Academic Excellence Workshops – Developing an Academic Community[1]

M. Catharine (Kay) Hudspeth

An Overview

An Academic Excellence Workshop Session

Imagine a group of historically under-represented ethnic students meeting voluntarily 4 hours each week to discuss engineering mechanics (or mathematics or chemistry or physics). They usually are working in self-selected groups of 3 or 4. As the term progresses, they have become quite comfortable with each other and are not hesitant to move around the room to check on how another group is approaching a problem. Friendly rivalries develop, and they will good-humoredly challenge each other's solutions. To break the routine, the facilitator will sometimes divide the group into two teams. Each team will then compete to solve a "challenge" problem--one that requires a higher degree of sophistication. They will work intensely and with great enthusiasm in hopes of becoming the first team to complete the problem correctly. Many times when the workshop period is over, students remain to complete the solution of a problem or to conclude a discussion of some technical point. Frequently, they will arrange to study together at additional times, especially to review for an examination. Thus the students not only master the material with a higher level of understanding and learn how to communicate technical material, they also experience the rewards of membership in an academic community. Subsequent terms will find clusters of these students enrolled in common sections of more advanced coursework. What creates this enthusiasm for learning that we too seldom see? Or perhaps a better question is: "What inhibits students from pursuing this type of inquiry?"

Academic Excellence Workshops, A Closer Look

A typical Academic Excellence Workshop can range in size from 7-28 with an average of 12 students, all enrolled in designated sections of the course (mathematics, chemistry, physics, or engineering mechanics). Homework and readings are to be attempted prior to the workshop. These students voluntarily (for credit or not) meet twice a week for 2-hour sessions to work selected problems *at least as difficult as* the homework, under the guidance of a facilitator who prepares the worksheets after consultation with the lecture professor. The facilitator guides the students to work in small groups to solve the problems and to discuss the correctness of the steps taken and the accuracy of the answer. Specifically, the facilitator's primary function is to create an atmosphere where the students feel secure in asking questions, in making mistakes, and in learning from each other. Ideally, the sources of information become the other students rather than the facilitator.

The facilitators are critical because they have primary responsibility for conducting the workshop. They are all undergraduates, mostly from the target ethnic groups themselves and, now that the program has been in place for several years, frequently "workshop alumni." The most successful display considerable ingenuity in keeping the workshop stimulating and lively, varying the workshop format by embedding problems in humorous settings, and by conducting contests, pre-exam preparation, post-exam parties, and so on. Their goal is to establish a welcoming camaraderie among the participants while expecting intellectual rigor and collaborative effort.

In order to be successful as a facilitator, candidates are well grounded in the subject area to be facilitated, usually having completed work at least two quarters beyond the workshop course. They must also be able to communicate effectively and excel in community building. More than once, candidates with better academic records are passed over in favor of others who are more aware of and empathetic with student needs. Clearly the selecting and training of facilitators is an important part of the program.

Since the sessions are designed to coach the students in learning how to learn, the facilitator, whenever

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[1]Some portions of this article have previously been published in "Developing an Academic Community Through Academic Excellence Workshops," and in "Academic Excellence Workshops: New Directions or New Beginnings for Equity Education" (with P. Hiemenz).

possible, does *not* directly answer a student's question; either the student is asked another question to guide him/her to greater insight *or* the student is referred to another student. The facilitator models the behavior of the "ideal" student, by asking those questions which a superior student would ask of him/ herself. Thus the facilitator needs not only to have mastered the content, but must be able to understand the conceptual challenges of the material from the participants' perspective. Only when several students are unable to resolve the question does the facilitator step in. The following types of questions are routinely used by facilitators:

Why did you do that?
Is this problem similar to any others you have worked? How?
What do you have in your notes that might relate to this problem?
What makes this problem different?
How do you know your answer/procedure is correct?
What do *you* think?
Is there another way to do this?
How are these problems related, or are they?
What other versions are there of this type of problem?
How will the answer change if this quantity increases (decreases)?

The environment that the facilitator strives to create is one of mutual support and friendly competitiveness. The students move from problems similar to the homework to those much more challenging, more difficult than ones they are likely to encounter on tests. The problems selected for the worksheet are deliberately chosen to require the students to synthesize from homework and class and to apply that knowledge in a new setting. Through this graded structure of the worksheet, the best student is challenged while those less quick have the support of others to clarify concepts and to test their understanding. Thus the difficulty of the problems forces students to collaborate. For some students this is the first time that cooperative learning has been encouraged and rewarded.

The students are challenged to articulate exactly *what* the underlying structure of a problem is and how to apply it. The students thus are forced to engage in *active* learning, rather than memorizing an algorithm to apply by rote. The students are encouraged to debate among themselves about tactics, procedures, and results. They learn from each other when there are several methods available and discuss how they know when each is appropriate. No matter how strong (or weak), no student is permitted to avoid this dialogue with others. The student who finishes a problem quickly is encouraged to explain his/her approach to those with questions. *All* must engage in discussions about the content. They learn to use the technical vocabulary and to correct each other's errors. When they examine each other's work, they learn that the process of working out a problem on paper is a form of communication; they learn that there is a standard language for technical material.

There are several elements critical for a workshop program to produce the desired results:

-The students must be challenged with novel, inventive problems that require a synthesis of concepts taught.
-The structure must require all students' active participation; specifically, it should preclude one or two doing the work for the rest.
-The evaluation of student work must focus on the positive results and provide guidance on how to eliminate the unproductive strategies so that all aspects of the students' efforts lead to a more full understanding of how to approach and solve problems.
-The workshop content *must* reinforce that of the course for which it is offered; that is, there needs to be close coordination between the lecturer and the workshop facilitator.
-The lecturer should *not* be the facilitator unless the workshop is an integral part of the class and serves all students.

In most instances campuses have chosen to use the workshop model for supplemental activities parallel to a given course rather than to modify the structure of the classroom instruction itself. Some faculty, however,

have chosen to structure much, if not all, of their "lecture" using collaborative learning. Some campuses are building collaborative learning into "recitation" or "lab" meetings that are a part of the course. The mechanism for providing the structured collaborative learning opportunity to under-represented students is irrelevant as long as the positive and challenging atmosphere is retained. They must be in the majority, however, if they are to gain the full benefit from the experience.

Why Workshops: Non-academic Factors

Dr. Uri Treisman developed the workshop structure at UC Berkeley after closely examining the sharp difference in performance between Asian and Afro-American/Hispanic students in calculus.[2] By thoroughly immersing himself in the lives of both groups, Treisman observed that the Asian students had fully integrated the academic and the social so that studying together was an integral component of their day. By contrast, the Afro-American and Hispanic students, however rich their social lives, tended to be academic loners. The difference in behavior can be discussed in two respects: *collaboration* and *connectedness.*

Collaboration is the cornerstone of sophisticated intellectual accomplishment. In part, this comes from explaining concepts in detail to others and in part by being challenged by another's probing questions. Whether we speak in terms of "study buddies" or "cooperative learning," the essence is the same: collaboration between learners helps keep all more actively involved and decreases passivity and complacency, thereby maximizing understanding.

The premise that the workshop problems are to be solved through group effort requires the use of more challenging problems on the worksheets. Several advantages follow from this dynamic. Demanding problems elicit genuine debate about the principles and strategies required to solve them. Analytic and synthetic thinking can be consciously modeled through the facilitated group effort applied to difficult problems. Second, the awareness that the group successfully solved some really demanding problems builds self-confidence and removes any hint of remediation which sometimes taints minority programs. Finally, the student is more likely to take a difficult exam in stride if his/ her preparation routinely includes difficult problems.

Connectedness arises from the workshop's place in the larger setting of the equity programs. In the workshop, successful academic strategies are taught through group work in the context of a specific course. Outside the workshop, the common professional goals and curricula continue to bring these same individuals together. The MEP study centers should serve as hubs to support this sense of community. In this way, the workshop strategies can be utilized long after the student has completed the course for which the workshops are offered. A sense of community pervades the broader equity programs and the individual workshops: a sense of belonging, of security, and of trust.

Why is connection to a community so important for historically under-represented students, especially in technical majors? First of all, it is precisely because they are underrepresented. It is not uncommon for these students to find themselves the only member of their ethnic group in a class; some perceive themselves to be the only person of their ethnicity in a major until they join these programs. In contrast to the situation just described, some of these students have never attended a school that was not composed primarily of students of their own ethnicity. It is generally recognized that all students, regardless of ethnicity, experience a degree of culture shock on transition to the university. How much more intense this is for the underrepresented student!

A second consideration is the intrinsic difficulty of the subject matter required in technical majors. A student may have sailed through high school (or community college) earning good grades with relatively little effort. Now in a technical major at a university, the students frequently find that the strategies that worked in high school are woefully inadequate for more intense college work. The isolated student may interpret the difficulty encountered as an indication of his/her unsuitability for the chosen major. The well-meaning professor says, "ask questions," but to the unconnected student this is just another burden rather than helpful advice. The paucity of role models at home and in the professions compounds the self-doubt.

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[2] Treisman, 1985.

By being connected to an ethnic community in the same field, several elements of this scenario are alleviated. Of special value to the tentative student are the undergraduate facilitators, many of whom have confronted these same issues very recently in their own lives. Above all, the student discovers that being questioned and challenged are integral parts of university life and are not personal or ethnic attacks.

Why Workshops: Pedagogical Issues

There are two levels of teaching for which faculty are responsible: the first, which all recognize, is the technical content, the second is the *process* by which students *learn* that content. Professors give homework for the students to practice their mastery of the content, and judge this progress through quizzes and tests. Ordinarily, however, faculty provide little structure to guide the students to develop their *learning* strategies, and test their mastery only indirectly in so far as tests reflect the *application* of these strategies to the content.

While faculty *can* more consciously model in detail their problem-solving strategies in lectures and can create a structured opportunity for the students to develop their learning strategies through collaborative learning, most often this instruction comes outside of class. By structuring discussion among students about technical content, facilitators can help them develop a network of peers and a mode of communication through which they may continue to mature technically. In order to understand a concept thoroughly, one must be willing to test that understanding by applying it in a variety of settings and to articulate the distinctions and similarities among them. By sharing insights, by learning whether errors were errors of mechanics or of understanding, by sharing different approaches to the material, students not only master the content, but they teach each other *how* to learn.

The motivation for extensive homework assignments is to have the students spend considerable time practicing; however, practice in and of itself guarantees no positive results. One does not improve if the practice is unguided, no matter how many hours are invested. The greatest increase in understanding occurs when we explore new approaches, employ different techniques, and reflect on the results. That is, in order to learn the most, we must increase the risk of being wrong, then analyze the outcome. A woman or minority student may not be willing to take those risks if he/she does not feel the support of a community of learners or have the audience with whom to refine his/her thinking. No student will risk appearing incompetent in a group in which he/she feels excluded. Therefore, we need diverse ways to nurture and mold an effective academic community for those who are highly motivated yet who in the past have *not* had such an opportunity. In this way, we can give students knowledge about the educational and technical culture and the transitions required for a successful adjustment from high school or community college.

Specifically, then, we assume that the traits of an "ideal" technical student *can* be developed in those less experienced, and further, we assume it is our responsibility to do so. The professor, the program staff, and the facilitators are the ones who establishes the atmosphere of inclusion or exclusion for the students. Thus we professionals strive to foster collaborative learning among workshop students so that they may learn in the same way that *we* continue to learn--from our peers.

Distinguishing a Workshop from Supplemental Instruction

There are several differences between an academic excellence workshop (AEW) and supplemental instruction (SI). While both are led by peers, the facilitator in an AEW meets weekly with the professor and does not attend the lecture; in SI the leader attends the lecture and does not meet regularly with the professor. Thus the AEW facilitator role places more responsibility for the course on the student. By meeting weekly with the professor (and perhaps by having taken a course with the professor) the facilitator is expected to interpret the professor's expectations rather than to coach the student on how to take notes on a specific topic or to re-explain "what the lecture meant." The students in an AEW are expected to check with peers or to meet with the lecturer first if there is difficulty in understanding the material; only then does the facilitator step in with an alternate explanation. Thus the primary function of the AEW is to coach the students on how to become effective learners and secondarily on mastering the particular material. When a workshop is most effective, the students continue in subsequent terms to apply the techniques learned in the workshop to current coursework.

Overview of Results

The impact of the workshops are several: of course improved grades in the targeted course are a short-term result; the students have also been empowered to learn independently of special tutoring and realize that they *are* capable of excellent work; more importantly, the students have established their own academic community they will retain for their remaining undergraduate studies.

The Workshops *continue* to affect the students' academic performance in subsequent courses. They have learned to value the peer network so that they schedule their future coursework with peers in order to form their own independent study groups where they continue to employ the strategies that they learned in the workshop: to question results, to clarify concepts, to encourage each other to a higher level of mastery of the material. They have also discovered that most faculty welcome questions and student involvement so they are more assertive in their classes. More importantly, however, they have experienced the excitement of quality academic performance and know how to work with others to create that same level of intellectual involvement in their other courses. The workshop teaches the students how to learn, enabling them to be more independent, more sophisticated learners.

When undergraduates are selected to be workshop facilitators special benefits accrue. While facilitators can be faculty, other professional educators, graduate students, or upper-division undergraduates, each campus needs to evaluate the benefits and liabilities of each. At many schools, undergraduates are chosen, with the full awareness that more intensive supervision is required on the part of the program coordinator and the faculty, but the added benefit is the faculty mentoring of the facilitators. Most are considering a doctorate and some are considering a teaching career. With the growing need for American-educated students to pursue graduate engineering degrees, faculty need to be alert to these means by which they can encourage students to consider graduate study. Further, by guiding the facilitators in their work, faculty give them the opportunity to see the personal rewards to teaching.

With some reflection, program directors and technical faculty *can* find ways to create a structure through which students can develop their own problem-solving strategies and become independent learners. Minority students are ready to take advantage of any opportunity that provides structured guidance in a manner that assumes they *desire* to learn.

The Supporting Structure

Key Staff

While many programs may not choose to organize the staff supporting the facilitators exactly as outlined below, it is critical that the functions given be managed in order to have a program that supports *excellence* among the students.

The Developer Because the program strives to reinforce the learning in the specific disciplines, a faculty member is designated in each department to serve as a liaison and as a resource for the facilitators. We call such a faculty member the "developer" for the discipline, a title that reflects the crucial role played by faculty members in initiating and sustaining the workshop. These developers for the discipline work closely with the facilitators and coordinate faculty and department support. To sustain the academic integrity of the program, they always participate in the facilitator interviews and frequently recommend candidates. They continue to work as resource persons with the facilitators, providing reference material, suggesting strategies and even occasionally coming to the rescue when facilitators feel overwhelmed. Within their respective departments, the developers explain and promote workshops among faculty.

Large technical programs offer some unique challenges to maintaining focus in the workshop. In a given term, it is not unusual to find 6-10 sections offered of a basic course for which the program conducts a workshop. Unsynchronized lecture and test schedules are inevitable with many instructors, so effective group study means block registration of students into one or two of the possible sections. The department chair, the developer, and the designated lecture instructors work cooperatively to achieve two goals: to register participants properly and to support the facilitators. Throughout the term, the developer fosters the weekly discussion between the facilitator and the designated lecturers.

The Lecture Faculty The lecture instructor plays a different but equally vital role in the workshop structure sketched in Figure 1 by agreeing to meet weekly with the facilitators. Otherwise, the professor conducts the course as usual. Instructors are enlisted because they have reputations for approachability and thoroughness. For their cooperation, these participating faculty receive information from the facilitator about troublesome points and the guarantee of a student core who are keeping up with the material, working problems, and developing the self-confidence to participate actively in the class. Several instructors have commented positively on the intellectual liveliness that the workshop participants create in a class.

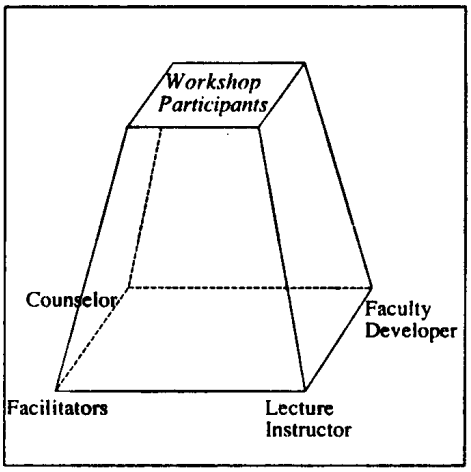

Figure 1

The Counselor The fourth element in the base of Figure 1 is a counselor, a staff member of MEP, whose duties include routine visits to workshop sessions. The facilitators, who rapidly get personally acquainted with participants, are able to alert the counselor if anyone in the group appears to be having difficulties, so that timely intervention is possible. This intervention occurs inconspicuously during the regular informal chats with counselor. The counselor is also able to keep a watchful eye on the facilitators who, as undergraduates themselves, are subject to the same stresses as the workshop participants.

The counselor thus serves as an additional resource person for the facilitator, covering a different area of need than the developer. Considering the various interactions among the elements represented in Figure 1, it is apparent that the base upon which participants depend is well reinforced indeed.

Training of Facilitators

Undoubtedly the most challenging and rewarding elements of a successful AEW program is the training and mentoring of the undergraduate facilitators. Of course it is easier to use a professional as the lead in the workshops, but the opportunities to develop undergraduates is missed. In any case, the workshop leader needs to have both preservice training and on-going professional development. As a result of the training, the prospective facilitators should understand the goals of the program: To help each student (1) maximize his/ her academic performance, (2) become a member of a technical academic community, and (3) enhance his/her communications skills. The facilitators also should understand their responsibility to be a bridge to peers, to faculty, to the institution, and to academic excellence.

The pre-service training for the facilitators should help them replace the lecture and tutoring modes (where the main role is disseminator) with one of facilitating/managing the *process* of learning. To assist in understanding this difference, much of the training should require participation and collaboration. After a program is established, excellent continuing facilitators should lead segments of the training to teach others their excellent techniques adapted for the particular student body and campus environment. Three significant elements should be included in the training: (1) how to create a collaborative environment, (2) the different cognitive levels at which one can question, and (3) how the worksheets are generated. Facilitators also need to know how to vary the activities from session to session. All of these elements of the pre-service training can be covered in 1 ½ to 2 days. During the term, on-going reinforcement and training should occur.

Creating a collaborative environment The key elements necessary to create a workshop environment are:

* Positive Interdependence
* Individual Accountability
* Roles & Norms
* Team Goal(s)
* Communication -- Group feedback
* Cohesiveness: Interpersonal & Task

Positive Interdependence Much of our society is structured by "negative dependence" – I win, you lose – that reinforces a competitive environment. While certainly there are elements in our technical culture that continue to reinforce competition, the ability to collaborate with others to achieve a common goal is a critical factor in excelling both as a technical student and as a professional. The structure of the workshop and the rewards system used within the workshop need to reinforce mutual responsibility, the "win-win" we so often hear of. Two examples from current programs: If the group's grade on a major test is 10% above the class average, they earn free pizza for the workshop. If all members score above a certain level then all members get bonus points.

Individual Accountability One of the common complaints about group work is that one or two people "do all the work," that some "get a free ride." The facilitator needs to make sure that each person understands his/her responsibility. When groups are working together, the facilitator should *choose* someone to report for the group and *not* ask for a volunteer. The person selected may be the person that the facilitator suspects is least participatory, thereby emphasizing the team's responsibility to keep all informed of the work. The facilitator should also build in individual quizzes and practice tests to provide individuals with feedback about their mastery of the material.

Roles and Norms The facilitator needs to be particularly clear about his/her role and that of the participants. The degree to which the expectations are articulated is a predictor of success for the workshop. Carefully delineating what the participants should (and should not) do, what the facilitator will (and will not) do, and what the campus norms are for the workshop is especially important when the workshop participants are new to campus. The relationship of the workshop to the course also should be discussed: how does the workshop support the course, what is "off limits" in the workshop.

Team Goals One of the adjustments that students must make when they come to a collaborative environment is to set team goals, for they may not have experience setting specific personal, short-term goals to measure their success. Thus the facilitator has an opportunity to guide them to set both personal and workshop goals for the term and to determine how they will measure success in meeting them.

Communication – Group Feedback We each make adjustments in our behavior and goals based upon the feedback that we receive. In the workshop, it is important that participants receive timely feedback on content mastery, study strategies, and on group participation. Especial emphasis needs to be made to ensure frequent "process feedback." In particular, timely discussions of group successes and ways to improve effectiveness are essential. The facilitators also need to solicit input from the participants about what is going well and what changes they would suggest. In this way students begin to take more responsibility for their own learning and learn how to give constructive feedback to others.

Cohesiveness: Interpersonal and Task The facilitator needs to be alert to students who tend to be loners and dominators, to those who are have accelerated backgrounds, and those with weaker preparation, in order to equalize the level of participation. They need to understand the basics of conflict resolution and to be shown some effective techniques for handling typical challenges that arise. The facilitator(s) should also work to create a community in which students know each other as people and have opportunities to talk about non-academic topics on occasion. For instance, after major tests, a "community building day" strengthens the bonds among the participants.

This brief sketch of the elements necessary for collaborative work can only suggest their importance. Those responsible for administering the workshops should read some of the many sources available as references on collaborative/cooperative learning. If one must choose only one as a resource, then **Joining Together** would be it – it has excellent overview and terrific exercises![3]

Cognitive Levels When generating questions for students, the facilitators should understand the range of cognitive levels. Dr. Benjamin Bloom and his colleagues developed a classification system for cognitive

[3] Johnson and Johnson (1997).

behavior which has been simplified somewhat here.[4] Each successive level requires that the previous one(s) be mastered.

Recall – knowledge of basic facts
Comprehension – ability to state basic concepts in own words
Application – ability to apply concepts to routine problems
Analysis – ability to differentiate among types of problems & to solve more complex problems
Synthesis/Evaluation – ability to apply knowledge to unique situation; to solve more complex problems different from "ones they have seen before"

Thus, the ability to solve exercises at the synthesis and evaluation level shows mastery of the given material; however, students need to demonstrate knowledge at each of the lower levels first. The challenge for the facilitators (and those who prepare the exercises for the workshop if it is not the facilitator) is to balance the current level of the participants with the level of mastery expected by the course.

Worksheet Generation Different programs have different administrative processes for generating the worksheets. In some cases, the facilitators create the worksheets themselves. If so, they need to be given practice in generating a worksheet that reflects a range of skills, yet will be instructive to the participants. If others (faculty or coordinators) generate the worksheets, the facilitators need to understand in what ways they may supplement or trim the given exercises. In order to have the workshop most productive, the sessions should not revolve around tutoring the students on their homework– that is *not* a workshop!

Because worksheets are specific to the needs of the campus and the students enrolled, the program should have some means for preserving worksheets from one term to the next to serve as a catalyst for the creation of the next term's worksheets. One way to accomplish this is to have each facilitator (or team) turn in a notebook of worksheets and activities at the end of each term.

Avoiding a Deadly Routine Workshops for younger, less sophisticated students need to have more variety in the daily routine in order to focus them on learning the material. The facilitator should vary the format enough so that the students look forward to coming to workshop and encountering the material (and each other) in new ways.

Small discussion groups
Use models/manipulables
Game format: Jeopardy/Password/Family Feud
Food/incentives
Competitions: One-to-one or group(s) vs. group(s)
Individual Student Conference
Students outline chapter/section
Work at blackboard
Discuss concepts
One group write questions for another group
Round-Robin problem solving
Mock exams

The Facilitator section of this handbook includes a schedule of how facilitators might vary the activities to accommodate the demands at different points in the term.

On-going Training The staff involved in any workshop program needs to meet regularly to monitor the state of the workshops, the participants, and the facilitators. For a small program, this may be accomplished through weekly meetings among staff. Larger programs using students as facilitators can easily structure the meetings as a credit course in which the facilitators enroll. This allows them to build it into their schedules and places this academic leadership on their transcript.

[4]Bloom, et al, pp. 201-7. Allen and Rueter, pp. 57-61.

Program Administration

Careful administration of a workshop program is an essential. Bridges need to be built (or reinforced) with the relevant academic departments and students need to be recruited early on. The administrative structure needs to be developed that will both support the program in the long term and will be supported by the administrative processes and people. Detailed tracking needs to be built from the beginning so that later documentation of the programs strengths (and weaknesses) is possible. Resources need to be generated and maintained. Facilitators need to be monitored. . . . And the list goes on! Much of the "nitty-gritty" of how one program handles this level of detail is documented in the administrative section.

Measuring Success

It is no surprise that success can be measured at a variety of times and in a variety of ways. In order to measure success during the term, the Quick Checks to Assess Workshop Climate, included later in this section, can be used by administrators, facilitators, and participants alike. It attempts to measure the "climate" of the workshop: the collaborative **community** established, the level of **communication** among participants, and effective reinforcement of **content**. These three elements – the "three Cs" – (community, communications, and content) are all vital to a successful *workshop* program.

On-going measures of a program are outlined in Appendix I under "best practices." Expected outcomes are also given along with the necessary data for both short- and long-term program evaluations. Those interested in examples of relatively short-term evaluations may refer to two papers written about the Statics and Dynamics workshops and one on the overall program.[5] For those interested in longitudinal studies, two dissertations have been done on the Cal Poly Pomona program.[6]

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[5] Hiemenz and. Hudspeth, pp. 38-42; Hudspeth, Shelton, and Ruiz, pp. 12-16; Shelton, and Hudspeth., pp. 35-39.

[6] Bonsangue, (1992); Mills, (1999).

CONTEXT FOR CAL POLY POMONA'S WORKSHOP PROGRAM

Cal Poly Pomona is an urban, largely commuter, public university. Of the 16,082 undergraduate students enrolled Fall 1999, 2309 were science majors and 3405 declared engineering. The primary ethnic groups and their representation are:

	Asian Am.	White	Latino	Filipino	Afro-Amer
Campus	31.7%	24.6%	22.8%	6.9%	3.6%
Science	41.1%	18.7%	17.9%	8.1%	3.6%
Engineering	32.0%	22.2%	22.5%	9.2%	3.3%

The Academic Excellence Workshop Program is now administered jointly by the Maximizing Engineering Potential (MEP) and the Science Educational Enhancement Services (SEES). The MEP was established on campus in 1983 and had about 450 members when it began a pilot workshop program in Fall 1986. In Fall 1987, the Science Educational Enhancement Services program was initiated in the College of Science, and it established a close collaboration with MEP. Both are college-based equity programs designed to increase the retention and graduation of historically under-represented ethnic groups and provide other services in addition to the Academic Excellence Workshops.

The workshop program is a collaborative effort of 4 academic departments across the two colleges.

Courses now supported: Intermediate Algebra, College Algebra, Trigonometry, Pre-calculus, 3 quarters Calculus, 3 quarters General Chemistry, 3 quarters Organic Chemistry, 3 quarters General Physics, 3 quarters College Physics, 2 quarters Engineering Mechanics. From 8 to 13 workshops are offered each quarter.

Course size: Targeted courses usually enroll 20-45 students.

Workshop size: Minimum of 7 students to a maximum of 24; average size of 12. Groups of 10 or more are led by 2 facilitators.

Parallel to regular academic courses: students must be enrolled in regular targeted section(s), meet for 2 hours twice weekly to work on problems above and beyond homework; NO credit; attendance expected; if miss 3 or more sessions, may be dropped from workshop program.

Closely tied with offering department: Each has a designated "developer" faculty member who works with facilitators on content and coordinates faculty and department support. They always participate in the facilitator interview and frequently recommend candidates. They continue to work with the facilitators as resource persons, providing reference material and suggesting strategies.

Targeted students: African American, Latino/Hispanic, Native American students in engineering or science.

Facilitators: Workshops are led by paid upper-division undergraduates who meet weekly with the course instructors. At this time most are former workshop participants and members in MEP or SEES. They prepare worksheets, meet weekly with lecture professor, monitor attendance, call those absent, and attend weekly staff meetings. The hourly rate is from $8.50 - $10.50 for an average of 12 hours per week.

Facilitator Training: Facilitators, selected for both academic ability and interpersonal skills, attend a two-day

training. They meet weekly (a 1-credit course) to discuss strategies for dealing with challenging students, for imparting study skills, for creating group involvement, and to mentor each other.

Administration: Jointly by MEP and SEES; monitoring and counseling by MEP staff.

Funding: Grants, lottery dollars, industry donations, and institutional monies, facilitator wages now cost about $53,000 annually.

Benefits to participants: Participants significantly outperform non-participants when the control group consists of other under-represented students; an the average, their performance equals or exceeds that for all students by at least 0.5 letter grade.

Our data for 1998-99 show that workshop participation has a significant effect upon the performance of historically under-represented students. The average grade earned by participants in a course exceeded that earned by the class as a whole. The relative performance by discipline is given in table below.

Discipline	# of Workshops	# of Participants	Ave. AEW Grade	Ave. Section Grade
Chemistry	10	143	2.47	2.31
Mathematics	14	128	2.50	2.09
Physics	9	74	2.44	2.16

Benefits to facilitators: Almost all facilitators report increased self confidence as well as a sense of satisfaction from their role as facilitators. As a direct consequence of the experience, several of these facilitators have entered (or have completed) graduate/professional school; some are considering academic careers.

Benefits to campus: Workshop participation significantly increases retention in college and retention in the major. Preliminary results indicate that calculus workshop participants also complete their required mathematics courses in a more timely fashion with significantly fewer course repeats. Finally the workshop program has provided a vehicle for cooperation among faculty members from four departments and two colleges. The success of the program has also attracted the attention of faculty from other institutions so a network at the faculty/institutional level has been established to allow interchange of ideas and information.