

FINAL REPORT
OF
THE LOS ANGELES
COLLABORATIVE FOR
TEACHER EXCELLENCE
(DUE 9453608)

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EXECUTIVE SUMMARY

The Los Angeles Collaborative for Teacher Excellence (LACTE), like all NSF Collaboratives for Excellence in the Preparation of Teachers, had as its primary goal the improvement of the math and science education of future teachers. LACTE, however, unlike some other collaboratives, chose to address the preparation of both secondary (single subject credential) teachers, and elementary (multiple subject credential) teachers. The approach to improving teacher preparation was multifaceted since, from its inception, LACTE believed there are many elements that combine to affect the preparation of a teacher.

The LACTE project had six major foci:

1) Improvement of the disciplinary courses that pre-service teachers take as undergraduates

LACTE has directly supported the revision or design of over 25 ongoing courses and modules for science and mathematics classes that enroll future teachers. Over 50 other courses have been indirectly impacted, by changing the viewpoint and the teaching tools of their instructors, either through curriculum development grants for another one of their classes, or through LACTE faculty development activities. LACTE courses follow the recommendations for more effective math and science education set forth in NSF's *Shaping the Future* and the National Academy's *From Analysis to Action*. This means the courses are hands-on and minds-on, student-focused rather than faculty-focused, they utilize a variety of instructional approaches, are outcome oriented, teach students the skills necessary to succeed in the course and the discipline, and employ assessment appropriate to the teaching approaches and the course goals.

2) Faculty enhancement

LACTE made faculty development a cornerstone of its efforts. Over 500 faculty members from the 10 LACTE institutions and other local colleges and universities participated in LACTE faculty development workshops. Over 80% of the LACTE workshop participants report having made some change in their teaching as a result of their experiences with the project, and many have revised their entire teaching portfolio.

3) Student support and involvement

LACTE involved over 400 students every year, recruiting them through science and math classes, student clubs, campus publications, councillors, LACTE-wide events, and word of mouth. LACTE student groups are established entities on every campus, and on several have been incorporated into official student clubs. Recruiting is done primarily by the current LACTE students rather than by faculty. LACTE students have also done outreach to high school students, encouraging them to consider a career in teaching, so that the pool of potential teachers continues to expand. LACTE works to encourage more students from underrepresented groups to consider a career in teaching. Overall, the demographics of LACTE students mirror those of the students at the LACTE schools. Internships, providing mentored classroom experiences for the future teachers, have grown as the project has matured. LACTE students cite the internships as the activity that most influences their decision to be teachers. Scholarships are important for retention of these prospective teachers; about 50 LACTE students received NSF-supported scholarships of \$500 to \$4000 each year. For some recipients, the scholarship allows them to go to school full time instead of part time, or to complete their credential rather than entering teaching on an emergency permit. As with the LACTE faculty, LACTE students are also making the transition from learner to practitioner to leader. One of the greatest successes of the project has been the LACTE annual Future Teacher's Conference. These day-long workshops, which draw close to 200 participants, have been conceived, planned, and implemented by LACTE students. It brings students from LACTE campus together with their colleagues from other LACTE campuses, and with in-service teachers. In the summer of 1999, LACTE instituted a new learning opportunity for its new teachers, the LACTE Teacher Leadership Workshop. This week-long summer workshop, and its associated school-year follow-ups, provided a focused experience in learning and teaching life-science through inquiry.

4) Dissemination

In the later years of the project, faculty and leaders from LACTE have been highly active and visible on both the local and national levels. They have presented their work at a variety of local and national science and mathematics disciplinary meetings, MAA/AMS, AAAS, APS, NCTM, ASM, SACNAS, AMATYC, a Gordon Conference, a National Academy of Science Workshop, and The Lilly West Conference on College Teaching. They also made numerous presentations at colleges and universities, within LACTE, and at other schools across the country. LACTE faculty continue to share their work in peer-reviewed publications. Faculty have articles published or accepted in *The Journal of Chemical Education*, *The Journal of College Science Teaching*, *The Journal of Excellence in College Teaching*, *The CUR Quarterly*, and *Instructionally Speaking*. Course and instructors manuals are another means by which the LACTE curriculum developers disseminate their work. There are now course manuals for eight LACTE courses, a manual for integrating Technology in Calculus which is applicable across most calculus curricula, instructors manuals for three of the LACTE courses, and a cadre of “How-to” Manuals for various projects and activities which are integral to LACTE, such as the annual Future Teachers Conference. All these manuals have been shared across the LACTE Collaborative, with other local colleges and universities, and with other CETP sites. A new LACTE website www.lacteonline.org has been created to post the major accomplishments of the grant.

5) Collaboration and connections

The faculty and administrators involved in the management and implementation of LACTE are truly a team. Through the years of this project, bonds and working relationships have been formed which span disciplinary and institutional borders. LACTE faculty have also developed strong relationships with colleagues on other campuses, both 2-year and 4-year. Faculty from different campuses have collaborated to give presentations, write grants, and work on curriculum development. Their interactions transcend the oft seen assumed superiority by 4-year institution faculty when dealing with community college faculty. LACTE faculty know and respect each other as colleagues. Their home institution merely defines the students with whom they interact, not the perceived quality of the faculty or their work.

6) Institutionalization

The gains made through LACTE in curriculum are part of the schools’ permanent course offerings. Many student groups are now official student clubs so they can receive ongoing support from their institutions. Some of the internships come with support, some can be done for course credit, and some of the LACTE schools have committed hard dollars for these in the last years of the project, and can be expected to do so beyond the NSF funding period. Both a FIPSE and a California Partnership for Excellence proposal have been submitted to obtain ongoing funding for the annual Future Teacher’s Conference and the Meet the Teachers Roundtable. Another FIPSE proposal has been submitted for support for the Summer Leadership Workshop for New Teachers. Finally, in 2000, Washington Mutual Financial agreed to sponsor the Future Teachers’s Conference. Several LACTE faculty are working on proposals to tap the significant increases in the funding of the California Subject Matter Projects to support more workshops for new LACTE teachers and colleagues from those teachers’ schools. But without question, the most important permanent outcome achieved through LACTE is the change in the hundreds of faculty who have participated in various aspects of the project. Through its intensive faculty development program, LACTE has helped literally hundreds of faculty members modify their approaches to better educate all their students. Thus LACTE’s influence reaches on the order of 25,000 students every year, and will continue to do so for the rest of these faculty members’ teaching careers. This influence is further leveraged through these faculty members interaction with others in their departments, and through their sway on hiring committees. And with a significant number of LACTE administrators supporting hiring of faculty with LACTE-like teaching approaches, the Collaborative’s legacy will endure.

Section 1: Better prepared teachers produced

It is difficult to quantify the number of better-prepared teachers LACTE has produced. For one, it is not easy to define a LACTE-produced teacher, as students have been affected by LACTE in numerous ways. Second, it is hard to track LACTE students as they move around the Los Angeles area: from community college to four-year institution, to credential program, to the classroom. The time frame in which we are operating is also problematic: a student beginning their pre-service experience at a community college, such as El Camino, may still not have completed their credential since a pre-service student coming from one of the 5 LACTE community colleges typically takes 5-7 years to complete their baccalaureate degree with an additional year for the credential program. What we do know however is that many of the pre-service teachers who came out of our community colleges have been exposed to LACTE modified curriculum. The majority of pre-service math courses across all the LACTE community colleges, are being taught by LACTE-faculty, most of the future teachers are involved in future teacher organizations on their campuses, and many have been to at least one of the LACTE Future Teacher's Conferences, or the Meet the Teachers Roundtables. It can also be said that many of the math and science teachers who have been to one or more of the LACTE-sponsored faculty development activities now use student-centered teacher strategies in all of their classes, thus exposing a greater number of individuals to this style of pedagogy, and that many of these students who are in these classes will not identify themselves as being prospective teachers until later in their educational program.

One of the most difficult things LACTE had to face was the issue of how to identify prospective teachers on the two-year college campus. Through the work of LACTE, and other initiatives, many community colleges now classify and track those students who identify themselves as being interested in teaching.

More can be said about the quantity and quality of the teachers produced by the LACTE four-year institutions, since tracking is much simpler. At the three CSUs in the project, literally hundreds of future math and science teachers have been better prepared through LACTE activities. The Masters in Math Education faculty at CSUDH have worked closely with the LACTE team to develop and revise curricula for new math teachers. The math workshops developed in association with LACTE have attracted students from all of the participating campuses. New science teachers have been recruited from the Biology Master's program as a consequence of involvement with the Campus LACTE Student group. Three former CSUDH master's degree students who are now K-12 teachers have worked together to develop the K-12 Teacher's lab manual used in the Liberal Studies Pre-Teacher sections of the required General Biology course. They are also the teachers in the course, thus "closing the circle" and allowing them to bring their own perspective into the classroom for their fellow students.

At CSULA, the students preparing to teach in elementary school and secondary math/science areas were exposed to active and cooperative learning in an ever-increasing percentage over the course of the LACTE program. LACTE has accomplished three major changes in the way Cal State LA educates teachers. First, classes in biological science and physical science were developed to incorporate content and pedagogy into classes specifically designed for multiple subjects students. Surveys indicate that these students enter these classes with a very negative view on science but they leave these classes excited to be able to teach science to their future students. Secondly, a BS degree in Natural Science was designed which was specifically designed for students who want to be secondary science teachers. Before the Natural Science degree students were not recruited nor trained to be science teachers. This new degree is designed to produce secondary science teachers with a broad training in biology, chemistry, geoscience and physics as well as knowledge of the best pedagogical techniques for teaching these subjects. Thirdly, CSULA developed a new blended degree that is in the final process of approval. This degree combines the 186 unit Natural Science degree with the 45 units of education classes into a single 186 unit degree that provides the students with the science content and the education classes for the preliminary credential in science. Anecdotal and case study evidence from teachers involved in the project at CSULA continues to support the claim that these students are better prepared than those coming out of the same institution only a few years ago.

At the third CSU involved, CSU Fullerton, both the liberal arts mathematics, and math for elementary teachers curriculum was modified to focus more on a student-centered approach to the curriculum. Students completing

these courses reported that they felt better equipped to succeed in their credential courses and better prepared to teach.

During the 6 years of the LACTE grant, over 200 students at Loyola Marymount University expressed interest in the LACTE program and had their name placed on a LACTE student mailing list. Nearly all of those students also participated at some level, ranging from attending a student meeting or participating in a LACTE event such as Meet the Teachers Roundtable or Future Teacher's Conference or a math or science conference offered by a professional society such as the Los Angeles County Teachers of Math Association, the Greater Los Angeles Teachers of Science Association, the California Mathematics Council, or the National Science Teachers Association, all the way up to taking on an internship assignment at a museum or school. Hundreds more students enrolled in a variety of LACTE-developed or revised courses or were taught by faculty whose teaching practices were changed by the LACTE faculty development program. Nearly 60 LMU students received LA CTE scholarships totaling \$119,000. Over 50 students from LMU received valuable pre-professional experience in LACTE-sponsored internships and earned nearly \$80,000. Both formal and informal evaluations performed throughout the project have consistently shown that students rate LACTE courses, events, and internship experiences highly in terms of how they are helping to prepare them for a teaching career. LACTE scholarship or internship money has made a real difference to many students enabling them to move forward toward their degree and credential.

Section 2: Diversity

All 10 of the LACTE institutions have diverse student populations, and reflect the community they serve. At El Camino College, for example, 2000-2001 academic year data indicates the following composition: Black 22%, Hispanic 25%, White 25%, Asian 21% and Other 7%. Data further indicates that the pre-service student population reflects the student population at large. At Fullerton College, the percentage of Latino students is dramatically increasing as the community demographics change. As these changes took place, LACTE responded by continually developing recruitment tools to attract minority students to the project.

At El Camino, two recruitment strategies that have been particularly successful in targeting underrepresented populations were (1) presentations at Project Success, Puente Project and the Pam American Club which alerted minority students interested in teaching to the opportunities of the LACTE project, and (2) math and science counselors recruited underrepresented students during scheduled counseling appointments.

CSUDH is the most diverse in the CSU system. The majority of the students are minorities. This is true for the science as well as non-science majors. While many of CSUDH's undergraduates go into K-8 teaching, they have not actively recruited or trained our science majors for teaching K-12. The LACTE Student Group was very active on the CSUDH campus and attracted many science majors into its ranks. The only graduate program in science is in biology and many of those students became active in the LACTE student group, several having already begun teaching while working on completing their degree and/or their teaching credential. The LACTE Coordinator worked closely with the Science Society, an established student group on campus.

CSULA is another of the most ethnically diverse universities in the country, with a fall 2000 student population consisting of 53% Latino, 22% Asian-American, 16% white and 9% African-American. In addition, the student body was 60% female and 40% male. This diversity was mirrored in the CSULA teaching training programs including both multiple subjects and single subjects math and science.

At LMU, the demographic data collected in the annual reports submitted over the past 5 years clearly shows that the diversity of the group of pre-service teachers at LMU reflects, for the most part, the diverse population of the university itself. A number of strategies were employed at LMU to encourage more students to consider a career in teaching math or science. A list of strategies is given in table 1, and those that were particularly focused on minority recruitment are marked with an (*). Many of these activities have been used at the other LACTE campuses. Overall it was noticed that the most successful approaches involve (1) students recruiting other students, (2) favorite teachers stressing the value of attending meetings, events or conferences, and (3) specific teaching career-related activities to bring in more students. For example, the founding of a Math and Science Teachers Club at LMU and the commitment by the administration to continue the Meet the Teachers Roundtable at LMU will be significant in ongoing recruitment of students to consider math and science teaching careers. In addition, the continuation of math and science teaching internship opportunities at several sites is another powerful recruiting device.

Table 1: Effective LACTE Recruitment Strategies

- Brochures/Flyers/Announcements/Presentations
 - in Gateway Courses
 - in LACTE Courses
 - to Ethnic Student Clubs (*)
 - to Math and Science Clubs
 - to Future Teacher Clubs
- Flyers/Announcements Posted in Math/Science/Education Buildings
- Contact Minority Student Support Service Staff to Request Their Assistance (*)
- Coordination with MESA programs (*)
- Special Meetings/Lunches/Receptions to Attract Students
- Advertising
 - Support Group Activities through Flyers/Announcements
 - Internship Opportunities through Flyers/Announcements
 - LACTE Scholarship Opportunities through Flyers/Announcements
- Email to Math/Science/Ed Faculty to Request Their Assistance
- Enlist Students to Make Announcements/Presentations to Clubs/Classes
- Articles in Student Newspaper/College Newsletter
- Direct Mailings to Students/Minority students (*)
- Materials Distributed Off-campus by Campus Recruiters or Faculty
- Information Disseminated by Financial Aid Office
- Information Disseminated by Education Department at Credential Info Meetings

Section 3: Program Changes

Significant changes have been made in the programs of study for prospective teachers at all the LACTE campuses. At El Camino College, during the academic year 1998-99, the college began its work in designing and implementing a Teacher Education Program, which is a new focus for two-year colleges. The Teacher Education Program has incorporated a number of the components of LACTE (early field experience, course revision, alternative teaching methodologies, recruitment strategies). Preliminary findings indicate that El Camino College has done an extensive job in preparing its future elementary school teachers both to transfer and in mathematics and English. In addition, findings indicate that the level of satisfaction regarding their course work and teachers at El Camino College is high. For the most part, the community colleges are limited in their ability to offer teacher preparation classes. Four of the LACTE community colleges offer the two semester mathematics content courses, Mathematics for Teachers I and II, and all have been revised with regard to the content and pre-requisites in order for them to meet the transfer requirements to four-year institutions.

There has been an increased focus on the role of the two-year college in the math and science preparation of prospective teachers, and, since the publication of the findings of the joint NSF/AMATYC taskforce, all of the community colleges have taken a close look at articulation and programs which can support future teachers on the community college campus. LACTE faculty have been in the forefront of this effort. They teach the classes in which prospective teachers enroll. They serve as advisors to these students helping to facilitate the move from the two-year college to the four-year institution. They are leaders on their own campuses, serving as coordinators in teacher preparation programs, directors of learning centers, coordinators of staff development, or division chairs. Each LACTE faculty member has assumed the responsibility to continue to focus on the objectives of the project even as the funding cycle comes to a close. They will be in the forefront of the teacher preparation effort for years to come.

As one would expect, changes have been more significant on the four-year campus. Students who wish to go into teaching in California must earn an undergraduate subject matter degree before going into a credential program. However, new blended programs are being implemented across the CSU system which will allow the integration of credential courses into the undergraduate program. The faculty who are instrumental in the development of this program have worked closely with LACTE faculty. The education program at all the LACTE 4-year schools directed students into the LACTE courses. The student responses have been extremely enthusiastic both in the LACTE classes and after they have been in the classroom using the LACTE materials and ideas. They also feel supported by the University faculty whom they feel free to call upon.

At Cal State Fullerton, the revised Liberal Arts Mathematics class, based on current topics in mathematics and taught with hands-on methods, is being adopted as the standard math course for Liberal Arts Majors. The course was developed with LACTE support. This course, along with the science courses developed through the NSF-sponsored ConCEPT project, will constitute the math and science foundation for all elementary teachers at CSUF.

At Loyola Marymount University, it is now possible for pre-service elementary teachers to choose a concentration either in Mathematics or Natural Science. New LACTE courses in Life and Physical Science, and revision of courses in the math department, have provided the necessary coursework for these concentrations. The math department has also modified their minor to make it an appropriate track for prospective teachers. Also, LMU has recently been received the very prestigious accreditation from the National Council for Accreditation of Teacher Education (NCATE.) Changes in the liberal studies major which prepares students for the multiple subject credential include the following: a revised Mathematics concentration, a new Natural Science concentration, new Mathematics content workshop courses to supplement the two courses already in place for these students; a new sequence of science content courses which each include laboratory components to emphasize the empirical nature of science – Experimenting in Science I and II. New courses have also been developed in mathematics and science to serve those students who are going on to teach at the high school level. A revised major (Bachelor of Arts in Mathematics) was designed by the Mathematics Department in cooperation with the School of Education that will enable students to receive a bachelor's degree and a preliminary credential in 4 years. In addition, it will be possible

to obtain a clear credential and a Master of Arts in Teaching Mathematics in an additional year (including the summers). The Bachelor of Arts in Mathematics includes the LACTE-developed courses as requirements. Other LACTE course development projects in precalculus and differential equations are electives in the program. Special faculty advisors who are experts in secondary mathematics teacher credentialing/training will be assigned to students in the Bachelor of Arts in Mathematics major. Prior to the LACTE grant the secondary math methods and the secondary science methods courses were combined and taught as a single course (in which science predominated). With the initial use of LACTE grant resources a separate secondary math methods course was offered and has been offered annually for 5 years now. In addition, the School of Education has made a commitment to offering separate methods courses for secondary math and science. Math and Education cooperate on advising to see that sufficient numbers of students are ready to take the course each year during the appropriate semester. Efforts have been taken to highlight in the bulletin the programs involved in teacher preparation and to direct the students on where to obtain information about the teacher education programs. This is done at the University, College, and Department levels. Also, the University recently established a minor in Education to provide better contact between students interested in Science and Mathematics teaching and the School of Education. Also, this will help identify those students interested in teaching to the Science and Mathematics faculty as well.

One of the major accomplishments in the area of program change occurred at Cal State Los Angeles implemented a new blended accelerated content and methods program for elementary teachers in 1997-98, in response to the state request for new 4-year credential programs. Now they have implemented the same type of program for high school science teachers - a program which concludes with the capstone course "Natural Science Field Studies", a LACTE-funded course. The General Education (GE) Program at Cal State LA was completely reorganized during the period 1997-1999. The science GE courses have included in them the notion that students in these classes need to be active learners. LACTE faculty have been involved with the design and teaching of all of these new programs. To show the significant influence of the LACTE project on the new science program, Better Educated Science Teachers (BEST), an outline is given in table 2

Table 2: The BEST program at CSULA

| | |
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| <ul style="list-style-type: none"> • Combines the 186 quarter unit BS degree in Natural Science and the 45 quarter unit preliminary secondary teaching credential • Cooperative effort between departments of Chemistry and Biochemistry, Biology and Microbiology, Geological Sciences, Physics and Astronomy, and the College of Education • Approved the California Commission on Teacher Credentialing (CTC) • Students provided with classroom teaching experience beginning in the freshmen year and increasing in duration during the following three years. • Students participate in Cal State LA outreach programs to local elementary schools | |
| <p>courses include:</p> <ul style="list-style-type: none"> " Biology/Physics 157: Learning Science Through Inquiry, a LACTE-supported course " Natural Science 495: Natural Science Field Studies, a capstone course developed by LACTE co-PI, Ken Anderson (Microbiology) " Chemistry 158: The Chemistry of Everyday Things, a LACTE-sponsored course developed Don Paulson (Chemistry and Biochemistry) " Chem 301ABC: Organic Chemistry, a sequence redesigned by Don Paulson, with LACTE support to include active learning and cooperative learning " Natural Science 461: Topics in Physical Sciences Content and Pedagogy " Natural Science 462: Topics in Life Sciences Content and Pedagogy " Physical Science 180: The Nature of Physical Science " Bio 156, 360, and 470, classes redesigned by Robert Nakamura (Biology and Microbiology) with LACTE support | |

Section 4: Faculty and Institutional Change

There has been both faculty and institutional change as a direct result of the LACTE project. There changes focusing on faculty are three-fold. First, the majority of the math and science faculty are keenly aware that there are pre-service teachers in their classes, both in major and non-major courses. Second, pedagogical changes have been incorporated into major and non-major courses; these include cooperative learning strategies, active learning strategies, and alternative assessment procedures. Third, LA CTE faculty and others working on teacher preparation programs at many of the LACTE campuses are involved in various types of prospective teacher advisory committees, focusing on all of the teacher education efforts on campus.

There are several changes that have impacted the colleges that can be directly or indirectly related to LACTE. First, faculty who reflect the ideas purported in the LACTE project are playing key roles in the hiring processes of math and science faculty. Specifically, LACTE faculty are members of the math and science faculty hiring panels and have contributed to revising the job descriptions and interview questions. Second, the philosophy and design of the LACTE project is reflected in any new or re-designed Teacher Education Programs at the LACTE campuses. Third, at many locations the active LACTE student groups have been incorporated into the college's student club infrastructure, allowing these clubs access to funds for advertising and recruitments and other support. At El Camino College, the Teachers Club has over 600 members and many participate in the LACTE activities and events. At Glendale College, the LACTE Future Teachers Club has set up an endowment to support future events and regularly holds fundraisers.

On the four-year campuses, the science and math faculty have taken a more positive role in recruiting and preparing their students for teaching in K - 12 by offering courses which use transferable techniques, content either appropriate or adaptable to the K-12 classroom and establishing relationships with teachers in the community. At CSU Dominguez Hills, there is now funded assigned time for a Science Pre Ed Advisor and workload assigned specifically for the LACTE developed courses. At CSULA there has been a large increase in the number of math/science faculty who routinely employ active and cooperative learning in their science classes. In fact, one estimate is that at CSULA alone, LACTE or LACTE-influenced faculty have made profound changes in the teaching of over 50 different science and math classes, and many more faculty in these departments are beginning to experiment with certain cooperative and active learning techniques.

Another major item of note is that at many of the CSU's, the promotion committees have now begun to acknowledge that pedagogical research in the sciences with publication in refereed science education journals is as valid as traditional laboratory research in terms of professional development leading to tenure and promotion. Many of the deans also strongly supports this form of research, and in one case a dean overturned a negative recommendation for promotion based upon a committee's negative view of pedagogical research. This would not have been possible before LACTE.

Both institutionally and on the faculty level, teacher preparation has a much higher visibility at LMU than before the LACTE grant. In addition when LMU's new president took office in the Summer of 1999 he declared that teacher preparation would be on of the top four areas for future growth for the university over the next 5 to 10 years. In the Spring of 2000, a new University Committee chaired by the Academic Vice President, with membership including the Dean of the School of Education, the deans of the Colleges of Liberal Arts, Science and Engineering, and Communication and Fine Arts, and various representatives from liberal studies, special education, bilingual ed, and secondary subject matter programs was formed to coordinate efforts of these colleges and the School of Education in the training of K-12 teachers at LMU. Also in 2000, LMU President Robert Lawton agreed to help institutionalize many of the gains made through LACTE. He established a Mathematics and Science Teacher Preparation (MASTeP) Committee consisting of membership from faculty in Math, Science, and Education. The activities of the committee include coordination of internships for future K-12 teachers, advising of the student run Mathematics and Science Teacher (MAST) Club, organization of events such as the Meet the Teachers Roundtable, organization of the luncheon seminar series describing innovations in Math, Science, and Engineering education for faculty in the University, functioning as Secondary Science and Secondary Mathematics advisory boards, and development of additional programs to enhance K-12 teacher preparation in Math and Science. Funding for these programs totals more than \$16,000 annually for three years

though the President's office and the Office of the Dean of the College of Science and Engineering. Recently, a three year, non-tenure track, lecturer faculty position in Science Education was approved for the Natural Science Program. It is hoped that a full-time, tenure track position will be approved soon

Section 5: Change in Institutional Relations

One of the most underrated outcomes of the LACTE project is the number and nature of connections between the LACTE institutions, especially the connections made between the two and four-year institution. From its inception, LACTE was a true collaborative with all 10 institutions as equal players. As the grant comes to a close, many connections still exist.

El Camino College is continuing its relationship with CSUDH in several different capacities. First, the college will continue our collaboration on the Undergraduate Teaching Conference, co-sponsored by LACTE. Second, the college has deepened its working relationship with the Liberal Studies Program and Blended Program. They have secured an agreement that provides the opportunity for Liberal Studies majors who seek a supplementary authorization to their credentials to complete all of the mathematics courses at El Camino College. El Camino College, Santa Monica College, Glendale College, and Fullerton College faculty have collaborated on mathematics courses taught at the two-year college level.

At CSUDH, the campus has an office of Science Education which together with the faculty of the department of Mathematics has established strong relationships with the community college faculty and the K-12 faculty in the community public school system. The campus hosts well-attended annual meetings on campus of mathematics teachers and those preparing to become mathematics teachers. The science faculty in all departments have worked together to create the Integrated Science Program for students who plan to become high school science teachers in biology, chemistry, physics and geosciences. In the process, the courses in the program have been reviewed and changes made to be more responsive to the need for well-prepared science teachers in our public schools. Over the past few years more attention has been focused on establishing relationships with the faculty of the surrounding community colleges and this has resulted in annual joint conferences to share effective teaching and learning strategies. In addition, we have begun to form liaisons with surrounding industry. The initial activities have included "shadowing" of key employees within the companies to learn what technologies are being used.

At LMU relations among mathematics, science, technology, or engineering faculty and departments and education faculty and departments. As a result of LACTE, there is much better communication between the Science and Mathematics faculty and faculty in the School of Education. In many cases, faculty from the respective Departments did not even know each other before the LACTE grant. Now, there is continual contact between these two groups of faculty as they work on several joint projects involved in teacher preparation. The MASTeP committee was established to carry on many of the activities initiated by LACTE on the LMU campus. This committee consists of faculty from Science, Mathematics, and the School of Education. This committee has sub-committees, also with representation of faculty from each discipline, that work on internships for the students, moderate the MAST student club, run the Innovations in Math, Science, and Engineering Education seminar, coordinate workshops and seminars for future teachers such as Meet the Teachers Roundtable, and participate in the Math and Science Education advisory board. As a result of LACTE, there is much better communication between the faculty at LMU and faculty at the community colleges, especially faculty at Santa Monica College, our partner school. Before the LACTE grant, faculty at LMU knew few faculty, if any, from the community colleges. Now, there is continual contact between these two groups of faculty as they work on several joint projects involved in teacher preparation. These projects include Meet the Teachers Roundtable and the Future Teacher's Conference. In an effort to continue this connection, the President has provided office space with a desk, phone, and computer for post-LACTE Collaborative-wide activities.

There has also been an increase in the number of connections between the K-12 community and/or industry and the post-secondary community that LACTE. As a result of the interaction of faculty and students in Mathematics and Science courses and internships with teachers, administrators, and personnel from K-12 schools, there is a much stronger and more developed relationship than before LACTE. These connections include both public and private schools, museums and aquariums, and local professional math and science K-12 teacher organizations.

Section 6: Disseminable Products

LACTE has supported the development of over 40 courses or course modules. Early on in the grant, LACTE created a curriculum committee with responsibility for oversight of this process. A comprehensive set of instructional design guidelines for these course or modules is shown in table 3 on the following page. These guidelines were developed to ensure that curriculum funded by LACTE would be of the highest quality and address the pedagogical criteria outlined in the grant proposal. Course developers were put through a series of interviews and follow-up surveys to ensure the material was being developed to LACTE standards. Out of this process, entire courses, course modules, laboratory manuals and planning handbooks were developed, all of which reflected the goals of the grant. A complete list of the curriculum funded wholly or in part by the grant is given in the appendix, and descriptions of many of these products can be found on the LACTE website www.lacteonline.org

Some of the highlights include an entire new course, “Transforming our World through Biotechnology” at Santa Monica College; course material for a course “Learning Science- Teaching Science” at LMU; a new lab course specifically for future teachers; a science course developed by Ken Anderson at CSU Los Angeles transported to LMU and used as the basis for the development of a new environmental science course; and, at LMU, a complete course on Experiments in Science developed specifically for prospective elementary school teachers.

Not all of the LACTE material that was developed was intended for the classroom. One of the greatest successes of the project, was the creation of the LACTE Future Teacher’s Conference. Out of the development of this event, came the Future Teacher’s Conference Planning Handbook, a complete step-by-step guide to developing the concept of the conference. This handbook was made available to all the CETPs, and is also available to be downloaded on the website. A similar handbook was also created to accompany the Meet the Teachers Roundtable event. In addition, short instructional videos were developed to provide additional information for those collaboratives that wished to develop their own events. At the present time, at least three other collaboratives have hosted similar events with the support of the LACTE planning team. In one instance, faculty from LACTE visited the student group from Project TEACH, the Seattle area Collaborative and described the steps involved in the planning of the conference. Later that year, the student planners of the Green River conference attended the LACTE event at Santa Monica College and took many ideas back to be incorporated in the Green River Future Teacher’s Conference.

Table 3: LACTE Curriculum Standards

Introduction:

- Overview, where does the course/module fit into the major/credential program
- Expected prerequisite content knowledge and background of the student
- Description of the audience _ for majors, general education, potential teachers etc.
- Syllabus, Textbook (how is it used? as a reference, problems, reading), Grading, etc.

Goals:

- Content: knowledge expected of the student at the end of the class
- Skills: what the student is expected to be able to do (e.g. problem solving and critical thinking, or ability to communicate about the subject in both written and oral form)
- Attitude: is the student comfortable and confident with subject and specific material

Pedagogical Approaches: By what means will your stated course/module goals be achieved

- | | |
|--|--|
| Lecture (content area specified) | Cooperative work (groups, pairs) |
| Hands-on activities | Investigations (might be laboratories) |
| Use of literature, videos, web sites | Use of computers and technology |
| Observation (could be labs, field trip observations, etc.) | |
| Other (please specify) | |

Assessment:

- Inclusion of both formative (pretests, informative writing, ungraded) and summative (graded exams, quizzes) instruments
- Indication of how assessment is linked to your stated course/module
- Techniques should measure various aspects of cognition other than recall: for example comprehension, application, analysis, synthesis and evaluation
- Course evaluation: Success rate, instructor reflections, student feedback, continuation in program, other?

Other things to consider including in course/module manual:

- Specific advice on implementing pedagogical approaches your course/module employs
- Discussion of preparation time and materials (cost and sources) needed for activities
- Student manual if appropriate
- Visual material to be utilized: power point, overhead transparencies, computers
- Reference materials, if any, and sources
- Software: cost and sources
- Laboratory Activities, technical supplies and equipment
- Required purchase for students: safety items. Laboratory kits
- Time needed to do activity

At LMU, Two science courses, Experimenting in Science I and Experimenting in Science II, were developed for students pursuing an elementary subject credential. In the first year the Experimenting in Science I course was taught (year one of the LACTE grant), over three-quarters of the students had already taken the science methods course for elementary teachers. The School of Education faculty involved in teaching the methods course had to spend much of their time covering content material the students did not have before discussing methods material. A recent survey of the same Experimenting in Science I course but in year five of the LACTE grant revealed that less than one-quarter of the students had already taken the methods class. This change to the preferred sequencing of courses (namely, science content first then science methods) is evidence of the “positive reputation” the two new science courses have. It is also evidence of an improvement in curriculum at LMU as a result of the LACTE grant. Another outcome observed in the Experimenting in Science I and Experimenting in Science II classes involved student perception regarding both their ability and interest in science. Utilizing both pre- and post-surveys, a significant increase was observed both in the students’ perceived ability to do science as well as their interest in science. The Experimenting in Science courses emphasize the process of doing science by including many activities which involve “hands-on” learning both individually and in groups. In addition, students are required to develop several experiments/activities to present at a local elementary school. By teaching science emphasizing process, we feel these future teachers will present their science lessons in a format very different from the typical textbook based science teaching in K-8.

Whether the project involved creation of a complete course, or modules for an existing course, all LACTE curriculum was held to the highest standards. Faculty involved in the development of the curriculum frequently met to discuss issues of pedagogy, assessment, and ways in which to improve the courses. LACTE hosted day-long symposia in which the new curriculum was presented to groups of faculty from other institutions, not just LACTE institutions), connections were made, and much of the curriculum was then transported to other institutions, meeting one of the major goals of the project, namely transportation of products.

Section 7: Evaluation

Evaluation was approached on numerous fronts. First, there was the formal evaluation, required by NSF. Initially, LACTE contracted with the **ETI** research group, to conduct the first two years evaluation. Unfortunately, the logistics of interacting with this particular group did not result in the kind of information LACTE was looking for and so the contract was cancelled. LACTE then worked with a research organization more familiar with the educational structure of the LA basin. **Nunn Consulting** provided important data on the project, they performed numerous evaluations of course material as it was being incorporated into the LACTE institutions. They conducted interviews with LACTE students and teachers, as well as participants in the LACTE student groups and our student conferences. For example, in a phone survey of 90 LACTE students, the most important goals students indicated that they had for themselves as teachers, were:

- Instructing with hands-on techniques
- Making meaningful connections between concepts and students lives
- Helping students better understand/value math and science
- Helping students who would otherwise “fall through the cracks”
- Helping students overcome their fear of math and science
- Learning from students
- Helping students think for themselves, enjoy learning, and become life-long learners
- Helping students see the connections between different disciplines

When these students were asked which LACTE opportunities were most valuable they cited:

- Conferences, symposia, workshops, and professional panels
- Internships
- Discussion groups, roundtables, student group meetings
- LACTE classes modeling appropriate teaching techniques
- Tutoring
- Opportunities to observe and evaluate K-12 teaching activities
- Mentoring by faculty members and other professionals

With this information, the LACTE leadership was able to affect project development. We increased the number of internship opportunities, expanded the Future Teacher’s Conference and the Meet the Teachers Roundtable, offered an more extensive summer academy for new teachers, which was expanded to include year-long follow-up activities, and finally we continued to support campus students group.

Another area in which evaluation was crucial was to measure the success of the LACTE courses. Students in most, if not all of the LACTE courses were surveyed over the life of the project. When asked “What specifically about this class helped you understand the material?”, answers included:

- Working with others in group activities, projects, discussion, etc.
- Hands-on instruction and learning
- Examples and demonstrations with manipulative
- The professor emphasizes understanding as opposed to memorization
- Instructors’ visual and graphic materials
- Instructors’ connecting subject matter and the real world
- Written handouts and worksheets

We also asked the students for recommendations for strengthening LACTE courses, responses here included:

- Cover fewer principles - spend more time on material under discussion

- More class discussion and student participation
- Time in class to work on problems/activities
- More open-ended questions from instructor
- Increased use of computers in the classroom
- More demonstrations, visual aids, activities and examples
- Less time on instructor lecturing
- Greater linkages between materials and other subjects

All of these suggestions were then funneled to all the LACTE faculty through the evaluation reports and incorporated into existing curriculum, or used as the basis for new development.

LACTE also reported its findings in numerous presentations at national and local conferences and symposia, as well publications in journals.

Another area in which evaluation was conducted was campus specific, for example El Camino College, through a research project funded by the Chancellor's Office of the California Community College under the Funds for Student Success category, focused on determining the level of academic and career preparation of future teachers who have completed coursework at El Camino College. The three-year project collected data from current and transfer ECC students. The assessment instrument provided the prospective teachers with an opportunity to discuss how the LACTE project has impacted their education and preparation.

At CSUDH, records have been kept of LACTE students some of whom have graduated and are teaching on emergency credentials. A few have completed their undergraduate degrees and the credential. They have kept in contact and have proven to be valuable mentors to those students who are still working on their degree or credential. The numbers are not so large that we have had any problems staying in contact. Through their feedback we have been able to identify those features of the campus LACTE program that we plan to institutionalize. These are noted in the next section.

CSULA has used the recently released 1991 PRAXIS exam in general science as a measure of the Assessment of the Natural Science Program. CSULA faculty examined the 160 multiple choice questions on a practice test from ETS. These questions had been given to 1140 examinees in an actual March 1991 PRAXIS test. From that examination the faculty choose 40 questions to cover topics in general science, biology, chemistry, geoscience and physics. During Winter Quarter 2001, the instructors for NS 495, the capstone course in Natural Science, administered the test to 23 students in their course. These results indicate that our students in the Natural Science degree have scored very similarly to the natural average on this assessment instrument. CSULA faculty also plan to develop an instrument to assess the attitudes of our science students before and after completing the reformed science classes in order to assess whether they have improved attitudes toward science.

Over the course of the LACTE grant, a number of LMU faculty learned a significant amount about evaluation through faculty development workshops, working on the Curriculum Committee to develop evaluation instruments for curriculum development projects, writing proposals for course development, being involved in course development projects and having to assess those projects, organizing and evaluating special events such as Meet the Teachers Roundtable, and setting up and evaluating internships. Several examples can be given of how formative assessment results affected the project development. The mid-course feedback forms assisted project developers in improving their courses. The comments gleaned from interns increased awareness of the importance of internship supervisors playing a mentoring role. As a result specific guidelines were written for internships that require scheduled time be built into the internship experience for the intern to get feedback from the supervisor and an evaluation form to be filled out by the supervisor was developed.

A major case study was undertaken in 2000, observations of LACTE students in the classroom, follow-up interviews and interviews with the teacher's principal were incorporated into a document that is available on the website. This data was shared with the CORE project looking at all of the NSF Collaboratives.

Section 8: Other

In addition to meeting and exceeding many of the objectives of the grant, there have been numerous other outcomes and features that were unexpected. From the initial planning phase of the project through its conclusion, the community college faculty played a major role in the grant. In fact, during the projects final eighteen months both the Project Director and Project Managers were community college faculty. The issue of community college faculty being equal players from the inception was one of the unexpected outcomes. Two-year faculty were always considered equal partners in the project, and as the project progresses their role both in LACTE and in the NSF CETPs continued to grow. The faculty have been advisors on NSF projects, authors of national documents on teacher preparation, and participants in other grants and projects.

At some institutions, new positions have been developed as part of the project: At LMU there is a new permanent Science Teacher advisor similar to the Pre Med advisor and with release time from the Dean's budget. This person will be responsible for continuing the student meetings which feature presentations designed to recruit and prepare science majors to a teaching career. The faculty science educator will also work closely with the campus Science Society. Two LACTE "graduates" are now teaching the special pre-teachers introductory biology laboratory developed by LACTE. They are able to bring their very real classroom experience into their teaching. Their ability to relate their first hand experience and the excitement that science brings to the classroom has made the class more exciting for their college students. One of our Hispanic LACTE graduates won second place at the 2000 CSU Research Conference, she has subsequently completed her master's thesis and is continuing her career as a high school teacher. An unexpected consequence of the LACTE program on the CSU Los Angeles campus was the interest generated among the biology graduate students for a career in K-12 teaching. This interest has stimulated dialogue and planning by science faculty and education (science) faculty in developing a Master's in Science Education. One LACTE student was chosen to participate in the NSF/Dept of Energy summer internship program at Lawrence Livermore Labs in Berkeley. Many of our scholarship winners have told us that without these funds their plans to go into teaching would have had to have been put on hold, and many LACTE faculty who were adjunct when they were first exposed to the LACTE-model of instruction, credit LACTE workshops with providing them the skills to secure a full-time position.

The past six-and-a-half years has been an amazing ride for those involved in the project. University faculty have developed new teaching styles focusing on the student and their needs. Community College faculty have been able to work with University faculty to build connections between departments and institutions that will live on long after the funds are exhausted. Students have returned to their LACTE mentors and thanked them for giving them the tools to do a better job in their classrooms, and attendees at LACTE student events have cited these events as key milestones in their decisions to go into teaching. The project had its share of ups and downs, but overall the outcomes, both planned and unforeseen, give credit to the dedicated individuals who put so much of their time and energy into this vitally important cause.

Appendix A: Major LACTE disseminable products and publications

Differential Equations with Computer Lab Experiments (2nd Edition) by Dennis G. Zill, Brooks Cole Publishers, 1998

An Introduction to Probability and Statistics, Instructor's Manual by Suzanne Larson and Thomas Zachariah, LMU

Workshop in Mathematics for Elementary Teachers I and II, Student Manual and Instructor's Manual by Robert Vangor, LMU

Instructor's Manual: Math for Elementary Teachers Labs, by Jacqueline Dewar and Robert Vangor, LMU

Instructor's Manual: Differential Equations, to accompany the text "A First Course in Differential Equations", by Dennis G. Zill; Loyola Marymount University

Student Workbook and Instructor Manual: Enlivening Biology through Biotechnology, Bio 4; Santa Monica College, Mary Colavito

Modules Manual: TI-83 and Excel Activities for Calculus; Occidental College, Lars Kjeseth, Mickey McDonald, and Emily Puckette

L. Fathe, and E. Hoagland, “Advice to Course, Curriculum, and Laboratory Improvement (CCLI) Grant Writers”, *The CUR Quarterly*, Sept. 1998.

L. Fathe, J. Quinn, and M. McDonald, “An Integrated Calculus and Mechanics Course for Weakly Prepared Students”, *Journal of College Science Teaching*, Vol. XXVII, #2, Nov. 1998.

Course Manual: General Biology Lab for Future Teachers, Bio 103; California State University Dominguez Hills, Carol Guze

Planning Handbook: Future Teacher’s Conference; LACTE, Jacqueline Dewar & Judy Kasabian

Planning Handbook: Meet the Teachers Roundtable; LACTE, Jacqueline Dewar & Judy Kasabian

Video: to accompany planning manuals for the LACTE Future Teachers Conference and Meet the Teachers Roundtable

Activities Packet to accompany Math for Liberal Arts; Fullerton College, Mark Greenhalgh
 A complete listing of LACTE products is shown below. Detailed descriptions of many of these products can be found at www.lacteonline.org

LACTE courses or course modules

| COURSE OR MODULE TITLE | DEVELOPERS | CAMPUS |
|--|---------------------------------|---------------|
| Seminar in Mathematics Education | John Wilkins | CSUDH |
| Liberal Art Mathematics for Prospective Elementary Teachers | Michael Clapp, Susan Kasparian | CSUF |
| Math for Liberal Arts | Mark Greenhalgh, Yash Manchanda | Fullerton |
| Science Curriculum and Instruction for Beginning El. Sch. Teachers | Jean Adenika_Morrow | CSULA |
| Mathematics for Elementary Teachers_Mixing Content and Pedagogy | Gerry Beer and Alice Lang | CSULA |
| A Field Experience Course of Prospective Teachers | Judy Kasabian | El Camino |
| Mathematics for Elementary Teachers | William Shamhart | Glendale |
| Experimenting in Science I: The Physical Sciences | Jim Landry | LMU |
| Science Workshop for Elementary Teachers | Jim Landry | LMU |
| Mathematics for Elementary Teachers Laboratory | Robert Vangor | LMU |
| Experimenting in Science II: The Life Sciences | Gary Kulick | LMU |
| Opportunities for High School Chemistry and Biology Teaching | Chris Craney, Kaye Lord | Occidental |
| Elementary Mathematics Education | Mickey McDonald | Occidental |
| Developing an Ethno_mathematics Module | Shirley Gray | CSULA |
| Learning Science Through Inquiry | Ken Anderson, Martin Epstein | CSULA |
| Designing an Interplanetary Colony | Vincent Lloyd, Joe Holiday | El Camino |
| Learning Science Through Museum Education | Phyllis Hirsch | East LA |
| Biology of California's Natural Alpine Communities | Debra Anderson | East LA |
| Natural Disasters/Environmental Geology | Poorna Pal | Glendale |

| | | |
|--|-------------------------------------|--------------|
| Introductory Astronomy _ Hubble Telescope | David Hurst | Glendale |
| Intermediate Algebra Involving Collaborative Groups | Larry Cudney | Glendale |
| An Interdisciplinary Approach to the Study of Env. Questions | T. Choe, P. Drennan, J. Robb | LMU |
| Transforming Our World Through Biotechnology | Mary Colavito | Santa Monica |
| Mathematical Modeling | W. Armacost, G. Jennings | CSUDH |
| Natural Science Field Studies | Ken Anderson, Bob Nakamura | CSULA |
| Natural Science Field Studies | Ken Anderson, Kim Bishop | CSULA |
| Marine Biology Laboratory Manual | Francisco Gago, Susan Bower | Glendale |
| Differential Equations | Dennis Zill, Warren Wright | LMU |
| Introduction to Probability and Statistics | S. Larson, T. Zachariah | LMU |
| Environmental Science | J. Dorsey, G. Diniusi, B. Grebe | LMU |
| Physical Geology of California | Scott Bogue, Margi Rusmore | Occidental |
| Introduction to Human Evolutionary Biology | John Hafner, Patti Hafner | Occidental |
| Comparative Anatomy and Physiology | Gary Martin, Krista Chamberlain | Occidental |
| Calculator and Computer Based Activities for Intro Statistics | Emily Puckette | Occidental |
| Further Integrating Technology into Occ. Calculus Program _ TI 83 | L. Kjeseth, E. Puckette, M. McDonal | Occidental |
| Precalculus Workbook _ Symbolic, Graphical and Data Analysis | Michael Grady | LMU |
| Workshop Course for Mathematics Majors | J. Dewar, S. Larson, T. Zachariah | LMU |

Appendix B: Websites

Website housing LACTE course material, case studies, program objectives and other material relevant to the project: <http://www.lacteonline.org>

Web page on Maria Agnesi, created by Shirley Gray, CSULA:
<http://curriculum.calstatela.edu/faculty/sgray/Agnesi/>

CSULA Active and Cooperative Learning Web Page:
<http://curriculum.calstatela.edu/faculty/dpaulso/active/>

CSULA/LACTE Science Education Web Page:
<http://vearthquake.calstatela.edu/LACTE/>

Appendix C: Selected presentations by LACTE faculty and students

Active Learning Strategies,” Workshop presented to *NSF Conference on Shaping the Future, Undergraduate Education in Science, Mathematics, Engineering and Technology*, Presented Professors Jean Adenika-Morrow (Curriculum and Instruction), Ken Anderson (Biology and Microbiology), and Don Paulson (Chemistry and Biochemistry), California State University, Los Angeles, March 14, 1997.

Teacher Summer Science Academy, K. L. Anderson, ACCESS Center, CSU, Los Angeles Campus, July 8-26, 1996.

“Hands-on Student Workshops,” Ken Anderson and Donald Paulson have given more than a total of 100 student workshops over the past three years to precollege students.

“Interactive Science for Prospective Teachers,” J. Eichinger and K. Anderson, California Science Teachers Association, October 3-6, 1996 Sacramento, California.

“Hands-on Exercises to Demonstrate Industrial Biotechnology and Model Building,” J. Briganti, K. Anderson and D. Opheim. National Association of Biology Teachers, October 16-19, 1996, Charlotte, North Carolina.

“Prospective Elementary Teachers and Science,” K. Anderson and J. Exchanger. National Science Teachers Association, Global Summit, December 27-29, 1996, San Francisco, California.

“Inquiry-based, Hands-on Microbial Workshop,” K. L. Anderson, ASM Undergraduate Microbiology Education Conference, May 1-4, 1997, Fort Lauderdale, Florida.

“Active Learning and Cooperative Groups in the Chemistry Lecture Class, Donald R. Paulson, National Symp. Collaboratives for Excellence in Teacher Prep. June 5-7, 1997 CSUDH.

“The Use of Active Learning Strategies,” K. Anderson and N. McQueen National Symp. Collaboratives for Excellence in Teacher Prep. June 5-7, 1997, CSUDH. Carson, CA

“Active Learning and Cooperative Learning in the Organic Chemistry Lecture,” Donald R. Paulson, *The Lilly West Conference on College and University Teaching*, Lake Arrowhead, California March 7-9, 1997.

“Microbial Discovery Workshop” K. L. Anderson, American Society for Microbiology, National Workshop, Gwynedd-Mercy College. Pennsylvania August 6-10, 1997.

“The Tragic Red Herring: Content vs. Critical Thinking in Teacher Preparation of Teachers,” Donald R. Paulson, Presented at the *Gordon Research Conference - Innovations in College Chemistry Teaching*, January 4, 1998.

“Active Learning in the Chemistry Lecture Class,” Donald R. Paulson, 5th Annual LACEPT Statewide Conference, Louisiana State University, Baton Rouge, LA, January 31, 1998

“Active and Cooperative Learning in the College Lecture Class,” D. R. Paulson, CSU Symposium on College Teaching, CSU San Bernardino, February 21, 1998

LACTE students Maria Ramos and Sonya Parker presented a session on air pressure at the Western Regional Meeting of the National Association of Science Teachers in Las Vegas, April 1998.

“Active Learning in the Science Classroom,” A workshop presented at the 7th National Conference, Council on Undergraduate Research, D. Paulson, P. Drennan, and L. Fathe Occidental College, Los Angeles, CA, June 26, 1998.

“Capstone Courses,” K. Anderson, J. Matson and K. O'Sullivan, LACTE/MSTEP Conference, California State University, Los Angeles, October 16, 1998.

“Active Learning and Cooperative Learning in the Chemistry Classroom,” Donald R. Paulson, LACTE/MSTEP Conference, California State University, Los Angeles, October 16, 1998.

SACNAS Society for Advancement of Chicanos and Native Americans in Science) K-12 Teacher Workshop, Ken Anderson October 9, 1998. Washington, DC. Workshop for 100 K-12 teachers.

American Society for Microbiology June 2, 1999, Ken Anderson, Chicago, IL Teacher Science

Day workshop for fifty teachers and fifty microbiologists.

Gordon Research Conference on Undergraduate Microbiology Education, General Microbiology- Project Based Laboratories, Ken Anderson, New London, CT, June 26- July 1, 1999.

LACTE/MASTEP Symposium to Encourage Teaching Beyond Curriculum, Capstone Courses, Ken Anderson (with J. Matson and K. O'Sullivan). CSULA October 16-17, 1998. Los Angeles, CA.

National Biology Teachers Association. November 4-8, 1998. Reno, NV Decomposition - Leaves and Grass, Ken Anderson (with T. Rooney), Microbiology, Technology, & the Elementary Student, Ken Anderson (with M. Hodges), Slime Molds- Inquiry-Based Learning, Ken Anderson (with D. Opheim).

American Association for the Advancement of Science, Anaheim, CA, Preparing University Faculty to Teach While Educating Future Teachers, Ken Anderson, January 21-26, 1999.

American Society for Microbiology - General Meeting June 3, 1999. Chicago. Division W Session, Ken Anderson, Precollege Outreach Initiatives - The Future of Microbiology: Using Inquiry in Teaching in Microbiology.

"Active Learning and Cooperative Learning in the College Lecture Classroom," Paulson, D. R., Workshop for College Faculty, Adams State College, Alamosa Colorado, October 5, 2000.

"Active Learning and Cooperative Learning: A Success Story from the Chemistry Classroom," Paulson, D. R., Annual Meeting of the American Association for the Advancement of Science, San Francisco, CA, Feb. 18, 2001.

"Workshop Activities for Mathematics Courses"; Mark Greenhalgh, Fullerton College; Judy Kasabian, El Camino College; Fran Manion, Santa Monica College; and Peter Stathis, Glendale College, California Mathematics Council - Community Colleges Meeting, September 19, 1998

Presented at the American Mathematical Association of Two-year Colleges, 24th Annual Conference, Portland, Oregon, November 5-8, 1998:

1) "A Workshop of Activities for Mathematics Courses"; Mark Greenhalgh, Fullerton College; Judy Kasabian, El Camino College; Fran Manion, Santa Monica College; and Peter Stathis, Glendale College;

2) "A Mathematics Anxiety Course for College Students", Judy Kasabian, El Camino College

3) "Portfolios and Active Learning :Non-Traditional Methods in Traditional Courses" Michael Clapp and Susan Kasparian, California State University Fullerton.

Presented at the Lilly West Conference on College and University Teaching, Lake Arrowhead, CA, March 6-8, 1998:

1) "Portfolios and Active Learning :Non-Traditional Methods in Traditional Courses", Mark Greenhalgh and Yash Manchanda, Fullerton College; and Michael Clapp and Susan Kasparian, California State University Fullerton

2) “Interactive Applications of the World Wide Web”, George Wiger and William Wilk, California State University Dominguez Hills

3) “Strategies to Motivate College-level Students: Techniques from a Mathematics Anxiety Class”, Judy Kasabian, El Camino College

4) “How to Provide a Supportive Experience to Foster Student Success: Lessons from an Integrated Calculus and Mechanics Course”, Laurie Fathe and Lars Kjeseth, Occidental College.

5) “Developing Skill, Confidence, and Community in Freshman Mathematics Majors”, Jacqueline Dewar, Loyola Marymount University.

“An Interdisciplinary Approach to Environmental Questions”; Tina Choe and Phillipa Drennan, Loyola Marymount University; and Jeannie Robb, St. Bernard’s High School, presented at LACTE/MASTEP Symposium “Beyond Curriculum”; California State University Los Angeles, October 16, 1998

“Helping to Improve K-12 Education: How Higher Education can Contribute”; Laurie Fathe, Project Director, LACTE presenting at the California Citizens Commission on Higher Education hearing on its report *A State of Learning: California Higher Education in the Twenty-First Century*, Los Angeles Trade Technical College, September 22, 1998.

Representatives from the Los Angeles Collaborative for Teacher Excellence have presented at numerous other locations in the six and one half years of the grant. Representatives of the collaborative presented at the last six annual meetings of the American Mathematical Association of Two-year Colleges, annual meetings of the National Council of Teachers of Mathematics, National Science Teachers Association, American Microbiological Society, American Physics Society, and meetings of the Lilly Conference on Teaching and Learning. Representatives also served as presenters and/or panelists at many of the NSF sponsored PI meetings of the CETPs.