foundation of people, activities, content and investigation for the large scale learning community. These components are: (1) Internet Learning Community Projects (a revised form of the Phase 1 Pilot Projects); (2) After-School/Community Technology Centers that can link in-school and after-school work using the Internet; (3) Evaluation and Research to continue to learn and refine the model; (4) Collaborative Technology Leadership to train teachers and campus partners on how to work together systemically using new technologies; and (5) the Nexus Web-collaborative space to provide tools, libraries, and places to collaborate and learn at a very large scale.

This report documents the evolving nature of the IU model. Section II of this Report gives a brief overview of the IU Phase 1; Section III describes the evaluation methods used for assessing work in Phase 1 and to be used in modified form in Phase 2; Section IV describes the Phase 1 Pilot Projects; Section V describes overall accomplishments; Section VI presents lessons learned; Section VII discusses next steps in Phase 2 of the IU Project; Section VIII outlines a set of recommendations to funders, universities, and the K-12 community; and Section IX provides a review of the literature in the areas of collaboration and Internet technology for K-12 education. Several appendices contain details of the evaluation, contact information for key project personnel, references and bibliography.

## II. Project Overview - IU Phase 1, 1996 - 1998

In October 1996, the Interactive University Project, in partnership with the Oakland Unified School District and the San Francisco Unified School District, received a \$650,000 two-year grant from the Department of Commerce's Telecommunications Information Infrastructure Assistance Program (TIIAP) to build a national model of the use of the Internet for University/K-12 collaboration. This grant resulted from the campus' and school districts' commitment to collaboratively experiment with the Internet for educational outreach. Total project funding amounted to approximately 5 million dollars over two years, which included a large percentage of non-federal matching funds. Funding was provided by the U.S. Department of Commerce TIIAP, the Chancellor's Office, the Berkeley Pledge, UC Berkeley's Information Systems and Technology, the forty campus departments and units involved in the pilot projects, the San Francisco and Oakland School Districts, AT&T, IBM, Pacific Bell and Sun Microsystems. UC Berkeley's Executive Vice Chancellor and Provost Carol T. Christ is the principal investigator and sponsor of the project. Project leadership from the school districts is provided by Associate Superintendent Maria Santos (San Francisco Unified School District) and Associate Superintendent Yolanda Peek (Oakland Unified School District). Project activities are coordinated through Information Systems and Technology with David A. Greenbaum as project director. Approximately forty campus academic and outreach departments participate in the IU.

### Goal and Objectives

The **goal** of the IU K-12 Project in Phase 1 was to develop a national model of how the University can best use the Internet to help K-12 students, their families, and teachers in disadvantaged urban communities.

Project **objectives** are to:

- enhance student achievement;
- foster collaboration between the campus and schools;
- promote the integration of teaching, research, and community service; and
- identify effective, scaleable, and sustainable Internet outreach methods.

These objectives correspond to the following school districts' goals: (1) improve teaching and learning; (2) improve staff, parent and community participation in the educational process; and (3) increase integration of technology into the curriculum.

### Pilot Projects

The heart of the IU in Phase 1 was a set of twenty pilot projects conducted over the past two years, involving campus faculty, students, and staff and Oakland and San Francisco teachers and students. These projects explored various Internet mediated outreach methods including: digital curriculum development; access to digital library and museum

collections; on-line access to faculty and distinguished visitors; electronic mentoring; electronic tutoring; electronic recruitment and admissions counseling; and the facilitation by University personnel of peer-to-peer networks of teachers and students in the schools. Projects used, and integrated with the curriculum, a wide variety of Internet tools: e.g., e-mail, the Web, MOOs, and desktop video-conferencing. Teachers from schools in San Francisco and Oakland were the key K-12 partners in these pilot activities. The IU Project funded departments and units from all major disciplines on the UC Berkeley campus to carry out pilot programs in the areas of K-12 core and supplementary curriculum, mentoring, recruitment, and the transition from school to career. Pilot projects took place at 10 high schools, 10 middle schools, and 6 elementary schools in Oakland and San Francisco. The IU supported individual campus units in the evaluation of their pilot efforts, and conducted project-wide evaluation, tapping the expertise of the UC Berkeley Graduate School of Education.

### **IU Web Site**

A Project Web site was created at the location: <<http://iu.berkeley.edu/iu>> that includes: links to all the pilot projects and their deliverables (teacher and student Web pages, digital curriculum, best practices for their subject matter, etc.); on-line evaluation instruments, *i.e.* pre/post questionnaires; an archive of pilot project highlights, and other resources.

### **UC Nexus Project**

The UC Nexus Project is a statewide initiative of the University of California to promote high quality education in California's schools through computers and Internet technology. The program is designed to join together UC's existing efforts in instructional technology and make them more accessible to, and supportive of, K-12 teachers, students, and their schools and communities. The Interactive University Project was selected by the UC Office of the President to design and implement the UC Nexus Web-based collaborative space to enable structured and very large scale involvement of UC students, faculty, and staff in K-12 schools throughout California – with a particular emphasis on the learning practices of students, families, and teachers in disadvantaged public schools. The UC Nexus gateway Web site will provide a collaborative environment for K-12 outreach, serving the entire 9-campus UC System and the K-12 community throughout California.

### III. Evaluation

The evaluation of the Interactive University Project was designed to:

- Examine how Internet-based technology can be best utilized within K-12 schools and classrooms to improve teaching and learning, increasing integration of technology into the curriculum; and
- Identify important components of ‘collaboration-building’ among university and K-12 partners within the context of technology implementation.

#### 1. Tiered Evaluation Plan

Due to the scope of the project, a tiered evaluation plan was developed comprising two primary levels: *micro-level* pertaining to individual pilot projects, and *macro-level* pertaining to the IU as a whole. The micro-level evaluation focused on key issues of student achievement and the specific consequences of using technology-based methods of outreach. The macro-level evaluation addressed project-wide issues of collaboration involving University and community partners using the Internet, project sustainability, and project scale. Please refer to Appendix A for the complete text of the evaluation plan.

Strategies were developed to gather data using a combination of human interactions and technology-mediated interactions. The following data collection methods were used:

- pre/post questionnaires
- focus groups
- individual and group interviews (audiotaped and videotaped)

Appropriate combinations of the above instruments were selected to assess the broad issues of:

- Building and Sustaining a Collaboration
  - Collaborative Framework
  - Role of the Internet
  - Pre-requisites of an Effective Collaboration
- Impact of the Internet on:
  - Student Achievement
  - Teacher Practices
- Integrating research, teaching, and service
- Technology issues
- Issues related to project sustainability and scale

The IU pilot projects’ primary target audiences are presented in Table 1 below. Some projects worked with students and teachers, while others focused on one target audience,

either teachers or students. Four of the fourteen projects that targeted students conducted in-depth micro evaluation in partnership with the Graduate School of Education.

**Table 1**

	<b>Students</b>		<b>Teachers</b>
	<b>Target</b>	<b>Micro Assess</b>	<b>Target</b>
<b>1 Arts On-Line, On-Site</b>	<b>X</b>		<b>X</b>
<b>2 Arts, Writing, and Internet</b>	<b>X</b>		<b>X</b>
<b>3 Personal Pathways</b>	-	-	-
<b>4 Enriching Student Writing through the Internet</b>	<b>X</b>	<b>X</b>	<b>X</b>
<b>5 Using Internet-Mediated Communication...</b>	<b>X</b>	<b>X</b>	<b>X</b>
<b>6 KIE – Knowledge Integration Environment</b>	<b>X</b>	<b>X</b>	<b>X</b>
<b>7 Electrical Engineering and Computer Science</b>	<b>X</b>		<b>X</b>
<b>8 Lawrence Hall of Science</b>			<b>X</b>
<b>9 Interactive MESA</b>	<b>X</b>		
<b>10 Materials Science</b>	-	-	-
<b>11 The Living Culture of California Indians</b>			<b>X</b>
<b>12 Using Internet for Cultural Restoration</b>			<b>X</b>
<b>13 Connecting Students to the World</b>	<b>X</b>		<b>X</b>
<b>14 Interactive Approaches to Islam as Global Religion</b>	<b>X</b>		<b>X</b>
<b>15 California Heritage</b>	<b>X</b>		<b>X</b>
<b>16 Exploring Urban Biodiversity – City Bugs</b>	<b>X</b>		
<b>17 ISTAT – Integrating Science, Teaching, and Techn.</b>	<b>X</b>		<b>X</b>
<b>18 Spanish Speakers’ Family History</b>	<b>X</b>		
<b>19 School to Career - IURD</b>	-	-	-
<b>20 FIRST – Foundations in Reading Through Sci/Tech</b>	<b>X</b>	<b>X</b>	
<b>TOTAL</b>	<b>14</b>	<b>4</b>	<b>13</b>

Various audiences participated in the evaluation: K-12 students; K-12 teachers; K-12 administrators; adult school students; UCB students (graduate and undergraduate); UCB faculty; UCB staff; and project coordinators. Please refer to Appendix A for a matrix of evaluation issues versus evaluation audience.

Evaluation baseline data were gathered from K-12 and campus pilot project participants (K-12 teachers, students, school and district administrators, as well as UCB staff, faculty, and students). In addition to interviews and questionnaires for individual participants, the evaluation team designed a focus group protocol to elicit in-depth detail on lessons learned and best practices. These focus group interviews involving campus and K-12 participants were conducted during Fall and Spring of the 1997-98 school year. A total of 375 individuals contributed to the evaluation. Table 2 below gives the breakdown of evaluation participants.

**Table 2**

<b>Target Audience</b>	<b>Macro Questionnaire</b>	<b>Focus Group or Interview</b>	<b>Total</b>
K-12 Students	275		275
K-12 Teachers and Curriculum Specialists	25	27	52
K-12 Administrators		2	2
UCB Coordinators and Staff	18	10	28
UCB Faculty	2	1	3
UCB Administrators		3	3
K-12/UCB Liaisons		2	2
IU Strategic Planning Group		10	10

*Macro-Level Evaluation:* The IU evaluation team collected and analyzed common data from project participants along the following themes:

- Key Learning Experiences (e.g. what obstacles were encountered? how were they overcome?)
- Effective Strategies (e.g. what made an impact on student achievement and why? are strategies sustainable? do they scale? what were unintended consequences of using technology and information infrastructure?)
- Recommendations (e.g. what are important issues and steps to take in the context of collaboration? how do Internet tools enable and facilitate University faculty, staff, and student participation in systemic educational outreach efforts?)

*Micro-Level Evaluations:* Each pilot project collected and summarized pilot project activity data using assessment measures determined within the scope of their particular project emphasis, and project-specific evaluation instruments with guidance provided by the IU evaluation team, as appropriate.

## **2. Data Collection and Analysis Procedures**

The pre/post questionnaires for all target audiences were placed on the Web, tied to a back-end database <<http://iu.berkeley.edu/iu>>. The IU evaluation employed the Descriptive Survey method as described by Leedy (1985). All interviews and discussions were videotaped or audiotaped, then transcribed. Transcriptions of the interviews were used for analysis and interpretation. Analysis of the qualitative data followed the principles of qualitative data analysis as outlined by Miles and Huberman (1984) comprising data reduction and display, conclusion drawing and verification. Within this framework, the data were analyzed for common thematic components. Quantitative analysis of the survey data was conducted to provide aggregate summative information about specific target groups.

## IV. Phase 1 Pilot Projects: UC and K-12 Partners

Listed below are the twenty pilot projects of the IU Phase 1. Included is information about the UCB partners, the UCB key personnel, K-12 schools participating, and the key K-12 personnel.

### 1. *Arts, Education, and the Internet*

**UCB Partners:** History of Art Department; Berkeley Art Museum and Pacific Film Archive; and Cal Performances.

**UCB Key Personnel:** Harvey Stahl, Carol Paxson, Stephen Gong, Ella Baff, Richard Rinehart, Barney Desroches.

**K-12 Schools:** Burton Academic High School (SF); Lowell High School (SF); Gloria Davis Middle School (SF); Oakland Technical High School (Oak); Madison Middle School (Oak).

**K-12 Key Personnel:** Don Melsopp, Pam Garrett, Tim Lamarre, Sarah Feldman, Deborah Gordon, Marcia Meyers.

### 2. *Personal Pathways*

**UCB Partners:** Berkeley Pledge Recruitment Corps; and Academic Achievement Division.

**UCB Key Personnel:** Roberto Rivera, Josefina Baltodano, Tom O'Brien, Dale Ireland.

**K-12 Schools:** To be determined. Several Community Colleges will participate.

### 3. *Enriching Student Writing Through Internet Technology*

**UCB Partners:** Early Academic Outreach Program (EAOP); Graduate School of Education: Bay Area Writing Project; College Writing Programs.

**UCB Key Personnel:** Yvette Gullatt, Carol Tateishi.

**K-12 Schools:** McClymonds High School (Oak).

**K-12 Key Personnel:** Barbara Essig, Ralph Belany, Myrtle Sample, Lu Paulette Taylor, John Tazel, Marsha Milam, Richard Charlesworth.

### 4. *Using Internet-Mediated Communication for Literacy Development*

**UCB Partners:** Graduate School of Education: Division of Language, Literacy & Culture; and Instructional Technology Program (ITP).

**UCB Key Personnel:** Richard McCallum, Owen McGrath.

**K-12 Schools:** MLK Middle School (Berkeley Unified School District).

**K-12 Key Personnel:** To be determined.

### 5. *Electronic Mentoring and Academic Guidance Network (EMAGN)*

**UCB Partners:** Graduate School of Education and Counseling and Psychological Services.

**UCB Key Personnel:** Lisa Kala, Nina Gabelko, Jeff Prince.

**K-12 Schools:** Burton Academic High School (SF).

**K-12 Key Personnel:** Clarence Cummings.

6. *The Knowledge Integration Environment (KIE)*

**UCB Partners:** Graduate School of Education; and Lawrence Hall of Science.

**UCB Key Personnel:** Marcia Linn, Jim Slotta, Philip Bell, Linda Shear, Cary Sneider.

**K-12 Schools:** Roosevelt Middle School (SF).

**K-12 Key Personnel:** Karen Manno, Ramona Muniz, Judy Smith, Brenda Davis, Ronna Voorsanger, Mimi Bisson, Jennifer Gordon.

7. *EECS: Engineering Curriculum, Science Fairs, Admissions, and Teacher Support via the Internet*

**UCB Partners:** Electrical Engineering and Computer Science; and Lawrence Hall of Science.

**UCB Key Personnel:** Randy Katz, Sheila Humphreys, Richard White, Melanie Light, Cindy Manly-Fields, Harriette Stevens, Alan Gould.

**K-12 Schools:** McClymonds High School (Oak); Oakland Technical High School (Oak); Skyline High School (Oak).

**K-12 Key Personnel:** Michelle Page, Joseph Bullie, Emmanuel Onyeador, Parker Merrill, Hellon Key, Joseph Sklar, Kathy Keeran, Janice Lord-Walker.

8. *Connecting UCB with High School Mathematics and Science Classrooms via the Internet*

**UCB Partners:** Lawrence Hall of Science; and Electrical Engineering and Computer Science.

**UCB Key Personnel:** Harriette Stevens, Alan Gould, Sheila Humphreys.

**K-12 Schools:** Burton Academic High School (SF); McClymonds High School (Oak).

**K-12 Key Personnel:** David Lauter, Michael Treguboff, Delano Spicer, Joseph Bullie, John Tazel.

9. *Interactive MESA*

**UCB Partners:** Mathematics, Engineering, Science Achievement; and Synthesis Coalition.

**UCB Key Personnel:** Alice Agogino, Blas Guerrero, Michele Decoteau.

**K-12 Schools:** To be determined.

10. *“Materials” and “Earth’s Resources” Disciplines*

**UCB Partners:** Materials Science and Mineral Engineering; and EECS.

**UCB Key Personnel:** Kal Sastry.

**K-12 Schools:** To be determined.

11. *The Living Culture and History of California Indians*

**UCB Partners:** Phoebe Hearst Museum of Anthropology; and Bancroft Library. **UCB**

**Key Personnel:** Rosemary Joyce, Lori Reyes, Kathleen Butler.

- K-12 Schools:** James Denman Middle School (SF); A. P. Giannini Middle School (SF); Twenty-first Century Academy (Elementary school, SF); Prescott Elementary School (Oak); Laurel Elementary School (Oak).
- K-12 Key Personnel:** Carolyn Nickels, Ted Barone, Janet McCormack, Mildred Hale, Claudine Wright, Dorothy Rose.
12. *Using Technology for Cultural Restoration at the American Indian Charter School*  
**UCB Partners:** The Center for Particle Astrophysics; and International and Area Studies.  
**UCB Key Personnel:** Rose Sergeant, Jeanette Zerneke.  
**K-12 Schools:** The American Indian Public Charter School (Oak).  
**K-12 Key Personnel:** Luke Enemy Hunter.
13. *Connecting Students to the World*  
**UCB Partners:** Institute of International Studies; Berkeley Multimedia Research Center; and Human Rights Center.  
**UCB Key Personnel:** Harry Kreisler, Beth Atkin.  
**K-12 Schools:** Thurgood Marshall Academic High School (SF), McClymonds High School (Oak).  
**K-12 Key Personnel:** Brian Simmons, Maggie Harrison, Ben Schmookler.
14. *Interactive Approaches to Understanding Islam as a Global Religion*  
**UCB Partners:** Office of Resources for International and Area Studies; Center for Middle Eastern Studies; and Department of Architecture/Slide Library.  
**UCB Key Personnel:** Susan Larson, Jane Turbiner, Larry Michelak, Joan Kask, Karin Beros.  
**K-12 Schools:** Horace Mann Middle School (SF).  
**K-12 Key Personnel:** Marg Costello, Nick Bartel.
15. *The Interactive University California Heritage Pilot Project*  
**UCB Partners:** University Library; Center for the Teaching and Study of American Cultures; Graduate School of Education; Instructional Technology Program; and Hearst Museum of Anthropology.  
**UCB Key Personnel:** Lisa Yesson, Ellen Meltzer, Tim Hoyer, Lisa Kala, Ron Choy.  
**K-12 Schools:** Lincoln High School (SF); Mission High School (SF); Marina Middle School (SF); John Swett Elementary School (SF); Fruitvale Elementary School (Oak); Neighborhood Center Adult School (Oak).  
**K-12 Key Personnel:** Christina Leung, Kay Hones, Victor Jacob, Jerry Fleming, Roseanne Vidaver, Lorraine Perry, Rafael Pau, Jack Geissler, Noel Krenkel, Ed Fonseca, Juanita Wilson, Marlene Wilson, Carolyn Chin.
16. *Exploring Urban Biodiversity*  
**UCB Partners:** College of Natural Resources - Divisions of Insect Biology and Ecosystem Science; Lawrence Hall of Science; and UC Cooperative Extension.  
**UCB Key Personnel:** Vernard Lewis, Felix Sperling, Donald L. Dahlsten, Eddie Dunbar.

**K-12 Schools:** McClymonds High School (Oak).  
**K-12 Key Personnel:** Michelle Page, Joseph Pinador.

17. *Integrating Science, Teaching, and Technology (ISTAT)*

**UCB Partners:** UC Museum of Paleontology; Center for Particle Astrophysics; Berkeley Seismographic Station; and Space Sciences Laboratory/Center for Extreme Ultraviolet Astrophysics.

**UCB Key Personnel:** Judy Scotchmoor, Rachel Winheld, Lind Gee, Anne Miller-Bagwell.

**K-12 Schools:** Burton Academic High School (SF), Thurgood Marshall Academic High School (SF); Mission High School (SF); Visitation Valley Middle School (SF); Lowell Middle School (Oak).

**K-12 Key Personnel:** John Crossman, Nancy Moulthrop, Laurel Reitman, Gilden Chung, David Egert, Jennifer Fong, Carlos Colom, Nathan Draper, Caleb Cheung.

18. *Spanish Speakers' Family History Project*

**UCB Partners:** Berkeley Language Center; and Department of Spanish and Portuguese.

**UCB Key Personnel:** Mark Kaiser, Gwen Kirkpatrick, Julio Ramos, Herminia Kerr.

**K-12 Schools:** Lick Middle School (SF); Lowell Middle School (Oak).

**K-12 Key Personnel:** Connie Hendrix, Gladys Dalmau, Jose Montano, William Spafford.

19. *School-to-Career Programs using the Internet*

**UCB Partners:** Institute of Urban and Regional Development; and Graduate School of Education - National Center for Research in Vocational Education.

**UCB Key Personnel:** Victor Rubin, Nan Maxwell, Andrew Smiles.

**K-12 Schools:** Castlemont High School (Oak); Neighborhood Center Adult School (Oak); Skyline High School (Oak); McClymonds High School (Oak), Oakland High School (Oak).

**K-12 Key Personnel:** James Lytle, Alicia Townsend, Brenda Tucker-Johnson, Ron Mingo, George Miller, Tami Bell, Barbara Citragno, Rhea Settles.

20. *Reading Through Science and Technology*

**UCB Partners:** Space Sciences Laboratory/Center for EUV Astrophysics and Graduate School of Education.

**UCB Key Personnel:** Ruth Paglierani, Rick McCallum.

**K-12 Schools:** Hoover Elementary School (Oak).

**K-12 Key Personnel:** Marie-Eve Thomaes, Mary Cristiamakis.

*(To be included here in the final published version of this report will be a brief summary of the broad characteristics of the projects, with tables sorted by modality, grade level, and curricular area; 1-2 pages per project according to the "Project Highlights" template and presented in the following order: Humanities; Social Science; Science, Mathematics, and Engineering; Other)*

## V. Project Accomplishments

### 1. Collaborative Framework

The Interactive University established a framework for inter-campus and university/K-12 collaboration to manage the work of the twenty pilot projects. The IU brought together more than 40 campus departments and units, 10 high schools, 10 middle schools and 6 elementary schools in San Francisco and Oakland, as well as an adult center, a charter school, several community colleges, and a middle school in the Berkeley Unified School District. Table 3 displays the total number of university and school district participants involved in the IU.

**Table 3**

UC Berkeley			K-12	
Faculty and Professional Researchers	Staff	Graduate and Undergraduate Students	Teachers	Students*
21	49	50	76	1900

\* Estimate based on class size of 25 students

#### Inter-campus Collaboration:

The Interactive University Project established a structure to facilitate communication and collaboration of UC Berkeley’s technology-focused outreach projects. Interactive University Project activities provided a forum for continued communication and sharing on technology issues for outreach among campus groups. Key elements of the inter-campus collaborative framework included:

- Facilitation of new collaborations among campus groups;
- Pilot project coordinators meetings;
- IU Freshmen Seminar to engage undergraduate students in the project;
- IU Seminar Series to highlight the various pilot efforts and share the project’s progress with the campus community; and
- IU Faculty Advisory Committee.

#### Campus/K-12 Collaboration:

The IU also established a robust human and programmatic infrastructure that built strong campus/K-12 relationships. Collaborative work went beyond the design and implementation of individual pilot projects to encompass considerable effort defining technology infrastructure and professional development strategies in the schools. Key elements of the university-community collaborative framework included:

- **Steering Committee:** This committee was chaired by UC Berkeley’s Executive Vice Chancellor and Provost Carol Christ, and included senior representatives from school districts, local government, and corporate partners. The charge of the Steering Committee was to recommend how the IU can best coordinate with other agencies and industry for maximum leverage and benefit to K-12 schools.
- **District/University IU Project Liaisons:** Two full time teachers on special assignment served as project liaisons. The liaisons had access to their district’s information and procedures, and served as conduits of communication between IU campus personnel and district personnel at multiple levels.
- **Strategic Planning Group:** A team composed of key IU campus and K-12 district personnel (including the Project Liaisons) met every six weeks to discuss long-range project strategy, and to reflect on challenges, lessons learned, and best practices.
- **Monthly Meetings with District Leaders:** Monthly meetings among IU managers, Associate Superintendents for Curriculum and Instruction, and District Technology Coordinators facilitated joint decision making.
- **Strong Leadership:** The IU project benefited from strong leadership at all levels – Executive Vice Chancellor/Associate Superintendent; pilot project coordinator/school Principal; campus personnel/teachers and other school personnel.

The Strategic Planning Group played a key role in support of joint planning at all levels. The Group designed a staged planning process to align schools’ and campus partners’ goals for the pilot projects. The process facilitated (1) identification of school and campus pilot project partners; (2) planning between campus and school participants; (3) project sign-off by principals and district personnel; and (4) allocation of TIIAP school-district subcontract grant funds in support of pilot projects. Key steps of this planning process included district-wide open houses for the Interactive University project, a school application and buy-in process, a planning retreat for pilot project participants, and several project-wide events on campus that combined technology demonstrations with general project orientation, technology training and planning time. In addition, the Group served as a formative evaluation tool that allowed adjustments to the IU project implementation based on feedback from participants and reflection on best practices.

The IU collaborative framework, with the key elements listed above, was a necessary pre-requisite to carry out IU project implementation and evaluation.

## **2. Impact on Students**

Fourteen of the twenty pilot projects worked with students directly, or indirectly through their teachers. These fourteen projects carried out evaluation at the “macro” level, which

focused on Internet technology use, attitudes towards technology, knowledge of colleges and universities, and attitudes toward higher education.

Knowledge of Colleges and Universities: The macro evaluation questionnaires aimed to identify whether students had gained knowledge about the university in these various aspects: college requirements, college research, college life, possible majors and subject areas of interest. As part of students' interactions with university personnel and resources (coordinators, faculty, etc.), students became exposed to the university in various ways. Overwhelmingly, teachers felt that their students had increased their knowledge about what it takes to go to college through their collaboration with UC personnel and through access to UC resources, e.g., campus visits, Internet chats with faculty or other individuals, and other face-to-face or technology-based interactions with university personnel. Improvements were found in students' perceptions of the benefits of attending college. By the end of the project, students listed education and learning as a benefit of college attendance, despite their perceived drawbacks of cost and time.

Attitudes and Higher Order Skills: Teachers also reported that their students' attitudes toward the subject matter were enhanced. One commonly described theme was that many students enjoyed the move away from more traditional types of learning. K-12 students expressed satisfaction from interactions with UCB experts – from students to faculty and staff. Improvements in student critical thinking, problem solving, frequency and competency of computer use, knowledge and interest in subject matter, and pride in their work, were also reported by the teachers. Teachers described that participating in the IU projects encouraged sharing of ideas/knowledge among their students, who were observed asking each other for advice on the computer, Internet searches, or through peer tutoring, as well as sharing knowledge with each other as part of team work.

Literacy and Science Outcomes: Four of the fourteen pilot projects that targeted students conducted in-depth evaluation at the "micro" level, assisted by their strong collaboration with UC Berkeley's Graduate School of Education (both faculty and graduate student researchers). The micro evaluation methodology varied, depending on the nature and disciplinary content of each project. For example, three of the projects (*Project FIRST – Foundations in Reading Through Science and Technology*, *Using Internet-Mediated Communication for Literacy Development*, and *Enriching Student Writing Through Internet Technology*) assessed the impact of their interventions on literacy at the elementary, middle, and high school levels respectively, while the *KIE – Knowledge Integration Environment* project assessed impact on middle school science teaching and learning. These projects reported increases in student achievement in the areas of literacy, science, and technology.

*Foundations in Reading Through Science and Technology – Project FIRST* reported positive outcomes for first grade students from Hoover Elementary School in Oakland. Project FIRST involves UCB America Reads undergraduate students working one-on-one with first graders on basic literacy skills, Internet-mediated literacy activities with remote 'key pals' and inquiry-based science curriculum activities. Through pre and post-assessment of student literacy performance and science/technology attitudes, a

comparison group, teacher and tutor interviews, and observations, Project FIRST demonstrated improved student reading scores in 14 of 16 literacy measures, increased computer literacy and competency, as well as increased positive attitudes towards technology and science.

*Using Internet-Mediated Communication for Literacy Development* conducted case studies of students in middle school who had standardized test reading scores in the lower quartile compared to national averages. The project paired students with volunteer UCB staff, who interacted with the students through the Internet using a MOO (Multi-user, Object Oriented) text-based computer environment. The experience served to increase the motivation and skills of the middle school students. In particular, the case study of one at-risk student demonstrated that gaining mastery of the technology served to enhance the student's outlook on school and learning, since she took on a computer expert role among her peers.

*Enriching Student Writing Through Internet Technology* used a variety of engaging Internet resources, such as art from various museums, to encourage high school students to write fiction, autobiographical statements, etc. The high school students exchanged their writing with UCB undergraduates for review and critique. The project found that face-to-face meetings between the K-12 and university students were needed to balance the impersonal nature of email and free format of the Web. "Putting a face to the name" was very important, particularly for the high school students, who then viewed their 'key pals' as real people. The quality of the written exchanges improved after the students got to know each other face to face.

*KIE – Knowledge Integration Environment* developed Web-based inquiry investigations on engaging science topics, i.e. deformed frogs and twins. The tailored computer environment allowed students to gather evidence from various sources, including the Internet, and interactively debate their opinions with scientists and UCB science graduate students. The project created tools to assess student science knowledge, beliefs, and language. Analysis of the pre/post data yielded evidence of increased knowledge of science concepts, computer skills, language skills, and overall motivation for school work. Teachers reported that the use of the Internet in the context of a more active scientific style of inquiry that involved researching and debating student opinions with scientists was powerful for engaging students with a wide range of abilities and preparation. Teachers also reported that their students' perception of how scientific investigation is carried out changed dramatically as a result of participation in the KIE project. At the end of the project, students understood that science is an evolving, changing enterprise, and that advances are made through investigation, experimentation, and the continual comparison between theory and evidence/data.

### **3. Impact on Teacher Practices**

The IU project involved 76 Oakland and San Francisco teachers from grades K through 12 working in partnership with UCB personnel. Teachers played a variety of roles in the

pilot projects, co-developing and classroom testing Web resources, conducting on-site project coordination, providing professional development to their colleagues, and implementing IU activities in their classrooms.

The Value of the Internet for Teaching and Learning: Participation in the IU project changed teachers' perceptions of the value of the Internet for teaching and learning. Teachers are motivated to use innovative pedagogical approaches and tools when they see tangible benefits for their students. At the beginning of the project, teachers were skeptical and unsure of how the Internet would impact their students. After the project, many teachers reported that the use of Internet technology increased motivation and participation among a range of learners (high to low achieving students). Teachers indicated that Internet technology enhanced their students' academic performance by helping them gather research results and information otherwise unavailable from more traditional classroom resources. They also reported that participation in the IU projects facilitated a role of facilitator or advisor for their students, which in turn made students more independent in their learning.

Integration of Technology into the Curriculum: Through their experiences as part of IU pilot projects, teachers engaged in new areas of curriculum development, received exposure to the university and its resources, and had opportunities to engage and/or collaborate with other teachers. K-12 administrators, pilot project coordinators, and teachers reported increased engagement on the part of teachers in using technology and its potential in the classroom. Teacher attitudes about their professional identity were also affected through the exposure to new resources, events and activities at the university. Project participants described experiences in which new practices were enabled through exposure to the university-school activities and events. These practices included the integration of university resources and Internet resources within the curriculum.

Teacher Networks: The IU catalyzed the creation of support networks among teachers. Administrative team members and coordinator focus groups, as well as final teacher presentations revealed that collegial systems were forming between different teachers. The IU also catalyzed changes in teachers' perceptions of the university and the types of university resources that could be useful in the classroom. These outcomes proved beneficial and productive for the teachers and their curriculum development and technology integration efforts.

Professional Development: Teachers also benefited from on-going professional development in technology. Project-wide Internet technology training (e-mail, videoconferencing, Web browsing, Web authoring, chat tools, etc.) took place on campus during IU-wide events. In addition, as part of their matching effort in support of the IU project, the San Francisco and Oakland Districts offered on-going technology training workshops for IU teacher participants throughout the school year. Teachers attended the workshops to learn the use of several applications, such as Web authoring, presentation tools, multi-media tools, word processing, and use of spreadsheets. Content-based professional development was also offered by various campus units through summer workshops, and through the curriculum development efforts, in which the teachers

learned the content while adapting and integrating research materials with Internet technology for use in their classrooms.

#### **4. Impact on the School Districts**

The impact of the IU project on the school districts has been multi-faceted. The partnership between the university and the two school districts continues to be very strong, and has already had an impact in the community by allowing a systematic infusion of research-based content and technology into schools across all grade levels. The multi-disciplinary and campus-wide nature of the Interactive University has made it easier for curriculum leaders at the districts to build school and teacher participation across all grade levels.

An important accomplishment of the IU is the catalyst effect it has had in fostering collaboration between the Oakland and San Francisco Unified School Districts when applying for state and federal grants. Both districts face similar challenges prevalent in diverse, urban settings. Collaboration improves the chances of success when seeking external funding, and increases the cross-fertilization of ideas to tackle similar problems. Collaboration between the two school districts allowed for the mutual sharing of lessons learned, and the investigation of alternative methods of implementation.

#### **5. Impact on UC Berkeley**

A key impact of the IU Project on the Berkeley campus has been the strong coordination among projects focusing on the use of Internet technology for educational outreach. The IU fostered collaboration among several groups that do not traditionally interact. Additionally, as a result of the IU, there has been increased interaction between the Graduate School of Education and academic departments/outreach units, facilitating project evaluation.

A Vehicle for Participation in Outreach: The IU served as an important vehicle for the participation of faculty, staff, and students at all levels in educational outreach in partnership with the K-12 community. Participating graduate student researchers gained experience in evaluation, student assessment, program coordination, and adapting research results for broader audiences.

In addition, the IU facilitated collaboration between undergraduate and K-12 students through tutoring relationships. These experiences have awakened an interest in teaching in many of the undergraduates. Campus staff and faculty gained a greater understanding of pre-college educational issues, and forged lasting relationships with personnel at the district and school level. Campus participants increased their knowledge of K-12 curricula and their understanding of curriculum constraints, as well as students' levels of knowledge and experience.

Collaboration Among Campus Groups: The coordination provided by the IU has fostered collaboration among various technology-oriented campus outreach efforts when applying for extramural funding, making the UCB campus more competitive in a climate that values partnerships to leverage a variety of existing resources.

Integration of Research, Teaching, and Service: The IU served as a vehicle for integrating research, teaching, and service. Teachers reported that students were able to utilize faculty research through Web-based curricula, and by accessing a variety of university resources through e-mail with undergraduate students, visits to the Berkeley campus during science fairs, and weekend campus tours and field trips. Feedback from UCB students stated that the project served K-12 students by increasing their awareness and excitement about UC Berkeley and research being conducted on campus. Several teachers and University faculty reported that the Web serves as an effective conduit for sharing research results from the University with K-12 audiences. Teachers, through their presentations, shared how the university's role of integrating teaching, research, and service was realized. An example cited how students had read the works of faculty members and then had the opportunity through interactive chat sessions to speak with faculty and other distinguished individuals about their research and questions. The IU developed a model of how a campus as a whole can use Internet technology for large scale engagement with K-12 schools and the community.

## 6. Products and Resources

The activities of individual pilot projects provided project participants unique opportunities to experiment with various Internet modalities, such as chat, MOO, the Web, and email. Through the Internet, students and teachers were able to access UC Berkeley's research collections, library resources, data, interactive simulations, and expertise. The following are a few examples of the activities conducted by the pilot projects and the resources they created:

- *Arts On-Line, On-Site and Arts, Writing, and the Internet* combined live performances and museum field trips for students with virtual Internet experiences to stimulate writing at the high school level, which students subsequently posted on the Web. The project developed a *best practices* set of criteria and guidelines, with recommendations for teachers and art organizations to use as a checklist to evaluate educational resources for arts education on the Internet. Middle school students created a virtual, 3-D exhibit of African masks with written descriptions of their art work.
- *California Heritage Project* developed a comprehensive suite of elementary, middle, and high school lessons using unique photographs and other primary sources from a collection of 25,000 images of California history from the Bancroft Library. Lesson topics ranged from California earthquakes to 'Rogues and Rascals' and the Great Depression. These lesson plans resulted in student-developed Web sites, multi-media projects, family archival boxes, writing and mapping projects, and quilts. The

project developed a *California Heritage Collection & K-12 Project* brochure and an on-line guide to using the collection.

- *Connecting Students to the World* used ‘chat’ tools and Web-based curriculum to provide high school students with a series of on-line conversations with distinguished visitors to UCB. This project developed several curricular units on the Web to support live chat sessions between scholars and K-12 students in a variety of current social studies issues (human rights, recent conflicts, etc.). In addition, the project developed lesson plans to teach students best strategies and protocols for conducting effective interviews.
- *Connecting UC Berkeley with High School Mathematics and Science Classrooms via Internet Technology* established a methodology for electronic mentoring between high school students and UC Berkeley undergraduates. High school students participated in science research projects (wetlands) and published the results on the Internet. The project also developed a Web tutorial for teachers.
- *EECS – Engineering Curriculum, Science Fairs, and Teacher Support through the Internet* used a variety of outreach approaches to support teachers and students through the Internet. Products include: Web sites for the project and for science fairs, videotape to supplement an *Electronics Uncovered* Web site, and a *Selected Internet Resources for Teachers* Web site.
- *Exploring Urban Biodiversity – City Bugs* developed an on-line insect taxonomy field guide that was used by high school students to identify their specimens collected in an urban setting. Students developed their own Web pages featuring their findings. The project also developed classroom exercises and Web activities on insects and a technology tutorial for students. Two videos were produced and aired on television as part of the program: *Kids from CAOS* and *Class Act*.
- *Project FIRST – Foundations in Reading Through Science and Technology* developed a methodology for assessing literacy skills and attitudes toward science and technology of emergent readers. The project developed an undergraduate tutor training package and lesson plans to structure ‘key pal’ email interactions between first graders in Oakland, CA and Newton, MA. The project also piloted a science curriculum involving weather observations, recording, and sharing through the Internet. First graders also participated in a project that integrated astronomy, technology, and art, resulting in paintings of the nine planets and the Sun based on Internet imagery from NASA.
- *Integrating Science, Teaching, and Technology* developed Web-based curriculum units for Earth and space science that combined hands-on classroom activities with computer based work for students from grades 6-10. Through these lessons, students were able to access a variety of UCB research resources, such as on-line fossil collections, real-time earthquake information, and NASA space images. The project also developed a Web scavenger hunt activity highlighting UCB research resources. A series of weekend field trips for middle school students and their families offered participants opportunities to interact with technology-based resources as well as researchers at UCB.
- *Interactive Approaches to Understanding Islam as a Global Religion* created extensive research portfolios on the Web on various aspects of Islam, tapping cultural themes such as food, dress, literature, travelers, etc. Students were able to

exchange email with a traveler during a tour of the Middle East and compose stories based on their interactions.

- *Interactive MESA* provided Web-based simulations of experiments such as the “Egg Drop” competition, allowing students to refine their egg cushioning containers by interactively adjusting the parameters of the simulation through the Internet. Students were able to post their egg drop competition results on the Web, and conduct threaded discussions using the *SpeakEasy* Web tool.
- *Knowledge Integration Environment – KIE* involved a partnership between teachers, science graduate students, and education graduate students to develop inquiry-based investigations that accessed Web-based evidence for ‘deformed frogs’ and ‘twins’ projects. Products included Web curricula for the two projects, a student assessment methodology and tools, and a 6-minute video of students debating the deformed frog issue.
- *The Living Culture of California Indians* project developed a *California Indian Cultures* Web site as the basis for teacher-developed lesson plans.
- *Spanish Speakers’ Family History Project* partnered undergraduate students from UCB with Spanish speaking middle school students, who created Web pages featuring their family customs, origins, and cultural backgrounds.
- *Using Internet Technology in Support of Cultural Restoration* allowed an American Indian charter school to use the Internet to enhance the school curriculum, from mathematics to social studies.

In addition to the above resources, four of the projects listed above developed a digital curriculum guide for middle school and high school aligned with San Francisco Unified School District’s content and performance standards in the areas of language arts, science, and social studies. The format and structure of the IU digital curriculum guide will be used as the model for UC Nexus’ Library of Digital Curriculum Materials.

## VI. Lessons Learned

This section discusses lessons learned in the following categories:

1. Building and Sustaining a Collaboration
  - A. Collaborative Framework
  - B. Role of the Internet
  - C. Pre-requisites of an Effective Collaboration
2. Impact of the IU on:
  - A. Student Achievement
  - B. Teacher Practices
3. Integrating Research, Teaching, and Service
4. Technology Issues
5. Project Sustainability and Scale
6. Evaluation and Assessment

### 1. Building and Sustaining a Collaboration

#### A. Collaborative Framework

A strong IU collaborative framework was essential, resulting in ongoing partnerships among campus groups, and between the campus and the San Francisco and Oakland Unified School Districts. At UCB, decision-making is generally distributed into the hands of individual departments and units. In the context of educational outreach, a decentralized mode of operation has generally resulted in individual, uncoordinated projects that rarely share experiences and are prone to redundancy. The campus-wide collaboration infrastructure set up by the IU resulted in a more systemic approach, addressing common issues such as program evaluation and K-12 technology infrastructure. In addition, collaboration between UCB and K-12 districts had traditionally occurred between individual campus department/units and school sites. The IU structure fostered leadership and communication at many levels ranging from the Vice Chancellor-Associate Superintendent level to the teacher-UCB personnel level. This structure of communication was essential to: (a) leverage resources, (b) validate a culture of service and outreach at the university, (c) ensure substantial commitment and in-kind support from the campus departments/units and the districts, and (d) identify supportive policies and incentive/promotion strategies to encourage participation in educational outreach.

#### Decision Making:

Joint planning to define the IU overall structure and pilot project activities was required to address different expectations regarding the nature of the pilot projects as well as the lack of a common language between the university and K-12 personnel. K-12 Teachers, UC coordinators and faculty, and IU managers found the various joint planning activities

(district showcases, planning retreats, kickoff events) very useful. Two key elements of the IU collaborative framework facilitated joint planning: The IU Strategic Planning Group and the IU school district Liaisons. The Strategic Planning Group, composed of key campus and district personnel, including the Liaisons, facilitated joint decision-making and planning. This group also allowed close collaboration between the two districts, San Francisco and Oakland. The two IU District Liaisons were found to be extremely helpful by teachers, campus coordinators, and IU managers – Liaisons often went above and beyond the call of duty to resolve issues and facilitate communication.

Collaborations occurred not only between the university and the school district, but also within settings. Among K-12 participants, teachers spoke of the importance of having opportunities to network and share their experiences among their peers. Teachers were able to enhance their classroom practice, share resources, encourage other teachers to use the Internet, and discuss the status of their projects. UCB participants had similar experiences, discovering the value of collaborating among themselves. Although they found IU seminars and the formal presentations informative, and appreciated the structured time they were given with their teachers, coordinators felt that conversations in which they could talk informally with each other about their experiences were even more helpful. Such opportunities allowed them to share their experiences, frustrations, and setbacks that all of them were dealing with and might not have otherwise shared.

#### Key Elements Needed for Collaboration:

The experiences gained through the IU Project point to the following key elements that are necessary to build and sustain collaboration between the University and K-12 communities:

#### Key Elements to Build/Sustain a University/K-12 Collaboration:

<i>K-12 Teachers</i>	<i>UC Coordinators</i>
- Time	- Commitment
- Shared goals	- Funding
- Communication	- Shared goals
- Commitment	- Communication
- Availability of technology	- Respect

After the project, “funding” replaced “technology” as one of the top five elements from the point of view of K-12 teachers. Leadership support was also identified by campus participants as a key element of a university/K-12 collaboration.

Shared Goals: Shared goals are important in a collaboration because both parties need to be working toward a common vision of what they want to achieve. When both sides see potential benefits, there is a greater interest and motivation to work toward those shared goals. 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. Furthermore, it became clear in focus groups that UC Coordinators, IU Management, UC Administrators, and K-12 Administrators were also aware of the importance of shared goals and how the project should be linked with K-12 curriculum goals, standards, and frameworks.

*Time:* 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. Focus group participants seemed to agree that a large collaboration like the IU takes time to establish. Furthermore, given the schedules of participants at UC and K-12 schools, many felt a need to balance the time demands of the project with their regular job duties that needed to be fulfilled. Time needed to be set aside for seminars, meetings, collaboration, curriculum planning, and training. This was a common theme for faculty, coordinators, and teachers. Administrators were sensitive about the demands they placed on faculty and coordinators, and coordinators were, in turn, sensitive about the demands they placed on their teachers.

*Communication:* Communication, in general, is necessary to ensure that all partners have opportunities to plan, discuss, solve problems, and agree on mutual goals and objectives. In short, it is a key means to building a collaboration and relationship between partners. In general project participants found that weekly contact via email and other forms of communication were necessary to maintain good communication. They acknowledged the importance of frequent face-to-face meetings in the beginning stages of the projects in order to plan and agree on roles and goals.

*Commitment:* A certain level of commitment is required from both UC and K-12 participants in order to maximize the chances for success. On pre- and post-surveys, both teachers and coordinators named commitment as one of the top five factors necessary to build and sustain a collaboration. Commitment referred to perseverance in the face of obstacles with technology, follow through on promises, and most importantly, interest and motivation to make the project work from both sides. Some pilot projects had to contend with challenges such as high teacher turn-over and lack of adequate campus coordination.

*Respect:* University/K-12 collaborations require an understanding that there are cultural differences between these communities and that all partners make valuable contributions as professionals to the collaborative process.

*Funding:* It is impossible to carry out a project like the IU without adequate and on-going funding for personnel and other resources. Funding was identified by campus coordinators, teachers, and district personnel as a necessary factor in building and sustaining a collaboration.

*Leadership Support:* IU participants at all levels identified the importance of leadership support. Leadership support at the districts can facilitate the deployment of adequate

technology infrastructure and ensure sufficient access to existing computer lab facilities. Professional development during district in-service days can also be facilitated through leadership support. On the university side, support from top levels of the administration is crucial for promoting policies that support outreach efforts by faculty, garnering support from campus units, and publicizing projects to alumni and community members. University administrators can provide support for outreach efforts through their leadership and facilitation. Their involvement signals to the campus community that outreach programs are important, and they are able to bring together the right people to participate and help make decisions about the allocation of resources.

## B. The Role of the Internet

*Balance Between Face to Face and Electronic Communication:* The IU project used a combination of face-to-face and Internet-mediated methods to facilitate interactions. The use of the Internet facilitated communication when access was easily available to project participants. All groups (teachers, coordinators, faculty, and UC students) discussed the strengths and weaknesses of Internet technology in the context of collaboration. The most common strength reported for all groups was the convenience of the Internet. It allowed for fast, easy, asynchronous communication among partners and wide dissemination of information. The Internet also provided K-12 partners access to university resources and information through the Web to help with curriculum design and planning. At the same time, all groups spoke of the impersonal nature of technology — how technology cannot replace the value of face-to-face interactions and how miscommunication can occur through the written word.

The availability of technology in the schools was also a constant challenge, which created problems for teachers to access e-mail for communicating with their partners.

*Different Technology Cultures Between University and K-12:* One the biggest obstacles was the differences in infrastructure and culture of technology use between the schools and the university. The university values and supports (through access and reliability) the continual use of e-mail, while this is not generally the case for the K-12 community, where teachers lack enough time and don't have ready access to computers to send and reply to electronic messages. Because of the university's familiarity with Internet technology and culture of use, it is not surprising that technology was seen as entirely positive in building relationships among partners at UCB. UC students felt that e-mail was "essential" because it reaches vast audiences. The UC faculty commented that e-mail was fast, convenient, and enabled collaborative work. These comments reflect the widespread use and connectivity of the network on the UC campus. In comparison, very few teachers reported that they used e-mail or technology to communicate or collaborate with one another. This is once again attributable to the culture of schools with technology availability, access, and use.

University personnel had to adjust to these technology limitations in their partners' schools and find alternative means of communication, such as phone calls and more school site visits. Additionally, whether the outreach project is technology-based or not, campus coordinators felt that site visits were a necessary part of the relationship building

with the teacher and students and an opportunity to gain a greater understanding of the school culture, and the time demands on the teacher. Technology was seen as only one component of an overall project that includes a human relationship. Thus, while the Internet can play a key role in supporting effective relationships and collaborations among communities, Internet mediated learning activities work best when balanced with face-to-face connections.

*Internet as a Tool for Supporting Relationships:* One of the unique potentials of the Internet is to support collaborative work, amplifying and strengthening existing face-to-face relationships. Internet technology has the potential to link projects and personnel that would otherwise work in isolation. Use of the Internet for collaboration distinguishes the Interactive University Project from a ‘virtual university’ or ‘distance learning’ model.

### C. Pre-requisites of an Effective Collaboration

To enhance the success of multi-faceted projects such as the IU, certain pre-requisites need to be in place at the school site and at the university.

At the school site, the following were identified as pre-conditions:

- a liaison between the school and the university to help with communication, lead workshops and training, assist in getting equipment and materials;
- schools and classrooms appropriately equipped with Internet technology and materials;
- easily accessible computer lab;
- on-site technology support;
- robust/reliable district technology infrastructure;
- teachers who have adequate background in content area and technology;
- support from the principal; and
- a structure of appropriate compensation or release time for the teachers.

On the university side, these were identified as being pre-conditions:

- effective project coordination;
- adequate numbers of undergraduate and other mentors;
- adequate funding;
- an adequately staffed management team to oversee the entire project;
- personnel who are familiar with doing outreach and with technology training;
- greater knowledge of school technology constraints/realities; curriculum materials used; and programs already in place.

## 2. Impact of the IU

### A. Student Achievement:

Teachers' Reports of IU Impact on Students: The macro-level evaluation effort was able to elicit information that affects student academic achievement, such as knowledge and attitudes towards attending college or university, as well as attitudes toward the project's subject matter. With one exception, individual Interactive University pilot projects did not specifically target students' knowledge about colleges and universities as a key goal. Yet, as part of students' interactions with university personnel and resources (coordinators, faculty, undergraduates, etc.), K-12 students became exposed to the university in various ways, leading to positive outcomes. As part of the IU project, K-12 students gained knowledge about colleges and universities in general and UC Berkeley in particular, increased their skills and knowledge of technology and subject matter, improved their attitudes toward attending college and toward the subject matter, and enhanced process skills such as critical thinking, collaborative work with peers, and research methods. These outcomes were primarily reported by the teachers, who overwhelmingly felt that students had gained knowledge about the university through their participation in the project. Teachers referred to students' knowledge about resources available at the university (i.e., libraries). Teachers also felt that their interactions with University personnel and facilities "demystified the University and made it more attainable." Teachers most often described that students' attitudes had been affected in the following ways: through raising students' awareness of college, and raising students' interest in attending college.

Benefits of Combining Internet Modalities: As discussed in Section V, students saw benefits in using the Internet to access research based resources from UC Berkeley, and for collaborative interactions with campus faculty, staff, and students. The interactivity of the Internet, particularly the communication it allows with remote peers and experts, was cited by teachers and students as a unique benefit of the technology. In general, projects that combined several Internet modalities, e.g. chat, email, and the Web, yielded more positive results. A combination between technology mediated and face-to-face interactions was found by most projects to be essential. If face-to-face interactions were not possible due to geographical constraints (i.e. between Hoover elementary school children in Oakland and their Newton, MA 'key pals') exchange of class pictures enhanced the electronic communication.

Assessment vs. Scale: A challenge that occurred in the area of measuring student achievement is the tension between careful assessment and scale of the project. The need to have a controlled environment in which to conduct in-depth assessment conflicts with the need to impact a large number of students and teachers. An appropriate balance between these competing needs must be found. Projects that demonstrated clear student gains purposely focused on a single classroom or a few classrooms in the same school. This allowed for a refinement of the assessment methodology during the pilot project phase, and investigation of expansion options for the future.

## B. Teacher Practices:

An important lesson learned in the context of teacher practices is that professional development of teachers needs to focus on increasing teacher expertise in the integration of technology with the curriculum, going beyond the acquisition of basic computer skills. Several pre-requisites need to be in place for this to happen effectively:

### *K-12*

- teachers need to be familiar with basic technology tools, i.e. basic operation of the computer, knowledge of common software applications, comfort with e-mail and Web browsing; basic Web-authoring skills;
- easy and ‘just in time’ availability and access to an Internet connected computer at the school site, and preferably also at home;
- on-site technical support;
- knowledge of the subject matter fundamentals; and
- compensated time.

### *University*

- university personnel need to be familiar national, state, and district curricular standards, and with curriculum materials already in use by the teachers;
- professional development workshops or institutes need to move away from a “delivery of content” model and engage teachers in collaborative creation of classroom materials that integrate Internet resources with effective pedagogy; and
- adequate project coordination needs to be in place to provide on-going support of the teachers during intensive institutes and throughout the school year.

## **3. Integrating Research, Teaching, and Service**

*Menu of Opportunities for Faculty Participation:* Given faculty’s time constraints and obligations to the university campus, technology can play an important role in helping to integrate teaching, research, and service. Internet technology can leverage faculty’s time, resources on campus, and help in the outreach mission to get these resources into the community. Faculty members who participated in the IU project were enthusiastic and willing to utilize technology resources to fulfill the outreach mission of the university. The technology can provide faculty with a menu of opportunities for outreach that require varied time commitments. For example, faculty can spend a small amount of time per week exchanging e-mail with teachers or students to answer questions, providing feedback in a way that can leverage their own expertise with a reasonable time commitment on their part. Faculty can participate in chat sessions or asynchronous threaded discourse to have more in-depth interactions. Furthermore, faculty can partner with teachers in the collaborative development of Web pages that adapt their work and research for use in the classroom.

*Incentive and Reward Structures:* To promote greater faculty involvement in outreach efforts and the integration of their roles of teaching, research, and service, campus-wide

policies, strategies, and incentive structures need to be in place. Based on interviews with UC Administrators and faculty, it was clear that faculty would like to take a greater role in outreach but need accommodations made for such efforts. One suggestion that arose was a bonus incentive package as part of the financial structure. Another structure that could be tapped is a release time structure so that faculty could get some of their workload decreased to work on projects like the IU. Another UC Administrator felt that a reward structure for individual performance can help to promote participation in outreach. By building outreach into the tenure structure, involvement will be seen by faculty and staff as a fulfillment of the university's and their own responsibility, not just as an extracurricular activity. Aside from campus-wide strategies and incentive structures, it is important to make outreach easier for people to do, and technology can potentially accomplish this.

*Balance Among the Primary Missions of the University:* The distinctive mission of UC Berkeley is to serve society as a center of higher learning, providing long-term benefits through the discovery, transmission, and implementation of knowledge. The University's mission is carried out through three primary components: research, teaching, and community service. Traditionally, faculty advancement has hinged first and foremost on the quality of the research performed (publications and extramural funding), with the quality of teaching being a second consideration, and community service a distant third. The number and enthusiasm of faculty who participated in the IU demonstrates that there is an inherent interest on the part of the faculty to participate in educational outreach. A more balanced weighting among research, teaching, and community service would allow those faculty members interested in educational outreach to participate more fully in these important activities tied to their disciplinary concentration. In addition, having educational outreach as a criterion for faculty advancement will ensure accountability and peer review of the quality of the outreach effort.

#### **4. Technology Issues**

*Infrastructure and Connectivity:* Issues of technology infrastructure and support were a recurring theme in pilot project implementation. There were delays in getting infrastructure in place, problems with servers, connectivity and classroom wiring, and with Internet access even when classrooms did have computers. This often caused frustrations on the part of teachers, students, and coordinators as the real goals of the project were prevented from being realized according to the original timeframe. Getting the K-12 classroom properly connected, equipped, and maintained, as well as teachers trained in fundamental technology tools, are major challenges and ones that the school district will need to resolve over time. Internet connectivity and computer access for teachers and students were difficult to get in place to the level required for the pilot projects to proceed on their original timelines. This issue required extensive communication and facilitation between the IU management team, pilot project participants, the school personnel, and the district personnel. A large amount of management time had to be spent facilitating this interaction.

Equitable Distribution of Resources: Distribution of technology resources was also a challenge. The IU school district liaisons faced the challenge of how resources could be distributed equitably among the participating schools, in view of the wide range of technology infrastructure readiness in these schools. There is a tension between equitable distribution of technology and providing individual teachers with well-equipped facilities for the integration of the Internet with the curriculum.

Technical Support: Technical support was also a recurring issue for teachers and students. Network and hardware problems were reported by both groups in pre- and post-surveys as some of the top difficulties they have had in working with computers. In focus groups, similar concerns arose from coordinators, administrators, IU management, and faculty. Network and hardware problems can delay projects' curriculum plans if they are not dealt with immediately and effectively. There are very few on-site technical support people or trouble shooting teams in the school districts that can immediately solve such problems. Often, there is just one computer resource person in the school who is also a regular classroom teacher, and the demands on that teacher are great. Teacher and coordinator post-surveys indicated that they needed on-site technical support or someone within the district because the support they did receive was insufficient or non-existent. In every focus group with teachers, coordinators, administrators, faculty, and management, this need was voiced. There were difficulties with the district e-mail server, inaccessible technology, computer hardware problems, accessing and sending e-mail, connectivity, etc. Some projects solved these types of problems by having the coordinator, liaison, undergraduate student tutors, or more proficient K-12 students act as troubleshooters. It is clear that a more formalized method of on-site technical support is necessary, e.g., an on-site individual, a team to serve the entire district, or a help line. 'Just in time' technical support is essential for technology-rich projects such as the IU, where pilot efforts utilized a variety of Internet based tools and outreach modalities.

Evolution of Internet Tools: The continual state of evolution of Internet tools and the lack of standards presented a challenge, particularly for the K-12 community, which has limited resources to dedicate to technology support and upgrades. This challenge extended to professional development of K-12 personnel, which needed to be frequent and on-going. Projects such as IU can potentially set up a structure to facilitate choice of tools, levels of sophistication, and professional development at K-12 sites.

Combination of Internet Outreach Modalities: Final reports from pilot projects that utilized one or several Internet outreach methods (such as digital curriculum development, electronic access to experts, electronic mentoring/tutoring, etc.) indicated that the most effective way of utilizing Internet tools was to combine various modalities. In this way, the more "static" uses of the Web (information delivery) can be complemented and enhanced through collaborative uses of the technology. A matrix of the technology tools utilized by each project is presented in Table 4.

**Table 4**

		Research Web Resc	Student Pages	Develop Web Curr	Email/ Listserv	Video- Conf.	Moo	Other
1	Arts On-Line, On-Site	X	X	X	X	.		Live Perf.
2	Arts, Writing, and Internet		X		X			Live Perf.
3	Personal Pathways	-	-	-	-	-	-	-
4	Enriching Student Writing through the Internet	X		X	X			
5	Using Internet-Mediated Communication...	X			X	X	X	
6	KIE – Knowledge Integration Environment		X	X	X			
7	Electrical Engineering and Computer Science			X				
8	Lawrence Hall of Science	X		X (teach)	X			
9	Interactive MESA			X				
10	Materials Science	-	-	-	-	-	-	-
11	The Living Culture of California Indians			x	x			
12	Using Internet for Cultural Restoration	X			X			
13	Connecting Students to the World		X	X	X			
14	Interactive Approaches to Islam as Global Religion	X	X	X	X			
15	California Heritage	X	X	X	X			
16	Exploring Urban Biodiversity – City Bugs		X	X	X			
17	ISTAT – Integrating Science, Teaching, and Techn.	X		X	X			
18	Spanish Speakers' Family History		X					
19	School to Career - IURD	-	-	-	-	-	-	-
20	FIRST – Foundations in Reading Through Sci/Tech	X		X	X			

For projects such as IU to succeed, it is essential that teachers, other K-12 personnel, and campus personnel, all be brought to the same high level of competency in the use of Internet technologies. The campus and, particularly, the partnering school districts, had ongoing training sessions for teachers at the district computer laboratory facilities. These sessions were very well received by the teachers, and helped participants come up to speed on the various technology tools used by the pilot projects. It is important to note that Internet and computer training is a slow process but one that is critical to the success of project like the IU.

## 5. Project Scale and Sustainability

Distinct cultures exist between the University and K-12 schools. The Internet represents another culture with its own, often foreign, language and practices. There is a need to build bridges between these three cultures to arrive at a common understanding of needs, goals, vision, values, incentive and reward structures, etc., if we are to build a common culture across the institutions concerned with supporting disadvantaged K-12 schools using technology. The Internet is key to building large-scale collaboration between the K-12 and University systems. Meaningful scale will come from extending face-to-face relationships with the Internet, especially when the technology becomes part of the basic fabric of our work.

Scale: A key issue investigated by the IU project pertained to how outreach activities can be effectively scaled. From the results of the pilot projects and IU project as a whole, we have found that to involve large numbers of campus faculty, students, and staff working together with large numbers of K-12 teachers, students, and family members using the technology we first needed to develop appropriate collaborative frameworks. These frameworks need to be adopted jointly by K-12 and the University, and need to outline the most effective methods for: (a) using technology for teaching and learning; (b) infusing University digital learning materials into various curricular areas; and (c) integrating relationship-based outreach such as electronic mentoring into regular school and University practices.

Below, we list several strategies that emerged as a result of the IU project that address the issue of scale:

- *Technology Infrastructure:* A common computer platform and choice of software packages for the K-12 schools can facilitate training, technical support, and maintenance;
- *Professional Development:* A “trainer of trainers” approach in which a cadre of lead teachers can gain in-depth knowledge and experience in the areas of leadership, collaboration, integration of technology and curriculum, and sharing of best practices;
- *Teacher Support Networks:* To build capacity at the school sites, teachers need to increase their collegiality and become part of technology-mediated support networks where they can share best practices and resources, exchange ideas, and tap distributed expertise;
- *Joint Collaborative Frameworks:* Collaborative frameworks between university and K-12 participants that can be expanded and amplified through the use of Internet technology facilitates ongoing communication and sharing of expertise;
- *Transferability:* Identification of project components that can be replicated in other settings, such as assessment methodologies, curricular materials, training packages, tutoring and mentoring strategies, etc.;

- *Responsiveness to National, State, and District Curriculum Standards:* Development of curriculum materials that respond to content and performance standards ensures applicability beyond a given classroom or district;
- *Modularity:* Development of curricular materials that are modular and easily adaptable to various classroom needs facilitates dissemination of resources to many sites;
- *Curriculum Embedded Assessment:* Traditional and alternative assessment tools that are embedded in the curricular materials facilitates their use in a variety of classroom settings without the need for additional evaluation resources;
- *Balance Between Face-to-Face and Technology-Mediated Interactions:* Extension of face-to-face interactions through electronic communication can amplify and strengthen relationships between university and K-12 project participants.

Sustainability: During evaluation interviews and focus groups, participants spoke about factors that sustain a collaboration. These factors pertained to sustaining the motivation of individual members, as well as the larger scale issues related to the administration and maintenance of efforts such as the IU.

Individual project level: Administrative team members, teachers and coordinators related that one of the key factors for sustaining outreach projects is their relevance to the K-12 curriculum. Teachers need to be able to see the relevance of the project and its resources to the needs of their students. Other issues related to the sustainability of individual projects were the time and funding provided for the campus coordinator. As the coordinator often deals at the front lines of the collaboration relationship, it is critical that s/he be adequately funded to provide ongoing support for the teachers.

IU wide: Various university administrators described the need to house the efforts in a research unit, with various departments playing collaborative roles. One university administrator described that departments with particularly successful projects could remain for periods of time, and new projects and participants could enter as well. Departments with particular research emphases in collaboration and outreach would also play an important role (i.e., the School of Education). Furthermore, the institutionalization of the IU Project under a research unit would allow for the creation of an incentive and recognition structure to attract and maintain faculty member involvement. At the school site, university and K-12 administrators described the need for development and connections between the IU and other district wide technology initiatives supported through other sources of funding. There were often visible connections between the efforts of Interactive University and other project grants.

## 6. Evaluation and Assessment

Evaluation occurred at both the macro, project-wide level as well as at the micro, project-specific level. Surveys were developed to address the macro questions, as well as the coordination of focus groups with key individuals. Projects were asked to complete their

micro evaluation through final project reports. Individual projects were assisted in the development of their micro evaluation through initial meetings during the summer or at the beginning of the year (i.e. development of pre and post assessment measures), and the provision of assistance upon request throughout the year.

Importance of Evaluation: During interviews and focus group discussions among university administrators and coordinators the importance of evaluation was noted. Specifically, individuals within these audiences described the importance of pre-evaluation to collect baseline data. They described the importance of assessing students' skills prior to the onset of activities in order to measure change. Evaluation and assessment skills were not always a part of the repertoire of knowledge for project coordinators. Projects that had a strong collaboration with the Graduate School of Education were able to conduct in-depth student assessment in the context of their interventions. Four IU projects fell in this category, as discussed in Section V. Projects based in academic departments where the research expertise lies outside program evaluation and student assessment needed a significant amount of consultation from the IU evaluation personnel on micro evaluation issues pertinent to their specific project. Due to the large number of pilot projects, and the resources needed to conduct the macro evaluation effort for the entire IU project, the evaluation team did not have sufficient resources to help individual pilot projects develop and implement a robust micro evaluation plan.

Time and Resources: Comments from Pilot Project Reports revealed the importance of conducting focused investigations and allowing sufficient time to assess student achievement. Also essential was the availability of dedicated expertise and sufficient support from graduate students for the conduct of project evaluations, and the importance of providing opportunities and support for UCB and K-12 participants to become “reflective practitioners” in the context of educational outreach.

Multi-faceted projects of the complexity of the IU need to dedicate significant resources to evaluation and assessment at the macro and micro levels. As increasing numbers of academic units on campus become involved in educational outreach, there will be a need to build their capacity, knowledge, and expertise in the area of evaluation and assessment. The Graduate School of Education, School of Psychology, School of Public Policy, etc., do not have a sufficient number of graduate students to support the growing number of outreach efforts on campus. Outside professional evaluation groups may be needed to act as consultants and independent evaluators for outreach programs.

## **VII. Next Steps – Strategy for Phase 2 of the IU Project, 1999-2001**

This section provides (1) a discussion of the overall strategy for Phase 2 of the IU; (2) detailed discussion of the proposed objectives and outcomes for Internet Learning Community Projects (which replace Phase 1 Pilot Projects); (3) a list of the Internet Learning Community Projects; (4) overview of the implementation strategy for the Internet Learning Community Projects; (5) summary of the evaluation strategy for the new projects; and (6) the timeline for these projects for FY '99 - '00.

### **1. Strategic Overview of IU Phase 2 - Laying the Foundation for A Large-Scale Learning Community Mediated by the Internet**

Phase 1 of the IU (1996-98) focused on pilot projects and early exploration of the Internet for educational partnerships. In Phase 2 (1999 – 2001), the IU is building upon lessons learned to lay the foundation for a large scale, Internet-mediated learning community between the University, schools, and community. Our focus is to address the issue of scale, using the Internet to amplify and extend effective UC/K-12 relationships.

#### Phase 2 Goal and Objectives:

The goal of the IU remains focused on developing a national model of how the University can best use the Internet to support K-12 teachers, students and their families in disadvantaged urban communities. Our Phase 2 project objectives are to:

- Enhance student achievement;
- Enable teachers to use technology to improve teaching and learning;
- Foster collaboration and a common educational culture at a very large scale between the campus, schools, and community;
- Promote the integration of teaching, research, and public service; and
- Identify effective, scaleable, and sustainable Internet outreach methods.

#### Leadership and Support:

UCB Executive Vice Chancellor and Provost Carol Christ continues to be the project sponsor and principal investigator. SFUSD's Associate Superintendent Maria Santos and OUSD's Associate Superintendent Yolanda Peeks are the school partner leaders for the project. UC Berkeley's Information Systems and Technology organization coordinates IU activities.

The IU will receive approximately \$2.5 million of grant support for Phase 2 from the UCB Chancellor's Office - Berkeley Pledge, UC Office of the President, California

Department of Education (through our school partners), the US Department of Housing and Urban Development, and Sun Microsystems.

### Major Project Components and Activities – An Integrated Framework:

Today, on the foundation of two years of pilot projects, the IU is building a large, collaborative learning community in the San Francisco Bay Area, using the Internet to create and sustain relationships (both across distance and face-to-face) that improve K-12 education. To build this system, the IU has identified five major project components it will develop with school and community partners over the next three years. Each component is designed to support and reinforce the others and to serve as the foundation of people, activities, content and investigation for the large scale learning community.

*Internet Learning Community Projects:* Teams of UC faculty and students, and K-12 teachers and curriculum specialists, will develop exemplary digital learning materials for use in the K-12 community. These materials will: be driven by local, national and California content, performance and technology standards; focus on core curriculum; employ effective digital pedagogy; include tools for customization by teachers; scale to be used by many schools; incorporate assessment methods; and foster an on-going set of UCB/K-12 relationships. The IU is sponsoring 11 Internet Learning Community Projects: 7 core projects and 4 planning projects.

*Evaluation and Research:* We will continue to carry out and refine the IU project's evaluation at the macro-level of overall work, of student achievement through curriculum embedded assessment, and of teacher reflection on new teaching practices. We will link this evaluation work to the research community at the campus who are exploring questions of the use of the Internet in teaching, community collaboration, and systemic educational improvement.

*After-School Community Computing Centers:* We plan to create and maintain well-equipped, supportive environments at schools and in community based organizations where both students and family members can come during non-school hours to learn, explore and interact using technology.

*Educational Technology Collaborative Leaders:* Through leadership training programs, we hope 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. These leaders will serve as a nucleus of trained and experienced personnel around which a larger organization can be built, expanded, and sustained.

*Web-based Collaborative Space (UC Nexus):* We will create portals and communities for UC/K-12 collaboration through our development of the UC Nexus site for all nine UC campuses and the Office of the President. The portals will present a series of

interconnected sites that give students, teachers, families, administrators and researchers access to: Internet collaborative tools; Web-based places to find and work with others; a library of digital learning materials and distributed learning objects; exemplary projects and teaching practices; and a channel for news about California's best uses of technology to improve teaching practices and education.

## **2. Objectives and Outcomes for Internet Learning Community Projects in IU Phase 2**

The IU is supporting seven core Internet Learning Community Projects (fully funded for the three-year award period) and four Planning Projects (partially funded for a shorter duration). These IU projects are funded by (1) Technology Literacy Challenge Grants from the State of California awarded to the Oakland Unified School District (OUSD) and the San Francisco Unified School District (SFUSD), (2) the Berkeley Pledge, and (3) the UC Office of the President Nexus Project. As described in the IU Request for Proposals (RFP), the Internet learning community projects are one key component of the IU's overall activities.

These projects will develop Internet-based outreach methods to:

- Improve K-12 student achievement and instructional practices;
- Support K-12 teachers and schools, especially in disadvantaged communities;
- Investigate how the Internet can best be used to improve teaching and learning and to create a large-scale University/K-12 learning community;
- Link research, teaching, and public service (the project will balance service and research goals); and
- Create a common commitment and culture between UCB and K-12 partners in the use of the Internet to improve education.

The IU and district partners have identified the following outcome areas for IU projects to address through collaborative project planning. IU and district staff will work with project teams to implement the following outcomes over the next three years.

These outcome areas are the key measures of success both for individual projects and for the IU as a whole. These outcome areas are designed to provide focus for your project team, encourage project scalability, and facilitate project evaluation.

### **1. Student achievement and assessment**

Enhancing student achievement is at the heart of the IU projects. UCB, district and school team members should work collaboratively in specifying student outcomes and developing the appropriate student assessment approach. Although assessing student outcomes can be challenging, the IU and district staff will provide consultation and support in identifying appropriate student assessment methods. In this outcome area, projects should:

- Improve student outcomes in relation to relevant curricular content/performance standards, language arts standards, and technology literacy standards.
- Develop/use appropriate student assessment methods (e.g., portfolio, exhibition, performance, use of rubrics, etc.).

## 2. Teacher professional development in the use of the Internet to improve teaching and learning

Teacher professional development is a key component of building successful Internet learning community projects. We recommend the creation of a core project team (as defined in Section IV) that will include an initial cadre of Teacher Leaders to facilitate professional development and project planning. Teacher Leaders will play a key role in developing and testing curriculum materials, planning and implementing student assessment, and in disseminating project results to an extended teacher team in the later phase of each project. Sharing results between Teacher Leaders and an extended group of teachers is a key element of project scalability. Overall, teacher professional development activities should seek to:

- Develop innovative pedagogy through ongoing collaborative planning and reflection.
- Improve content knowledge.
- Enhance technology knowledge.
- Integrate content, technology, and innovative pedagogy where possible.

## 3. Digital learning materials and identification of effective teaching and learning strategies using the Internet

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.

Digital learning materials should be based on and serve to identify and embody effective teaching and learning strategies using the Internet. We have provided district-recommended teaching strategies in Attachment 2 to assist projects in developing exemplary learning materials. Use these strategies as a foundation for your work and try to define how technology can realize, extend, and amplify these strategies. You may also be identifying new strategies through the use of technology. It is important that projects work to understand how technology can be effectively integrated into the curriculum; teaching strategies are the bridge for this integration. Defining and documenting effective strategies is an important element of the IU activities. We look forward to working with project teams to explore innovative ways of sharing these strategies in the dissemination of project results.

We recommend the use of the IU template for the development of digital learning materials. This template, developed by K-12 teachers, will be revised based on input from projects. The current template can be found at:  
<http://iu.berkeley.edu/iu/internal/digiguide/template/index.html>

For this outcome area, projects will:

- Develop exemplary digital curricular materials.
- Investigate, define, and document how the Internet can be used to enhance and extend key district and other teaching strategies.
- Add materials and best practices to UC Nexus site (<http://ucnexus.berkeley.edu> - this Nexus capability is expected to be available in Spring 1999).

#### 4. Collaborative learning relationships facilitated by the Internet

A central focus of these projects is to build a large-scale learning community involving UCB and K-12 participants that is facilitated by Internet technology. Technology-facilitated relationships should be complemented with face-to-face interactions to successfully achieve project objectives. Internet learning community projects should promote the development of collaborative networks and use innovative strategies to address the *scale* of these networks. These networks may involve:

- K-12 teachers and students.
- UC faculty, staff and/or students.
- District staff.
- Community and family partners.

#### 5. School Environment / Families / Leadership

Projects are strongly encouraged to take a leadership role in sharing project progress and outcomes with school personnel, families and local communities. Communications with participating school sites are particularly important. As possible, projects will:

- Ensure that participating teachers work and share with other teachers, department chairs, etc. in school.
- With district/IU assistance, secure principal's understanding and support.
- Develop some basic outreach to families; add information into digital learning curriculum for families.
- As appropriate, develop after-school activities using digital learning materials and environments.

### 3. List of IU Phase 2 Core and Planning Projects

#### *Core Projects: 1999-2001*

1. **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. UC Berkeley 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.

**Principal Investigator:** Professor Ruth Tringham, Department of Anthropology. **UCB Partners:** Department of Anthropology, Archaeological Research Facility. **School:** Roosevelt Middle School, Oakland.

2. **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.

**Principal Investigator:** Carol Tateishi, Director, Bay Area Writing Project. **UCB Partners:** Bay Area Writing Project, Graduate School of Education. **Oakland Middle Schools:** Bret Harte, Carter, Claremont, Elmhurst, Havenscourt, King Estates, Lowell, Madison, Montera, Simmons, Cole, Swett.

3. **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.

**Principal Investigator:** Gerald Lowell, University Librarian. **UCB Partners:** The Bancroft Library, the Teaching Library, the American Cultures Center. **SF Schools:** Franklin MS, Hoover MS, International Studies Academy HS, Lincoln HS. **Oakland Schools:** Roosevelt MS, Montera MS, Lowell MS.

4. **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 U.S. History and Civics curriculum.

**Principal Investigator:** Harry Kreisler, Executive Director, Institute of International Studies. **UCB Partners:** Institute of International Studies, Human Rights Center. **Schools:** San Francisco High Schools, Oakland Middle Schools.

5. **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 6<sup>th</sup> and 7<sup>th</sup> 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, Western Europe and the spread of Islam.

**Principal Investigator:** Joan Kask, Director, Office of Resources for International Area Studies. **UCB Partners:** Departments of Near Eastern Studies, South and Southeast Asia Studies, East Asian Languages, Classics. **Oakland Middle Schools:** Brewer, Carter, Claremont, Elmhurst, Frick, Havenscourt, King Estates, Roosevelt, Westlake.

6. **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 6-12 grade teachers in San Francisco to create a suite of inquiry-based digital science curriculum materials.

**Principal Investigator:** Professor David Lindberg, Director, UC Museum of Paleontology. **UCB Partners:** UC Museum of Paleontology, Space Sciences Laboratory, Berkeley Seismological Laboratory, Center for Particle Astrophysics. **San Francisco Schools:** Galileo HS, Mission HS, Thurgood Marshall HS, Horace Mann MS.

7. **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 in Project FIRST. 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.

**Principal Investigator:** Dr. Isabel Hawkins, Senior Fellow, Center for Science Education. **UCB Partners:** Space Sciences Laboratory. **School:** Hoover Elementary, Oakland.

*Planning Projects: 1999*

8. **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 District and the Center for Latin American Studies. The project will plan how to develop a Latin American Web Site 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 with students in Latin America.

**Principal Investigator:** Isaac Mankita, Acting Vice Chair, Center for Latin American Studies. **UCB Partners:** Graduate School of Education, Graduate School of Journalism, Departments of Geography, Sociology and Ethnic Studies. **Schools:** Oakland and San Francisco.

9. **College of Natural Resources: CityBugs 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.

**Principal Investigator:** Donald Dahlsten, Associate Dean, College of Natural Resources. **UCB Partners:** Environmental Leadership Program, College of Natural Resources, Division of Insect Biology, Essig Museum of Entomology. **Schools:** Oakland and San Francisco.

10. **Environmental Science at Galileo Academy of Science & 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 11<sup>th</sup> and 12<sup>th</sup> 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 mentor/tutors through a UCB Service Learning Class.

**Co-Principal Investigators:** Professor William Berry, Environmental Science; Professor L. Ling-chi Wang, Chair, Ethnic Studies. **Partners:** Environmental Science, Ethnic Studies, Lawrence Hall of Science, the Urban Watershed Project. **Schools:** Galileo High School and other San Francisco High Schools.

11. **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 (ECAI) 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.

**Principal Investigator:** Professor Lewis Lancaster, Acting Chair, Center for Korean Studies. **UCB Partner:** Center for Korean Studies, Institute for East Asian Studies. **Schools:** San Francisco.

## **4. Overview of Implementation Strategy for Internet Learning Community Projects**

The Internet Learning Community projects organize their activities around three key components:

1. Creation of a Core Leadership Team
2. Development and Exploration of Digital Curriculum Materials
3. Dissemination and Scale

Stage 1 – Core Leadership Team: Early on, each project establishes a core leadership team composed of faculty, staff, and students from UCB; several technology-savvy, experienced teachers; and district curriculum specialists. The team establishes digital curriculum development priorities based on content areas, most appropriate uses of technology, curriculum standards, availability of complementary curriculum resources, and key student learning objectives. The team receives on-going professional development in technology, content, and pedagogy, which is provided by team members to the entire group, and/or by other experts from the campus and district.

Stage 2 – Resource Development Driven by Standards and Focused on Student Achievement: After the establishment of the team, and the development of a long-term project plan, the core group works intensively on a cycle of development, classroom testing, assessment, and refinement of the curriculum materials. Most of the development occurs during the summer, while the classroom testing and refinement happens during the school year. Teams follow a digital curriculum template and guide for the development of the materials, developed during Phase 1 of the IU project. The materials are modular and easily adaptable to a variety of classroom situations and needs. During this stage, the team investigates and documents development strategies, best uses of Internet technology for various learning objectives, particularly for the support of K-12/University relationships, and best teaching practices. At this time, focused assessment of the impact of the digital learning materials and practices is designed and implemented. Feedback from this assessment is a critical driver in the further refinement of the materials and activities prior to major dissemination and scale.

Stage 3 – Dissemination and Scale: Once the curriculum materials are robust, the core team focuses on dissemination and scale issues. Several design elements of the Internet Learning Community Projects facilitate broad dissemination of the curriculum materials, as well as scaling of methods and practices. Lead teachers serve as trainers for other teachers at their site, helping them further test and implement the use of IU technology resources in their classrooms. Lead teachers help build the professional development capacity of the district by leading workshops during district-wide in-service days. They also document and share best teaching practices as a result of their participation in the IU projects.

The issue of scale is addressed in a multi-faceted approach. The “trainer of trainers” model followed by the core leadership teams serves to involve large numbers of teachers and prepares them to use technology materials in their classrooms. The way in which the projects design and develop the curriculum materials is inherently scalable, due to resource modularity, strong ties to curriculum standards, built-in assessment, and content background materials for teachers. The involvement of district curriculum specialists facilitates the adoption and dissemination of materials throughout the district. *Please see* the discussion of scale in Lessons Learned (section VI.5), particularly the list of strategies for scale on pages 31-32, for further detail of scale strategies we are attempting to employ in Phase 2.

The UC Nexus collaborative space allows digital curriculum materials to be disseminated in a consistent way through Web portals tailored to educator needs in the State of California. The UC Nexus library of digital curriculum materials will host the resources, testimonials from teachers on best approaches for using the resources in a variety of classroom situations, assessment tools, and access to university and district experts tied to the content and curricular standards.

A pre-requisite to scale is integration of the IU with other technology-based initiatives at the Districts. Such integration allows for leveraging of resources such as coordination of professional development activities, and prevents duplication of effort. The IU is well coordinated with other district technology initiatives, *i.e.*, State and Federal Technology Challenge grants awarded to both San Francisco and Oakland.

## **5. Evaluation Overview for Internet Learning Community Projects**

The IU evaluation effort for Internet Learning Community Projects will encompass three components: (a) assessment of the overall IU project; (b) student assessment; and (c) teacher reflections on instructional practices.

The implementation of the first component (item "a" above) will be led by the Graduate School of Education and will identify effective strategies in the development of the overall IU Internet learning community model. Projects will be expected to participate in activities such as responding to on-line pre/post questionnaires, being part of focus groups and/or individual interviews, and distributing consent letters to project participants as required by the UCB Human Subjects Protocol. Tools and methods to be used here are discussed in detail in the evaluation methods section of this report (see section III).

Project teams, in close consultation with District assessment specialists and IU staff, will be responsible for defining K-12 student outcomes and identifying appropriate assessment tools as discussed in Section III.1. of the Overview of Award Conditions. IU staff will provide graduate student support to assist with individual project assessment plans beginning in Fall 1999. IU staff will also work with district assessment specialists to identify where district or other standardized assessments can help measure student

outcomes of IU projects.

With support from District and UCB project personnel, lead teachers will be expected to reflect upon, and document, best instructional practices using the digital curriculum materials developed as part of the projects.

The results of the overall project evaluation, the student assessment component, and teacher reflections on best practices, will be incorporated into progress reports and a final IU Evaluation Report.

## **6. Timeline for Internet Learning Community Projects for FY '99-'00**

FY '99-'00 represents the second "year" of Internet Learning Community Projects in IU Phase 2. We are using the following "timeline nomenclature" to clarify where we are in the life of the Internet Learning Community Projects because of the timing complexities created by the grant cycle the IU is on (the grant cycle is primarily driven by the federal fiscal year):

Year 1: January 1 – August 31, 1999

Year 2: September 1, 1999 – August 31, 2000

Year 3: September 1, 2000 – August 31, 2001

Year 4: September 1, 2001 – December 31, 2001\*

(\*Note SFUSD funding currently through 9/30/01)

### **Fall 1999**

#### **Team Building/Project Planning: Solidify/recruit teacher leader teams**

- Submit IU project plan template including timeline with key events
- Schedule planning sessions with teachers
- Complete district paperwork for teacher leader compensation
- Coordinate with district staff to brief school principal or appropriate administrator on plan for the year

**Professional Development:** ongoing in content, pedagogy and technology as needed

#### **Development of Digital Learning Materials: Early development**

- Teams begin to develop/test at least one "module"
- Consult with district curriculum specialist/appropriate staff in planning and development

#### **Evaluation/Assessment: Planning and initial implementation**

- Team members complete IU macro-level pre-survey
- Develop student assessment objectives and measures for at least one "test module"
- Consult with IU evaluation team as needed

**Technology Use: Experiment with technology integration strategies**

- Ask teachers to experiment with a technology strategy in their module
- Share feedback on experimentation

Administrative:

IU Project Coordinator meetings:	September 28, 1999
	November 30, 1999
	December 21, 1999
Progress Report Due:	January 31, 2000

**Spring 2000**

**Development of Digital Learning Materials:** Intensive development and early dissemination

- Teams continue to develop and test “modules”
- Teams share results to date with local school colleagues, IU, district and/or other colleague meeting in early Spring
- Schedule a late spring showcase opportunity for teacher deliverables (invite principals)
- Publish at least one module on the web based on UC Nexus template

**Professional Development:**

- Project-specific training in content, pedagogy and technology as needed
- District/IU sponsored leadership institutes in late Spring to train teacher leaders how to support other teachers in both face-to-face professional development and in the use of online collaboration tools

**Team Building/Project Planning:** Develop teacher leaders

- Begin planning for summer institute with teacher leaders and district staff - *schedule summer dates early!*
- Recruit new teachers for summer institute

**Evaluation/Assessment:** Data collection and planning for Yr 3 (Fall 2000–Summer 2001)

**Technology Use:** Experiment with UC Nexus

- Get teacher input into how UC Nexus tools can be used
- Test UC Nexus with a technology integration strategy

Administrative:

IU Project Coordinator meetings:	TBD
Progress report due:	June 1, 1999

**Summer 2000** *Preliminary: Needs more definition*

- Project summer institutes jointly led by campus coordinators and teacher leaders from Years 1 and 2 (note: new teachers would not be required to participate as teacher leaders)
- Project specific scale strategies (e.g, reaching new teachers through summer institutes, using technology to disseminate learning materials, testing curriculum in new classrooms, getting curriculum “endorsed” by district curriculum specialist and/or school department chairs, etc)

## VIII. Recommendations

The findings of this study are consistent with the literature on collaboration and the effective use of technology in the classroom. Important factors for collaboration discussed in the literature (time, commitment, shared vision/goal, and communication) were also identified as important collaboration characteristics by IU participants. Student achievement data from our pilot projects suggest improvements in the areas of literacy, science, art, and technology. Because of delays associated with technology implementation at the school sites, many projects were not able to fully implement their activities as planned. Phase 2 of the IU targets schools with sufficient infrastructure to be able to carry out the teacher professional development and student centered activities.

The amount of time allotted to implement Phase 1 of the IU project as well as accurately assess student outcomes proved to be too short. With the incredible demands on teacher time, there was a tension between the need to evaluate project processes and outcomes versus the lack of time available for teachers. In some projects, completing evaluation instruments or participating in evaluation activities proved burdensome. This will be a continual dilemma. Strategies need to be developed that allow for better integration of evaluation and assessment measures that can be embedded in classroom or curriculum as part of the teaching day.

Expertise in education evaluation and assessment was not readily available within pilot projects. This may have contributed to the small number of projects who were able to directly assess student achievement.

Several discussions regarding the IU project evaluation results among key district and UC personnel have yielded the following recommendations to funders, to universities, and to the K-12 community.

### To Funders:

- Support various types of evaluation, i.e. alternative assessment - portfolio, etc.
- Fund personnel to provide schools with sorely needed on-site 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 conduct baseline assessment to measure impact of project on students and teachers.
- Fund more professional development covering more than just technology, but also how to establish shared goals and well-defined outcomes, and training on evaluation and documentation.
- Fund ongoing technology training, particularly as it relates to curriculum.

### To Universities and K-12:

- Conduct formative evaluation to assess projects as they proceed, to improve their design and implementation. Assess classroom impact through curriculum

embedded assessments, train teachers to keep careful documentation through tools such as on-line journals, to determine best practices.

- Raise 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: school selection, clarification of goals, infrastructure readiness, etc.
- Conduct ongoing technology professional development in a “co-training” model, where both university and K-12 are trained together in technology, pedagogy, assessment, integration of technology into the curriculum, classroom management using technology, etc.
- 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.
- Investigate the possibility of a dedicated outreach unit on campus with academic leadership.

#### To Universities:

- Design projects that increase K-12 student knowledge of college application procedures, college entrance requirements, etc., particularly at middle and high school levels.
- Ensure careful balance and coordination of tools, people and resources to carry out student assessment.
- Emphasize and facilitate faculty involvement, to be integrated as part of the project on a long-term basis.
- Tap resources from districts’ research offices for evaluation purposes
- Establish rewards and incentive structures to facilitate faculty participation in outreach activities.

#### To K-12:

- Pay immediate attention to technical support needs at the school sites.
- Establish a baseline level of readiness for teachers to participate in technology-based projects (perhaps two tiers of readiness: for teachers participating intensively in the partnership and developing curriculum resources – teacher leaders – and for those participating less intensively who may only field test resources).
- K-12 administrator (Principals) should take on the responsibility of assessing how well teachers integrate technology and curriculum.

## **IX. Literature Review**

### **1. Internet Technology for K-12 Education**

The use of Internet technology provides a unique opportunity for fostering engaging and active student learning in the schools. Decades of research on technology use in schools suggest that, properly used, technology can enhance the achievement of students (United States Department of Education, 1996). The specific uses of Internet technology includes on-line access, the use of multi-media images, video and audio technologies, and distance learning via live interactive communications.

The effects of such Internet technology use are not in the technology itself, but in the instruction which is enabled by technology (Copley, 1997). Instruction is enabled by myriad factors that accompany the well-planned use of technology in schools. Although these factors are interrelated, they can be classified into three broad categories. First, technology use allows for interactive learning through a constructivist, student-centered process. Students with access to technology have been found to learn how to organize complex information, recognize patterns, draw inferences and communicate findings (United State Department of Education, 1996; Cradler, 1994). Second, equity and increased achievement is enhanced within a technology-rich classroom (Cradler, 1995). Increased achievement has been found for a wide range of students, including at-risk, learning disabled, and Limited English Proficient (LEP) students. This occurs through increasing basic skills, motivation and equity. Lastly, technology use affects classroom dynamics and teaching methods by changes in interactions within the context of the classroom (United States Department of Education, 1996; National Coalition for Technology Education and Training, 1997; Copley, 1997; Cradler, 1995). In combination, these factors can form a powerful classroom tool, which allows teachers to better engage a wider range of students.

#### A. Technology and Constructivist Learning

Technology has significant potential to reform education and enhance student achievement by refocusing attention on the learner and the learner's own knowledge construction. The individual's construction of knowledge has been a predominant theory in the learning sciences, i.e. cognitive science. In particular, work by Piaget has been the source of large volumes of work on the constructivist process, and its implications for learning and education. Brodzinsky, Sigel, & Golinkoff (1981) describe Piagetian theory as the construction of knowledge through the organization, structuring, and restructuring of experience. Piaget asserted that existing schemes of thought become modified through interaction with the physical and social world in a unique way by different individuals based upon their own pre-existing schemas and prior knowledge. Computers and Internet technology allow for constructivist learning by enabling students to conduct self-paced learning, active seeking and confirmation of knowledge sources, and optimally, interaction with knowledge sources not easily accessible through more traditional means.

Many of the goals of constructivist learning have been achieved in classrooms which have effectively utilized technology in education. Research has revealed that technology increases performance when interactivity is prominent, and that instructional programs provide for interactive opportunities (Cradler, 1994). Students using Internet technology can solve situational problems. Students can apply higher order thinking skills to the analysis and synthesis of real-life problems. The outcomes in teaching also reflect the constructivist paradigm. Findings reveal that technology allows for less directive and more student-centered teaching, and an increased emphasis on individualized instruction.

Cradler (1994) in a review of the research related to technology and educational achievement, highlighted particular features critical for effective technology applications. These features can greatly facilitate constructivist learning. He describes that there needs to be immediate adjustment of task difficulty in relation to student responses, and instant feedback of correctness of responses. This allows students to spend significantly less time gathering data, and focus on understanding what data mean. Furthermore, the degree to which the learner has control over learning (i.e. self-pacing), has been found to be a benefit of technology (see review by Copley, 1997). If these features of educational technology use are upheld, then the learner is provided with the opportunity to engage in an environment that optimally facilitates active learning, self-directed learning, and problem-solving.

### B. Access and Student Achievement

Internet technology expands student access in the context of the core curriculum by enabling students to tap wider networks of knowledge from organizations, universities, and other remote expertise. The Center for Applied Special Technologies conducted a national study of on-line communications in schools (see review by Copley, 1997). Their findings reveal that fourth and sixth grade students scored significantly higher on two to four learning measures. They concluded that on-line access helps students become independent and critical thinkers. Furthermore, the students are able to effectively express their knowledge and ideas in compelling ways.

Technology use has been credited for increasing achievement by affecting motivation, attitudes, and confidence. Technology-rich schools report higher attendance and lower drop-out rates (Copley, 1997). Studies on technology use reveal that students are more challenged, engaged, and independent when using technology. Students gain a greater sense of responsibility for their work. For example, it has been noted that student writing that is shared with other students over a network tends to be of higher quality than in-class writing samples. By engaging in self-directed and more independent learning, students seem to acquire a greater sense of ownership for their work and their own learning. Furthermore, studies reveal that students are empowered by the ability to teach others about technology use. In fact, students often know more about computer operation than do their teachers (see review by US Department of Education, 1996).

Lastly, Internet technology allows for student achievement gains for a wide range of students. Gains have been documented for learning disabled, low-income, and LEP

students. Examples of Internet technology reveal the methods by which this can be achieved. Teachers can connect their students with students from other classrooms. For example, using a listserv teachers can connect with other classrooms studying a similar topic of interest. One teacher described that the connection of inner city urban students with private school students allowed for the exchange of scientific information that would not spontaneously happen within a classroom (Cradler, 1995). Teachers can bring in students with different or special needs to work together on the same project. Technology use has been shown to significantly improve problem-solving skills of learning disabled students, and writing skills and attitudes for urban LEP students. The individualized nature of instruction offered by technology use allows students to engage at their own pace, responding to their needs.

### C. Classroom Dynamics and Teaching Methods

The use of technology in education also provides a unique avenue to alter classroom dynamics. The classroom context is changed through different types of interactions among students and teachers, increased family involvement, and teachers' development and awareness of new teaching methods. Technology used to promote student-centered learning can help teachers and students interact in fundamentally different ways. Teachers are less directive, and spend more time advising students (Cradler, 1994 ). Project-based activities not only allow students the independence to engage in self-directed learning, but teachers can spend less time providing information and more time engaging with students about the information collected. Technology also increases student collaboration on projects. This allows the teacher more time to individualize instruction. Student group projects also allow students to exercise their communication, and interpersonal skills.

### D. Impact on Students and Families

The involvement of families in their child's education is a critical avenue to increased student achievement. An increase in family involvement has been found to occur through increased time on educational activities at home, increased communication between teachers and parents about their children's assignments, and even students teaching their parents about technology (US Department of Education, 1996). Some projects have included the provision of computers at home. Yet, the avenue for increased family involvement can stem from within the classroom as well. For example, students in one school district created an electronic bulletin board to provide the community with information, and announcements. Technology can serve as a powerful avenue to increase parental involvement in their children's education.

### E. Impact on Teachers

Recent research from Apple Classroom of Tomorrow (ACOT) reveals that technology prompts teachers to question old assumptions about instruction and learning. Outcomes for educators include rethinking and revision of curriculum and instructional strategies, and greater participation in school and district restructuring efforts (Cradler, 1994).

Teachers report increased interest in teaching, productivity, and increased planning and collaboration with colleagues (Cradler, 1994 ). Teacher collaboration through Internet technology allows teachers to overcome the isolation they experience in their classrooms (see review by US Department of Education, 1996). These aspects of technology use can alter classroom dynamics and teaching strategies by providing teachers with more awareness, resources, and knowledge in the classroom.

## **2. Collaborative Partnerships**

Collaborative efforts between schools and universities are recognized for their potential positive impact on educational improvements for students. At one level, schools benefit because of university experience and training, while universities can benefit by not having to divert resources to remediation of students who were not adequately trained in elementary and secondary school (Lagowski, 1994). On another level, collaborations are likely to become more common and necessary for institutional growth because of diminishing funds and resources for education (Lasley, Matczynski, & Williams, 1992). Funding for education is not increasing and given competing requests for funds or resources, both human and fiscal, collaborative partnerships enable educators to make the most of their efforts without compromising the quality of their program endeavors.

This emphasis on cooperation rather than competition in collaborative partnerships encourages educators to work together to design programs that meet the primary needs of all constituents. Furthermore, cooperative efforts diminish the likelihood of duplication of effort and wasted resources. Collaboration is most effective when there are agreed-upon goals and a common means of reaching those goals. It takes time to reach consensus on the methods to be used, and it takes effort and personal sacrifice to reach the compromises that are necessary in partnerships. However, the benefits gained through collaborative partnerships are reflected in educational improvements for children.

In a true school-university collaboration, each institution is an equal partner, working towards the solution of common problems while meeting their own self-interests (Fiorentino, Kowalski, & Barrette, 1993). This perceived common interest is what draws parties to collaborate. Collaborative partnerships require an investment of time, energy, and emotion by all constituents to subordinate special interests and to make egalitarian decisions and equitable participation possible. Given this goal of shared power and mutual vision, how is a successful collaboration built?

### A. Building a Collaborative Partnership

Digby, Gartin, and Murdick (1993) identify factors to consider in developing effective university and public school partnerships. These authors stress the importance of early identification of possible partnership schools and demographics, such as student socioeconomic levels, student ages, minority composition, school size, and school location. Other important factors to consider are the needs and interests of public school teachers, and how they can match the specific research interests and pedagogical agendas

of the university personnel. The partnership should focus early on areas of mutual interests and concern, and collaborators need to recognize the perspectives of all involved. The collaborators also need to delineate the nature, structure, and purpose of the partnership arrangement and establish goals and short-term objectives. True collaboration demands interdependence since no school-university partnership is successful unless both parties are eager to participate.

### B. Elements of an Effective Collaboration

Aside from a shared goal and an eagerness to participate, there are other considerations in developing an effective collaboration. A review of the literature on numerous school-university collaborations revealed various content and goals, but themes emerged about necessary elements for a truly effective partnership (Digby, Gartin, & Murdick, 1993; Goodlad, 1994; Fiorentino, Kowalski, & Barrette, 1993; Lagowski, 1994; Noguera, 1997).

The first element is communication. The effective transmittal of information within a relationship is essential in a public school-university partnership. Without it, each partner may be unaware of the demands and needs of the other. Opportunities for dialogue also allow for the acknowledgment of problems and honest self-evaluation of the effectiveness of existing systems. Furthermore, when the research and educational outreach interests of the university coincide with the interests of the school, more productive relationships are possible and serve as the basis for collaboration.

Once communication is established, partners must show concern by recognizing and meeting the needs of both institutions through agreed upon goals. Participants must work to provide the resources that will contribute to the partnership. There should be acknowledgement and rewarding of participation, time, and effort so all partners feel validated.

Even when the communication of needs is effective, partners must realize that meeting identified needs requires time and planning. As a result, compromise becomes important, as well as focusing on active solutions.

The underlying premise of an effective partnership must be commitment by both sides to the relationship. They must be committed to the idea that forming a university-public school partnership will lead to improvement in the educational system by increasing the quality of education for all involved. Commitment also implies that time and resources will be allocated by each partner.

### C. Benefits

Considering the time and effort invested in building a school-university collaboration, what benefits can be expected? Partnerships can provide an effective means by which universities and public schools may initiate curricular programs to meet the unique needs of their area; provide new ways of organizing and allocating responsibility among

teachers, administrators, and university educators; new ways of allocating budgets and new sources of funding as well as more efficient uses of existing resources to support instruction; and encouragement, resources, and opportunities for collaboration between public school and university colleagues for thinking, developing, evaluating, and revising ideas about teaching and learning (Digby, Gartin, & Murdick, 1993).

On a professional level, teachers may find that by having outsiders in their classrooms and asking questions about what they are doing will compel them to think about their teaching in new ways (Zietlow, 1992). Furthermore, teachers will gain confidence in sharing their knowledge and practical expertise with university educators, and they will also benefit from university training and research.

#### D. Challenges and Issues

Such an effort to organize school and university personnel does not happen easily, and is not without challenges. As noted earlier, collaborations take more time and effort to reach consensus, as well as personal sacrifice of individual goals to reach compromise (Lasley, Matczynski, & Williams, 1992).

Furthermore, there are issues of “turf” and control (Payzant, 1992; Lieberman, 1992). Both the school and university have their work defined, and may guard what they view as theirs. A clash of cultures may also occur as school systems and universities may have different norms, roles, and expectations (Goodlad, 1994). For example, the regimen of time and space in the schools versus the relative freedom of time and space in the university; an ethic of inquiry in the university versus an ethic of action and meeting immediate needs in the schools. Both sides need to arrive at a full understanding of how the other agencies operate and a willingness to overcome the differences.

Another challenge is the importance of leadership at the top (e.g., University presidents and deans, school superintendents, executive directors) to support the mission, vision, and sense of what the organization can be about (Goodlad, 1994; Payzant, 1992). Similarly, it should be acknowledged that the process of partnerships is slow as lines of communication are being established, working relationships nurtured, and structures being built. Structures and processes do not happen instantly, and patience for results and continued support for the project are necessary (Goodlad, 1994).

In addition to support by leadership at the top, decisions about leadership within the collaboration are necessary. Leadership is best seen as empowerment and shared responsibility (Goodlad, 1994), not power to just one or several figures. The more leadership is spread around, Goodlad contends, the better off the partnership will be.

Finally, how people can be motivated to participate and maintain their involvement is important to consider. Based on inducements-contributions theory (Haymore-Sandholtz & Merseth, 1992), when people’s contributions to an organization outweigh the perceived inducements, they may question both their commitment to and continued participation in the organization. Therefore, the balance between demands and rewards is

an important factor to consider as educational institutions attempt to reform structures, operating procedures, and curriculum. Teachers put considerable amounts of time into their jobs outside of school working hours. Extrinsic inducements/rewards as well as intrinsic inducements/rewards need to be considered as teachers, as well as university members, make decisions about how to allocate their time and energy. Haymore-Sandholtz and Merseth (1992) found that extrinsic rewards in power, status, and pay helped to sustain teachers' participation. Power consisted of involvement in decision making, as teachers formerly had few opportunities to formulate policy and that their input now led to observable changes. Status related to their opportunities for grant writing or presentations at state and national conferences. Teachers realized that professional educators valued their input and considered them as equals. Finally, although the pay was an honorarium or stipend, given the amount of time required of the teachers, the pay fell far short of their hourly rate. However, they viewed the compensation as having more symbolic than real value, as their status as professionals was validated. Intrinsic rewards included gains in expertise, increased knowledge and efficacy in teaching techniques, enhanced collegial interaction, and more positive attitudes and feelings about themselves as teachers. What this implies is a balance between demands and benefits, but more importantly, that teachers and university personnel need to feel validated for their efforts.

#### E. Collaboration and Technology

Given the benefits of Internet technology for K-12 reform discussed earlier, it seems logical to combine the advantages of collaborative partnerships and of technology use to reap greater educational rewards. Jacullo-Nolo (1992) describes the Technology Institute which was designed as a school-university partnership between a liberal arts college and five urban public schools districts. The goal was to bring technology to teachers and increase student opportunities to learn. The Institute provided in-service teacher development opportunities, and it was hoped that knowledge about computing would enable teachers to develop their students' knowledge about computers and their skills in using them. It was found that the program influenced how participating teachers used computers in their classroom and made a marked impact on their professional lives. The results indicated that 90 percent of those responding to the survey said the training increased their confidence in their teaching. Ninety-one percent reported increased enthusiasm for teaching, 95 percent had an increased interest in curricular reform using computers in the classroom and 96 percent had an increased interest in continued professional growth. Students also benefited, as 90 percent of the teachers reported that their students' interest in subject content had increased, and over half reported that student attendance had increased and class disruption decreased. Furthermore, over 88 percent of the teachers reported increased student participation.

Related to professional growth, the National Education Association's Mastery in Learning Project, which helps school communities restructure based on university research on effective teaching, learning, and curriculum, allowed teachers nationwide to access the computer-network. Perry (1992) reported that the technology allowed teachers to talk frequently with other teachers across the country, helped them to draw on

resources and ideas beyond their classroom, and provided on-going support without barriers of time and distance. Furthermore, technology was found to be an efficient way to meet students' diverse needs with different children doing different things at the same time.

## **Appendices**

- A. Evaluation (sample instruments; demographic data of participants; results)**
- B. Interactive University Key Project Personnel - Phase 1**
- C. References and Bibliography**

## Appendix A

# Evaluation Report

The evaluation issues explored by IU are listed below, followed by major findings:

1. Building and Sustaining a Collaboration
2. Impact of the IU on:
  - a. Student Achievement
  - b. Teacher Practices
3. Integrating Research, Teaching, and Service
4. Technology Issues
5. Project Sustainability and Scale
6. Evaluation and Assessment

### 1. Building and Sustaining a Collaboration

- Summary of Key Elements to Build/Sustain a Collaboration:
 

<i>K-12 Teachers</i>	<i>UC Coordinators</i>
- Time	- Commitment
- Shared goals	- Funds
- Communication	- Shared goals
- Commitment	- Communication
- Availability of technology	- Respect

Note: After the project, “funding” replaced “technology” as one of the top five elements from the point of view of K-12 teachers

- Summary of What Needs to Be in Place Before Beginning a Collaboration:
  - What needs to be in place before beginning a collaboration? (K-12 responses)
    - Liaison between school and university
    - Infrastructure in place (schools and classrooms)
    - Easy access to computer lab
    - On-site technical support
    - Teachers with knowledge of content and technology
    - Reliable server for communication
  - What needs to be in place before beginning a collaboration? (UC responses)
    - Coordinators
    - Availability of UC student mentors
    - Funds
    - Management team to oversee overall project
    - Familiarity with outreach and technology training
    - Familiarity with infrastructure and ongoing programs at school site
- Summary of Outcomes of the Collaboration:

- Outcomes of the Collaboration: UC/K-12
  - K-12 Teacher responses:*
    - Innovative curriculum ideas
    - Enhanced student achievement
    - Increased technology competence
  - UC Coordinators responses:*
    - Positive changes in teachers' perceptions of UC
    - Increased understanding of K-12 curriculum
    - Increased understanding of student levels of preparation
  - Administrators (K-12 and UC) responses:*
    - Need of longer time frame
    - Need for focus on smaller # of projects
    - Increased awareness of ongoing nature of the collaboration
  
- Outcomes of the Collaboration: Intra K-12
  - K-12 Teachers:*
    - Sharing ideas/knowledge among students through the pilot projects
    - Improvement of teacher/student interactions
    - Students becoming more independent learners
    - Sharing resources/ideas among teachers
    - District-district collaboration
  
- Outcomes of the Collaboration: Intra UC
  - Coordinators:*
    - Establishment of network for future collaborations related to outreach
    - Sharing ideas and resources

## 2a. Impact of the Internet on Student Achievement

- Summary of Knowledge of College and University:
  - 15% increase in students' gathering of information on college/university
  - 4% increase in knowledge of admissions requirements
  - 76% teachers reported that students gained knowledge about college because of IU

*"Students began to have discussions about their educational plans...; college has emerged as an option. They used Internet to research college courses, majors, campuses..." - K-12 Teacher*

- Summary of Attitudes about College and University:
  - 59% of students felt IU had not affected their attitude toward college/university
  - 21% of students felt it had
  - 88% of teachers felt IU had affected students attitudes toward college/university by raising student awareness and interest

*“Yes, I feel their views have been affected. I believe working this closely with University people has made them realize that they can make it to college too. Some of the material made them realize just how challenging college can be...” - K-12 Teacher*

- Summary of Knowledge of Subject Matter:  
15% of teachers reported increased knowledge of subject matter by their students. Areas affected:
  - Critical thinking/problem solving skills
  - Computer use
  - Increased interest in subject matter

*“For the young writer, [Internet] offers multi-media opportunities and emphasizes the valuable awareness of an audience. The ‘under construction’ nature of Web pages also helps the author focus on writing and research as processes that, at their best, involve revision, collaboration, and feedback...” - K-12 Teacher*

- Summary of Attitudes about Subject Matter:
  - Consistent agreement from all data sources that students demonstrated an increase in attitude toward subject matter:
    - More pride in their work turned in to teachers
    - Internet and university audience enhanced interest
    - Increased understanding about the changing nature of research in the subject matter (science)

*“An engaging project topic, use of Internet, and a more active and scientific style of inquiry that involved researching and debating their own opinions proved to be powerful for the range of students.” - K-12 Teacher*

## **2b. Impact of the Internet on Teacher Practices:**

- Summary of Role of Internet - K-12 Teacher Responses:
  - From pre-questionnaires: 36% of teachers indicated no role for Internet in the classroom, and 15% indicated it had “little” role
  - From post-questionnaires: 25% of teachers indicated that Internet had enhanced academic achievement in their students through research, e-mail, and project presentations
  - Teachers most often described increased student achievement through the use of Internet technology when the technology was used for interactive purposes
  - A common theme across all accounts from teachers was that the use of Internet technology promoted increased motivation and participation among a range of learning styles (high to low achieving students).
- Summary of Role of Technology - focus on e-mail

Strengths:

- Convenience
- Allows fast, simple, asynchronous communication
- Wide dissemination of information

## Weaknesses:

- Impersonal nature of the technology
- Miscommunications are more likely to occur
- Lack of access in the K-12 environment
- Unanticipated Outcomes:
  - engagement in new areas of curriculum development using technology
  - increased collaboration with other teachers
  - increased content knowledge in various curricular areas
  - increased motivation of teachers who were previously uninterested in technology
  - changes in teachers' attitudes about their professional identity
  - increased teacher demand for professional development to learn how to integrate technology and University resources into the curriculum

*“We had a similar experience in that one of the two teachers was much more ambivalent about technology to start with and was taking a stance that ‘show me this could be a tool in creating a curriculum that I want.’ And she was very convinced by the end of it and quite excited about [it].”*  
*[Pilot Project Coordinator]*

*“We are getting people asking for a lot more professional development ... for a lot of those things that we thought they would need... So in a sense, it's great that we have people going beyond the project and [that] they're doing a lot more collaboration with each other.”* *[IU Management Personnel]*

## General Comments:

- 81% UC coordinators vs. 63% teachers reported that email helped build their relationship
- UC coordinators reported that e-mail (94%) and the Web (50%) helped them collaborate with other UC outreach personnel
- 17% K-12 teachers reported using e-mail to communicate with one another
- Most often identified obstacle in using technology to build a university/K-12 collaboration: differences in infrastructure and access between both types of institution

*“Every teacher should have a computer with e-mail capacity in the classroom, and ideally also at home.” - K-12 Teacher*

### 3. Integrating Research, Teaching, and Service:

- Summary of Integration of Research, Teaching, and Service:
  - K-12 teachers would like more face-to-face interaction between UC faculty and their students
  - UC faculty would like to use technology as a communication tool due to time constraints

*Incentives and rewards are needed:*

- Financial bonus/incentive
- Release time
- Performance rewards for outreach
- Build outreach into tenure and promotion structure

### 4. Technology Issues

- Summary of Technology Issues:
  - Students Use of Internet (pre -> post):
    - Daily users: 17% -> 28%
    - 2-3 times/week users: 19% -> 28%
    - Weekly users: 16% -> 7%
    - Infrequently: 22% -> 5%
    - Never: 19% pre and post

*Increased computer use in students already interested in technology*

- How Students Use Internet (pre -> post):
  - Games: 65% -> 62%
  - Web: 47% -> 63%
  - Word processing: 45% -> 47%
  - Educational CD-ROM: 38% -> 37%
  - E-mail: 35% -> 54%
  - Internet chats: 32% -> 37%
  - Usenet groups: 8% -> 12%
  - “Other”: 6% -> 9%
- Teachers Use of Internet (pre -> post):
  - Daily users: 69% -> 79%
  - 2-3 times/week users: 18% -> 4%
  - Weekly users: 5% -> 0%
  - Infrequently 5% -> 0%

*Increased computer use in teachers already interested in technology*

- How Teachers Use Internet (pre -> post):
  - Games: 28% -> 21%

- Web: 87% -> 71%
- Word processing: 92% -> 83%
- Educational CD-ROM: 59% -> 46%
- E-mail: 90% -> 79%

Note: One important indicator is that the teachers' responses on the "Usefulness of Internet" increased from 38% in the pre-questionnaire to 62% in the post-questionnaire. One interpretation of the data is that teachers use the Internet less for browsing and more to conduct research, create Web pages, etc.

- Infrastructure  
*Recurring theme in all evaluation measures:*
  - Delays in getting infrastructure in place
  - Problems with servers and connectivity
  - Lack of wiring in classrooms
  - Internet access even when classrooms did have computers
- Distribution of Technology Resources:
  - The IU school district liaisons faced the challenge of how resources could be distributed equitably among the participating schools, in view of the wide range of technology infrastructure readiness in these schools.
- Summary of Technical Support Needed:
  - Both K-12 teachers and students identified network and hardware problems as a top difficulty in using computers
  - Insufficient or non-existent technical support was identified in every focus group as an impediment to technology projects

*"The whole support piece is lacking. We don't have technical support. So I find a lot of our curriculum people spending a lot of time on technical issues rather than helping the teachers think about ... curriculum integration..." K-12 Administrator*

- Summary of Technology Training Needed:  
*Both K-12 teachers and UC coordinators wanted training in:*
  - Internet use
  - Web page authoring and design
  - Curriculum design involving the Internet
  - Use of applications and videoconferencing*They reported receiving training in:*
  - Web authoring
  - Internet use and search engines
  - Software applications
- Summary of Internet Tools and Outreach Methods:
  - Internet Tools

The continual state of evolution of Internet tools and the lack of standards presented a challenge, particularly for the K-12 community, which has limited resources to dedicate to technology support and upgrades. This challenge extended to professional development of K-12 personnel, which needed to be frequent and on-going. Projects such as IU can potentially set up a structure to facilitate choice of tools, levels of sophistication, and professional development at K-12 sites.

- Internet Outreach Methods

Final reports from pilot projects that utilized one or several Internet outreach methods (such as digital curriculum development, electronic access to experts, electronic mentoring/tutoring, etc.) indicated that the most effective way of utilizing Internet tools was to combine various modalities. In this way, the more “static” uses of the Web (information delivery) can be complemented and enhanced through collaborative uses of the technology.

## 5. Issues Related to Project Sustainability and Scale:

- Summary of Sustainability:

*Pilot project level:*

- Relevance to K-12 curriculum
- Shared goals between UC and K-12
- Teachers’ perceived relevance of UC resources to their classroom practices
- Time and funding for the UC coordinator

*IU-wide level:*

- An outreach “home” on campus to serve as an umbrella for individual projects
- Connection to research
- Recognition by faculty
- Connection between IU and other grants/major initiatives at the Districts

- Summary of Scale:

Requirements for being able to expand/scale Internet outreach projects:

- Build strong collaborative networks between K-12 and the University
- Outline the most effective methods for:
  - using technology for teaching and learning;
  - infusing University digital learning materials into various curricular areas; and
  - integrating relationship-based outreach such as electronic mentoring into regular school and University practices.
- Links to K-12 curriculum standards
- Teachers release time and easy access to technology
- Increased professional development for teachers
- Increase teacher collegiality
- Continued development of joint collaborative frameworks between UC and K-12

## 6. Summary of Evaluation

- To assess student achievement, sufficient time and focused investigations are key.
- The availability of dedicated expertise and sufficient support from graduate students are essential.
- UCB and K-12 participants need opportunities and support to become “reflective practitioners” in the context of educational outreach.
- Importance of evaluation recognized by UC coordinators and K-12/UC administrators
- Need for more baseline data on students to measure change
- Need for more evaluation training of university personnel not connected with the Graduate School of Education

## **Appendix B**

### **Project Key Personnel**

#### **Phase 1**

- The UC Berkeley Executive Vice Chancellor and Provost Carol Christ (Project Principal Investigator)
- Associate Superintendent for Curriculum Maria Santos (Project Leader at the San Francisco Unified School District - SFUSD)
- Assistant Superintendent for Instruction Yolanda Peeks (Project Leader at the Oakland Unified School District - OUSD)
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## Appendix C

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