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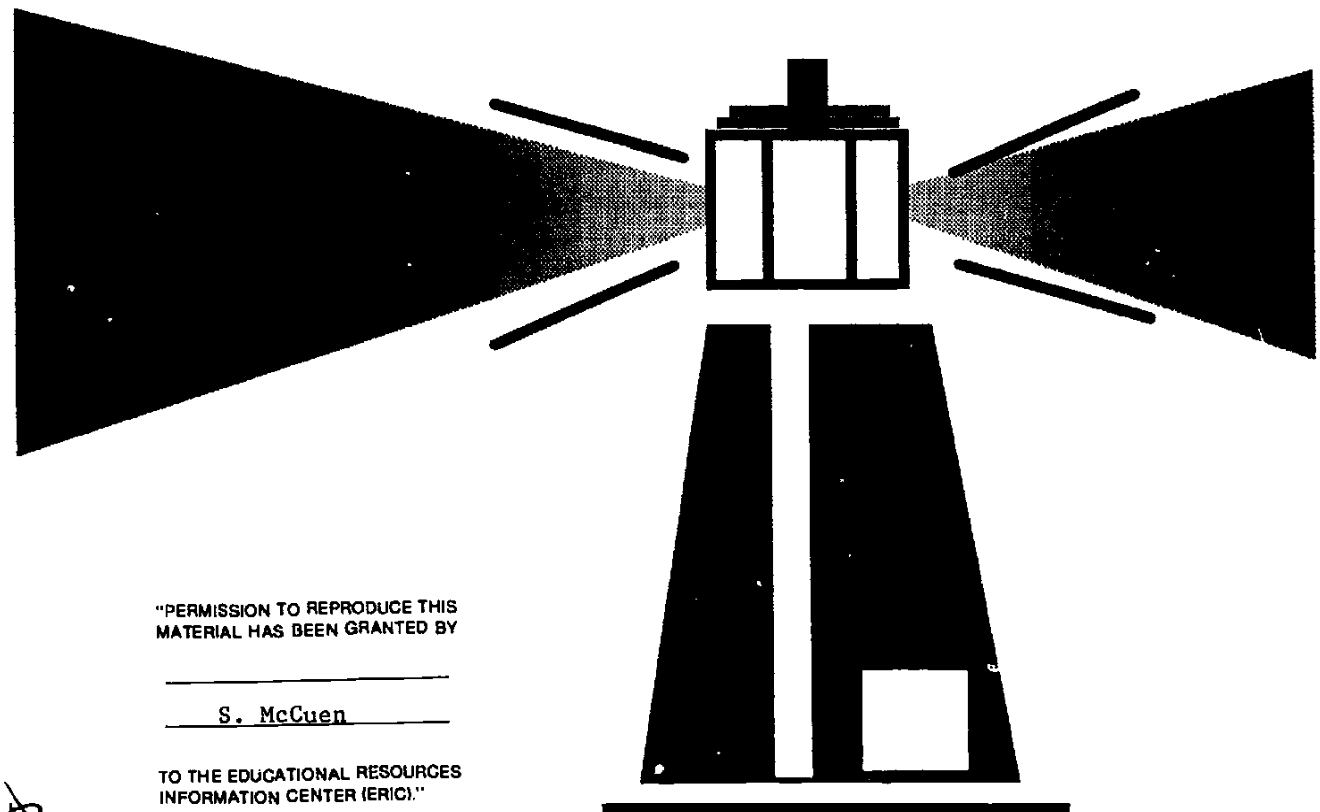
ABSTRACT

American River College's (California) Peer Assisted Learning (PAL) project is a 2-year project initiated in 1992 to improve the retention and performance of minority students and others in math, biology, and chemistry through increased contact and involvement with their peers. PAL involves a cadre of 24 student Learning Assistants (LA's) who have successfully completed targeted math, biology, and chemistry courses and who work with 8 project faculty. The LA's meet with a small group of four to six students for 3 hours each week throughout the semester. Students in the study groups work on class assignments and supplemental materials. The LA's also meet weekly with the course instructors to discuss the progress of the groups and to receive suggestions. The LA's, who are paid for time spent in training, tutoring, and meeting with faculty, undergo 18 hours of training in small group peer-assisted learning. Using focus group interviews, as well as an examination of student grades and retention, the PAL project was evaluated, revealing: (1) 69% of the students receiving tutoring felt the sessions were quite, very, or extremely helpful; (2) grade comparisons revealed that in all but one of the targeted classes, tutored students out-performed non-tutored students; and (3) success rates (percentage of students receiving course grades of A, B, or C) were much higher for tutored students than for non-tutored students. A discussion of focus group results, and the LA tutor training course outline are included. (PAA)

Beacon Project

Student Catalyst Program:
Peer Assisted Learning
Annual Report 1992-1993

American River College



Los Rios Community College District
Sacramento, California

AMERICAN RIVER COLLEGE BEACON PROJECT
Student Catalyst Program: Peer Assisted Learning

Annual Report 1992-93

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TABLE OF CONTENTS

INTRODUCTION

This is the first year report for the Beacon Project, ***Student Catalyst Program: Peer Assisted Learning*** at American River College. The project is funded by the American Association of Community Colleges (AACC) and the Kellogg Foundation and is one of 24 nationwide that are implementing recommendations in the report **Building Communities: A Vision for a New Century**. Our project seeks to build community by "involving students in the life of the college."

This project is one outcome of the college's focus on student involvement the past two years. It was inspired by the work of Dr. Uri Treisman at UC Berkeley who used collaborate peer study groups to improve minority student success in math. Dr. Treisman met with our project staff and representatives of our associate colleges in February and gave us an update on his work and suggestions for improving our project.

Our assessment of the project at the conclusion of the first year is that we have indeed involved students in the life of the college. The student/student, student/faculty and faculty/faculty relationships that have resulted from this project are impressive. We have found that these relationships have enhanced students' confidence and security, as well as their sense of accomplishment. This has been accompanied by higher grades and improved retention.

We feel the project has had a significant impact -- and we are exploring ways to institutionalize it after the grant expires.

A word of thanks to the entire Beacon staff -- each staff member connected with the project has put in far more time than was compensated for by the small stipends. The success of this project is due to their tireless commitment to improving instruction for students.

Special thanks go to our college president, Dr. Queen Randall, whose support, both moral and financial, helped us bring this idea to fruition.

Project Directors:
Nancy Reitz, Chemistry Instructor
Sharon McCuen, Dean, Research and Development
American River College
July, 1993

AMERICAN RIVER COLLEGE
Beacon College Project: Peer Assisted Learning
Summary

American River College has been selected as an ACCJC/Kellogg Foundation Beacon College to implement the project **Student Catalyst Program: Peer Assisted Learning.** The project began in June, 1992, and will be completed in July, 1994.

Beacon Colleges are selected to implement the recommendations of the national report Building Communities: A Vision for a New Century. The goal of our project is to involve commuter students in the life of the college. The Peer Assisted Learning project was an outgrowth of the collegewide student involvement focus at American River College, begun in fall of 1991. It is based, to some degree, on research conducted by Uri Treisman at UC Berkeley on minority students in calculus. The ARC project is being piloted in certain math and science "sequence" classes that have high drop- out rates. The project targets, but is not limited to, minority students that are underrepresented in math and science.

The project involves a cadre of 24 student "Learning Assistants" who have successfully completed the targeted course and who work with eight project faculty. The LA's meet with a small group (4-6 students) from the class for three hours a week throughout the semester. Students in the study groups work on class assignments and supplemental materials. The Learning Assistants meet weekly with the faculty member to discuss the progress of the groups and receive suggestions.

The Learning Assistants undergo extensive training in small group peer assisted learning. They also meet together during the semester to share problems and successes. They are paid for time spent in the training, tutoring and meeting with faculty.

It is anticipated that the students in the study groups will form close relationships with their peers: the Learning Assistants and the other students in the group. This added involvement in the learning process should lead to greater student success in terms of retention, grades and attitudes. A research component has been developed to measure the project outcomes.

In addition, the close relationships of the Learning Assistants with their faculty member, the other LA's, and the students in the groups should increase their involvement in the life of the institution. A possible side benefit could be to motivate students to enter the teaching profession.

A Beacon College agrees to involve other community colleges in the project. ARC's project has 10 associate colleges from central and northern California. They will participate in the development and evaluation discussions and will receive all materials developed.

Research Office, July 1992

AMERICAN RIVER COLLEGE
Beacon College Project: Peer Assisted Learning
Project Staff 1992-93

Project Directors

Nancy Reitz,	chemistry faculty member Student Involvement Coordinator
Sharon McCuen,	Dean, Research and Development

Project Trainers

Mimi Cudzilo	counselor
Kathie Read	Director, Learning Resource Center

Project Faculty	**Course**
Luther Nolen	Chemical Calculations
Karen Pesis	Chemical Calculations
Nancy Reitz	General Chemistry
Rina Roy	General Chemistry
Nini Cardoza	General Chemistry
Alyce Fiedler	General Biology
George Bleekman	General Biology
Sandy McKaig	Elementary Algebra
Paul Van Erden	Elementary Algebra
Jim Eckerman	Calculus, Algebra

Project Researchers

Dick Rasor, Jim Barr, Lori Rasor

Instructional Representative

Suzie Nissen

Clerical Assistance

Jo-Ann Klint, Mary Smith

FIRST YEAR IMPLEMENTATION

Planning for the Beacon project, Student Catalyst Program: Peer Assisted Learning, began in the spring of 1992 when the college learned it was funded for the two-year project by AACC/Kellogg Foundation. Project faculty were selected from math, biology and chemistry. They in turn recruited 24 Learning Assistants (LA's), on the basis of having passed the targeted course with a B or better grade. The LA's as a group reflected good participation by underrepresented groups.

Project staff met frequently during the summer months to organize the project, develop plans and resolve issues.

The 24 Learning Assistants started the program by attending a full day of tutor training the Saturday before classes started. Training continued during the semester for a total of 18 hours; students received one credit for the training and were paid for the hours spent in training.

The faculty in the project asked for volunteers to be in the study groups during the first weeks of class; underrepresented students were targeted, however the project was open to anyone who was interested. The groups began meeting the fourth week of classes. Groups were to meet for three hours a week in any configuration; it was later agreed that two sessions of 1 1/2 hours seemed to be the best. Group size ranged from two to six; the consensus among the LA's was that the most effective group size was three-four students. The composition of the study groups varied -- some groups were of lower level students; other groups had students with quite diverse skills and abilities. A major problem was finding rooms for the study groups to meet; it was agreed it would be handled administratively the next semester.

The Learning Assistants were paid $5 an hour for their training sessions, for three hours a week with their study groups and for one hour a week to meet with their faculty member.

The Learning Assistants were asked to keep careful attendance records of their study groups, and to keep a journal on how they approached the sessions and what the results were. The journals were collected and read monthly, with feedback given by the trainers.

The project was implemented in three disciplines: math, chemistry and biology. Each department approached the project somewhat differently, based on their needs. The LA's in chemistry were fairly advanced students who had taken a number of chemistry classes. The biology and math LA's tended to be students who had just taken one class in that discipline. The fact that the college offers considerable one-on-one tutoring for math may have impacted the participation of math students in the project; early results showed greater attendance problems in the math groups.

Focus group sessions with faculty, Learning Assistants and students in student groups toward the end of the first semester gave us good formative evaluation information. As a result of the feedback, several modifications were made for spring. The changes included starting the sessions earlier in the semester (second week), paying LA's for two hours a week preparation time, and setting up a system for assigning rooms for study groups to meet. All of these changes had a positive impact on the project.

Because of some attrition (some LA's dropped out for personal reasons, some transferred to four-year institutions) we added seven new Learning Assistants spring semester. These students attended two half-day training sessions before the semester started. The students then enrolled in Interdisciplinary 12, Introduction to Tutor Training.

In addition, both new and continuing LA's continued to meet monthly to discuss issues with the counselor/trainer. Students indicated particular interest in role playing and discussion of problems and solutions. A special session was held on communication with students of different ethnic and cultural backgrounds.

One of the major problems of the Beacon project during the fall semester was attendance -- students in the study groups would often attend only before a test or quiz, or when they were in trouble. Some approaches were tried in the spring to address this issue.

Several chemistry instructors gave students the option of Beacon study groups or another assignment; this resulted in some very large study groups that the students perceived were less effective, although the retention rates were good.

In addition, some chemistry instructors had the Learning Assistants work with students in the lab for one-three hours, and then work with the students in small groups outside the lab for two hours a week. This seemed very successful.

In all, the second semester went more smoothly than the first. Both project staff and Learning Assistants had a better understanding of the project and many of the problems had been ironed out. The project faculty in particular seemed more comfortable with the project. Some reported they were getting good feedback about their teaching effectiveness from the Learning Assistants. Some reported the additional time they spent with Learning Assistants was balanced by having to spend less time answering questions in class and during office hours.

PROJECT EVALUATION

One of the issues addressed by the project staff during the early part of the project was the kind of research that should be conducted to evaluate the success of the project. The Research Office suggested an experimental design in which students interested in participating would be randomly placed in study groups (the treatment) or in control groups. However, the project staff felt that this could be detrimental to the project, particularly since some of the students who needed the project the most might end up in the control group. It was finally agreed that focus groups would be used for feedback, and grades and retention would be evaluated.

First semester results from the focus group sessions were encouraging. The major objective of this project was to "involve commuter students in the life of the college." Responses from both LA's and students in study groups indicated that bonds were formed between students and teachers and among students, and that the students felt more "connected" to the institution.

In addition, faculty reported dramatic improvements in the grades of some of the students in the study groups. And, chemistry students consistently said they didn't think they would have made it through the semester without the sessions. Of the students in the study groups, 69 percent said the sessions were quite, very or extremely helpful and 12 percent said they were helpful. Some 16 percent said the sessions were moderately helpful and 3 percent said they were not sure.

There were some unanticipated positive outcomes: some students reported they were establishing study groups in other classes; some of the study groups planned to get together after the course was over and students reported greater sense of "competence" and "security."

A grade analysis showed that tutored students, as a group, reported lower high school GPA's than the non-tutored; however, in spite of the lower GPA's, the tutored group performed as well as the non-tutored.

At the end of the second semester, focus groups were once again conducted. Unfortunately, the sample of both the faculty and student groups was not what we had hoped for, so the results are not conclusive.

Our major evaluation of outcomes came at the end of spring semester. Grades for all students in the Beacon classes were evaluated, comparing students who had received the Beacon tutoring with students who had not. The success rate of the students with the Beacon tutoring was stunning (see pages 10-11). In every class but one, students in Beacon study groups had a higher GPA than the other students. And the success rate (percentage of students who received an A, B or C) for the Beacon students was overwhelmingly higher. Even though students self-selected into the Beacon groups, faculty strongly encouraged underrepresented and at risk students to participate. This grade analysis, plus the focus group feedback, causes us to be very optimistic about our project. Evaluation research will continue next year.

Summary of Results for Beacon Project - First Semester

Major Results of Focus Group Discussions:

* (Faculty) Learning assistants were very helpful and brought students to an improved level of course performance.

* (Faculty) The skill/motivational level of students electing to receive tutoring was diverse. The result was that some students made remarkable gains while others remained at a low performance level.

* (Learning Assistants) They reported improved skills/knowledge about the subject matter.

* (Learning Assistants) They felt more connected with the college.

* (Learning Assistants) There was a clarification and validation of likes and dislikes regarding professional matters (i.e., career choices such as teaching).

* (Learning Assistants) They felt good about themselves because they were helping others.

* (Learning Assistants) They felt good about their contribution because they believed the tutoring made a difference in academic progress.

* (Student Learners) Approximately 70 percent reported that the tutoring sessions to be either quite helpful, very helpful, or extremely helpful.

* (Student Learners) They felt a greater sense of competency.

* (Student Learners) There was more involvement with classmates leading to a better social climate and a sense of social connection.

* (Student Learners) There was a greater sense of connecting on a personal level with instructors.

* Student learners gave the highest ratings to the program, followed by learning assistants, then faculty.

continued . . .

Major Results Regarding Student Grade Performance:

* Tutored students, as a group, reported lower high school GPAs than the non-tutored.

* In spite of lower high school GPAs, the tutored group performed as well as the non-tutored group overall (i.e., no statistically significant differences in grade distributions of combined courses). In some courses, the tutored group outperformed the non-tutored.

Major Results of Student Survey (Given at Start and End of Semester:

* Both tutored and non-tutored groups lowered their academic loads over the semester. This also made more time available for study.

* Between 1% - 8% of all students reported no emotional support from family or significant others for going to college.

* The tutored group expressed more worry about being successful in the target course than the non-tutored.

* Recommendations for the course and the particular instructor were high positive for both groups (e.g., 77% - 83%).

* Students who withdrew from their courses, as a group, usually had lower high school GPAs than either tutored or non-tutored groups.

* Students who withdrew from their courses, as a group, revealed differences on the survey instrument (given at start of term) from tutored or non-tutored students who persisted:

  (Had less time for academics; course was of lower priority; received less emotional support for college from others; had more negative advance publicity about course; had less success with previous similar courses; perceived the course as requiring much more work than other courses; were more worried about their success in the course.)

Summary of Results for Beacon Project - Second Semester

Major Results of Focus Group Discussions:

(Note: Our samples in all categories, and particularly the student learners, were not adequate -- primarily because the sessions were scheduled so close to finals and the end of the year. A large proportion of the student learners were in very large chemistry groups which we have determined are not effective.)

* (Faculty) Learning Assistants appeared more content with the program this time; there were fewer complaints by LA's.

* (Faculty) Learning Assistants consistently involved student learners in active learning.

* (Faculty) While student learners were basically committed to the Beacon Project, Learning Assistants were highly committed.

* (Faculty) The program helped build student learners' confidence and helped improve retention.

* (Faculty) Tutoring resulted in freeing up office hours so that instructors could spend more time with students who needed more one-on-one contact with their instructors.

* (Faculty) There was a disappointment of not being able to recruit more students who need help in the program.

* (Learning Assistants) LA's felt attrition in the study groups was a problem and that perhaps the groups should start larger.

* (Learning Assistants) listed what they felt they had gained from the project: a greater sense of community with the college, better interpersonal and communication skills, increased knowledge of the course material and money.

* (Student Learners) All of math students felt the tutoring sessions were extremely helpful; of the chemistry students (primarily those in the large groups) 27 percent reported the sessions to be extremely helpful and 68 percent reported the sessions were moderately helpful.

* (Student Learners) Four out of five math students felt they would have dropped a full grade or more without the tutoring. Some five percent of the chemistry students felt they would have dropped a full grade and 28 percent felt they would have dropped half a grade.

* (Student Learners) Math learners rated the program 8.80 (on a scale with 10 the highest) and chemistry students rated it 5.85.

Evaluation Of Beacon Outcomes Spring 1993

The Beacon Project for this semester focused upon eight different courses. Within each course, there were students who received tutoring and those who did not. The assignment to treatment was not done randomly. Rather, students self-selected in a positive manner their treatment, or, in the case of one class, believed it to be the better of two choices. The results by course are presented in Table 1.

Table 1. Grade Outcomes For Students Who Received Tutoring And Those Who Did Not Receive Tutoring.

Course	% A	% B	% C	% D+F+WT	GPA	% Success Rate
Biology 16						
Tutored (n=8)	25.0	62.5	12.5	0.0	3.13	100.0
Not Tutored (n=82)	26.8	20.7	25.6	26.8	2.72	73.1
Chemistry 1A						
Tutored (n=25)	32.0	36.0	24.0	8.0	2.96	92.0
Not Tutored (n=107)	22.4	18.7	10.3	48.6	2.36	51.4
Chemistry 2A						
Tutored (n=91)	49.5	38.5	6.6	5.5	3.34	94.5
Not Tutored (n=22)	27.3	18.2	4.5	50.0	3.25	50.0
Chemistry 2B						
Tutored (n=12)	33.3	50.0	16.7	0.0	3.17	100.0
Not Tutored (n=23)	30.4	17.4	8.7	43.5	3.14	56.5
Chemistry 3						
Tutored (n=21)	38.1	28.6	23.8	9.5	3.05	90.5
Not Tutored (n=11)	9.1	18.2	9.1	63.6	3.0	36.4
Math 9A						
Tutored (n=6)	0.0	50.0	33.3	16.7	2.33	83.3
Not Tutored (n=29)	3.4	17.2	6.9	72.4	1.53	27.6
Math 51						
Tutored (n=7)	14.3	28.6	14.3	42.9	2.0	57.1
Not Tutored (n=28)	10.7	17.9	7.1	64.3	2.67	35.7
Math 53						
Tutored (n=5)	20.0	40.0	40.0	0.0	2.80	100.0
Not Tutored (n=26)	3.8	3.8	26.9	65.4	1.77	34.6

Conclusion

Because GPA's do not include WT's (or class drops) in the calculation, the overall success rate is a better measure of course effectiveness. The rate is simply the count of students who received grades of A, B, C, or Credit divided by all ending grade notations including WT's.

The evidence overwhelmingly favors the students who received tutoring in their respective courses. In every course this past semester, the success rate was notably higher for students who received such tutoring. The GPA's, with but one exception, were also higher for the tutored group.

Even though students were not randomly assigned to such treatments, the findings strongly suggest advocacy of implementing an institution-wide tutoring program.

SPECIAL CHALLENGES AND OUTCOMES

This section of the evaluation is based on the written and verbal reports submitted by the participating faculty as well as the on-going discussions the directors had with the Beacon Learning Assistants, some Beacon students, and the Beacon faculty. These comments will be related to the project objective of 1) building more community on campus; 2) increasing retention in the chosen classes which historically have poor retention; 3) increasing student success; and 4) building channels for success in math and science for underrepresented students. In addition, unpredictable outcomes of the project are included.

During the first semester, all Beacon Learning Assistants met with their students three hours per week outside of class. Participating students only incentives were the encouragement of their faculty and the desire for improved success. Some changes were made by the chemistry department in the second semester. In the freshman chemistry, the learning assistants worked one to three hours per week in the lab sections with students <u>and</u> met two hours per week outside of class. In the preparatory chemistry program, the students were required either to participate in a Beacon group two to three hours per week outside of class <u>or</u> do a collaborative team project. Each of these was worth one exam. As a result, the pre chemistry Beacon groups were large -- anywhere from ten to thirty students. These changes made a difference in the student comments as reflected below.

Students in all three participating areas (math, chemistry, and biology) reported greater interaction among themselves and with the Learning Assistants. Learning Assistants reported greater interaction with students and other Learning Assistants. Many commented they would never have gotten to know these students and felt these new friendships created a support system for their academic studies. Some biology 16 students continued to meet after the end of the semester. Some algebra 1 and freshman chemistry students reported they tried to schedule their next semester's classes in order to continue the study groups. The chemistry 1A learning assistants reported discussing problems in their respective chemistry 2B classes -- even though they were not studying under the same instructor.

Without any doubt, the project has resulted in building community on the campus. Aside from these student interactions, faculty from across the math and science disciplines have come together discussing problems in learning/teaching. The library and instructional staff have worked together to create study spaces for the groups. Since there are about 25 individual groups needing collaborative study space each week, this was a formidable task on a campus which guards its classroom sites zealously.

Regarding student retention and student success, many individual students have reported that the Beacon project made the difference as to whether they stayed in the class and whether they successfully completed it. The most frequent comment along that line came from reentry students (particularly women). Several algebra 1 students reported they had tried the class in the past, became discouraged, and dropped. In spring semester, they commented they not only stayed in the class but also performed significantly better. As the semester progressed, the instructor confirmed this. Similar student reports were received from biology 16 and chemistry 1A. The chemistry 2B students (organic for nursing students) gave the project very high marks and said it made all the difference as to whether they felt successful.

In both of the preparatory chemistry classes that made the collaborative project required, the retention rates in the classes were the highest we have ever seen. However, there is no way of knowing the cause. The chemistry 1A, biology 16, and algebra 1 instructors also reported they would liked to have seen other students in need participate; however, the students did not elect to do so. Work schedules, limited tutoring hours, as well as the class workload (particularly in chemistry 1A) prevented many interested students from participating. Student participation is the single most important issue for this project. In the classes in which it was not required (all math, chemistry 1A, and biology 16), attendance irregularity was reported.

Two students who are learning disabled reported successfully completing chemistry 1A and biology 16, and both feel without such a program, they would not have done so.

Our efforts to particularly target underrepresented students did not work out as well as hoped for the first year. There were few minority students enrolled in the chemistry and math classes in particular. However, in chemistry, the number of underrepresented learning assistants in fall 1993 has increased significantly. We hope this will make a difference in the upcoming year. We are simultaneously working on other strategies to make the program more appealing to these students. The project has opened up more discussion among the faculty on how to implement such strategies, so this has been an interesting spin-off (including other grants).

Lastly, there have been some unexpected outcomes. The most notable is with the success of the Learning Assistants. For the most part, they bonded with each other and some individuals were particularly successful. Of the eleven chemistry Learning Assistants, four won the highest chemistry and science awards. They reported that their "teaching" had significantly improved their own success in their next class. One was accepted at MIT, another at Stanford and won a regent's scholarship. Most of them have transferred to the four-year schools heading towards professional programs. Several of the Learning Assistants (from all areas) have reported they now plan to go into secondary or college teaching, some of whom had never considered teaching previously. One student reported she now knows she doesn't want to teach but the experience has helped her solidify her career goals.

Another of the unexpected outcomes resulted from the Learning Assistants' working in labs. Beacon and non-Beacon students reported greater understanding of their lab work. Feedback to the instructors from the Learning Assistants has resulted in lab modifications which we feel will improve learning/teaching.

Previously mentioned is improved campus communication across disciplines and with the support staff in the library. We also have added to the campus tutoring program by adding a module for our current tutoring program on tutoring in group settings. This will be shared with other colleges.

ASSOCIATE COLLEGES

Our Beacon Project received commitments from 10 community colleges in northern California to be Associate Colleges (see next page). Our first task was to ask each president to name a contact person who would be our primary contact. Information on the project was sent to this contact person from time to time.

A meeting was held at the college with representatives from the 10 associate colleges on October 9, 1992. Each college was invited to send three representatives, ideally representing the math, chemistry and biology disciplines. In addition, our own project staff and Learning Assistants attended. The full day meeting featured an overview given by project staff and a panel presentation by Learning Assistants. Discussion followed on how ARC could help the Associate Colleges implement the model. The evaluative comments from the representatives were very positive. One representative wrote: "Had a great time! I have never been to a more informative and exciting seminar! I definitely hope to be a part of establishing this project at my college."

A second meeting with associate colleges was held February 19, 1993. Despite the day bringing one of the major storms of the winter, there was a good turn out and all but one college was represented. Project directors gave an update on the Beacon project, and the project researcher gave a report on the first semester evaluation. However, the highlight of the meeting was a presentation by and discussion with Dr. Uri Treisman, whose research inspired the project. Dr. Treisman discussed his work in teaching calculus to minority students through the use of collaborate groups and also his progress in increasing the numbers of minorities who major in math and science. Dr. Treisman has appointments at both UC Berkeley and University of Texas at Austin. In the afternoon Dr. Treisman gave an address that was open to all interested faculty.

Video tapes of Treisman's morning meeting with Beacon project and associate college staff and the afternoon lecture were sent to each Associate College. In addition, the project directors volunteered to visit any college to assist in replication of the project.

At the end of the year, a letter was sent to the contact person at each associate college asking about their plans for implementing the project. Two associate colleges responded they are hoping to implement a modified version of the project: Napa Valley College and Sacramento City College. Staff from other college staff have expressed a strong interest. Despite this interest, the timing of this project is not conducive to replication. This year California community colleges are facing declining enrollments (due mainly to rising fees) and reduced budgets. Many colleges are "downsizing" and few are adding new programs.

The major cost of this project is the salaries for the Learning Assistants. We will propose that diverting some money from traditional one-on-one tutoring programs to group tutoring programs can be very cost effective, if there is adequate training and faculty support for the tutors.

Beacon Associate Colleges:

Butte Community College
Cosumnes River College
Lake Tahoe Community College
Modesto Junior College
Napa Valley College
Sacramento City College
San Joaquin Delta College
Sierra College
Solano Community College
Yuba College

PROSPECTS FOR INSTITUTIONALIZATION

The first year evaluation results relating to student success make a good case for institutionalizing this project. Continued evaluation will be conducted next year as we discuss institutionalization.

The primary cost of this project, as stated before, is the salaries for the Learning Assistants; faculty get only nominal stipends. We feel, however, funds allocated for traditional one-on-one tutoring can be stretched further by using group tutoring techniques, and we see this as a viable way to institutionalize the project. Evidence corroborating this came at the end of the year, when the director of the tutoring program indicated that funds had gone much further this past year because of the Beacon Project.

Two components are necessary however to institutionalize the project: training for the tutors and faculty willing to spend the time with the tutors. The former has been resolved on this campus by the creation of a new course, Interdisciplinary 12B, Introduction to Group Tutoring, developed by one of the Beacon trainers. This course will be required of all Learning Assistants in 1993-94 and open to other interested students.

COURSE OUTLINE

Learning Assistant/Tutor Training

Saturday Class (8 hours of instruction) August 29, 1992

Introduction of Participants
Introduction to Tutoring and Basic Concepts
Tutor and Tutee Bill of Rights
The First Session
Questioning Skills/Probing Skills
Learning Styles
Listening Skills
Panel Discussion
Mechanics of the Learning Assistant Program

Training Session No. 2: (2 hours) September 3/4

The Tutorial Plan
Structuring a Tutoring Session
Developing Guidelines
Group Tutoring & Role Playing

Training Session No. 3: (2 hours) September 24/25

Tutoring in the Physical Sciences
Discussion of Actual Group Sessions-Problems & Success Stories

Training Session No. 4 (2 hours) October 15/16

Guest Speaker on Group Dynamics
Evaluation of Learning Assistant Session (video)
Discussion of Problems Success Stories

Training Session No. 5 (2 hours) October 29/30

Guest Speaker on Test Anxiety
Study Skills
Discussion of Problems and Success Stories

Training Session No. 6 (2 hours) November 12/13

Learning Disabled Students,
Cultural Gaps and the Communication Process
Discussion of Problems and Success Stories

The Mathematics Workshop Model: An Interview with Uri Treisman

By May Garland

This is a model that reflects the belief that students, if given the necessary direction and support, can piece together their own understanding.

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Philip Uri Treisman received his Ph.D. in math and science education from the University of California-Berkeley and went on to develop a unique program there, Mathematics Workshops, to help minority students succeed and progress in mathematics. Initially, he was interested in studying why students took calculus at all. The administration refused resources for this lofty project but told him they would grant both funding and time if he studied why minorities were flunking calculus.

Treisman's findings contradicted the popular beliefs that motivation, standardized test scores, and economic background predict student success or failure. Instead, he found a correlation between success and students studying in groups. These findings led to the creation in 1977 of the Berkeley Mathematics Workshop program—a kind of "honors program" offering an intimate setting for Black and other students to work on interesting, challenging mathematics exercises together—which dramatically increased the success of minority students in calculus. He is currently a math professor at the University of Texas-Austin where a similar model, the Emerging Scholars Program, teaches math to freshmen. Treisman won a prestigious $285,000 MacArthur Fellowship grant in June of 1992 to be used, over a 5-year period, to continue his work.

May Garland (M. G.): Let me start our conversation by congratulating you on receiving the MacArthur Foundation Fellowship. Certainly your work with minority students and mathematics helped earn you that honor, and that's the topic of our interview. Tell us about your program and how it developed at Berkeley.

Uri Treisman (U. T.): My work began in 1974 while I was developing a new TA training program at Berkeley. I began wondering about student learning, particularly in mathematics. Did they use their textbooks? Did they talk to other students about working math problems? What did they do when they got stuck on a problem? These questions eventually led to a systematic comparison of two groups of students in Berkeley's freshman calculus program—one African Americans and one Asians. My study exposed as myth several accepted reasons for academic failure of minority students at Berkeley. Contrary to popular opinion, these students were highly motivated to succeed; their families were highly supportive of education; most of them were well-prepared academically; and performance differences were not a function of income. However, what I did find was that many of the African-American students studied in isolation, and that their academic and personal lives were quite separate. In contrast, the Asian-American students frequently formed informal "study-groups" to share mathematical knowledge and to check out their understanding of what was required by their professors and by the University. With these insights my colleagues and I began the Mathematics Workshop program.

The model that came out of this work created for students a lush ground, providing them with extraordinarily rich mathematical material and a welcoming community structure built around academics. It offered the students plenty of opportunities for self-correction and an environment in which they could safely make public their understandings. The discussion was shaped by a careful selection of mathematical problems and by good coaching. This is a model that

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reflects the belief that students, if given the necessary direction and support, can piece together their own understanding; at heart it trusts the students to master the material.

We approached the project in a spirit of empirical experimentation, and that's our same spirit today! We continue to work with a small number of core ideas and lots of customization.

M. G.: What were the major influences in the development of the Mathematics Workshops?

U. T.: Actually, the results of our own research evaluation studies of these projects caused us to make substantial changes. We discovered that many of our apparent successes, in fact, were failures. Connected to this was the great involvement of Leon Hinkin, a math professor and many times department chair at Berkeley, who taught me to search for my victims: to try to understand something about the students you fail to serve. This has been a very important strategy. Another important influence was my interaction with colleagues in historically Black colleges, especially Xavier. Discussions with colleagues there early in the development of this work gave me important information. In particular, they explained that the tendency toward isolationism is not a characteristic of the students but is a characteristic of the institution. It is not a failing of the students; it is their reaction to a hostile institutional climate. Those are the principle influences, plus my own education, spending time on a Kibbutz in Israel, and being part of the 60s.

M. G.: That rich, interactive environment that you described earlier is at the implementation phase of your programs. Let's back up now and explore the core ideas that inform the workshops and that predict their success.

U. T.: The first idea and the easiest to see, but not necessarily the most important, involves group work or cooperative learning along with community building. Ethnographic studies of ignored students, side-stepped students, and students that experience difficulty showed that two things tended to isolate them. The first was study patterns. These students typically maintained a separation between their academic life and their personal and work lives. They drove to school, took courses, went home, and did their homework. School work was not in any way part of their "other" life. I saw that these students were not able, in fact, to figure out what the real enterprise was about. They had misconceptions about certain items in the curriculum which were never challenged. A second parallel feature was a kind of marginalization that was inadvertently fostered by the way campuses addressed the problem of these students "so called" underpreparation or at-risk status. If the students were minorities, the campus would usually speak to these students as members of their ethnic group. They also tended to focus the students' community around ethnicity rather than around shared intellectual interests and common professional goals. It struck me that in addressing what we now call multicultural issues, the real task was to help these students learn to live in several communities, which minority professionals must do in this country. I wanted to provide for these students a multicultural community that was focused on shared intellectual interests and common professional goals. And I also wanted it to serve an individual learning function which was to be a source of continual disequillibration: a repeated challenge to their knowledge base. So cooperative learning together with community building is a central feature of these programs.

The tendency toward isolationism is not a characteristic of the students but is a characteristic of the institution.

Demarginalization at the management level is a second program feature, related to the first feature. For political reasons, in the 60s for minorities and in the 80s for underprepared students, college administrators, not the regular faculty, took responsibility for the welfare of these students. In many cases individuals with relatively little status have been hired to serve the underprepared. They are poorly paid, frequently part-timers, and disconnected from the real curriculum of the institution. These services and this constituency are not centrally connected to faculty life and departmental life. By demarginalization I mean centering these programs in academic departments and having them managed by mainstream senior faculty. That doesn't mean that student affairs personnel and junior faculty are not involved, but principally the leadership comes from mainstream senior faculty, not the administration.

The third feature has to do with addressing structural impediments. In the early days of our work, we found, very painfully, that our apparent successes really were not sustained when we looked 5 years down the road at the transcripts of the students we had served. The sources of our failure were very subtle. First, we found that certain forces, like pre-calculus in our institution and the arithmetic and algebra courses at state institutions, in fact, did not work. A meaningful proportion of the students would get "As," but, when you looked several years down the road, virtually none of them had survived in the field that they were initially interested in pursuing. They learned the content of these courses. They learned the skills in the developmental courses, but no one checked to see if the students who mastered those courses ever entered mainstream majors and excelled in them. And this is especially true in mathematics. For example, large numbers of students take intermediate algebra in community colleges, planning to enter technical careers, but very few of them (fewer than 5%) ever pass first-semester calculus with a "B" or better.

M. G.: Is that because they still don't feel confident even though they mastered intermediate algebra?

U. T.: No. It has nothing to do with confidence, except that the faculty may instill false confidence. The character of the curricular structural impediments is complex. In cases like pre-calculus the problems are essentially ones of coherence of the curriculum and its link or disconnectedness with what comes next. In college pre-calculus, the idea is that students didn't grasp the concepts of pre-calculus in high school; so what they didn't get in a year of high school, we simply say louder and faster and think that maybe in 40 hours they will get it this time. The language used in pre-calculus is different from that used in calculus courses. The level of difficulty of problems is different. The character of the problems is different. This creates a curricular structural impediment due to the lack of coherence in teaching approaches between college pre-calculus and calculus: courses that really don't work, that by design limit advancement.

There are also other structural impediments. Advising is one. Students spend time getting advice which really is not based on real studies about the diverse ways in which successful students learn. Rules such as study 2 hours for every class hour have no empirical base. For minority students and for students who have little history in higher education this advice is misdirected. In my program advising is integrated with the mathematics workshop, and it is based on the needs of individual courses and students.

Another core idea is that faculty and departmental cultures may need to change. Once the college population shifts and you have large numbers of nontraditional students, then it is critical that this work become part of the department's main mission. That work doesn't focus on improvement of teaching, which is what administrators look for, but it raises questions of the reallocation of faculty energy: questions of curriculum and of who teaches what. These are questions of the collective responsibility of the faculty. Successful efforts to teach minorities in institutions with large numbers of minorities or large numbers of adult students have to address the central purpose of department life and functioning.

Programs that are successful with minority students are in congruence with institutional history and mission. One of the characteristics that is disturbing about developmental programs, and especially minority programs, is their isomorphism. They are identical across campuses between institutions that have very little else in common. One of the most important features of my programs is that they are congruent with institutional missions and histories and goals. At Berkeley the programs that I run are truly elitist because the students that come to Berkeley come there because of the elitism. At community colleges these programs tend to be organized around upward job mobility because that is the principal interest of the student and the principal purpose of the institution. On other community college campuses these programs focus on transfer. In some of the comprehensive colleges they are organized around teaching and teaching careers.

M. G.: Has there been a typical problem that institutions encounter in installing the program you developed?

U. T.: Yes, a common error was to look at one of the programs we got going and to pick only a few of its dimensions and try to create a program. For example, people would pick cooperative learning or having students work hard problems or raising expectations or increased faculty involvement or demarginalization of our work with minority students. When, in fact, all of these are necessary but not sufficient individual conditions for success.

M. G.: What is the target population for your programs and who identifies that group?

U. T.: In the beginning, the idea was to create a community that was multiracial: a majority who are minority. The idea was to choose the easy cases to establish a dramatic success and also to get a sense of what was possible. In more than 90% of the 150 programs at institutions around the country the strategy was to create a small, highly successful program that would produce a cadre of students who would become leaders in the subsequent generations of the program. Generally, the idea was to find strong minority students who were performing poorly. So the program's traditionally have included about half to two-thirds minority freshmen and then blue collar and rural white and some Asian students.

The important feature of counseling, advising, and student support is that they are integrated with instruction.

M. G.: So, is that the approach you use when an institution expresses an interest in one of your programs? You would have them identify a small group and work with them?

U. T.: Yes, and the reason is that there are very few mathematics departments in the U.S. that have more than one to two Black or Hispanic math majors with C or better averages. One reaction to this approach is "Well, you are just taking kids who would succeed anyway." But in fact, the statistics show clearly that virtually no minority students succeed in math, chemistry, or physics. So my idea was to create a dozen or two dozen such students and then build out. It is very important in most cases that one start slowly. Not only do you learn how to do it, but also you build faculty support, figure out the course, and have time for the adjustments.

M. G.: Have you seen any empirical studies suggesting that this model is successful?

U. T.: Oh, yes. A recent doctoral dissertation by Martin Bonsangue at Claremont Graduate School studied the Cal Poly Ponoma program and its expansion over 5 years. This program started with a small elite group and now serves a very large number—several hundred—ethnic minority students a year. There are some programs like the one at City College of New York (CCNY) that now have essentially transferred all sections of certain courses to this model for all students.

M. G.: Your mention of Cal Poly and CCNY leads me to ask you to give the readers several examples of programs elsewhere in the country that have successful mathematics workshops.

U. T.: Sure. Let me continue with a little more detail about the Cal Poly (California State Polytechnic University) program. The Academic Excellence Workshops are jointly run by the College of Science and the College of Engineering. Twice weekly workshops are linked to the regular freshman and sophomore mathematics, physics, and chemistry courses and one engineering course: Engineering Statics. The workshops are voluntary and carry no academic credit. However, they are widely attended by the minority students on campus. In part, this is because the program provides students with aggressive academic advising, preferred enrollment in courses, a place to study (which has special importance on a commuter campus), and a strong sense of community.

The program serves more than 100 minority freshmen a year. Faculty members oversee all curricular aspects of the program. As I mentioned earlier, Martin's study of minority workshop students at Pomona from 1986-1991 found that workshop students scored on average six-tenths of a grade point above their classmates in calculus, with the change being related to the higher proportion of workshop students receiving grades of B+ or better and the smaller proportion receiving grades of D or lower. The study also found that women in the workshop achieved the highest grades among all ethnic or gender groups in calculus.

In Texas, the Emerging Scholars Program (ESP) at the University of Texas (UT)-Austin was piloted in Fall 1988 and represents a move toward greater involvement of faculty members in the creation and management of such programs. The program is jointly managed by the math department and by the Office of the Dean.

The department is responsible for the mathematical integrity of the materials

continued on page 18

continued from page 16

and the supervision of the graduate TAs who run the ESP sections on a day-to-day basis. The Dean's office provides a coordinator who assists the faculty in the management of the program's non-academic tasks such as recruitment and scheduling.

ESP is part of the structure of the regular calculus program. The heart of the program is a highly enriched discussion section attached to a standard calculus lecture. Students attend 3 hours of lecture per week and 6 hours of ESP. For their work in ESP, students receive two additional hours of academic credit.

The results of the program have been dramatic. Over 85% of ESP students routinely earn As or Bs in calculus. To place this in an historical context, fewer than one third of non-ESP African-American and Hispanic students who took calculus in the last 5 years received As or Bs. Only half of those with Math SATs of 600+ made such grades. In contrast, 90% of the minority students who have participated in ESP have earned grades of A or B.

I could go on with programs at Wayne State, Rutgers, the University of Kentucky, and other places. One community college I should mention is Glendale Community College in Glendale California which reports very encouraging results in physics and calculus classes.

M. G.: I think that I am getting a clearer picture of the workshops and how they fit on a campus. Explain the elements of counseling, advising, and student support that are part of your programs.

U. T.: The important feature of counseling, advising, and student support is that they are integrated with instruction. They take place in the academic setting itself. Most of the Emerging Scholars Programs are intensified sections of regular courses. So they are part of the student's regular, credit-bearing load. Advisors, counselors, and other support staff are in these sessions, not off in a learning or counseling center. They are part of the course itself. So you have individuals who might do counseling in their own offices but who also show up in these sessions.

M. G.: Are students registered in the intensive sessions that you hold outside of class?

U. T.: It used to be in the early days that these were adjunct programs, not any more. Mostly they are intensified sections of a particular course, which are on the students' transcripts. Students get one or more credits for participating in the attached intensified sections. In this kind of intensive program, typically the students are encouraged to take a minimum full-time load: fewer classes, studied more intensively. And the program operates with some of the features of a cluster program. These students will not only be in their math class together but also in some other classes together. Teaching assistants or undergraduate peer teachers are engaged in regular monitoring of the students. They meet periodically to talk about the students. Also they are asked to probe because we know the sorts of things that get in the way. In certain of these programs if you are absent for 2 days or even if you are missing for 1 day, there will be a discussion about who's missing. And the assumption is made that you are sick, although no one is assigned to go find you. It's not on a formal level, yet the advising and counseling is an integral part of the community building. Students are encouraged somewhat systematically to take responsibility for each other. There is lots of group work so students really do have to rely on each other as well. What struck me in the beginning was that students saw tutors the day before an exam and advisors the day after the exam. What I have tried to do is to bring the tutors and the advisors into the intensive session itself, so that they are recognizable people connected to a class as opposed to just a person in an office.

M. G.: Returning adult students have lots of responsibilities besides going to school. What about students who can't attend class consistently or who have limited time outside of class to spend with their studies? Do you deal with that issue in any of the aspects of your programs?

U. T.: This is an important question but it suggests the wrong kinds of answers. Community colleges, comprehensive colleges, and 4-year institutions have admissions policies that are really more about marketing than about educational service. It is critical that universities and special programs figure out and study who they serve, who their beneficiaries are, what the real costs are to the institution, and what the costs are for the student to succeed. So at some institutions some hot-shot recruiter will go out and tell these people who are working 40 hours a week that they can continue to work 40 hours a week, raise three kids, take a class in the evening, and become an engineer. Well, those recruiters should have their kneecaps broken, or they should be forced to name five successes.

Now, in community colleges such as Seattle Central, Glendale, and Santa Barbara (places that have been working with these models), typically these programs serve individuals who have the time to interact with other individuals. The program works best for students who are ready to join a community of people with so-called shared intellectual interests and common professional goals. It turns out that many people in community colleges are above the age of 30, and going to college is an important part of their work life. These programs appeal primarily to that audience: people who are taking some time and want to be immersed in their learning; those who have focused goals. These programs serve some people well and not others. They are not so effective at community colleges, for example, with high school kids who were not eligible for 4-year schools and are very unfocused.

M. G.: Does the approach that you use in your programs work well with students who traditionally have had difficulty with mathematics?

U. T.: It depends upon what institution

continued on page 20

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continued from page 18

you are in. In community colleges I would say the answer is "yes" in mathematics because we have learned, and many teachers have learned, that students do badly in things that they have already failed at a few times. In the curricular reconstruction part of the program we've learned not to give people review courses and not to package the material in ways that are reminiscent of early failures. So curricular reorganization involves high theater as well as curricular integrity. And I think we are pretty good at helping students learn to separate their prior experiences from the tasks at hand. I think we have learned a lot from the women's movement in this regard. Students in many of the programs that I have seen come out with the idea that they have been victimized. You see these decreasing waves of anger over time at the fact that math, that is so pleasurable and beautiful, was denied them for whatever reasons when they were young. Our challenge is to help people compensate for years of uninvolvement. Math is very much like art in that, although it requires a lifetime of skills acquisition, the skills acquisition is not the purpose. The purpose is to make things and to communicate things and to solve problems, just as in art. But it's very hard to start as a 35-year-old if you haven't done any math your whole life. You can end up liking it and learn some of it, but you must be willing to give time to it. That's the hard part—not the anxiety around past math experiences but the reality of the necessary time investment.

M. G.: Can your approach be used with other mathematics courses and/or other disciplines?

U. T.: We know how to do this for calculus and we are learning how to do it for pre-calculus. We are now working on a large scale with the courses that precede pre-calculus; this involves fundamental curriculum redevelopment. The model applied to fields other than math will help students avoid failure when it is well implemented. What it will not do is produce students who are successful. To do that, as people have done it, requires a massive amount of work. Successful adaptations in biology, such as the one at CCNY, and in physics at Dickinson College have required the difficult task of curricular examination. They have reorganized the curriculum to make it an effective route into whatever field they are addressing. So you can't just do workshops in chemistry and expect the students to do well. What you can do with this model, as we have seen in various cases, is fundamental curriculum redevelopment.

M. G.: What structural changes need to occur on a campus for your programs to be successful?

U. T.: You don't need to make structural changes on a campus to create a program, but you do need to make structural changes to have a program grow and flourish. These involve mostly changes within a department and are facilitated by changes in departmental review. I think it is very important that faculty work in these programs as a part of their regular, evaluated professional work. Large numbers of faculty really care about minority students, but the tenure and promotion system offers no rewards for working with them. Changes may involve different approaches to faculty leadership and chairmanship of departments: holding the entire department accountable for doing its part to serve the multicultural interest of the institution. It may also mean changing the way faculty relate to student services and the academics.

M. G.: Our readers would be interested in having you discuss how relations between different areas on campus might change.

U. T.: In many institutions faculty links to student support services are minimal. Support staff tend to be involved in an advisory capacity and developmental faculty generally are not the most highly regarded people in their departments. There are of course some wonderful exceptions to this statement. In these programs, individuals who used to be drop-in tutors in learning centers now are hired jointly by the department and the learning center and then are assigned to work under the faculty members' direction in some of these intensive sections. The tutors then meet once a week with their learning center supervisor, usually in a case study model, with shared responsibility for the students in a particular section. There must be close connections with advising and institutional research because at a research institution these programs need to have a research component in order to have congruence with the institutional mission. These programs become laboratories for educational research. This type of connection between programs eliminates the marginalization.

M. G.: Can the mathematics workshops be integrated with other campus academic support services?

U. T.: There are lots of examples of this. The program at Cal Poly - Pomona that I described earlier is a very good one. Such an integration is easiest with entities like minority engineering programs. These programs tend to serve as the academic support part of those professional school programs. There is an increasing amount of cooperative activity with learning centers—especially in sharing tutors, jointly hiring tutors, training intensive section staff—and a very important part of this collaborative effort is that, in many cases, staff of the workshops have eventually worked in learning centers. Certainly this has been true at Berkeley for many years.

M. G.: Are faculty modifying their teaching style to facilitate student learning in the programs?

U. T.: Oh, yes. Many faculty who become involved in these programs find they are a source of personal rejuvenation. They are using alternative teaching modes. Less lecturing is a typical change. More student groups are used. More time is spent out of class constructing good problems

continued on page 22

continued from page 20

for students to solve. As a spin off, many of them also become involved in working with K-12 education. In the beginning you get faculty who are looking for a way to work on that which they care about. But you also get the "so called" responsible member of the department who believes that it is part of their mission to take their turn and work on these things. And many of these people are influenced for the first time by alternative ways of doing things. And that comes about by seeing students in a different light and participating in a broader community where there is discussion about teaching. But now teaching is only a little piece. It's really education that they become involved in. In most of the courses that we are concerned with curriculum becomes a collective responsibility of departments, not a personal responsibility of teachers.

M. G.: As the targeted students perform better, what if any changes occur within a mathematics department or elsewhere on campus?

U. T.: At UT-Austin, until about 10 years ago, there were 500 math majors and fewer than 10 were ethnic minorities. Now about a quarter of all math majors are ethnic minorities. Recently I taught the Galois theory, which is quite an advanced course usually taken by graduate students. In the class I had 15 students and 12 of them were Black and Hispanic. After working with students who have been involved in these programs faculty members begin to expect that ethnic minority students in their classes are going to work hard and will be class leaders. It changes the culture and expectations, and it enables people who have always cared about this stuff to come in and work on it. So at a place like UT-Austin you can "feel" the change.

M. G.: Your work sounds exciting for students and for faculty. Do you have some closing words for our readers?

U. T.: I think that educational reform and restructuring is coming and that people whose primary work is serving students to develop their skills are likely to be the first victims of reform. It is very important for those people to forge connections with academic departments. In most places faculty will be resistent. I think people in development studies whose real commitment is to students (and that's what this is all about) are going to have to go more than half of the way and find faculty allies throughout campus. I think partnerships will be critically important in the next decade.