

— **A. Teaching Assistant Training Program with a Focus on Teaching Improvement and Graduate Student Development**

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ABSTRACT

This paper presents a case study of a teaching assistants (TA's) training program in the Department of Mechanical Engineering and Engineering Mechanics at Michigan Technological University. This training program may be unique in that it is designed to achieve dual objectives: to improve the quality of undergraduate instruction by graduate TA's and to develop leadership skills in graduate students for their professional growth. The second objective was deemed necessary to provide the TA's who do not intend to pursue a teaching profession with an incentive to accept a very demanding program. The program consists of approximately fifteen hours spent during an orientation session given a week before the beginning of the academic year and another fifteen hours in weekly sessions distributed throughout the first quarter of the academic year. The topics covered during the orientation session include: learning styles, cognition theory, human development theory, diversity, and techniques for organization and presentation. The weekly seminar consists of discussions on just-in-time topics such as preparing quizzes, dealing with difficult students, and evaluating students. TA's are also asked to give mock presentations which are video-taped and analyzed in private at a later time. Throughout the training, various communication and interpersonal skills are emphasized and demonstrated. An analysis of teaching evaluations conducted before and after the training shows a marked improvement in the performance of TA's. Also, survey results showed that the TA's in the program are satisfied with the support and nurturing they have received for teaching and for their professional development. This TA training program has recently been presented to the entire campus as a model program.

INTRODUCTION

In the Fall of 1994, we were commissioned by Michigan Technological University (MTU) to develop a new teaching assistant (TA) training program for the Department of Mechanical Engineering and Engineering Mechanics (ME-EM). At that time we had a TA training program that was administered by the University Center for Teaching Excellence and offered to new TA's from all departments during the week preceding the first day of class. The program consisted of a two-hour long session on "what to do on the first day of class" followed by a two-hour long practice session. Foreign TA's underwent additional six-hour long discussion session on American classroom culture. These sessions were thought to be inadequate in preparing TA's for effective classroom and laboratory instruction, and we were given a free-hand in developing a new training program.

When we studied the programs offered by other schools we found out that many schools offer one form of TA training or another and that there is a great variety. We found informal TA training programs that are based on individual mentorship as well as formal programs with a substantial commitment from the administration. The



formal programs range from a short orientation administered a few days before the beginning of classes to ~~semester-long course~~ work to be taken by TA's for credit with grades. The diversity of the programs offered is as broad as the institutions that were offering them. We were particularly impressed by the program at Cornell University in which a formal graduate level course is offered, covering a wide range of topics that are specifically relevant to engineering. Later, we found out that similar extensive courses which focus on teaching engineering are offered in other schools like Purdue and the University of Michigan. Because they included a thorough and complete treatment of educational psychology, as well as teaching techniques, these courses became a model for our program. However, we realized that we needed to modify them extensively to suit our particular situation for the program to be successful.

The one particular situation of ME-EM Department that has had the most influence in shaping our training program is that more than a half of the TA's are pursuing a masters degree as their terminal degree and do not intend to pursue the teaching profession after graduation. This situation is quite different from those at, say, the University of Michigan or Cornell where three-credit courses are offered primarily to Ph.D. students who wish to become faculty members in the future. This is a critical difference on two accounts. First of all, the TA's who are teaching are doing so mainly to support their graduate education and may not see much of a long-term benefit in investing heavily in their teaching duties. That is, there is a question of motivation. Secondly, the duration of the teaching experience for MS students is shorter than that for Ph.D. students in general and, therefore, a training program must show immediate results in addition to any long term benefits. Consequently, we had to develop a program that is as extensive as our models from the University of Michigan and Cornell for the benefit of our undergraduate students but, at the same time, is effective (quick return) and efficient (allows our TA's to pursue their main business of graduate studies). To this end three guiding principles for the TA Training Program were established:

1. It must result in a substantial improvement in the teaching effectiveness of TA's.
2. It must be useful to the TA's themselves in their own graduate studies and for their professional growth.
3. It must be sustainable as a yearly program with a minimum cost to the Department.

The first principle points towards creating a training program that would be quite demanding from the TA's perspective in terms of both time and effort. However, we believe that TA's must be motivated to accept the demanding program whole-hearted before a genuine improvement in their teaching skills can be expected. This belief underlies the second guiding principle. The third guiding principle is added for the continuity of the program in a ever more persistent condition of dwindling resources.

As a first step in developing a training program, we conducted a survey of the TA's in ME-EM Department during Spring of 1995 to identify the level of satisfaction with the existing program and to obtain some feedback for improvement. The survey clearly testified to the need for a more comprehensive training program with a focus on teaching. For example, TA's commented that, *before* they start teaching, they would like to see more information on organizing lectures, keeping student attention, improving student participation, dealing with difficult students, making quizzes and exams, grading, and public speaking. The range of topics mentioned by TA's indicate that a new training program must address not only teaching techniques, but must also include programs to help develop their communication and interpersonal skills. They also would like to see some mentoring throughout their teaching duty so that they can deal with issues particular to the courses for which they are responsible *in a timely manner*.

This survey provided a number of key concepts for organizing a TA training program that would satisfy the guiding principles. For example, in terms of content, the new program was to include sessions on learning styles, cognition theory, human development theory, and problem solving process that would as well help TA's



themselves do better in their own research and course work. It also called for sessions on communication and interpersonal skills-as a means to improving the general leadership skills needed in their profession. In terms of : delivery timing, the program was to be divided in two main parts: the first part is to be conducted before the beginning of the quarter to deal mainly with teaching philosophies and attitudes; and the second part is to be conducted throughout the quarter dealing with timely issues at each stage in a teaching cycle (just-in-time concept).

In the following, we will outline the complete program we have developed for the Fall Quarter of 1995, The description of the new TA training program is followed by an analysis of the effectiveness of the program.

THE TRAINING PROGRAM

The training program consists of four parts. The Part 1 is required of all new TA's and administered by the University Center for Teaching Excellence during the week before the beginning of the quarter. The remaining parts are newly designed. The program is mandatory for all TA's in ME-EM Department and is administered by the Department. The authors team-instructed the entire Part 2, 3, and 4. One guest instructor gave one session in Part 3. Although the authors are not responsible for the-first part, its description is included below for the sake of completeness.

PART 1: University TA Orientation Program

1. For All New TA's (4 hours)

This session addresses the question "What should I do on my first day in the classroom?" A discussion session is followed by a role playing the first day in class.

2. For Foreign TA's only (4 hours)

The main focus of this session is to acquaint the foreign TA's with American culture in general and American educational experience in particular. The key questions addressed are: How should I react to Americans? How should they react to me? The ideas of non-verbal communication, humor, speech inflections, personal space, and male/female relationships are introduced and developed. Additional discussions are held on characteristics of effective explainers, asking and answering questions. A demonstration of some of the instructional styles of American teachers and the typical classroom behaviors of American students are conducted. TAs learn methods of recognizing and adapting to these styles.

3. For All New TA's (2 hours)

This two hour long session examines the relationships between students and faculty. Techniques for counseling undergraduate students are also introduced.

PART 2: Workshop

There are three main objectives for the workshop portion of the program. They are to inform TA's of the relevant departmental policies and the resources available to them; to introduce TA's to course coordinators and to acquaint TA's with course objectives, expectations, and teaching environment; and, to provide teaching attitudes and skills specifically needed in preparing for the first day of class.

1. Administrative Details (1 hour)

- Office, supply and Xeroxing policies
- Instructional resources (teaching aids, room scheduling, etc.)
- Human resources (Dean of Students, course coordinator, Director, etc.)



2. Meeting with Course Coordinators (2 hours)

The Course Coordinators (the faculty in charge of the course) meet with TA's to give a briefing of expectations. The briefing session include:

- Familiarizing the TA with worksite setting (classroom, laboratory)
- Advising the TA of worksite safety requirements and precautions
- Stipulating required features of the TA position (course outline, materials, grading criteria, help sessions, office hours, procedures, etc.)
- Reviewing basic principles of course material
- Discussing problem areas, assign responsibilities, etc.

3. Teaching (4 hours)

In this session the bare essentials of teaching skills are introduced with an emphasis on both the “human” dimensions and technical aspects of teaching and learning activities.

a. Knowing yourself

- Balancing teaching, research and studying
- Teachers' influence on students¹
- Attitudes and values²
- The teacher prototype
- The traits of effective teachers^{4,5}

b. Knowing your students

- Students at MTU
- Learning styles of students^{4,6}
- Theory on cognition²
- Attribution theory
- Difficult student⁷
- Knowing students by name

c. Knowing the art of Teaching and Learning^{4,8}

- Preparing syllabus
- Preparing lectures
- Pre-class activities (preparing for classroom/ lab)
- First day activities (setting ground rules-authority, expectations, rapport–trust)
- Making students receptive
- Getting students to ask questions

PART 3: Weekly Meeting

Each one and a half hour long weekly meeting consists of three components:

1. Just-in-time topics⁹

The topics include how to lead a dynamic class (how to induce active learning); how to make the teaching evaluation results help you teach better; meaningful quizzes and exams; dealing with students with special needs; attitudes and techniques for lab TA's; helping with problem solving; listening to students; and grading.

2. Questions and answers.

3. Taping of two 15-minute presentations by TA's.

TA's then meet with the Graduate Studies Director and a faculty expert in teaching in private at a later time to obtain feedback from tape.



PART 4: Mid-term Evaluation

All new TA's are asked to conduct a mid-term teaching evaluation during the fourth week of class and share the result with the Director of Studies Program. The TA's in need of help are then given additional nurturing such that they can improve and do well for the remainder of the quarter (and in future TA assignments).

DISCUSSIONS

We believe the above TA training program led to a significant improvement in the instructional activities of the TAs in ME-EM Department at MTU. In addition, we believe the program contributed significantly in making the teaching assistantship a very satisfying and rewarding experience.

The first belief is based on the results of teaching evaluations which were done on all TA's at the end of each quarter. Since the sample size is small (54 sections with 27 TA's in Spring of 1995 and 45 sections with 23 TA's in Fall of 1995) we refrained from making a full statistical analysis. However, the teaching evaluation results indicate a consistent trend as shown in Table 1, which tabulates the average score from the question No. 5 of the University Teaching Evaluation Form. The students taking courses are asked to evaluate their instructor by giving a score between 1 and 5, with 5 being the highest, to the question "Taking everything into account, I consider this instructor. . ." In Table 1, the TA's are categorized according to their level of teaching experience: the "rookies" (the first time TA's) and experienced TA's (those who taught at least once before). A subset of experienced TA's, the "continuing TA's", is a group of TA's who taught in both Spring and Fall Quarters.

Table 1: The Results of TA Teaching Evaluations

	Spring 1995 (orientation program only)		Fall 1995 (new training program)	
	mid-term	end of term	mid-term	end of term
Average of all sections	4.26	4.19	4.12	4.26
First time TA's	4.29	3.82	4.05	4.22
Experienced TA's	4.24	4.22	4.27	4.35
Continuing TA's	4.26	4.19	4.27	4.35

Several trends are observed. First, in Spring 1995, the TA's in all categories showed a decline in their teaching evaluation score with time, from the fourth week (mid-term) score of 4.26 to the final week (tenth week) score of 4.19. The decrease is most severe for the first-time TA's (from 4.29 to 3.82, a decrease of 0.47). The decline in the score maybe attributed to the willingness of students to suspend their judgment in the beginning, but being harsher in their final evaluation when appreciable improvements in their TA's performances were not observed during the course. Another possible, perhaps complementary, explanation may be that the TA's who were struggling with their teaching in the beginning of the course may have become frustrated in the absence of support and guidance from the Department.

The second observation is that in Fall '95, with the new training program, the TA's in all categories made improvements. While the improvement in the final score over the mid-term is modest (overall average increase of 0.14), this improvement actually represents a reversal of a declining trend. That is, the net improvement is 0.21 on the average, which is not negligible (Table 2).



The bit more detailed analysis offers a number of interesting insights. For example, the first time TA's are most vulnerable (the lowest score and the largest decline) when asked to teach without any formal training but are also the most responsive to training (the highest net improvement). This corroborates the finding that intervention at the earliest possible time is most effective in improving teaching performance. ¹⁰

Table 2: The Changes in TA Teaching Evaluation Scores

	Spring 95	Fall 95	net change
	change	change	
Average of all sections	- 0.07	+ 0.14	+ 0.21
First time TA's	- 0.47	+ 0.17	+ 0.64
Experienced TA's	- 0.02	+ 0.08	+ 0.10
Continuing TA's	- 0.07	+ 0.08	+ 0.15

In addition to the teaching evaluation scores, a survey was conducted to obtain feedback from the TA's who participated in the new training program. The comments from the TA's suggest a high level of satisfaction with the program. The TA's felt that the video-taping feedback session was the most useful part of the training program. TA's also felt that the training program was good for their personal and professional development.

CONCLUSION

The teaching assistants training program developed for the ME-EM Department at MTU achieved the dual objectives of improving the quality of undergraduate instruction by graduate TA's and developing "leadership" skills in graduate students for their professional growth. An analysis of teaching evaluations conducted before and after the training shows a marked improvement in the performance of the TA's. Also, survey results show that the TA's in the program are satisfied with the support and nurturing they have received for teaching and for their professional development through the program. We believe that this program can be effective in other colleges with a TA composition similar to MTU's.

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