A BRIEF HISTORY OF CPEC'S ITQ SBR PROGRAM

The California Postsecondary Education Commission's
Improving Teacher Quality Program and Scientifically Based Research

Background

The *No Child Left Behind Act of 2001* (NCLB), which reauthorized the *Elementary and Secondary Education Act of 1965* (ESEA), was intended to create dramatic changes in the nation's system of K-12 education: standards for highly qualified teachers, annual assessments of student achievement, substantial consequences for schools that failed to meet improvement goals, and additional federal resources to accomplish these goals. In contrast to these potentially revolutionary changes, Title II, Part A of the Act – the part dealing with teacher professional development -- remained quite stable. Building on fifteen successful years of the Eisenhower State Grant Program, NCLB left the program largely intact, making just one potentially far-ranging alteration: all proposals and projects now had to be evidence-based.

NCLB introduced the notion of "scientifically based research", defined in section 9101(37) as "research that involves the application of rigorous, systematic, and objective procedures to obtain reliable and valid knowledge relevant to education activities and programs." Further, the Act then went on to mandate that "all SEA activities supported with program funds must be based on a review of scientifically based research, and the SEA must maintain documentation that explains why it expects those activities to improve student academic achievement." CPEC's ITQ program, then under the leadership of Linda Barton White, immediately embraced this mandate and embedded it within its first Improving Teacher Quality (ITQ) RFP as the Knowledge - Research Continuum -- All Projects: 1) "MUST draw from scientifically based research; 2) MUST contain an evaluation research plan and 3) MUST employ a dissemination plan for adding to the existing research base that provides a foundation for the proposed project." In practice, this meant that proposed interventions had to be supported by scientifically based research, projects must contain an "SBR" component (the project-within-the project), and projects had to have a strategy for contributing their results to the SBR knowledge base.

The new requirement was hardly met with much enthusiasm by California's professional developers. During technical assistance workshops to explain the new RFP, Ms. White received a litany of complaints and reasons why such an SBR requirement was inappropriate/unreasonable. These comments fell into three broad categories: (1) The technical requirements for such research (e.g., IRB approval, access to district data) are too onerous; (2) We've never done this before and we don't intend to start now; and (3) The notion of SBR in an educational context is an oxymoron. When Ms. White relayed these comments to Department of Education officials, she was told that they hadn't intended SBR to involve hurdles like IRB approval and, therefore, it was less a mandate than a programmatic goal. Ms. White, not willing to let a good idea slip away, dropped the mandate and instituted an optional, pilot SBR program for that first, 2002, ITQ RFP.

The Pilot Program

Rather than requiring the 100+ proposers in that first ITQ competition to present SBR plans in their proposals, proposals were solicited and vetted without any mention of SBR. Once the grants were made, the seventeen awardees were invited to compete for an augmentation award based on their ability to conduct an SBR experiment. A notice was sent to the seventeen announcing CPEC's intention to identify, fund, and support a

cohort of ITQ projects interested and capable of conducting SBR studies. They were told augmentation proposals would be judged on four criteria:

1. Research studies must employ an experimental model that causally links project activities to teacher change and increases in student achievement

2. Research studies must be controlled (ideally through randomization though closely matched comparison group studies may be competitive)

3. Research studies must be data rich including data about both student achievement and changes in teacher classroom behavior

4. There must be a dissemination plan for making research results available to the field.

Further, the notice announced CPEC's intention to fund about five such augmentation awards, that funding would be about 10-15% of the underlying grant, and that researchers were expected to continue their efforts for one year after the underlying grant ended in order to capture changes caused by the grant.

Ultimately, CPEC received five proposals from the first ITQ cohort and funded three of them. The three were supplemented by two SBR awards made to grantees from the last of the Eisenhower competitions. CPEC has long mandated that every funded project conduct a mini-research project as a method for reflecting upon its own practice. While these mini-projects (and the $2000 grant that had supported them) were generally a long way from SBR, several projects had found ways to conduct experiments that involved the collection and analysis of student data. Two of these projects were so successful in doing this that they were invited to submit proposals extending and expanding their research so that it fully met all SBR criteria.

What did CPEC learn from this pilot program? The most important thing it learned was that while the conduct of SBR contained many challenges, it was eminently feasible: IRB approval never proved to be much of a problem, districts were willing to cooperate if the IHE approached them as colleagues, demonstrating causation was possible with careful, robust experimental designs. While it is probably true that some long time professional developers began taking their proposals elsewhere, a new, younger group of developers accepted the SBR challenge and gravitated to ITQ competitions. Finally, though not every SBR project proved to be a research gem, the pilot program demonstrated clearly that SBR was more than possible, it was a valuable part of any professional development project. The field also validated such work accepting several peer reviewed publications and presentations, as well as one Ph.D. dissertation. With proof of concept in hand, CPEC mandated that all proposers responding to its second ITQ RFP – the Academic Literacy Competition -- include SBR plans.

The Academic Literacy Competition

CPEC's 2005 ITQ RFP served as a model for the way the program would be run under new administrator Karen Humphrey. In particular, RFPs were now targeted at specific educational opportunities recognized by state and federal research and actions. For 2005, the target was academic literacy in grades 7-12; following years would target

the challenges of K-2 education and closing the education achievement gap. Second, all proposers now had to build the plans for an SBR experiment into their proposal, and secure the services of a qualified research director. In order to guide proposers, language similar to the following has appeared in all RFPs since 2005:

Research Design

Create a detailed research plan for evaluating the impacts of the intervention on students and teachers.

a. Clearly identify the research questions, experimental methods, data sources (which must include student achievement data), and analytic methods that will define the research.
b. Special attention must be paid to the difficulties of conducting controlled experiments in the project's school setting (e.g., permissions, selecting a matching control group, analysis and reporting of results).
c. In addition, proposers must identify any other programs or projects in the school or district that may produce confounding effects on the proposed intervention, and discuss how the research will filter out these effects to show that any impacts on students and teachers are actually the result of the proposed intervention.
d. The research plan should add to the existing research base that provides the foundation for the proposed project.
e. It should be understood that the primary purpose of the Improving Teacher Quality grant is to provide and evaluate high-quality teacher professional development. The research project is a required and integral component of the project but is not intended as the main focus. The portion of the project budget used for the research project should be sufficient for a rigorous, scientifically based evaluation, but should normally be limited to 8% to 15% of the total budget; if more than 15% is proposed, justification must be included in the Project Description.

Dissemination Plan

Briefly discuss the proposers' plans to disseminate key findings from the project.

a. The dissemination plan may include publication, presentations at professional conferences, online dissemination, and other strategies.
b. The purpose of the dissemination plan is primarily to facilitate replication of successful strategies in other low-performing schools, within or outside the targeted district(s), and secondarily to contribute to the research base on school turnaround.

Additionally, proposers were given the following scoring rubric so they would better understand the criteria that would be used to vet their proposal. Educational researchers were recruited to serve as panelists and every panel had at least one researcher to complement other panelist skills (e.g., academic literacy). The rubric included the following criteria:

- Research design presents a technically feasible research plan that includes a method for establishing causation (e.g., randomization, matching controls).

- Is clear about sources of student achievement data (i.e., instrumentation) and techniques for collecting such data.
- Describes the approach for analyzing and communicating project data and results.
- Identifies potential challenges (e.g., variable attrition, disruption effects) and describes how such challenges may be addressed.
- The Research Director is qualified to conduct this type of activity; experienced in evaluation and familiar with the subject matter and topics addressed by the grant. (See résumé/curriculum vita attached to the proposal.)
- Dissemination plan includes a description of research that will be disseminated to all stakeholders so they may directly benefit from the studies they supported.

CPEC received forty-plus proposals in the 2005 competition and made eight awards (one was shut down after the second year). The Academic Literacy seven had three years to implement their professional development plans, and their research directors worked with them during those three years as well as continuing through year four to capture all educational outcomes. In order to monitor and assist these projects, CPEC's Assessment and Dissemination Team hired an SBR specialist, Dr. PJ Hallam from UC Berkeley, to work with these projects and to begin to develop protocols for CPEC's SBR work. Early guidelines, shared with the projects, and in practiced today included:

- Measures that projects must meet early in their life cycle: designation of reasonable control sites, collection of baseline data, selection of instruments, IRB processing, accurate reporting of participant numbers. Projects that fail to carry out these activities in a timely manner (sometime during the first 18 months, preferably earlier) need to be called to account.
- In the intermediate stage, objective measures of progress include updates of the project's data collection and analysis. While each project has a different timeline, documentation of the construction and maintenance of key databases, such as teacher survey responses and student scoring data, provides evidence of the project's ability to complete the proposed research. Preliminary findings must be provided so that evidence of the project researcher's basic analysis capabilities can be evaluated and supported as needed. For example, if selected methodologies do not align with the nature of the data and study questions, or if conclusions are not logically linked to results, the project could get support to rectify these areas of need. Projects that do not provide preliminary findings of reasonable quality may need additional technical assistance.
- In the final stages, the ideal is production and dissemination of research reports that meet federal standards for SBR and are completed by the end of the 4th year. Published articles and/or inclusion in the WWC are the goals. Projects should make final information available to all stakeholders and in forms useful to each (e.g., CPEC requires a comprehensive, written final report; districts may prefer a power point presentation highlighting changes in student performance).

Additionally, CPEC instituted an annual fall SBR meeting in which all research directors from a given cohort came together to discuss progress, challenges, and opportunities. Research Directors also attended the annual winter meeting for all CPEC

project PIs and an SBR panel was always part of the program. Finally, a written annual report noting progress, results, and challenges was also required.

All of the Academic Literacy research projects, save one, were completed by mid 2009 and a dissemination conference for all CPEC grantees and other interested parties was held on the UC Irvine campus in September. Each research director had the opportunity to present his or her results and to answer questions. Perhaps the most interesting finding of the day was the diversity of the projects – although each had performed research on professional development geared to academic literacy, the studies were each completely different. Although most employed a quasi-experimental design, one was able to employ a true, randomized trial. Some were able to rely on state mandated tests as their source of student data, others had to develop assessment instruments more in line with the underlying professional development. Statistical techniques ranged from chi-squares to hierarchical linear modeling and everything in between. Most supported their quantitative studies with equally important qualitative work, but again, the diversity of techniques was staggering: video studies, classroom observations, questionnaires, case studies. When it comes to the application of SBR, one size cannot fit all.

While the five pilot projects had proven the feasibility of SBR, the seven academic literacy projects really demonstrated the necessary requirements of quality SBR: (1) an experienced research director, (2) close collaboration among all parties, particularly between the RD and the LEA, (3) an experimental design inextricably linked to the underlying professional development implementation, and (4) enough stability in the LEA so that the PD implementation has a chance to take effect, affected teachers are able to remain with the project, and data can be reliably interpreted across four years. Although not every one of the seven was lucky enough to have all four requirements met, each SBR project shed important light on its underlying PD project as well as the process of SBR. They were also extraordinarily successful in disseminating their results to the field.

Evaluation & Dissemination

CPEC's ITQ-SBR program is now in its eighth year. There are currently twenty projects, in three different funding cohorts, applying SBR to professional development projects and a fourth cohort is slated to begin October 1, 2010. What's been learned? As mentioned above, it has been CPEC's policy to require projects to build a dissemination plan into their proposals and to then implement those plans across the four years of funding as well as after. This policy has been a major boon for the knowledge-research continuum: With nearly every project contributing, these twelve projects have published 16 peer reviewed articles, made 45 presentations at regional and national meetings and conferences, published one book with a second in the offing, and formed the research basis for one Ph.D. dissertation. The quality of the work speaks for itself.

Second, CPEC has learned much about facilitating the conduct of quality SBR work within the structure of the ITQ program. In order to make that learning readily accessible to the field, CPEC issue a monograph --Examining Educational Experiments: A Field Guide for Conducting Scientifically Based Research – in early 2008. In its Introduction, CPEC explained (1) why the document was written, (2) exactly what a Field

Guide is, and (3) the Guide's intended audience. Excerpts from this document, in pertinent part, are as follows:

1. With so much on the table and at stake, the United States must apply its great knowledge generation engine to the discipline responsible for fueling that engine – education. Education is far more than a mere instrument of national competitiveness. With over 55 million students and 4 million K-12 teachers, it is the nation's largest profession; and, as Linda Darling-Hammond has persuasively argued, professions must be built upon a shared and growing knowledge base. To be sure, the professionalization of teaching requires more than the mere existence of such a knowledge base, and that base itself will be comprised of many different types of data, information and knowledge. This Field Guide is predicated upon a simple belief – the profession of teaching and the process of education must do a better job of generating knowledge about themselves. Other disciplines have made substantial progress by embracing and applying a wide array of exemplary research strategies and then feeding proven results back into the discipline. Education must do the same. The unexamined experiment is not worth conducting.

2. This Field Guide is intended as an adjunct to the theoretical knowledge contained in volumes such as Shadish, Cook and Campbell's Experimental and Quasi-Experimental Designs for Generalized Causal Inference. The field-generated materials contained in this Guide – checklists, timelines, flowcharts, guidelines and tips based on real world experiences – are designed to allow the researcher to apply the deep theory of causal inference to the hectic and messy world of school-based research. Speaking metaphorically, this Field Guide serves as a set of variably scaled maps to the SBR process. But like the novice traveler, the researcher, novice or not, is always warned not to confuse the map with the territory. The world of education- based research is far richer, and messier, than any two-dimensional map.

3. Since its inception, the Improving Teacher Quality (ITQ) Program, and the Eisenhower Program before it, have required a collaboration between institutions of higher education (IHEs) and local education agencies (LEAs). The No Child Left Behind Act's focus on scientifically based research adds a third party – the professional researcher. In order to be successful, ITQ projects must forge a real working collaboration among all of these partners. At a minimum, this requires an understanding of each partner's roles and responsibilities. This Field Guide is designed to help all of the ITQ partners meet this requirement by focusing on the critical junctures where the partners must work collaboratively to conduct scientifically based research on the underlying professional development project. In addition to a succinct overview of the SBR process, the Guide contains chapters on topics such as: how the professional development partner, typically the IHE, can find and work with research consultants; how the IHE and researcher can work together to meet the requirements of the Institutional Review Board; how the researcher can work with LEAs to secure the most useful data set; and how all can work together to insure that research results are successfully disseminated. Not everyone will need to read every page of the Guide, yet there is something of value for every ITQ participant in its pages.

In its hard copy form, almost 1000 copies of the Field Guide have been distributed to California educators. Today, an electronic copy is freely available to anyone wishing to download it from the CPEC website:

http://www.cpec.ca.gov/FederalPrograms/FieldGuide.pdf

Finally, eager to follow its own watchword -- that the unexamined experiment is not worth conducting – in 2008 CPEC contracted with a team of evaluation researchers from Claremont Graduate University headed by Professor Christine Christie (now at UCLA) to perform a thorough assessment of its SBR program. Although the team's 100 page report is far too detailed in data, analysis, and recommendations to briefly summarize for the purpose of this document, two major conclusions are worthy of note. Regarding the quality of the CPEC funded, SBR research the report stated, "The presence of exemplar SBR projects is an unanticipated finding of this evaluation given the bevy of challenges Research Directors, IHE Project Directors, and LEA representatives provided. Such SBR studies included specific design features that may have led to their overall success. Specifically, study questions were clearly stated, measurable, and reasonable in their scope. Each had a well articulated theory of change. Statistical analyses used were appropriate and well aligned with study design and number of study participants included in the analyses. These studies were challenged by many of the contextual factors common to all of the SBR projects, however the Research Directors for these projects remained flexible and adjusted study designs as needed to accommodate the contextual conditions as they were encountered. Thus, positive experiences conducting SBR and learning opportunities from these successes exist and can be offered as guides for other partnerships."

CPEC was also interested in the impact that an SBR project component might have on the underlying professional development project. The research team attempted to answer such questions through a series of online questions and structured interviews. The results are quite striking, "We also asked IHE Project Directors and LEA Representatives to rate their overall impression of the value of SBR added to their ITQ project. They used an 8-point scale (0 = "Adds no value" and 7 = "Adds significant value") to respond to survey items. All respondents (N = 17) rated the value of SBR highly (5 or higher), with 65% (n = 11) giving a rating of 7." Far from finding SBR an unwanted/unneeded imposition, the projects found SBR to be an immensely valuable program component.

Based on these results, it would appear that SBR is a win-win-win. It is a win for the funding agencies since it insures a high level of accountability. It is a win for the discipline because it increases the level and flow of quality information. And it is a win for the teachers and students because the projects are better.

APPENDIX I:

FIVE PILOT PROJECTS

Markham Mathematics Collaborative (MMC)

Project

The MMC, a joint project between UC Davis and Vacaville USD, was a school-based professional development project supporting fifteen teachers in one elementary school to develop pedagogical content knowledge through the application of cognitively guided instruction (CGI) strategies. The project had three stated goals:

1. To enhance teachers' capacity to make informed instructional decisions when planning mathematics instruction and when interacting with students during instruction.
2. To develop a community of practice at Markham where teachers engage in joint inquiry about their mathematics instruction that will support self-sustaining generative change.
3. Improve the achievement levels of children in Collaborative teachers' classrooms.

Project activities included:

1. Monthly meetings with the Markham staff, UCD mathematicians and math educators, and graduate students to analyze the cognitive demands of mathematical tasks, examine children's strategies and consider the CA mathematics standards.
2. Summer sessions for teachers to learn about using problem solving interviews as a method of both professional development and assessment
3. Weekly lesson logs to encourage teachers to reflect on their instructional decisions and to document changes in their knowledge base.
4. Videotaping and analysis of problem-solving interviews between teachers and their students.

Research

Changes in student achievement were assessed using scores from the California Standards Mathematics test (CST) for 2004 and 2005. Control groups of fifth and sixth grade students were developed from within Vacaville USD by matching each child in the Markham sample with a child from a different school according to the following criteria: (1) similar score on the 2004 CST (2) identical language designation (3) identical ethnicity and (4) identical free and reduced lunch status. The table below shows the mean student scores:

	Collaborative	Control	State	District
2nd n=37	449.78		366*	377.4*
5th n=30	328.4 (89.26)	283.7 (63.11)*	349.6	333
6th n=33	324.6(65.6)	315.3 (48.5)	339.5	344.6*

* statistically significant at p=.05 level

This table, as well as other data comparing the distribution of students by proficiency level, changes in scaled scores, and changes in proficiency levels all support the same conclusions: Second grade students of MMC outperformed all relevant comparison

groups; fifth and sixth graders outperformed the control group but did somewhat worse than state and district comparisons.

Mathematics Assessment at the High School (MASHS)

Project

MASHS was a joint project between San Jose State University and San Jose's East Side Union High School District. In particular, the audience was all the mathematics teachers at the district's four lowest performing high schools, all included in the Immediate Intervention/Underperforming Schools Program (II/USP). The driver for change was assessment, and the project incorporated a three-step change model: (1) performance assessment of the students using a battery of tests designed for the Northern California Mathematics Assessment Collaborative (MAC), (2) professional development activities designed to use the test results to determine the areas of greatest student weakness and try to understand the sources of those weaknesses, and (3) the development of curricular units to directly address the student weaknesses.

Additionally, MASHS was also intended to be synergistic with the work of MAC, a consortia of 25 districts with funding from the Noyce Foundation, that had a contract with the Mathematics Assessment Resource Service (MARS) to develop performance tests and scoring rubrics. MASHS design called for monthly meetings during the academic year and a "week of professional development" during the summer.

Research

Results from both MARS testing (open ended, higher level problem solving) and the CST (multiple choice) were available for well over 1000 students:

Total MARS 2005	Experimental	Control	All MAC
Perf. level	% Students at	% Students at	% Students at
1	57%	38%	48%
2	23%	32%	28%
3	14%	23%	19%
4	5%	8%	6%

Total MARS 2004	Experimental	Control	All MAC
Perf. level	% Students at	% Students at	% Students at
1	56%	44%	39%
2	34%	42%	39%
3	9%	12%	19%
4	1%	2%	3%

CST Results	2004	2004	2005	2005
	Prof. + Adv.	Basic	Prof. + Adv	Basic
School 1	8%	24%	11%	33%
School 2	3%	12%	11%	33%
School 3	15%	16%	20%	37%

School 4	9%	24%	10%	30%

These results demonstrate that while students in the experimental group made substantial progress (i.e., 10% more students met standard in 2005 compared to 2004), they still performed below the rest of their district peers and much below the MAC collaborative as a whole.

ArtsCore

Project

ArtsCore was a joint project between UC Irvine, Cal State Fullerton, Santa Ana College and 16 under-performing high schools (and feeder middle schools) in Los Angeles and Orange Counties. The project had three priority goals:

1. Developing curriculum that is aligned with both the California arts standards and the new UC/CSU visual and performing arts entrance requirements
2. Pioneering processes for getting these courses approved by UCOP
3. Developing curricular strands so that these new arts courses will also simultaneously support student growth in language arts. Research was focused on demonstrating that student work in arts courses could raise scores on tests of reading and writing.

These goals were supported by several activities: teacher leader workshops in the four arts disciplines, a five day summer institute, school-to-community arts programs with museums and performing arts organizations, and regional workshops for parents.

Research

In order to assess whether ArtsCore's writing-to-learn strategies had improved student writing skills, a subset of ArtsCore teachers was matched to a control group of teachers who were non-participants. In September 2005, and again in May 2006, students of these teachers were asked to write an essay in response to a prompt taken from the California High School Exit Exam (CAHSEE). UC Irvine English composition instructors were trained in scoring and all scoring was blinded.

TREATMENT GROUP	2005 Pre-treatment		2006 Post-treatment	
Score	Freq	percent	Freq	percent
1	149	59.8%	77	30.9%
2	71	28.5%	109	43.8%
3	27	10.8%	56	22.5%
4	2	0.8%	7	2.8%

CONTROL GROUP	2005 Pre-treatment		2006 Post-treatment	
Score	Freq	percent	Freq	percent
1	68	42.8%	79	49.7%
2	76	47.8%	62	39.0%
3	12	7.5%	18	11.3%

4	3	1.9%	0	0.0%

Although the treatment and control groups are not well matched on pre-treatment achievement, the gains exhibited by the treatment group are encouraging. A closer analysis focusing on individual student change showed that 45.3% of treatment students increased their score by at least one rank score, only 10.8% showed a decrease. A similar analysis of control students showed that 20.1% had a score increase while 25.7% had a decrease.

Professional Development Initiative for Mathematics & Literacy Teachers

Project

This project was a collaboration between the New Teacher Center at UC Santa Cruz, the four IIUSP high schools in the East Side Union High School District, and their six feeder schools in the Alum Rock and Franklin McKinley School Districts. The project has one, student- achievement based objective: To help the high schools and feeder schools meet their student achievement goals as measured by API targets. This goal was supported by three professional development interventions:

1. Develop an innovative, four week long, summer school laboratory experience for high school and middle school mathematics and literacy teachers.
2. Link teacher learning acquired during the summer laboratory with a rigorous, year long, coaching-based, content focused, professional development program for all teachers.
3. Form a leadership team and school site committees that meet each month to coordinate articulation, programming, and accountability measures across districts and schools.

Research

The underlying project had significant implementation problems and they adversely affected the research component. For example, the original plan required all summer school students to take the Northwest Education Association mathematics assessment as a pre-post around the summer school experience. For a variety of reasons, this never happened so it was impossible to determine the amount of mathematics students learned during the summer school. Researchers also intended to track the students associated with the math teachers who had participated in the summer school. But only four out the 15 teachers were from IIUSP schools rendering the sample size inadequate. Finally, researchers intended to use a variety of techniques to measure school level effects. However, attendance logs showed that only five of the 30 teachers who were supposed to attend all the events actually did so. Ultimately, the researchers put together some data from CST scores. While it was suggestive, it could not support any actionable conclusions.

While the failure of the research component is mostly attributable to underlying project failures, CPEC learned two important lessons: (1) just as the success of the underlying project relies upon a close collaboration between the IHE and LEA, the

success of the research component requires a close collaboration between all three partners and (2) research designs must be robust in order to counteract validity threats and to accommodate district changes.

Professional Development Resources Online: Mathematics (PD-ROM)

Project

PD-ROM is a joint project between Cal State Fullerton, the Orange County Department of Education, CSU Monterrey (to develop the video clips), the Butte County Department of Education (to develop the computing platform), CENIC, and several other school districts whose teachers were on-line participants. The goal was to develop and test an on-line mathematics curriculum that could serve as the 80 hour follow up to AB 466 training. The project was technologically very ambitious, seeking to develop three necessary components: (1) a sophisticated computing platform that allows multiple paths of communication, video streaming, coursework, lesson development, and more bells and whistles than a bell and whistle factory (2) dozens of video clips of teacher leaders presenting "outstanding" lessons and the software allowing teacher participants to interact with it and (3) sequenced course modules built on CAHSEE questions that include mathematical explanations, best pedagogical practices, and assessments. The project succeeded greatly in its technological ambitions; it fared less well as an online method for delivering professional development.

Research

PD-ROM, and its research component, was greatly compromised by teacher attrition. In the first cohort of 54 teachers, only 12 finished the online modules – an almost 78% attrition rate. The second teacher cohort had a 57% attrition rate. A focus group study of this attrition phenomenon revealed three major reasons for the high drop out rate: (1) the length of the program, (2) the fact that it ran during the school year, and (3) social isolation and the ineffectiveness of online discussions.

In order to assess the effectiveness of the program for those persisting, researchers compared the STAR test results for more than 4,000 students of 10 experimental teachers to almost 6,000 students from 11 control teachers. An analysis of the descriptive statistics indicated that at baseline 8% more students of the experimental teachers scored in the lowest math proficiency categories (combined far below/below) than the control students and 10% more control students scored at the most advanced levels (combined proficient/advanced). The descriptive post-test (outcome) statistics showed that the control group students, if anything, achieved at higher math proficiency levels than the experimental students. In order to dig deeper, the researchers applied a general estimating equations (GEE) model to investigate the association of math test performance and several explanatory variables. This analysis, though not statistically significant, show a weak trend toward the experimental group having more combined proficient/advanced students. The findings indicate that when compared with post-controls, the post-experimental group was *more likely* to have more combined proficient/advanced students and *less likely* to have combined below basic/far below

basic students. Thus, the GEE results contradict the preliminary conclusions reached through descriptive statistical analysis. Without more data (teachers and students) to explore more variables, this contradiction cannot be resolved.

APPENDIX II:

SEVEN ACADEMIC LITERACY PROJECTS

Content Academic Language Literacy Instruction (CALLI)

Project

The partners for Project CALLI were CSU Bakersfield and the Delano Joint Union High School District. The vision of this project was to help mathematics and science teachers better meet the needs of English language learners by providing such teachers with professional development in academic language and literacy, *as it related to their specific content areas*. The project had three main goals, (1) to produce an effective professional development model applying academic literacy in science and mathematics, (2) to increase teacher knowledge of academic language and implementation of such strategies in the classroom, and (3) to improve student achievement on the CST and CAHSEE. In order to achieve these goals, the project was organized around a summer institute with follow up sessions emphasizing the sharing of lessons and peer coaching.

Research

The research study focused on two clusters of questions. First, how student achievement changed, and second, how teacher's classroom behaviors and strategies changed (not discussed here). In order to assess student growth, the researchers compared student scores pre and post intervention for the two experimental high schools, a control high school, and overall state scores on both the CST and CAHSEE. Because of local problems with Biology and Earth Science curriculum (see full report) the data for those subjects are not deemed valid. As the following chart demonstrates, student scores improved dramatically in the three tested mathematics areas, but failed to improve in chemistry.

Scaled Differences for Math and Science in the Two Intervention High Schools, 2008

Subject	HS IA	HS IB
Chemistry	-9.8%	-0.1%
Algebra I	16.9%	29.2%
Geometry	49.7%	22.1%
Algebra II	40.7%	34.8%

Differences calculated as: School % (Proficient + Advanced (2008)) - School % (Proficient + Advanced (2008))

State % (Proficient + Advanced) (2008)) State % (Proficient + Advanced) (2008))

CAHSEE scores in mathematics showed similar growth. Although this research focused on math and science, one of the adaptations the project made during the course of the implementation was its intersection with English Language Arts and English Language Development. Since this was the case, researchers also analyzed the CAHSEE data for ELA. The data revealed that while the experimental and control high schools began in 2005 with similar scores, and all well below state averages, the experimental high schools made substantial gains commencing with project implementation: In 2007, both

experimental schools performed significantly better than the control, and by 2008 both were performing on a par with state averages.

Literacy in the History Classroom

Project

This project was a collaboration between the California History/Social Science Project (CH/SSP) at UC Irvine (UCI), faculty from the Department of Education at UCI, the Santa Ana Unified School District (SAUSD) and the Orange Unified School District (OUSD). The goals of the project were to:

1. Increase history teachers' commitment to addressing literacy issues in social studies classrooms
2. Develop classroom strategies and model curricula that enable them to address those issues effectively
3. Build a vertically and horizontally integrated support network of SAUSD history teachers with substantive training in academic literacy.

For LHC, academic literacy includes: (a) focus on vocabulary and accessing the history text--discrete aspects of language which is critical for history because of time chronology, cause and effect, comparison/contrasts; text structures different from everyday spoken language; and (b) emphasis on complex genres--discourse features used in specific academic genres and accessing of their codes and conventions. The project employed a six day summer institute and follow-up sessions where the project leaders visited the teachers to give demonstration lessons and provide input on teachers' lesson ideas.

Research

The study focused on two student research questions and three teacher research questions (not discussed here):

> SRQ1: Do experimental group students perform better than comparison group students in the area of content-based academic literacy?
>
> SRQ2: Are experimental group students more skilled than comparison group students in the area of historical analysis?

These questions were studied through a quasi-experimental research design with pre- and post tests. In addition, student achievement on the California Standards Test in English Language Arts (CST-ELA) was also analyzed. Unfortunately, the numbers involved: 31 experimental and 10 comparison teachers, and about 3000 students, were insufficient to generate unambiguous results.

Major findings SRQ1: Both comparison and experimental group students demonstrated improvements from pre-test to post-test. The 7th grade experimental students did not perform significantly better than comparison group students in the area

of content-based academic literacy. The 10th grade students did perform better than the comparison group of students in the area of content-based academic literacy, but the significance of the improvements was mixed and inconsistent.

Major findings SRQ2: Both comparison and experimental group students demonstrated improvements from pre-test to post-test. Both 7th and 10th grade experimental students demonstrated higher scores than comparison group students in the area of historical analysis. The same findings were true for English learner students in both 7th and 10th grade. The statistical significance of the experimental student gains was mixed.

Reading, Thinking and Writing in History & Science

Project

This project was a collaboration between the Grant Joint Union High School District, the Sacramento Area Science Project and the California History Social Science Project at UC Davis. The project's objective was to "improve student performance" in four areas: (1) increase knowledge of history; (2) increase knowledge of science; (3) increase reading comprehension in history and;(4) increase reading comprehension in science. These objectives were to be achieved by helping project teachers "master" three areas of instruction: (a) a repertoire of reading comprehension strategies; (b) learning techniques to scaffold student writing, and; (c) classroom discourse structures to support cooperative group work.

The project planned to train all of the district's history and science teachers over the course of the grant. This training would occur in two formats: (1) a one week summer institute, or; (2) during a "seven-day nonconsecutive academic year pull out program."

Teachers could choose which of the formats they would prefer. The project proposed a randomized trial experimental design to address one key research question: Does student achievement increase as a result of the program?

Research

The key research result is that both the science and history components of the program produced statistically significant impacts on student achievement:

Program	Outcome Measure	Standardized Effect Size (Cohen's d)	P-Value	Statistically Significant	
SASP	SASP Writing Test	0.158	0.043	yes	
HSSP	HSSP Reading Test	0.082	0.032	yes	

For both programs, the results are small but meaningful.

The evaluation also estimated the impact of the program on teacher attitudes using two measures of teacher self-efficacy: (1) the extent to which teachers believe their instruction helps improve the reading and writing abilities of students, holding constant their beliefs about how well students can learn (TSE-RW); and (2) the extent to which teachers believe their instruction helps increase the content knowledge of students, holding constant their beliefs about how well students can learn (TSE-CK). The SASP program had a statistically significant overall impact on TSE-RW (standardized effect size of 0.218 SDU, p-value = 0.045). The HSSP program did not have a statistically significant impact on either measure of teacher attitudes.

Redwood Area Academic Literacy Initiative (RAALI)

Project

RAALI was a partnership between Humboldt State University, Sonoma State University and Konocti Unified School District as the primary partners, as well as several other LEAs on the north coast. The projected supported academic literacy in high school science, mathematics and history through its four goals:

1. Provide a professional development program for teachers of science, mathematics and history and to enhance the literacy skills among ninth and tenth grade students.
2. Implement specific literacy curricular interventions in program high schools
3. Increase student achievement in mathematic, history and science as measured by achievement tests and program-developed assessment tools.
4. Conduct research focusing on the impact of the specific literacy curricular interventions developed and implemented as part of RAALI and related questions.

Research

The RAALI research effort was composed of three studies: 1) Main Effects Study of student achievement employed a non-Equivalent group, quasi-experimental design; 2) Lesson and Video Study which used a qualitative methodology; and 3) Teacher Knowledge and Implementation of Academic Literacy Study which used a matched comparison group, quasi-experimental design. Only the student results (1) are discussed here.

The Main Effects Study attempted to answer three research questions: (a) How does student achievement as measured by California Standardized Tests (CST) compare between students who receive RAALI interventions and those students who do not receive the interventions? (b) How does student achievement vary by the number of RAALI 'doses' (RAALI interventions)? and (c) How does student achievement vary with respect to the content of the 'dose' (science, mathematics, and history)? For year one of the program there were three major results:

1. Among Title I students, CST English Language Arts (ELA) scaled scores were significantly correlated ($p = 0.015$) with RAALI Dose. Students who received a full

RAALI dose or more performed 9.5 points higher (n = 458; mean = 320.6) than those who did not receive a dose (n = 1000; mean = 311.1).

2. Among Title I students, CST History scaled scores were significantly correlated (p = 0.049) with receipt of a full History dose. Mean test scores for students who received a full History Dose (n = 107; mean = 327.7) were 13.6 points higher than those who did not receive a RAALI dose (n = 2214; mean = 314.0).

3. CST Mathematics and Science test scores were not significantly correlated with RAALI Dose.

In year two of the program, test scores were not found to be significantly correlated with RAALI doses.

Developing Rigorous Education in the Arts to Motivate Students (DREAMS)

Project

DREAMS is a collaboration between the San Bernardino City Unified School District and the College of Education, California State University San Bernardino (largely the RIMS Arts Project) to increase the academic literacy skills of the District's secondary school students who take art. There are two primary goals with objectives that specify the projected outcomes:

1. Secondary arts educators will implement standards-based instructional practices.

   Objective 1: Teachers will participate in professional development to collaboratively design standards-based instructional units based on the arts standards in Aesthetic Valuing and Artistic Perception strands.

   Objective 2: Teachers will implement standards-based units and engage in action research to refine the units.

2. Secondary arts educators will increase their ability to improve students' academic literacy in the arts classroom.

   Objective 1: Teachers will participate in professional development to increase their academic content knowledge in the use of writing, reading, discourse and critical thinking in the arts classroom.

   Objective 2: Teachers going through the DREAMS Project will incorporate Academic literacy in instructional units then develop and implement in their classrooms.

Objective 3: Students of teachers in the DREAMS Project will evidence improvements in their academic literacy.

Research

HLM analyses indicated a significant gain for Cohort 1 over comparison ($p < 0.05$); there was no evidence of treatment effects for Cohorts 2 or 3. The Cohort 1 results indicate that the DREAMS program raised student scores on all four scales, measuring *arts academic literacy, arts content knowledge, critical thinking*, and *writing skills*. The main variables that correlated positively with higher student gains were: (a) higher frequency of in-class writing, (b) higher frequency of in-class discussion, (c) higher frequency of in-class critical thinking activities, and (d) prior California Arts Project experience.

Mean Student Writing Assessment Scores by Treatment

Group	Pre-test	Post-test	Change
Cohort 1	2.39	2.71	+0.32
Cohort 2	2.68	2.74	+0.06
Comparison group	2.84	2.87	+0.03

Accelerating Academic Literacy (AAL)

Project

AAL is a collaboration between the UCI Writing Project (UCIWP) and two school districts, Lynwood USD and Paramount USD. AAL replicated the eight-year Pathway Project (UCIWP and Santa Ana Unified School District) with a cognitive strategies approach to reading and writing intervention for teachers of English learners. The goals of the project were the following:

1. Develop a long-term partnership between UCI and Lynwood USD/Paramount USD to improve teacher quality and positively enhance student outcomes over a three-year period and beyond.
2. Enable Lynwood to raise its API base above the 700 mark (current base 625) and to move up and ultimately out of PI.
3. Replicate the efficacy of the Pathway Project, a cognitive-strategies based reading/writing intervention
4. that was highly successful in Santa Ana USD, in Lynwood USD and Paramount USD.
5. Improve the quality of teachers through intensive staff development in the UCIWP reading/writing intervention and provide them with the skills, strategies and curricular approaches to enhance the academic literacy of at-risk students and ELLs as measured by student outcomes such as performance on high stakes statewide assessments.
6. Increase experimental students' scores on standardized measures including the ELA portion of the STAR and CAHSEE.

Research

Despite a possible initial disadvantage, students in classes of teachers who received Pathway professional development out performed control group English/language arts grade from a C to a C+. These outcomes, students on most

measures. Three of these differences were statistically significant at the .05 level, including an increase the average strongly suggest that this project had beneficial effects on student performance beyond the ALA, an assessment designed specifically to match the aims of Pathway professional development. Similarly encouraging is the difference between treatment and control group scores on the CST E/LA assessment, which approached statistical significance at less than 7% probability.

Outcome Measure	Treatment Group	Control Group	Difference
ALA Writing Assessment Gain	+.7	-.3	1.0**
ALA Fluency Gain	+57	-13	70**
STAR CST E/LA	327	311	16*
CAHSEE Pass Rate[1]	88%	92%	-4%
E/LA Grade Semester 1	2.01	2.32	-.31*
E/LA Grade Semester 2	2.46	2.50	-.04
E/LA Grade Gain	.45	.18	.27**

* Approaches statistical significance (<.07).
** Statistically significant (p<.05 level or lower).
1. The overall CAHSEE pass rate was 47% for the two districts

Access to the Core

Project

The partners for Access to the Core were the UC Professional Development Institute based at UC San Diego, Local District 6 of the Los Angeles Unified School District, UC Irvine, and San Diego State University. The vision of this project was to continue bringing about systemic change to District 6 related to the needs of second language learners in core content courses. The project was organized around three goals: (1) include 8th and 9th grade mathematics and language arts teachers to broaden the current professional partnership focused on meeting the needs of second language learners, (2) improve achievement of 8th and 9th grade second language learners through implementation of standards-based instructional programs in mathematics and language arts, and (3) build local capacity in mathematics and language arts through district coaches and lead teachers. The project employed a cadre model of professional development -- first training a “change core” of at least three teachers (mathematics, language arts, ELD) for each school, and then supporting the cadre as it worked with teachers at its individual site.

Research

Research project is still in progress.

APPENDIX III:

DISSEMINATION

Markham Mathematics Collaborative (MMC)

Elementary School Teachers' Mathematics Instructional Decision Making in the Context of District Mandates on Instruction, H. Martin, Doctoral Dissertation, University of California at Davis, 2008

"Student needs vs. district mandates: Teacher compromises in the era of high stakes testing," H. Martin & R. Ambrose, presentation at North American Chapter of the International Group for the Psychology of Mathematics Education, 2007

Mathematics Assessment at the High School (MASHS)

"Figural and numerical modes of generalizing in algebra," Rivera, F.D. & Becker, J. R., *Mathematics Teaching in the Middle School* 11(4), 198-203, 2005

Research symposia presented at AERA and NCTM in 2005

ArtsCore

"Arts-Based Experiences as Preparation for Future Learning," Brouillette, L. & Fitzgerald, W., *Arts & Learning Research Journal*, 2009

"Teaching Writing through the Arts in Urban High Schools," Brouillette, L., Burge, K., Fitzgerald, W., Walker, P., *Journal for Learning through the Arts*, 4(1) 2008

Five presentations including AERA, Imagination in Education Research Group, and National Art Educators Association

Professional Development Resources Online: Mathematics (PD-ROM)

The curriculum developed by the grant is available at http://ed.fullerton.edu/seced/pdrom/

Content Academic Language Literacy Instruction (CALLI)

Cook Hirai, D. L., Garza, H., Garza, E., Borrego, I., & Mata, S. (2007, March). Motivating students to succeed. Paper presented at the Association of Bilingual Educators (CABE), Long Beach, California.

Cook Hirai, D. L., Garza, H., Garza, E., Borrego, I., & Mata, S. (2008, January). Improving student achievement: A successful professional development model for high

school teachers. Paper presented at Hawaii International Conference on Education, Honolulu, Hawaii.

Cook Hirai, D. L., Garza, H., Garza, E., Borrego, I., Kloock, C., & Mata, S. (2009, February). Analyzing effective professional development: Assisting ELL's overcome the Academic Language barrier in math and science. Paper presented at the National Association of Bilingual Educators (NABE), Austin, TX.

Garza, H., & Hirai, D.L., Garza, E., Mata, S., Borrego, I. , Kloock, C.T. (2009, April). Increasing student achievement in math and science: Research findings from an underachieving high school professional development model. Paper presented at the American Educational Research Association (AERA), San Diego, California

Cook Hirai, D.L., Garza, E., Borrego, I., & Kloock, C. T. (2009). *Academic Language/Literacy Strategies: A "How To" Manual for Educators*. New York: Taylor & Francis, Routledge.

Literacy in the History Classroom

Presentation at AERA 2009

Reading, Thinking and Writing in History & Science

Greer, Stacey. "The Grammar of History Textbooks II: Questioning the Text." *National History Education Clearing House*. Center for History and New Media at George Mason University, 2008 http://teachinghistory.org/best-practices/teaching-textbooks/20574

A series of seven articles in the *CSP Connection* (Jan 2006 – Nov. 2007) detailing this project's professional development strategies and focusing on academic literacy in the high school classroom.

Twenty two presentations at venues ranging from the 2008 annual meeting of the American Historical Association to the 2007 meeting of the National Science Education Leadership Association, and from the 2008 CSTA Science Education Conference to the 2008 Curriculum & Instruction Leadership Symposium.

Book in press, Classroom Techniques for Increasing Science Learning & Literacy

Redwood Area Academic Literacy Initiative (RAALI)

Four presentations at AERA and NRC conferences, presentation at the Secondary Literacy Summit VII, and three papers in preparation

Developing Rigorous Education in the Arts to Motivate Students (DREAMS)

Conference presentations including National Conference in California on Arts Assessment, The California Arts Project Statewide Leadership Conference, and National Arts Education Association Conference

Accelerating Academic Literacy (AAL)

Olson, C. and Land. R. (2008a) Enhancing the Implementation of a Reading/Writing Intervention through Literacy Coaching. *California English, 14,* 2, 27-31.

Olson, C. and Land. R. (2008b). Taking a Reading/Writing Intervention for Secondary English Language Learners on the Road: Lessons Learned from the Pathway Project. *Research in the Teaching of English, 42,* 3, 259-269

Presentation at National Council of Teachers of English Conference

Access to the Core

Presentation at National Conference of Bilingual Educators

Presentation at California Title I Conference