

## **Engineering Learning Center Coach Training Program for Minority Students**

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### **ABSTRACT**

The objective of the program described in this paper is to help under-represented minority students (African-American, American Indian, Hispanic, and Upper Peninsula Women) to be successful in a number of fundamental engineering courses during their sophomore year and make a smooth transition to the junior and senior level courses in engineering design and analysis. Michigan Technological University (MTU) already has an Engineering Learning Center (ELC) which is dedicated to achieving this objective for *all* students. However, it was hypothesized that the ELC, where students are coached by fellow students on several gateway courses such as Statics, Dynamics, and Mechanics of Materials, has the potential to be more effective as a means of helping minority students be successful if more ELC coaches were the minority students themselves. Consequently, eleven minority students were recruited and were given extensive training on learning and coaching skills over a course of two quarters. The training included sessions on diversity in learning styles, studying skills, problem solving skills, interpersonal skills, intrapersonal skills, and techniques for promoting motivation. All recruits successfully completed the training program and, subsequently, worked as ELC coaches. This program is in its second year and, while a quantitative assessment of the program cannot be made at this stage, anecdotal evidence indicates a need to sustain this program.

### **INTRODUCTION**

The objective of the program described in this paper is to help under-represented minority students to be successful in a number of fundamental engineering courses during their sophomore year and make a smooth transition to the junior and senior level courses in engineering design and analysis. The need for a special program arises for several reasons. A disproportionate number of minority students come from disadvantaged school districts, and most UP female students are from rural school districts. Preparation or encouragement to train for a science or engineering career may not have been emphasized during their secondary school

education and/or appropriate preparatory courses may not have been available. In addition, these students in particular may find it more difficult to adjust to the University campus and community environment, and to develop the critical personal connections that will provide them academic support. Often the high expectations from faculty, peers and self that encourage high performance from students are lacking. This situation may result in poor academic achievement of minority students and the development of few role models within this group.

MTU believes that academic confidence and leadership and the feeling of "connectedness" for students are key factors that contribute to retention and successful completion of a bachelors degree. One of the ways these factors can be provided is through training the minority students as coaches for the Engineering Learning Center (ELC). The ELC is a place where students are coached by fellow students on several courses such as Statics, Dynamics, and Mechanics of Materials. These courses are the first real engineering courses encountered by students and are considered gateway courses to later design and analysis courses. A comprehensive understanding of this material is often critical to success in other engineering courses. For many young engineering students, these are the most challenging courses they will have in their college career and are a factor in their decision to continue in engineering and science disciplines. The Center is founded on a learning theory that emphasizes the importance of human relationships in learning.<sup>1</sup> By providing assistance through empathic peers, the ELC encourages learning in an anxiety-free environment.

We hypothesized that ELC has the potential to be more effective as a means of helping minority students be successful if more ELC coaches were the minority students themselves. Consequently, eleven minority students were recruited and were given extensive training on learning and coaching skills over a course of two quarters. The training included sessions on diversity in learning styles, studying skills, problem solving skills, interpersonal skills, intrapersonal skills, and techniques for promoting motivation. Basically, these sessions were designed to help the recruits become more successful in learning the gateway courses themselves ("learn to learn better") and then later help others learn these courses better ("learn to teach others to learn better").

This program has three beneficiaries as shown in Fig. 1. The primary beneficiaries are the minority coaches who are trained to be successful and become leaders through "participation" in the program. The secondary beneficiaries are the other minority students on campus who are stimulated and motivated to do better because they can see minority students excel and in the leadership position in the academic arena. Basically the minority coaches become role models to

other minority students who benefit through "emulation". The tertiary beneficiary is the rest of student body who can appreciate the racial diversity through "association" with minority students. This last point is very important for Michigan Tech which is predominantly white.

## **TRAINING PROGRAM**

The training program is composed of three parts:

### Part 1: Learning the Learning Skills

- Orientation
- Preparing for class (receiving)
- Taking and reviewing notes
- Studying
- Cooperative learning
- Learning styles
- Problem solving techniques
- Consultation I with the Director of Learning Center

### Optional sessions

- Time management
- Stress management
- Test taking

While specific skills pertaining to learning are introduced during this first part, the underlying message during each and every session is that one should be aware of the diversities in learning and teaching styles,<sup>2</sup> intelligence,<sup>3</sup> cognitive developmental levels,<sup>4</sup> and learning objectives.<sup>5</sup> These diversities are colorblind and gender-free. We believe that educating the students about the presence of many types of diversities in operation in the classroom is important. We want the minority students to attribute their academic performance on either their innate ability or their effort,<sup>6</sup> and not focus on the "visible" differences in race and/or gender. We believe that the first step for meaningful learning is for the students to take the responsibility for their learning.

### Part 2: Learning the Gateway Courses

- Take at least one of the gateway courses.
- Take the Problem Solving Skills session for the corresponding course.
- Consultation II with the Director of Learning Center

During Part 2, students who are taking the gateway courses are given an overview of the course and the students who have already taken the courses are given a review. Emphasis is to show the students the structure of the knowledge covered in a class and the interconnection of the material presented in a textbook.<sup>7</sup>

### Part 3: Learning the Teaching Skills

- Tutoring attitude
- Tutoring techniques
- Motivating student learning
- Interpersonal skills
- Common areas of difficulty for students
- Consultation III with the Director of Learning Center

During this part, which was conducted parallel with Part 2, ELC coaches demonstrated good coaching attitude and techniques in mock coaching sessions. Recruits are then asked to participate in subsequent mock sessions to practice what they have learned.

In addition to the consultation with the Director of ELC at the end of each part, we worked to provide a supportive environment during the training period. This included dinner at the Director's home and several other informal gatherings. A glass case was installed outside the ELC and photographs of the coaches and coaches in training were displayed to recognize their service and instill a sense of ownership.

## **RESULTS**

All recruits successfully completed the training program. Eight out of eleven recruited students have become coaches, to date. The other three were taking the gateway courses. This program is in its second year and, while a quantitative assessment of the program cannot be made at this stage, a number of anecdotal evidences indicates a need to sustain this program.

## **REFERENCES**

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## **BIOGRAPHY**

DR. PECK CHO is an Associate Professor in Mechanical Engineering, the Director of Engineering Learning Center, and the Interim Director of the Innovation Center at MTU. His is currently interested in promoting creativity and industry perspective in engineering curriculum. He has received numerous awards from MTU, the State of Michigan, SAE, ASEE, and NSF for his work in teaching and research. He gives workshops on teaching and learning techniques.

DR. William W. Predebon is Professor, Associate Chair, and Director of Graduate Studies in the Mechanical Engineering and Engineering Mechanics Department and Coordinator of the Engineering Learning Center at MTU. He recently co-developed a graduate Teaching Assistant training program at MTU. He has earned several teaching awards at MTU and has published in the area of self-paced instruction.

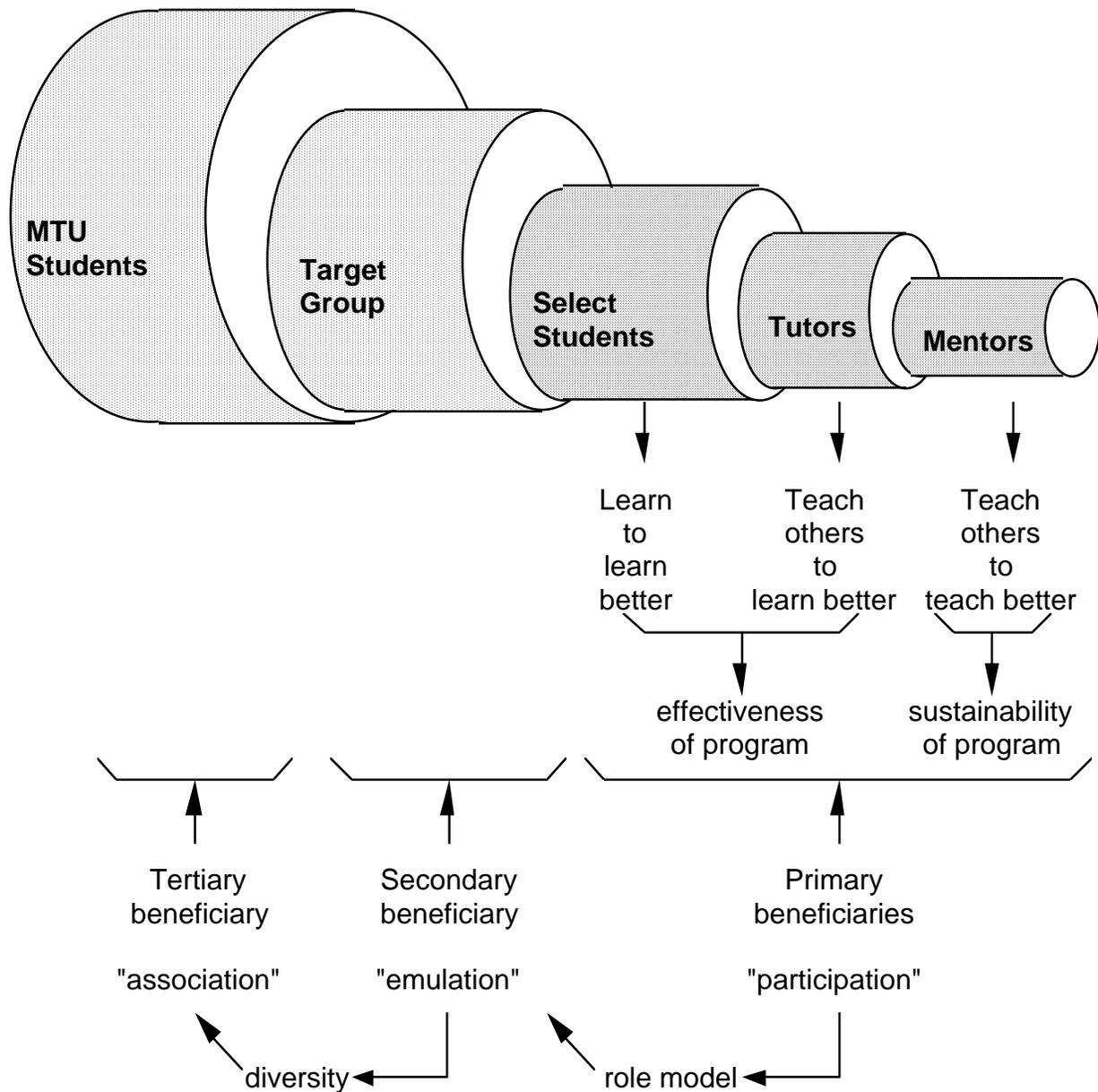


Figure 1. A schematic diagram showing the concept of the ELC coach training program