

WORKSHOPS VS. TUTORING: HOW ASU'S MINORITY ENGINEERING PROGRAM IS CHANGING THE WAY ENGINEERING STUDENTS LEARN.

Jennifer K. Adair¹, Maria A. Reyes², Dr. Mary R. Anderson-Rowland³, Dr. Demetris A. Kouris⁴

Abstract - For the past five years, the Minority Engineering Program in the College of Engineering and Applied Sciences at Arizona State University (ASU) has channeled retention efforts through their Academic Excellence Program. This program housed two components: peer tutoring and mentoring and group workshops. While both produced successful retention rates among minority students within the College, both students and faculty strongly expressed a need for a more structured and intensive program to assist engineering students with the more challenging courses. In fall of 2000, ASU's MEP remodeled their efforts at retention and created the Academic Excellence Workshop program. The workshop program replaces tutoring and mentoring programs with weekly workshop sessions. This non-traditional approach to academic support has necessitated a change in paradigm for staff, faculty, and students. The response to this change has been promising. This paper will discuss the AEW program structure and how the workshop concept has been promoted to students and faculty.

Index Terms – Workshop session format, group-learning, faculty/student/staff collaboration, workshop marketing

INTRODUCTION

The Office of Minority Engineering Programs in the College of Engineering and Applied Sciences at Arizona State University has offered academic assistance since its inception in 1993 [1,2]. This academic programming has ranged from basic tutoring to academic mentoring between upper and lower division students. These programs have been aimed at assisting minority students to feel comfortable and supported in the challenging curriculum of Engineering. Within the Engineering College, the number of undergraduate, underrepresented minority students (African-American, Hispanic, and Native American) has more than doubled in the past nine years, to nearly 700. As a result, the Minority Engineering Program has expanded programming to reach and support as many of these students as possible.

In 1995, the Minority Engineering Program began implementing a workshop-based program, centered on the

Academic Excellence model, as developed by Kay Hudspeth of California State Polytechnic University, Pomona, for minority engineering students [3]. In this model program, principles of group-learning, collaborative study groups, and faculty/facilitator collaboration are essential. However, due to staff limitations on time and resources, our Minority Engineering Program's version of Hudspeth's Academic Excellence remained a tutoring and mentoring program, with some group collaboration with upperclassmen working as facilitators/tutors.

However in the spring of 2000, the Minority Engineering Program director commissioned the newly hired Minority Engineering Program coordinator to re-evaluate the effectiveness of the Minority Program's Academic Excellence Program. This undertaking ultimately resulted in a re-structured program called the Academic Excellence Workshop Program. While the basic purpose of the Minority Engineering Program's academic assistance remained the same, the structure of this assistance changed dramatically and increased collaboration between important academic resources including students, faculty, department and college administrators, and key university staff. This paper will outline the Workshop structure and detail how the format is currently maintained. The paper will also explain how the Workshop is advertised to all involved groups.

WORKSHOP FORMAT

Building on Hudspeth's model, the Minority Engineering Program staff designed a program to involve faculty and undergraduate students in a group-learning atmosphere. The Workshop format was designed to sustain and to foster that type of environment. This format can be broken into three main areas: workshop structure, facilitator training, and faculty/facilitator collaboration.

WORKSHOP STRUCTURE

Workshop sessions coincide with offered University Main campus engineering curriculum courses. The 11 courses for the spring 2001 semester include mathematics, computer science, physics, chemistry, dynamics, statics, and

¹ Jennifer Adair, Arizona State University, Office of Minority Engineering Programs, PO BOX 875506, Tempe, AZ 85287-5506 jennifer.adair@asu.edu

² Maria Reyes, Arizona State University, Office of Minority Engineering Programs, PO BOX 875506, Tempe, AZ 85287-5506 mars@asu.edu

³ Mary Anderson-Rowland, Arizona State University, CEAS, Dean's office, Student Affairs, PO BOX 875506, Tempe, AZ 85287-5506 mary.anderson@asu.edu

⁴ Demetris Kouris, Arizona State University, Dept. of Mechanical and Aerospace Engineering, PO BOX 875506, Tempe, AZ 85287-5506 demetris.kouris@asu.edu

engineering core classes. Each course has a workshop session of 80 minutes, which is facilitated by a qualified undergraduate who has successfully completed the course and has been recommended by one of the course's instructors. The facilitator begins each Workshop session with a ten-minute review of the past week's material. The review is purposefully not a "question and answer" discussion, but rather a time for the facilitator to let each participant review the concepts, with which they should, at that particular time, be familiar. After this review, the participants are directed into groups of three or four where they are given a worksheet to complete as a team. All teams are encouraged to use the chalkboards, discuss the problem sets together, and successfully complete that week's worksheet. Following the workshop portion, the facilitator addresses all participants as a five-minute closure to the session. The group discusses upcoming deadlines and test dates. Also at this time, participants are able to make suggestions, comments, and receive last minute assistance with off-topic subjects.

Weekly worksheets are designed by the facilitator and approved by the faculty member/course instructor. The course instructor determines the worksheet format. Depending on the course subject and the instructor's preference, worksheets may simply list problem sets, or they may include long applications, utilizing diagrams, and/or pictures. Worksheets are meant to be a reflection of class material. Worksheets, once approved, are kept in a master file, which is updated weekly.

The only digression from this format occurs the week prior to any major exam given in the particular workshop's course. While the basic principles of the Workshop session remain the same, the first fifty minutes are spent in a timed exercise or practice test. Instead of the usual opening review, each participant is handed his or her own copy of the practice exam upon entering the workshop room. They are instructed to act as though it was the actual exam. After the fifty minutes, students spend the remaining thirty minutes correcting their practice exams in teams. Each team walks through the test questions, ensuring that each team member understands how to reach the correct answer. After the teams correct their exams, practice scores are recorded for each participant. Students are encouraged to email or to record their actual exam scores with their facilitator at the following week's session or whenever the scores are made available. This allows the facilitator to gauge the effectiveness of their practice tests.

FACILITATOR TRAINING

Undergraduate engineering and science students serve as the facilitators. The Minority Engineering Program offers training and resources for each facilitator. Training begins the week before each semester. All facilitators are required to attend a daylong training session. This training consists of exercises and role-plays, which help focus the facilitators

on the benefits of a workshop structure versus a tutoring structure. The first half of the day consists largely of lectures. Instead of breaking the facilitators into groups to practice, they are merely talked to and told to remember the material. Then, the second half of the day is spent in a group-learning atmosphere. Instead of lecture, the facilitators are put in groups. They practice leading workshop sessions and even practice their initial meetings with a "mock" faculty member. The first half of the training is purposefully given as lecture to contrast the second-half's emphasis on group-learning environments. Through this example, the facilitators appreciate first-hand the learning benefits of a workshop-type environment. They more fully understand the difference between tutoring and workshops.

The emphasis of facilitator training is on the concept of re-directive questioning and how to create a group-learning environment. Facilitators practice re-directing questions back to the students themselves, back to the teams they are in, and if necessary, back to the group as a whole. This is the key component of the workshops. By the end of training, each facilitator can explain the importance of helping students help themselves academically and can demonstrate using re-directive questioning to ensure the group-learning atmosphere is established and maintained under a variety of scenarios.

Each facilitator is given a Workshop manual, which outlines the principles practiced in the initial training session. The manual gives examples of re-directive questions, how to create a learning environment, how to successfully communicate with faculty members, and how to advertise the program successfully to students. The training manual's basic structure is a combination of efforts, stemming from past programming in the Minority Engineering Program and other successful academic programming resources [4].

Facilitator training continues throughout the semester with weekly meetings led by the Minority Engineering Program coordinator. These weekly meetings offer facilitators the opportunity to ask questions, explore new ideas, refresh skills, and get advice about collaboration and/or advertisement needs between themselves and their faculty advisor. In addition, twice a semester, the Minority Engineering Program coordinator observes each facilitator during his or her Workshop sessions. Each facilitator is given a written summary of their performance. Facilitators are encouraged to continue their employment semester to semester. As they choose to do so, they become important resources to incoming facilitators.

FACILITATOR/FACULTY COMMUNICATION

Faculty members of the Workshop targeted courses are first approached by the Minority Engineering Program coordinator, who calls an initial meeting to discuss the basic

principles of the Workshop program. These initial meetings are scheduled one or two weeks prior to each semester. In this meeting, the faculty member receives a packet of information, which the Minority Engineering Program coordinator summarizes. The faculty member is briefed on the workshop format and its emphasis on mastering material, instead of merely memorizing it. Most faculty members respond positively.

Once a faculty member has been introduced to the program, they are encouraged to officially give their support to the program. They do this by accepting the role of advisor to the program and by being available on a weekly basis to the facilitators. Faculty members are advised that the facilitator will be setting an appointment with them, as the course instructor, during the first week of the semester. At that time, the faculty provides the syllabus and textbooks, if available, as well as other resources to guide the facilitators through the creation of their weekly worksheets and practice exams. Faculty members are also asked to use overheads and flyers in their classes to promote the Workshop program to the students throughout the first week of school.

Faculty and facilitators continue to collaborate throughout the semester. Each weekly worksheet and each practice exam is to be approved by the faculty member, whether through email or in-person. Faculty remain in communication with Minority Engineering Program staff by sharing comments and concerns and by referring their students to the Workshop program as well as to the Minority Engineering Program website, which lists all programs and support offered to engineering students, including those targeted to minority students.

At the end of each semester, all faculty members are invited to a luncheon where they are thanked, as they have become key informants in assessing the effectiveness of the program. Faculty feedback has already led to changes in the Workshop program, such as having the faculty refer students to be facilitators, allowing worksheet approval to be done through email, and promoting the Workshop program as a mastery program, not remedial assistance.

Since its inception, the Minority Engineering Program coordinator has met with 22 faculty members from two colleges. Upon meeting with the Workshop coordinator, one particular faculty member immediately enlisted support from his department. Within three days of the initial meeting, he had recruited five additional faculty members, all of whom taught different mathematics courses, to assist in the program. These five faculty have grown into a solid academic base for Workshops in key mathematics courses.

PROMOTING THE WORKSHOP PROGRAM

Students and faculty are introduced to the Workshop program in diverse ways. The investment of both groups is crucial to the success of the Workshop program, yet promoting the program to each group requires different

approaches. Motivating students to participate in the Workshop program requires a paradigm shift. In general, students are accustomed to a tutoring environment where they are able to ask a question and be shown the answer. Tutoring is generally a casual environment. Students do not have to stay for a certain amount of time nor do they have to commit to attend consistently. Open tutoring labs allow little opportunity for the student to learn through teaching themselves or their peers.

Workshop sessions are a commitment of one hour and twenty minutes a week for the duration of the semester. While students are able to miss up to three sessions, they are encouraged to attend weekly. Students perceive this as a huge time commitment. They also tend to get frustrated with the facilitator's insistence for group learning. This means both faculty and the Minority Engineering Program staff must advertise the program in such a way as to make the time commitment appear efficient and timesaving in the long run. The Minority Engineering Program staff must also show the students that the material will be more helpful in their junior and senior years if they invest the time to learning it and mastering it the first time around.

The Workshop concept is advertised to students through four main avenues. The first is through the students' classmates and peer groups who have tried out the program and seen immediate, positive results. Another way they learn and essentially trust the program is through their professors, who advertise the program as a mastery program to increase test scores and to ensure a foundation for later courses. The third way is through the Minority Engineering Program office. The Minority Engineering Program staff contacts all students who are in its communication pipelines, including members of the minority engineering societies: The Society of Hispanic Professional Engineers, the National Society of Black Engineers, and the American Indian Science and Engineering Society. The fourth avenue is through other departments and academic centers on campus such as the Engineering Tutoring Center, the Coalition for Engineering Minority Engineering Societies (CEMS) Center, and the Women in Applied Sciences and Engineering (WISE) Center. Since there are many tutoring centers, especially for math and science, the Workshop staff coordinates with them to ensure that there is little or no duplication of services offered. For instance, the Workshop staff works closely with the Engineering College's Inclusive Learning Communities (ILC) Program, which offers group-learning and practice exams to students. Both the Workshop program and the ILC program refer students to the other program, depending on the student's need and weekly schedule. In addition, brochures, schedules, and applications are given to the American Indian Institute, the Math and Science Honors Program, the Native American Achievement Program, the Supplemental Instruction Program, the WISE Program, the Engineering Academic Services office, and the Engineering College Council, as well as other key resources that have direct communication with students.

The workshop participant pool has grown throughout the 2000-2001 academic year. During the fall 2000 semester, 100 students participated in the Workshop program. During the spring 2001 semester, 157 students registered to participate. This number is expected to continue rising about fifty students a semester as more students learn about the program and as more faculty become involved.

Promoting the Workshop to faculty members involves two issues. First, all 19 faculty members that have been approached, recruited, and interviewed to be in the program have expressed concern that students will often do well on homework, but still fail exams. They worry that students do not have the time available to master material and to be fully prepared for more challenging material in college or out in industry. The Workshop addresses this concern specifically by structuring one hour and twenty minutes to practicing and learning the material in a group setting each week; the goal being to master the course material, instead of simply memorizing it. Secondly, faculty members see the Workshop program as a means to teach students to think deeper about the problems and to work more effectively in groups. They see these two abilities lacking in a large number of current students and feel that these are crucial abilities for academics and industry. When initially approached about advising the Workshop program, they wanted to be assured that the workshop sessions trained the students to think on their own rather than rely on a tutor's knowledge and quick answers.

Initially, the Minority Engineering Program coordinator meets with each faculty member individually. At this meeting, faculty members learn the group-learning approach to their particular course. The Minority Engineering Program coordinator is up front about the weekly time-commitment and the need to advertise the program to the students in the first few weeks of each semester. Each faculty member is told that their time commitment is an initial meeting of an hour at the beginning of each semester, a specified weekly communication with the facilitator, and a general meeting/luncheon at the end of each semester. To foster a sense of collaboration and academic community, the Minority Engineering Program coordinator ensures that each faculty member's department chair and college dean are both aware of his or her participation in the Workshop program.

Overall, the Workshop program answers many of the concerns that faculty have regarding current engineering students. Faculty feel that their students do not have as much time to devote to their academics as they should, so the Workshop is seen as an opportunity for students to more completely understand the course material while still allowing for other important time commitments, such as work and family obligations. The Minority Engineering Program coordinator's methodology in garnering faculty support for the Workshop is to show them how the Workshop program is designed to produce students who think deeper about course material, work more efficiently in

groups, and strive to master the subject. The faculty response has been extremely positive. One of the faculty members summarized this when he said, "If a professor wants to teach and if he wants his students to really learn the material, he will participate in this program."

STUDENT SATISFACTION

In order to gauge the overall student satisfaction with the academic excellence workshops, the workshop coordinator created a mid-semester survey. Halfway through the spring semester, facilitators handed out these surveys to each of their workshop participants who were present. Forty-eight surveys were returned and analyzed.

The surveys indicated that an overwhelming number of students appreciated the program and believed it was making a difference in their course performance. When asked, "Do you feel that the Academic Excellence Workshops are improving your grade?" forty-six out of forty-eight students (97.9%) responded "yes". Additionally, forty-four students (93.6%) answered the question, "Has the Workshop program increased your confidence in completing homework, quizzes, and/or exams?" affirmatively. Also on the survey, students were asked to estimate their current grade. The largest percentage of answers was 33.3 % going to both the "A" category and to the "B" category. "C" followed with 20.8% and then "D" with 12.5%.

While "end of the semester" surveys will indicate whether students participating in the Workshop program received better grades than those who did not, it is important to note the confidence they expressed in the workshops and in themselves, even at the mid-semester point, because of attendance at the Workshops. It is obvious that an increased response rate will yield a more accurate reading of the students' improvement and give more indication as to the program's success. Notwithstanding, the mid-semester surveys, given at a randomly chosen week in the semester, gave a raw indication that the students are benefiting from the workshop experience and see improvement in their own ability to do the course work successfully.

Our preliminary results also showed that the facilitators benefited from the workshops because they participated in a teaching experience. The majority of facilitators commented that their skills and knowledge in engineering were dramatically improved as a result of preparing and teaching the Workshops. Many pointed out that they saw the benefit for their students, but they also saw it as a great benefit for themselves. One facilitator wrote, "It was a great experience and I learned a lot. Good Program. I believe it will only grow and get stronger." Another one said, "I thought it was a good experience overall, but a learning one as well. I hope to improve my worksheets and style of facilitating so that next year I might have more students." Most facilitators enjoyed the opportunity to be in a teaching capacity, while some students felt that they were not "cut out" to be

teachers. Most facilitators agreed that they were most successful as facilitators when they had demonstrated support from and involvement with the course instructors.

The facilitators made a number of suggestions as to how the program can improve. Many offered the idea to have more than one time slot offered for each Workshop. Other suggestions ranged from better advertising to utilizing all course instructors (not just those selected faculty members for a particular course) to getting the course instructors to motivate students to build their skills through the Workshops. The Workshop program staff is currently examining all of the suggestions and pursuing greater contact with faculty and an increase in student awareness.

CONCLUSION

The Workshop program emphasizes the benefits of group learning. The Workshop structure gives students opportunities to teach and to learn, as they are sometimes the teachers because a concept is familiar to them and sometimes they are the learners because the concept is challenging for them. It also maintains that the role of faculty, Minority Engineering Program staff, facilitators, and students are crucially intertwined in how students learn. Developing and promoting the Workshop program necessitates a change in perspective.

The Minority Engineering Program plays a key role in this changing perspective by promoting the Workshop as a beneficial investment of time and effort, as opposed to traditional tutoring environments. Students want to increase their grades and feel better prepared for upper division course and industry positions. Faculty want students to think deeper and to commit themselves to master the course material. The Minority Engineering Program coordinator promotes the Workshop by appealing to each group's concerns and desires. Not only has the Workshop resulted in a strong retention tool, it has become a recruitment tool and a means to assure parents, counselors, and students that the Minority Engineering Program is committed to the students' academic well-being as they prepare for upper-division courses, as well as post-graduate work and or industry positions.

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