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A Collaborative Action Research Model for Teacher Preparation Programs.

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Educational research has typically been the domain of university faculty, but the idea of practicing teachers conducting action research has recently gained support (Hubbard & Power, 1993). Shamon (1990) defines action research as inquiry that applies scientific thinking to real life problems, as opposed to teachers' subjective judgments based on folklore (pp. 143-144) to increase instructional productivity and produce information to disseminate to others to inform their practice. Van Lier (1994) sees it as small scale intervention in the functioning of the real world and a close examination of the effects of such an intervention (p. 1).

Support for the teacher as researcher is based several assumptions:

\* Practicing teachers are most familiar with the classroom setting and students.

\* Practicing teachers who have problem-solving minds and welcome change tend to be very suitable for this endeavor (Boyd, 1961).

\* The potential for a variety of data gathering is great, given that time spent in schools is extensive (Stocking, 1990).

Teachers conducting research in their classrooms can apply theory and research to applied practice; produce information to individual teachers' curriculum and classroom methodologies; utilize valuable data from the source; create a platform to disseminate knowledge to teachers locally, regionally, and nationally; and encourage teachers to apply problem-solving skills to real situations.

Preservice teachers with action research skills can be objective observers able and inclined to describe rather than evaluate student behavior. Fueyo and Koorland (1997) note: Instead of judging children as being unmotivated, misbehaving, or inarticulate, teachers prepared as researchers more likely describe the same child as ... getting out of their seat 60% of the time during the 30-minute lesson [original emphasis].... The more objective descriptions provide nonjudgmental bases for determining appropriate interventions and outcomes in contrast to using labels for categorizing or stigmatizing children (p. 342).

The belief that teachers can design objective studies with rigor and clear direction is inherent in the assumptions about and the value of action research. A perception of lack of rigor in teacher-directed research is the focus of criticism of teacher research. Toulmin (1982) argued that studies should be formed from positions that are rationally warranted, reasonable or defensible; that is, well founded

rather than groundless opinions (p. 115). Isaac and Michael (1987) noted that action research lacks scientific rigor because its internal and external validity is weak ... with little control of independent variables (p. 55). Applebee (1987) suggested that teachers are part of rather than removed from the context and therefore lack objectivity. To counter these concerns, teachers must acquire direction in the process through course work or inservice training and guided application experience. Teacher preparation programs are ideal situations in which to provide this training.

## Overview of Two Teacher Preparation Programs Integrating Action Research

At California State University San Marcos (CSUSM), faculty of two different teacher preparation programs integrate action research into course work and field experiences. Faculty developed the Secondary Single Subject Credential program with a framework and emphasis on preparing teachers for the 21st century. They used a number of high school reform documents to guide program development: California High School Task Force's (1992) *Second to None*, the National Association of Secondary School Principals' (1996) *Breaking Ranks*, and the National Commission on Teaching and America's Future's (1996) *What Matters Most*. Authors of these documents state the importance of teachers being reflective and critical thinkers continually involved in proactive efforts in classrooms and schools. The authors of *Breaking Ranks* specifically encourage classroom teachers' involvement in action research and urge university faculty to support and collaborate in this process.

Teachers with experience implementing action research strategies are most likely to use these strategies and encourage similar inquiry from their students.

A major theme in the required course, High Schools of the 21st Century, is the teacher as problem solver and researcher (Keating, 1997b). This theme is integrated into two other Single Subject Credential courses, Learning and Instruction in High Schools and Methods and Theories of Bilingual Education. A strong emphasis upon action research in the program emerged from the cognitive content of these courses and the related activities developed for field placements.

In the second program at CSUSM, the Concurrent Multiple Subject and Special Education Credential Program, the faculty expressly designed course content and experiences to enable graduates to create inclusive classrooms where all students, with and without disabilities, are educated within the same general education and community setting. The faculty blend elementary education, special education, the use of technology, and multilingual education into an integrated teacher preparation curriculum. Guided by principles of inclusive education, students develop and evaluate the effectiveness of modifications in curriculum and instruction so that learners with every type of diversity can participate in the same learning experiences (Villa & Thousand, 1995). Educators being prepared for this future role of inclusion facilitator engage in ongoing action research to identify, invent, and evaluate the effectiveness of the curricular and instructional adaptations they craft on a daily basis.

## Models for Implementing Action Research

Secondary Single Subject Teacher Preparation Program. In the Secondary Single Subject teacher preparation program, course work and field experiences are closely linked to model the importance of integrating theory with practice. The theme of the teacher as a problem solver and researcher emerging from three courses in the program clearly illustrates integration of theory and practice. In these courses, preservice secondary teachers receive a scope and sequence of training and experiences that guides them to conduct action research. What follows is a description of these experiences.

To provide a basis for student understanding of action research, preservice teachers discuss and analyze a number of selected readings illustrating theories and ideas related to the topic. They review a range of models for implementing action research projects (Hubbard & Power, 1993) and examine examples from a portfolio of exemplary research reports by prior graduates (Keating, 1997a). In a preliminary exercise, they apply research concepts through the portrait model of understanding a school culture that Lightfoot (1983) used in *The Good High School*, a core reading. Teams of students collaborate with each other and supervisors on the School Culture Assignment at their school field sites to conduct an ethnographic study. In this study, they make decisions collectively on such research issues as individuals to speak with, information to seek, methods of collecting and analyzing data, and results and implications. Each team shares its findings in

writing and orally at a presentation with other cohort members. The process assists the students in understanding the culture of the various school sites and beginning the process of designing questions and formulating research designs.

Developing reflective practice as a skill critical to teachers is not a new notion. In 1933, John Dewey (1933) observed that it was not teachers' belief in inference suggested by the context of their teaching that misguided practices. Rather, it was their failure to test the inferences. Schon (1983) identified the need to build this reflective process into the preparation of all professionals, including teachers: The development of action science [research] cannot be achieved by researchers who keep themselves removed from the contexts of action, nor by practitioners who have limited time, inclination or competence for systemic reflection. Its development will require new ways of integrating reflective research and practice (p. 320).

In developing a teacher credential program at CSUSM, the faculty emphasized reflective practice for the general preparation of preservice teachers so that they might become reflective practitioners. The skill of reflective thinking is equally important in implementing action research. This skill is particularly developed in the course Learning and Instruction in High Schools and reinforced in activities and assignments in other courses. The goal is for preservice teachers to become active learners with a disposition to continuously research, assess, apply, and refine knowledge throughout their careers.

To develop systematic reflection as a habit of mind, preservice teachers must acquire the prerequisite skills and consistently practice the strategies. The CSUSM secondary program faculty assist preservice teachers in developing skills of recreating significant and complex events to analyze and adjust their teaching practice. One strategy the program faculty use is reflective journals.

From the beginning of the program's first semester and simultaneous with their course work, preservice teachers are observing and reflecting on the practice of teaching at their assigned school field sites. University instructors and site supervisors (teachers at sites who coordinate master teacher selection and oversee student teacher field experience) assist them. To more clearly formalize reflective practice, they use a detailed reflective journal format to record the specific issues or questions important to them or their disciplines arising in their experience. The journal becomes the foundation from which questions for possible future action research projects spring.

In a structured process, preservice teachers journal about their classroom experiences. They begin their journal entries by placing the events of the classroom into a context: time of day, number of students, grade level, and so on. They next provide a brief overview of the sequence of events. They are prompted to identify as many events as they can remember. They then select one or two significant events and elaborate the activities in some detail. Even the selection of an event informs (i.e., Why was this event rather than that event selected?). Last, they analyze the significant event by posing and answering

questions such as What feelings, thoughts may have caused the event to occur? Why were they significant? What questions were raised? Faculty prompt them to ask themselves what different actions they might take if a similar event occurs.

The reflective journaling process helps preservice teachers develop the skills to take a broad view of events in their classes, determine which are of particular importance, and attempt to understand the whys and the hows of the event and what future actions they should undertake. They continually check their assumptions, ask themselves critical questions, and refine their practice based on the answers to their questions. They learn that reflection is an active process providing an opportunity to look at past experiences and relate them to future action. Schon (1983) notes that this sort of research may help practitioners to enter into a way of seeing, restructuring, and intervening which they may wish to make their own (p. 318). As preservice teachers proceed through the program, their experiences may help them develop the reflective habit of mind whereby a cycle of thought and action, informed by experience, begins to occur as a natural process.

Students meet with colleagues to discuss and exchange ideas. Based on common interests, they may elect to work as individuals, dyads, or teams to develop and submit an action plan proposal, using a prescribed action research project proposal format. Development of this proposal requires active involvement and collaboration with their master teachers. This helps facilitate two critical components of the process: encouraging active involvement of the practicing teacher in the



action research process and completion of protocol issues at the school site.

Upon approval of research designs and protocols, students begin data collection activities during both or either of the semesters, depending on the scope of the project. They summarize analyses, findings, and implications in a written report that they later use for a culminating oral presentation. Master teachers and site supervisors are active participants throughout the process. Fellow cohort members and faculty discuss findings with the teacher researchers leading to potential future questions for study.

Evaluation of the projects is a threefold holistic process involving assessment of the proposal, oral presentation, and a written report. Exemplary projects become part of each student's personal portfolio and part of the portfolio of exemplary projects that future students may examine as models.

Reflection and action research skills increase the probability that teachers will take more informed actions. Brookfield (1995) notes, Informed actions are those that can be explained and justified to ourselves and others. If a student or colleague asks us why we are doing something, we can show how our actions spring from certain assumptions we hold about teaching and learning. We can then make a convincing case for the accuracy by laying out the evidence--experiential as well as theoretical--that undergirds them (p. 22).

## Concurrent Credential Program. The principles of inclusive

education guide the faculty of the Concurrent Credential program. These principles require preservice teachers to develop skills to identify the need and have processes for adapting curriculum and instruction for learners with every type of diversity. Program faculty are very aware of Udvari-Solner's (1995) observation regarding the relationship between inclusive educational practice and the role of teacher as action researcher. The movement toward inclusion is a sociopolitical process ... that not only requires shared values about students and learning but also significant innovation and adaptation in instructional practices. In that regard, teachers have been viewed ... as agents of innovation due to their intimate, day-to-day interaction with issues of diversity (pp. 110-111). Udvari-Solner recognized that educators supporting inclusive practice must engage in ongoing research to identify, invent, and evaluate the effectiveness of curricular adaptations enabling students to have meaningful participation in curriculum content and instruction.

In the Concurrent Credential program, students think of themselves as creative solution finders. Using a variation of the Osborn-Parnes Creative Problem-Solving process (Giangreco, Cloninger, Dennis, & Edelman, 1994), they practice the questioning and testing of potential solutions to curricular and instructional mismatches for students and schoolwide organizational challenges. They learn to consider all their work-related challenges as action research questions and to systematically assess the current status, imagine an ideal future state, observe and gather facts, reflect, plan, act, and repeat the cycle.

The fourth case study in the following section of action research examples illustrates the use of the seven-step action research cycle to complete a major field-based project in the mathematics methods course. In conjunction with the supervising teacher, the students used action research to question and test potential solutions to mathematics teaching/learning challenges in their advance student teaching classroom placement. After implementing their plan, they observed and recorded their results in typical journal article format. They responded to the following four reflective prompts:

- \* What did the observations suggest about the effectiveness of your approach, and what would you change about your intervention or assessment approach if you were to go through this action research process again?
  
- \* What did you learn about yourself as a teacher through applying the action research model?
  
- \* What recommendations do you as a researcher offer other teachers about connecting assessment to instruction?
  
- \* Return to your responses from the first day of class and again respond, to the following questions: Where am I now with regard to my dreams and nightmares of being a learner/ teacher of mathematics? How have they changed? What are my plans for further achieving the dreams and avoiding my mathematics learner/teacher nightmares?

## Examples of Action Research Projects

In this section, we describe four examples of action research through voices of the preservice teachers.

### Example #1: The School Culture Assignment--Ethnographic Research by Secondary Student Teachers

Using a model of ethnographic research, preservice teachers in the Secondary Single Subject Credential program explored and reported on the culture of their school site. Each site team of five preservice teachers carried out this action project over the first month of the first semester and reported their findings to the full cohort. The narrative that follows is a summary of one report. The study was conducted at a high school that had lately come under community scrutiny because of the perception that gangs and violence have turned it into an unsafe and unproductive institute. Preservice teachers had heard some of these perspectives and were prepared to see the worst as they designed their collaborative school culture study.

Data collection included interviews, questionnaires, and observations of a variety of staff, faculty, students, administrators, and community members (police officers, school board members, and parents).

The preservice teachers examined teacher handbooks, curriculum guides, and discipline policies. Data analysis led them to conclude that first impressions did not apply to this school; misconceptions

regarding safety were based in part on the school location on a busy street

where people often viewed students through brief encounters in highly

visible crowds of Hispanic students. In contrast to public

perception, they found the school very friendly, warm, and welcoming, uniquely

bound in tradition and pride. One interviewee, a Spanish teacher,

described the culture well in stating, It is a jewel that no one knows

about and it is not until you get up close that you are able to see

this jewel (Moore, personal communication, April 23, 1997).

This study empowered the preservice teachers to pose relevant

questions and seek meaningful methods to answer those questions. It

connected them and university teacher education faculty more closely to

the field experience than ever before at that school (Keating, 1997b).

#### Example #2: Action Research in Secondary Science Education

After preservice teachers completed their ethnographic research

study, they formulated questions that focused more on their areas of

interest such as subject area concentration (e.g., science,

mathematics). Caroline, a preservice secondary science teacher, posed a

question related to effective strategies in teaching science to

linguistically diverse students. She implemented her action research project in

collaboration with three science teachers, one of whom was her master

teacher. The following is from her written and oral presentation.

I was interested in observing science teachers applying 'shelte

red'

science techniques known as Specially Designed Academic Instructio

n in

English (SDAIE). These are strategies considered effective with se

cond

language learners. I had several questions related to the use of t

hese

strategies in Science courses. These included: (1) In what ways ar

e

'sheltered' classes taught differently than mainstream classes? (2

) Is

there a variation in the use of these strategies between 'sheltere

d

science' teachers? (3) Does the amount and depth of content materi

al

covered differ from mainstream classes? (4) How effective are SDAI

E

strategies related to achievement and interest of the students in

science?

I used these questions to formulate hypotheses related to each

of these

four questions. I based these on information about SDAIE instructi

on which

I had read and discussed in my university courses. I used a triang

ulation

method to gather data--multiple observations of three different te

achers,

interviews and questionnaires with these teachers, and interviews

and

questionnaires from a focus group of students from these three classes.

Findings related to my questions included these general trends:

\* There are distinctive differences in strategies used in 'sheltered classes' compared to mainstream classes in both actual and perceived delivery of instruction. Unannounced direct observations of these classes as well as teacher and student data support this finding.

\* All three teachers used specific SDAIE strategies such as slowing the pace of the lesson, using multimodalities in delivering instruction, and student centered activities. The amount of time spent on SDAIE strategies varied from teacher to teacher however and this variation did seem to influence somewhat the impact on student success as measured by achievement (higher grades than in mainstream science courses) and increased positive attitudes towards science.

\* The number of topics covered in sheltered science classes was fewer than in others, yet both teachers and students observed that the more in-depth coverage of the topics resulted in a better understanding and greater achievement, which in turn yielded positive attitude towards science. Increased success appeared to be somewhat related to the degree to which SDAIE was used in each of the three classes. A somewhat small sample size was used in this study and it would be interesting to extend this study to a larger sample of teachers to see if this finding was valid.

Caroline concluded that the use of SDAIE strategies in sheltered science classes was very effective with linguistically diverse students. She concluded that her findings affected the way she taught science during the field experience (i.e., greater use of SDAIE). She reported that her master teacher was pleased that her findings validated the use of SDAIE. The master teacher became intellectually stimulated by the more formal process of using action research to evaluate educational classroom questions. This process highlighted for both the student and the cooperating teachers the importance of incorporating inquiry with students in teaching science in public schools (Keating, 1997a).

### Example #3: Critical Action Research in a Bilingual Setting

Critical action research (Crookes, 1993; van Lier, 1994) attempts to transform reality by following a problem-posing approach (Freire, 1970) with four stages: questioning, reflecting, voicing, and action. In the Methods and Theories of Bilingual Education course required for all bilingual secondary candidates, preservice teachers use the general action research model given to them in the High Schools of the 21st Century course with a somewhat different focus. They determine a specific issue that puzzles them in their field experience classroom, reflect on the causes that might influence such an issue, voice their concerns to the group, and proceed to act upon it. The process becomes self-empowering and provides a forum for individual and collective action.



After reading and discussing the pertinent literature, Sonya (a pseudonym) wanted to determine the qualities of a good English as a Second Language (ESL) teacher as perceived by high school native Spanish speakers. Her research design positioned the students' voices at the center, validating their input and legitimizing the shift in power relationships between the teacher and the students as researchers.

Her first step led her to question what she considered necessary qualities of a good ESL teacher. After reflecting, she shifted the locus of the investigation to the students' perceptions because she thought that they would be the experts in this area. Sonya sought input from other members of the class, as well as the professor. Her questionnaire consisted of five open-ended questions, and she distributed them to a total of 130 Latino high school students in each of her two schools. After reviewing the questionnaires, she determined that 33 of the student respondents were nonnative speakers of Spanish. Because she wanted to limit her research to Latino high school students who were native speakers of Spanish, she was left with 97 questionnaires to analyze. She analyzed the responses and categorized them in terms of generative themes (Freire, 1970).

Three major generative themes emerged from the students' responses: personal qualities, methodological approaches, and positive reinforcement. The personal qualities most often mentioned were nice, friendly, sympathetic, enthusiastic, helpful, 'Carinosa/o' (affable/loving), and patient. Most comments referred to the quality of

patience illustrated in the following representative comments:

- \* She took the time to explain.
  
- \* He went to great lengths to make sure we understood.
  
- \* She didn't get mad if we asked the same question.
  
- \* She showed us her humanness.

The students pinpointed teaching techniques that took into consideration their learning styles. Several visual learners described their teachers' efforts as follows:

- \* She used drawings to explain words.
  
- \* If we didn't understand she would draw on the board.
  
- \* She was different because if we didn't understand [orally] she would write it out.
  
- \* [She explained it again] and then [allowed us to] copy.

Students also mentioned the teacher's ability to elicit their voices: She told us stories and then let us talk about them.

Positive reinforcement was perhaps the most important aspect the

high school second-language students mentioned. They appreciated their teachers' encouragement, compassion, prodding, and gentle pushing to learn. Most respondents focused on the teacher's belief in their ability to learn, making comments such as

\* She wants us to learn.

\* She makes us learn.

\* She gives us ganas (desire) to learn.

\* She thinks we can learn.

Sonya's final analysis of her 1-year research project shows her ability to put theory, research, and practice together: In my research, I found many examples of Cummins (1994) and Krashen's (1994) theories. ESL teachers providing drawings and explanations, along with positive reinforcement, comfortable nonthreatening environments and caring attitudes seemed to motivate students. The interpersonal involvement between students and teacher created the environment for what Cummins names context embedded communication. Students feel good about themselves and good about their efforts to learn a language (Keating, 1997a). Sonya concluded by offering suggestions that can help future ESL teachers become effective agents of change in their communities:

Confidence in speaking through self esteem building and acknowledging that

each learner has an individual set of learning needs are the qualities of a 'good' English teacher. Each student brings her own issues, be they social, behavioral or academic to school. The 'good' English teacher must be able to see each student as an individual and give each student the self esteem and ganas [desire] to continue their language development. A 'good' English teacher cares about the success of each student.

To corroborate her findings, Sonya extended her study another semester and carried it out at the second site where she completed her student teaching.

#### Example #4: Action Research in Special Education--A Math Application

Robin (a pseudonym) was in a combined regular and special education teacher education program, the Concurrent Credential program. As part of a mathematics course, she designed an action research project in which she could demonstrate skills in identifying (with the supervising teacher) a mathematics learning challenge in the classroom, design and deliver an intervention, and evaluate the impact on students. The mathematics course faculty considered the ability to engage in action research a critical competency for the preservice teachers

because, in their future role as special educators, they would assist teachers to alter elements of instruction and curriculum to facilitate the learning of students struggling in academic and social/emotional domains. At the time of the study, Robin was student teaching in a third grade classroom of 17 students that included two students with limited English proficiency and one unmedicated student with attention deficit disorder.

The classroom teacher and Robin identified that Chris (a pseudonym) needed modification in mathematics instruction. Of Hispanic origin with a basic understanding of English, Chris was lacking the mathematics foundation of other third graders. She had difficulty getting started and frequently asked for clarification and correction as if she were afraid of doing the assignment wrong. Through action research, Robin and her master teacher identified three instructional objectives:

- \* Chris will increase in mastery of basic math facts to 90% accuracy.

- \* Chris will increase her mathematics vocabulary.

- \* Chris will demonstrate verbal behaviors showing increased self-confidence.

Prior to her intervention, Robin gathered data regarding students' mathematics performance using an interview (conversation), math

journal writing, weekly tests, daily accuracy on mathematics worksheets, homework, and direct observation while they were engaged in Excel

Math (Raymond, Brewer, & Ussery, 1991). The school district had adopted the Excel Math program with translations in Spanish that has as its stated objective the development of confidence in mathematics through direct instruction; guided practice; immediate feedback; and independent practice with word problems, thinking activities, and games.

The children were originally grouped homogeneously into three groups for mathematics instruction. On Monday through Wednesday, students were guided through the lessons and tested on the content on Thursday. Fridays were devoted to activities and games. The children often commented that they liked Friday math best because it was fun. In addition, students took home math practice sheets from various text books in a homework packet every Monday.

In designing the instructional intervention for Chris, Robin adapted the Excel Math program to support students' cultural and learning style differences by providing a visual, auditory, and kinesthetic model for each math procedure or concept (i.e., showing what to do, telling how to do it, and moving manipulatives to demonstrate the process). She regrouped the children heterogeneously so they could observe classmates' differing reasoning and problem-solving approaches and added students' use of concrete math manipulatives and lists of mathematics vocabulary words. She coached students to use alternative combinations of manipulatives to arrive at and check answers. She used repeated practice of mathematics operations to ensure mastery. To

encourage higher-order thinking and problem solving, she gave students a daily math stumper when they entered class every morning. The stumper was discussed and answered just before the end of the school day.

Robin's action research project yielded several results. Her initial assessment procedures showed that Chris had a better understanding of English and mathematical concepts and operations than originally believed. The intervention resulted in increased test scores on the part of all members of Chris' mathematics cooperative learning heterogeneous group as well as increased problem-solving efficiency. They started by working very slowly, figuring out how to approach each problem with manipulatives, but gradually began solving each problem more and more quickly. Chris doubled her worksheet completion rate.

Chris also seemed to improve in her enjoyment of and self-confidence in mathematics. She commented to her teacher that she really liked doing her math this way and made noticeably more frequent contributions during discussions and less frequent requests for clarification or corrections. She increased her use of mathematics vocabulary words, as illustrated by the following entry in her math journal that also shows her accurate understanding of the concepts presented that day.

Wat (sic) we did for math today was tiles solve it was fun. I lernd (sic) that 70 or eny (sic) old numbere (sic) that end (sic) with 0 the 0 is cold (sic) a place holder and that the 0 is coled (sic) the ones and the 7 or the noumber (sic) you picte (sic) is coled (sic) the tens.

This action research revealed how changes in instruction to support one student can have a positive impact on the learning of all students in a class. In adapting the Excel Math program, Robin built upon the students' familiarity with the program's format. Once students became accustomed to using manipulatives and the other supports (e.g., heterogeneous grouping, vocabulary list), their success with and enjoyment of mathematics increased, as suggested by the spontaneous testimonials included in the farewell card created by Chris and her classmates for Robin on her last internship day.

Thank you for all the stof (sic) you did for math. I will miss you doing math. I like the way you teach math.

#### Final Remarks

At the time of the writing of this article, the action research activities described were in their third year of implementation and revision; 164 students from the two programs had taken part in the action research activities. We from the core secondary program faculty and one of two special education faculty have been continually involved in refining the action research models. Both of the teacher preparation programs at CSUSM continue to emphasize inquiry and reflection as integral components of course work and field experiences. Both programs also attempt to connect theory to practice by integrating course work with field experiences, thus providing a solid framework and basis in which to incorporate the models of action research described in this article.



Preliminary findings suggest that both preservice teachers and supervisors perceived this approach as a powerful strategy for improving their teaching. The findings also suggest that the participants are more likely to use inquiry models in their own teaching.

Although results from these projects revealed some close collaboration between the preservice teachers and personnel at school sites, more involvement might increase the impact on teachers and their future use of action research methodologies. More formal mechanisms for enrolling school site personnel with student teachers in action research might include the development and delivery of course work or workshops on action research at times convenient for teachers or on school sites. For the 1998-1999 academic year, the secondary teacher preparation faculty received a grant to offer a course to practicing teachers on applying action research in the classroom.

Independent study is a possible continuing professional development delivery format for practicing educators. The Special Education program has used the World Wide Web as an independent study format to teach practicing general and special educators how to conduct action research through a totally asynchronous web-based graduate-level course (<http://www.csusm.edu/COE/faculty/thousand/description.html>) on data-based decision making in education. The course, first offered in spring 1998, is self-paced and requires participants to design and conduct at least one data-based student change research project for course credit.

We believe it is important to broaden the dissemination of the results of these collaborative research efforts. Aside from the customized booklet or portfolio showcasing the exemplary projects that students use to guide themselves through the process, there also is a need for more formal print publications to disseminate student's results to a larger audience. Electronic dissemination via the World Wide Web is another vehicle for expanding such dissemination. Anyone visiting the web-based, data-based decision-making course can view the action research in the special education mathematics example described in this article along with several other model action research studies.

The immediate impact on the thinking practices of the preservice teachers involved in the two programs is apparent from the results in students' projects. Yet, we wonder if program graduates will continue to practice action research once they enter the teaching field. We hope so. Clearly, teachers taught in their preparation programs to view inquiry as an expected norm are more likely to overcome the real and imagined barriers to action research. By maintaining links with program graduates, university faculty can encourage continued practice of action research. In an effort to continue communication with graduates, longitudinal studies have been and will continue to be conducted (Diaz-Greenberg, Keating, & Baldwin, in press; Nevin, 1998) to track graduates' actual use of what they learned in their credential programs. Another area for study includes the manner in which action research becomes part of their practice and the perceived effectiveness of action research projects that are actually implemented. These

studies should provide further guidance for faculty in both programs as they reflect on ways to prepare preservice candidates to inquire about their own practice.

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