

A GRADUATE PEDAGOGY COURSE FOR MATHEMATICS

TEACHING ASSISTANTS

by

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ABSTRACT

We will describe a three semester-hour graduate level mathematics course which focuses on issues related to the teaching of mathematics at the college level and is taken by all new graduate students entering our program as graduate teaching assistants. We attempt to assess the overall impact of this course on students' beliefs and practice related to the teaching of mathematics at the undergraduate level. We will do this by analysing survey data and information obtained from student records, student course evaluations, and interviews with students, faculty members, and administrators involved with the course from its inception in the fall of 2000 through the fall of 2004.

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CHAPTER I

INTRODUCTION

1.1 Global Need

In most large universities, graduate students are being employed as teaching assistants, and these teaching assistants play a vital role in the daily operations of these institutions. If universities could not employ graduate students as TAs, enrollment in graduate studies would suffer and many of the undergraduate courses offered by the university would not be available. “Universities rely heavily on graduate students to cover courses or handle instruction-related work that they cannot afford to cover otherwise, and they are likely to continue to use TAs.” [1] However, it wasn’t until relatively recently that universities began to rely on TAs to be completely responsible for a specific class. Prior to the 1960’s most universities used an apprenticeship model to train their TAs, where a faculty member was given a TA to help facilitate in the instruction of a course. However, between the 1960’s and 1970’s enrollment in large universities began to increase rapidly and in order to accommodate the increased number of undergraduate students, universities began to have larger classes with TAs serving as lab assistants and to lead discussions. TAs more frequently began to teach their own sections of some courses. [3] Due to the continuing growth in university enrollment, “it is projected that half a million new professors will be needed by the year 2014, thus increasing the likelihood that TAs will continue to be an integral part of the teaching fabric of colleges and universities in the near future.” [2]

Research has shown that university wide, roughly 40% of all undergraduate courses and 60% of the lower level courses are being taught by TAs. These numbers show how heavily universities rely on TAs to provide adequate instruction to their undergraduates and that it is necessary to include graduate TAs in their efforts to implement new curricula, pedagogies, uses of technology, peer evaluation of teaching, and assessment of student learning. [1] Since most of these TAs have little to no experience or training in teaching, most must rely on models of teaching they have experienced as students

themselves. It has become quite clear that this cannot adequately prepare TAs for the daily challenges of teaching at the university level. [2] Even though in many fields, including mathematics, it is widely accepted that if a person has an undergraduate degree or has a graduate concentration in the field, then they are qualified to teach. However, recently it has become quite clear that this is not necessarily the case, due to the criticism that universities have had regarding their undergraduate instruction. This criticism has been aimed at all levels of teaching at the university and has focused on the lack of training, including faculty members, in “how to teach”. However TAs are frequently the target of such criticism because they lack the experience, communication skills, and pedagogical skills to be effective teachers. [3]

Thus, most universities have begun TA training programs in order to supply their TAs with the necessary skills and support they need in order to become effective college instructors. Mathematics departments are one of many departments that need to implement such programs, because of the sheer volume of undergraduate students who take mathematics courses. Nearly all degrees sought at the university level require at least six hours of college mathematics and there is a high probability that at least one of these courses will be taught by a graduate student. Therefore, mathematics TAs need to be provided with some formal training and support in order to not only teach but prepare their undergraduate students for their future careers.

1.2 Sample Programs

A major project aimed at addressing this need is Preparing Future Faculty (PFF), initiated in 1993 by the American Association of Colleges and Universities (AAC&U) and the Council of Graduate Schools (CGS), with support from the PEW Charitable Trusts. A more recent NSF funded project, Shaping the Preparation of Future Science and Mathematics Faculty, was initiated jointly by the American Mathematical Society (AMS) and the Mathematical Association of America (MAA), in collaboration with AAC&U and CGS as part of PFF [4]. The goals of this project were to

- Increase faculty roles in helping graduate students gain knowledge about the professoriate as it pertains to a broad range of academic institutions.
- Develop model programs for the preparation of graduate students for faculty roles and responsibilities and assess their effectiveness.
- Disseminate within the disciplines alternative models and promising practices for reshaping doctoral education for the future professoriate. [5]

A quick internet search reveals a wide variety of Mathematics TA training programs ranging from those offering little or no training to others offering extensive training and year round support services for TAs. Some programs even offer teaching certificates to TAs. Four representative examples of such programs are described below.

The University of Wisconsin-Madison has a TA Orientation and Training session in the mathematics department. [6] This orientation and training session is required and occurs prior to the semester. The orientation serves as an introduction to the department for the incoming graduate students. Incoming TAs are typically assigned to teach discussion sections attached to a calculus course. During the pre-semester training session the TAs receive their teaching assignments and meet with the lecturer and other TAs assigned to teach other discussion sections. This meeting is merely an orientation of the course that the TA will be teaching. The incoming TAs will also be assigned a TA coordinator who is an experienced TA. The TA coordinator will lead the training session, where they discuss some issues related to the course to which they have been assigned and present two short lectures, the first to be presented that day and the second the following day. The emphasis of this pre-semester program is to get the TA ready to start the semester. Occasionally the department may convene general sessions to deal with wide-spread problems, but those are generally handled on an individual basis with either the TA coordinator and/or lecturer. During the course of the semester the new TAs will meet periodically with their TA coordinator and the lecturer to discuss the course and the problems therein. Also, one of the incoming TAs lectures will be videotaped so that they may evaluate his or her teaching.

Graduate students in mathematics at Duke University typically begin their TA responsibilities during their second year of study, when they serve as lab assistants or work in the help room. [7] Beginning in their third year, they teach their own section of 20-35 students, typically a calculus class. The teacher training program at Duke has two parts. The first part of the program is for the TAs who will be serving as lab assistants. Before classes begin for the fall semester, they will participate in a week long workshop, wherein TAs are introduced to Duke's laboratory calculus course. The second part of the program is intended for graduate students entering their second year of study or the year before they begin their teaching duties. These students are expected to participate in a weekly teaching seminar.

Also students usually teach for the first time in the fall of their third year and are observed twice, once during the 2nd week and again in the 3rd week. If any problems exist after the second observation, then another observation will be scheduled.

The University of Colorado-Boulder Graduate School offers a graduate teacher training certificate through the graduate teacher program. [8] The certificate is not recognized by the state of Colorado or nationally, but can be useful when seeking employment. In order to qualify for the certificate, TAs must meet a variety of requirements. One such requirement is to attend 40 hours of teaching workshops. Due to the requirements of this program, it takes a minimum of two years to gain certification.

The University of Connecticut offers a mathematics pedagogy course, Math 300-07, in order to provide students with a basic knowledge of the theories of teaching and learning mathematics along with the current research trends influencing mathematics education. [9] Emphasis is placed on the NCTM Standards and the MAA recommendations on college teaching. The objectives of the course are listed below:

- Students will gain an understanding of how the mathematics curriculum has developed and evolved from a historical and psychological perspective and ways in which various learning theories/theorists have impacted and influenced the teaching of mathematics.

- Students will be exposed to models of teaching and examine the role of domain knowledge, epistemology, pedagogy, curriculum, and assessment of teaching.
- Students will explore ways to enhance the teaching and learning of mathematics by understanding and applying learning theories impacting the field of mathematics education.
- Students will explore ways to enhance the teaching of mathematics at the college level as outlined by NCTM and the MAA.

The course meets 10 times for an hour and a half throughout the fall semester. The student's grade is based on three aspects; journal entries, critique and response, and class participation. The journal entries provide the student the opportunity to reflect on and analyze their experiences during the course. The critique and response is where two students pair up and critique each other's teaching. After the critique is written the student being critiqued writes a response to the critique. Class participation is based on the student's ability to discuss the assigned reading. The text for the course is the book by Rishel [11].

These four TA training programs provide a general view to the trends associated with the various types of programs and by no means describe the only types of programs.

1.3 Local Context

The particular context of interest herein is that of a state supported university which has experienced an enrollment increase from just under 25,000 students in the fall of 2000 to just over 28,000 in the fall of 2004. The Department of Mathematics and Statistics consists of 45 tenured, or tenure-track faculty, 8-10 lecturers, and 80 graduate student teaching assistants (TAs), and offers bachelor through PhD degrees. During the fall semester of 2000 just over 8000 students were enrolled in undergraduate mathematics classes, while in the fall of 2004 there were just over 9000 students enrolled in undergraduate mathematics courses. Of these only about 200 were undergraduate mathematics majors. The bulk of the department's teaching load is *service* at the undergraduate level; that is to say, teaching mathematics that is required of other

programs, for example engineering math for the College of Engineering or business math for the College of Business Administration. Also, all students at the university are required to take at least one math course, most two. In spite of its obligations at the undergraduate level, the department has historically viewed itself as a graduate/research department with primary emphasis placed on traditional disciplinary research, grant funding, and graduate education.

The TAs have always played a crucial role in meeting the department's undergraduate teaching responsibilities and this role is made all the more critical since the number of full time faculty positions has remained static during the above mentioned period of enrollment increases. In the fall of 2004 approximately 60% of all students taking undergraduate mathematics course were taught entirely by TAs. When restricted to freshman level mathematics courses this percentage approaches 80.

Prior to the fall of 2000 the "preparation" for all native English speaking TAs consisted only of a two hour orientation session (a few days before the start of classes), after which they received their teaching assignments and were introduced to their "course coordinator." A typical assignment was, and still is, to teach, as the instructor of record, two sections of one of the multi-section courses; for example College Algebra which is taught in 25-30 sections of 40 students each. A full time faculty member is assigned to teach one section of the course and is designated as the "course coordinator." This person supervises all the TAs teaching the particular course and meets regularly (for one to two hours once every two weeks) with all the TAs for the purpose of coordinating the course progress and dealing with issues that might arise during the semester.

Beginning in the fall of 2000 all new TAs were initially assigned non-teaching duties and were required to enroll in a newly developed, three semester-hour, graduate course called the Pedagogy Course. This course focused on issues involving the teaching of mathematics at the undergraduate level and was intended to prepare the TAs for their future teaching assignments in the mathematics department. It is this course that is the topic of discussion for the remainder of this paper.

1.4 Scope of Research

First we present a brief description of the development and evolution of the Pedagogy Course from its inception in 2000, followed by a detailed description of the course presented in the fall of 2004. The following question is then addressed: What impact has the Pedagogy Course had on TAs attitudes and practice with respect to the teaching of mathematics at the undergraduate level? In our attempt to answer this question we analyze data from the following sources: surveys of all the TAs teaching in the spring of 2005, end-of-term student course evaluations from all the classes taught by TAs in the fall of 2004, interviews with TAs who have taken the course and the faculty members who have taught the course as well as comments from the end-of-term student evaluations of the Pedagogy course itself.

CHAPTER II

TEXAS TECH UNIVERSITYS' PROGRAM

2.1 The Evolution of the Pedagogy Course

In the spring of 2000 the second author, henceforth referred to Author B, was asked by the chair of the mathematics department to create a new graduate level course focusing on issues involving the teaching of mathematics at the undergraduate level. It was felt that the department had an obligation to try to improve the quality of instruction in all the undergraduate mathematics courses and the best place to begin was with those taught by the TAs. Also state regulatory requirements necessitated increasing the graduate mathematics credit hours earned by the TAs prior to placing them into undergraduate mathematics courses as the instructors of record, with sole responsibility for teaching their classes. Author B set about to design such a course. Since the new course was to be taken along with the usual three graduate level mathematics courses taken by all new TAs there were explicit instructions that the Pedagogy course not place such a burden on their shoulders as to hinder the TAs progress in their “real math classes.”

In the fall of 2000 twenty new TAs were enrolled in Pedagogy, MATH 5360.005. The content focused primarily on classroom management, university and departmental policies and procedures, as well as lecture preparation and presentation. The primary resource was the Handbook by Rishel. [11, 12] Students were also given short reading assignments to be discussed in class. [15, 16, 17, 18, 19, 20, 21, 22, 23]. The main activity was for the TAs to present mini lectures which were video taped and then viewed and critiqued by the class and the instructor. The course met every Tuesday and Thursday from 3:30 until 4:50. The Thursday time period overlapped with the usual departmental colloquium time and students were required to attend the colloquia as they occurred. This comprised over half of the Thursday classes throughout the semester. Students were guaranteed an “A” if they attended class and participated in class discussions.

In the fall of 2001 MATH 5360.005 was taught to 19 new TAs by the Chair of the department. The meeting time and the colloquia requirement remained the same as in 2000, but the Chair decided not to video tape the mini lectures, and chose as the main resource the Steve Krantz book on how to teach mathematics [13,14] which the students were required to buy.

Author B again taught the course in the fall of 2002, this time to 24 new TAs. Video taping of the mini lectures was reinstated but video tapes were not viewed and critiqued in class. Rather the lecturer was presented with his or her tape, as well as written comments from the other students in the class, to be viewed and read only by the lecturer. The Krantz book was replaced by the Friedberg case studies [10] as a primary resource for the course, with the Handbook [11] and the articles listed above still used as resource material.

A third instructor, an Associate Professor with a reputation for an interest in teaching and creative thinking, was recruited to teach the Pedagogy course in the fall of 2003 with only 11 TAs enrolled. He closely followed the format and content of the course as it was taught in 2002, with less emphasis on colloquium attendance. The small enrollment was due to the fact that in the summer of 2003 a new graduate advisor, not yet attuned to the purpose of MATH 5360.005, had taken over the graduate program and did not require many of the new TAs to enroll in it. This notwithstanding, Author B was convinced that with the additional content and expectations the course had taken on over the years, it was time for Pedagogy to assume its rightful place as a legitimate graduate course in the graduate program.

2.2 The Pedagogy Course

There were significant changes made when Author B taught Pedagogy to 17 new TAs in the fall of 2004. The conflict with the colloquium schedule was eliminated by scheduling the course to meet from 8—9:20 AM each Tuesday and Thursday throughout the 14 week term. This allowed more class periods for the expanded content of the course and eliminated any conflicts with other scheduled graduate courses. The basic

ground rules were the same: students were told that attendance was required and class participation was expected.

The course is best described as a TA-centered, cooperative learning environment in which the TAs develop their own teaching philosophies and the instructor acts as facilitator, course recorder, and role model. It is important for the tone of the course to be set on day 1. The instructor formally welcomes the TAs to Pedagogy and introduces him/herself to the class giving his/her academic background (credentials add to credibility), enough personal information to make him/her appear human, and perhaps a statement about his/her philosophy of teaching mathematics. The formal, professional looking course syllabus containing all the pertinent information about the instructor (office hours, e-mail address, etc) and the course (website, resource materials, expectations, learning outcomes, etc) is handed out and covered in detail. The TAs are then encouraged to ask any questions they may have. Then the instructor steps back and asks the TAs to comment on what just happened and records their comments on the chalk board. Each TA is then asked to come to the front of the class and introduce themselves to the class.

The TAs are divided into groups of four or five each. Ideally each group would have at least one representative from each of the following: native English speaking TA, ESL (English as a Second Language) TA, females, and males. And the groups remain intact throughout the entire semester.

The groups are then given the first in-class group exercise: Compile a written list of initial concerns, fears, apprehensions, questions, issues, etc you would like to see discussed in this course. After about 20 minutes a representative of each group is asked to stand before the class and share that group's list with the class. After hearing from all groups the class is asked if anyone would like to add anything to the list. All the lists are collected by the instructor to be processed into a table called "Selected Topics to be Considered" with items grouped by category as appropriate and provided to all students at the next class. The table from the 2004 class is included in the Appendix. [A.1] If time permits (approximately 15 minutes needed) the groups are then asked to discuss and

agree upon a definition of “teaching” and to share their definitions with the class. (If time is not available the exercise is pushed to day 2.) These too are compiled by the instructor to be presented to the TAs at the next class. The definitions of “teaching” from the 2004 class are included in the Appendix. [A.2] Finally the students are provided copies of the paper “The Ethics of Teaching” [15] and given the following assignment:

Be prepared to discuss the paper “The Ethics of Teaching,” in particular be able to describe the 3 models of student-teacher relations and provide examples from your own educational experience of each (if possible).

At the beginning of day 2 the Selected Topics to be Considered is handed out and the TAs are asked to keep a record (using tick marks in the third column) of each time they think something happened, or was discussed, in class that related to that given issue. They are also asked if anyone wants to add another topic to the list. Two weeks prior to the end of the semester the students are asked to rate the extent to which each topic had been addressed. The summary of this rating from 2004 is included in the Appendix. [A.3]

The groups discuss the exercise assigned from the previous class for about 20 minutes, then a spokesperson (different from the previous one) presents the group’s examples to the class. After the group presentations there is a whole-class discussion in which key words associated with each model of teacher-student relation are solicited from the class and recorded on the board by the instructor.

The groups reconvene to discuss the following short case study from the Handbook. [11, 12]

On Tuesday you decide to go to a movie on campus. While standing in line with your roommate, you meet one of your students. You begin a conversation, which you continue in the theatre. Two days later, the TA coordinator receives a dyspeptic letter from another student in the class. The letter writer says that you were “out on a date” with one of your students, that the student you were with is “the soon-to-be-former” boy- or girlfriend of the letter writer, that you “are trying to break up the relationship,” and that the TA coordinator should not tell you about the letter because you will just try to fail her or him in the class, “...which you’ve been trying to do all term anyway.”

The TA coordinator calls you in anyway to “discuss the situation.” What do you do?

The groups are given the following instructions:

In addition to the indicated questions, list all the issues that might be involved in this situation. Report your conclusions to the class in the usual way.

The groups are given about 20 minutes to discuss the questions before reporting to the class. A class discussion then ensues with the instructor as facilitator and recorder. The class ends with a TA being recruited to present a mini-lecture (15 minutes) at the beginning of the next class and another reading assignment.

Day 3 is typical of the classes for the remainder of the semester. The instructor arrives early and sets up the video equipment in the back of the room. As the TAs enter the room they pick up the Mini Lecture Critique forms. (See Appendix [A.4]) The TA recruited from the previous class presents a 15 minute mini lecture on a topic he or she expects to be teaching in the not too distant future. The TAs in the class are encouraged to ask questions and the whole experience is video recorded. At the end of the lecture the TAs in the class take a few minutes to fill out their critiques and the critiques and recording are given to the lecturer.

The remainder of the class is spent with group activities inspired by previously assigned readings and/or case studies. Here we should point out that the Friedberg [10] case studies are much more intricate and detailed than the brief sample case study given above. In fact several of them require more than one class period to fully explore. As always the groups report their observations and conclusions to the class and the instructor's role is to facilitate the discussions, and record and report their outcomes. The next presenter is recruited and the next assignment is given. The TAs drop the minute paper responses in a box as they exit the class.

CHAPTER III

METHODOLOGY AND DATA

Our attempt to evaluate the course's effectiveness involved analyzing quantitative and qualitative data. The quantitative data came from a survey distributed to all TAs in the department in the spring of 2005 and the end-of-term student course evaluations of all the classes taught by TAs in the fall of 2004. The qualitative data came from interviews with TAs who have taken the course and interviews of instructors who have taught the course, as well as comments from the end-of-term student course evaluations of the Pedagogy course itself.

3.1 Quantitative Data

3.1.1 Surveys

In order to gain insight into their prevalent attitudes about teaching, we decided to survey our current cadre of TAs (spring 2005). In addition to giving us insight into the state of the teaching culture within our department, we hoped we might find evidence of our course impact on these attitudes. Our survey instrument (See Appendix [A.5].) was sent to all TAs for the spring term of 2005. This consisted of 79 TAs, of whom 44 (excluding Author A) had taken the Pedagogy course at some time. The TAs simply were asked to list in order of importance, with 1 being the most important, the top five characteristics of an effective teacher. Also they were asked if they had taken the Pedagogy course and, if so, when.

Prior to distributing the survey instrument, the authors agreed on the following list of key words/phrases to be used for the purpose of quantifying the survey results: Mechanical, Content Knowledge, Pedagogy, Faculty-Student Relations, Professional Ethics, and Personality. These were the result of consultation based on the experience of Author A as a TA and former student in the Pedagogy class, and Author B with 30+ years of experience teaching mathematics at the college level, as well as the developer

and three time instructor of the Pedagogy class. Below are examples of particular characteristics the authors agreed would be assigned to each key word/phrase:

- Mechanical: being prepared, talks loud, board technique
- Content Knowledge: knowledge of subject, appropriate homework and assessment
- Pedagogy: encourages class participation, flexibility in teaching
- Faculty-Student Relations: mutual respect, patience, availability
- Professional Ethics: fairness, adhering to grading scheme, doesn't give up on students
- Personality: Love of subject, motivates students

The surveys were collected by Author A who then numbered them and provided copies to Author B. Independently the two authors went through each survey categorizing each listed characteristic with one of the predetermined key words/phrases. The authors met regularly for the purpose of arriving at a consensus on the appropriate categorization for each characteristic listed on each survey response. Obviously some listed characteristics could be assigned to different categories. Coming up with a consensus for a given response sometimes took some discussion as well as looking at the TAs other responses to determine their meaning for a given response. For example, survey number 19's response to the third characteristic was *Interaction with students e.g. asking questions*. One could argue for either Faculty-Student Relations or Pedagogy. The final consensus was that he/she was referring to more of a pedagogical issue because of the phrase *e.g. asking questions* and the tone of his/her other responses.

For the sake of comparison, the mathematics TAs at the University of Connecticut were asked to rank seven attributes according to how they were helpful in relation to learning mathematics, at the outset of their mathematics pedagogy course. [2] The TAs believed the following to be the top seven characteristics for being an effective instructor: being able to deliver well organized lectures, being knowledgeable of subject matter, grading fairly, being available for help, stimulating interest, grading and returning work promptly, and knowing students names. These correspond respectively to the following

categories in our system: Mechanical, Content Knowledge, Professional Ethics, Faculty-Student Relations, Personality, Mechanical, and Faculty-Student Relations.

We received thirty-two responses out of 79 sent out. Of the 32 responders, 26 had taken the Pedagogy Course. A weighted scoring system was employed to see which types of characteristics were perceived by the TAs to be more important. This weighted point system is as follows: five points were given for the characteristics ranked first, four for the second, and so forth. The data revealed that Faculty-Student Relations are perceived by the responders to be the most important characteristic. Table 1 shows the results.

Table 1: Survey Analysis

	Mechanical	Content Knowledge	Faculty-Student Relations	Pedagogy	Professional Ethics	Personality
1	10	9	3	2	3	5
2	6	5	11	4	1	5
3	5	3	11	4	3	6
4	5	6	9	3	3	6
5	4	3	4	7	8	6
totals	30	26	38	20	18	28
points	103	89	114	49	42	81

We then grouped the responses in two categories, A and B. Group A consists of the learned skills, or practical attributes: Mechanical, Content Knowledge, and Pedagogy. Group B consists of the inherent traits, or philosophical attributes: Faculty-Student Relations, Professional Ethics, and Personality. Applying the same weighted point system to attributes in groups A and B yields the results shown in Table 2.

Table 2
Group Survey Analysis

All (32)	A	B
1	21	11
2	15	17
3	12	20
4	14	18
5	14	18
Total	76	84
Points	241	237
Avg	7.53125	7.40625

We then applied the same calculation by category of responders, those who had taken the Pedagogy course in each given term and those who had not taken it. These results are shown in tables 3—7.

Table 3
Group Survey Analysis
Didn't Take the Course

Didn't take (6)	A	B
1	4	2
2	3	3
3	2	4
4	4	2
5	4	2
Total	17	13
Points	50	40
Avg	8.33	6.66

Table 4
Group Survey Analysis
Took the Course in Fall 2001

Fall '01 (4)	A	B
1	3	1
2	3	1
3	0	4
4	1	3
5	0	4
Totals	7	13
Points	29	31
Avg	7.25	7.75

Table 5
Group Survey Analysis
Took the Course in Fall 2002

Fall '02 (4)	A	B
1	3	1
2	3	1
3	2	2
4	2	2
5	2	2
Totals	12	8
Points	39	21
Avg	9.75	5.25

Table 6
Group Survey Analysis
Took the Course In Fall 2003

Fall '03 (5)	A	B
1	4	1
2	1	4
3	2	3
4	2	3
5	2	3
Totals	11	14
Points	36	39
Avg	7.2	7.8

Table 7
Group Survey Analysis
Took the Course in Fall 2004

Fall '04 (11)	A	B
1	6	5
2	3	8
3	6	5
4	5	6
5	4	7
Totals	24	31
Points	74	91
Avg	6.7272	8.2727

There were two responses not included in the preceding tables because there was only one survey for 1998 (a seminar that preceded the course) and one from 2000.

Although no statistical significance can be given to these results they do suggest a possible trend towards giving more importance to those more inherent, philosophical attributes. The notable exception is the group of TAs who took the course in the fall of 2002. Those who had not taken the course appear to favor attributes from Group A, while the TAs from the 2004 class seems to favor Group B attributes. Information gained from the interviews with the students and instructors of the Pedagogy class might shed more light on this.

3.1.2 Course Evaluations

For many years our university has used end-of-term student course evaluations, “Student Evaluation of Course and Instructor” (SECI), to evaluate the effectiveness of our courses and instructors as perceived by the students taking the courses. Prior to the fall of 2001 the SECI consisted of just three phrases:

1. The overall quality of this course was:
2. The overall effectiveness of the instructor was:
3. I would tell other students that the instructor was:

To each of which they were asked to choose one of the following 5 responses: Poor, Weak, Average, Good, Excellent.

In the fall of 2001 a new SECI was introduced. The new form has 16 phrases, the first 10 with the subheading “Instructor’s Performance” and the last 6 with the subheading “Course Evaluation.” The students are asked to respond to each phrase by choosing one of the following: Strongly Agree (5), Agree (4), Neutral (3), Disagree (2), Strongly Disagree (1). For our purpose we consider only those 10 responses in the “Instructor’s Performance” category from the post 2001 SECI. They are

1. Overall the instructor was effective.
2. The instructor was available for consultation during office hours or by appointment.
3. The instructor stimulated student learning.
4. The instructor treated all students fairly.
5. The instructor treated all students with respect.
6. The instructor welcomed and encouraged questions and comments.
7. The instructor presented the information clearly.
8. The instructor emphasized the major points and concepts
9. The instructor went beyond presenting the information in the text.
10. The instructor demonstrated knowledge of the subject.

Both forms solicited written comments from the students.

In order to obtain information about their classroom teaching practice we decided to look at the SECI results from the classes the 48 TAs on staff in the spring of 2005 who had taught during the fall 2004 term. This includes responses from 1377 students in classes taught by TAs who had taken Pedagogy and 906 students in classes taught by TAs who had not taken Pedagogy. While we recognize there might be disagreement about the validity of student teaching evaluations in general, we are proceeding under the assumption that such evaluations accurately reflect students' perceptions. We then compared the aggregate average evaluation score (the average of the cumulative responses to all ten questions) for 28 TAs who had taken Pedagogy to the 20 who had not. Table 8 shows the results.

Table 8: Aggregate Course Evaluation

	Average	S_x^2	S_x	N_x	z value
TAs who have taken the course (28)	4.370719	0.652806	0.807964	13579	
TAs who haven't taken the course (20)	4.175789	0.825617	0.908634	8971	
Significance					16.46834154

Here S_x^2 is the variance, S_x is the standard deviation and z denotes the z-value statistic.

One might be tempted to conclude that the TAs who took Pedagogy received significantly better evaluations than those who had not taken Pedagogy. That conclusion might be reasonable under the assumption that each student response to any one of the 10 questions is independent of his/her response to any other of the 10 questions. However such an assumption of independence is dubious at best. Hence we decided to perform a similar analysis on a question by question basis. The results are represented in tables 9-18.

Table 9: Question 1 Analysis—Overall Instructor Effective

Course	avg	5	4	3	2	1	total	S_x^2	S_x	Z
Took	4.296188	647	540	114	60	3	1364	0.666427	0.81635	
Didn't	4.075221	312	419	114	47	12	904	0.793893	0.891006	
										5.976908

Table 10: Question 2 Analysis—Instructor Available

Course	avg	5	4	3	2	1	total	Sx ²	Sx	Z
Took	4.400148	721	455	160	11	0	1347	0.526984	0.725936	
Didn't	4.271562	381	345	119	10	3	858	0.587778	0.766667	
										3.919518

Table 11: Question 3 Analysis—Stimulated Learning

Course	avg	5	4	3	2	1	total	Sx ²	Sx	Z
Took	4.198983	613	501	200	50	13	1377	0.781598	0.88408	
Didn't	3.997725	278	372	191	25	13	879	0.781316	0.883921	
										5.273543

Table 12: Question 4 Analysis—Treated Students Fairly

Course	avg	5	4	3	2	1	total	Sx ²	Sx	Z
Took	4.497813	825	440	78	23	6	1372	0.517136	0.719122	
Didn't	4.470325	507	321	48	12	5	893	0.505004	0.710636	
										0.895422

Table 13: Question 5 Analysis—Treated Students with Respect

Course	avg	5	4	3	2	1	total	Sx ²	Sx	Z
Took	4.510654	819	448	70	18	6	1361	0.485364	0.696681	
Didn't	4.487859	526	319	44	11	6	906	0.499852	0.707002	
										0.756345

Table 14: Question 6 Analysis—Encouraged Questions

Course	avg	5	4	3	2	1	total	Sx ²	Sx	Z
Took	4.532151	850	404	73	21	5	1353	0.494713	0.703358	
Didn't	4.326923	449	317	89	16	13	884	0.70727	0.840993	
										6.01089

Table 15: Question 7 Analysis—Presented Information Clearly

Course	avg	5	4	3	2	1	total	Sx ²	Sx	Z
Took	4.188971	643	447	174	76	20	1360	0.921585	0.959992	
Didn't	3.938824	270	346	179	22	33	850	0.978585	0.989235	
										5.849232

Table 16: Question 8 Analysis—Emphasized Major Points

Course	avg	5	4	3	2	1	total	Sx ²	Sx	Z
Took	4.435199	749	478	108	19	4	1358	0.524538	0.72425	
Didn't	4.27991	388	383	97	11	7	886	0.590489	0.768433	
										4.786124

Table 17: Question 9 Analysis—Went Beyond Information in Text

Course	avg	5	4	3	2	1	total	Sx ²	Sx	Z
Took	4.094256	594	404	269	76	15	1358	0.950579	0.974976	
Didn't	3.920863	272	299	210	31	22	834	0.958916	0.979243	
										4.031562

Table 18: Question 10 Analysis—Demonstrated Knowledge of Subject

Course	Avg	5	4	3	2	1	Total	Sx ²	Sx	Z
Took	4.515487	832	417	84	20	3	1356	0.489059	0.699327	
Didn't	4.444944	493	322	60	8	7	890	0.530711	0.728499	
										2.280367

It is clear from Tables 12 and 13 that we observe no significant difference for questions 4 and 5 at the 95% ($\alpha = .05$, $|z| > 1.96$) confidence level. Without making a Bonferroni correction, [24] we would conclude that the TAs who took Pedagogy received significantly better evaluations on all the other questions. However making 10 comparisons increases the likelihood that we have encountered a chance occurrence, thus to maintain a 95% overall confidence level we apply a Bonferroni adjustment by using $\alpha = .05/10$ with $|z| > 2.807$ for each comparison. With this adjustment there is a significant difference in favor of those who took Pedagogy for all questions except numbers 4, 5, and 10.

Upon closer inspection we discovered the following. Of the 28 TAs who had taken Pedagogy only 5 were international, while 14 of the 20 TAs who had not taken Pedagogy were international. This leads to the question of whether the poorer evaluations are the result of an international TA (ITA) versus native TA issue. Therefore we compute the data question by question and compared all groups with the same significance test. The results are listed in the tables below and for the remainder of this paper TA-1 and ITA-1 represent, respectfully native and international TA's who have taken the course and TA-2 and ITA-2 represent, respectfully native and international TA's who have not taken the course.

Table 19: Question 1 Analysis by ITA or TA

	Avg	5	4	3	2	1		total	Sx^2	Sx		Z value
ITA-1	4.217391	104	89	21	15	1		230	0.799696	0.894257		
ITA-2	4.001656	181	294	87	33	9		604	0.797676	0.893127		
TA-2	4.223333	131	125	27	14	3		300	0.755975	0.869469		
TA-1	4.312169	543	451	93	45	2		1134	0.638563	0.799101		
ITA-1	ITA-2											3.114657
ITA-1	TA-2											-0.07673
ITA-1	TA-1											-1.2239
ITA-2	TA-2											-3.57704
ITA-2	TA-1											-7.15431
TA-2	TA-1											-1.59993

Table 20: Question 2 Analysis by ITA or TA

	avg	5	4	3	2	1		total	Sx^2	Sx		Z value
ITA-1	4.406393	120	71	25	3	0		219	0.554271	0.744494		
ITA-2	4.264758	241	233	79	4	2		559	0.564186	0.751123		
TA-2	4.284281	140	112	40	6	1		299	0.633678	0.796039		
TA-1	4.398936	601	384	135	8	0		1128	0.522164	0.722609		
ITA-1	ITA-2											2.380425
ITA-1	TA-2											1.790687
ITA-1	TA-1											0.109345
ITA-2	TA-2											-0.34903
ITA-2	TA-1											-3.49702
TA-2	TA-1											-2.25629

Table 21: Question 3 Analysis by ITA or TA

	avg	5	4	3	2	1		Total	Sx^2	Sx		Z value
ITA-1	4.01992	96	91	43	15	6		251	1.011602	1.005784		
ITA-2	3.931034	160	244	162	4	10		580	0.734441	0.856995		
TA-2	4.12709	118	128	29	21	3		299	0.849566	0.921719		
TA-1	4.238899	517	410	157	35	7		1126	0.722432	0.84996		
ITA-1	ITA-2											1.221337
ITA-1	TA-2											-1.29283
ITA-1	TA-1											-2.64162
ITA-2	TA-2											-3.05903
ITA-2	TA-1											-7.04831
TA-2	TA-1											-1.89453

Table 22: Question 4 Analysis by ITA or TA

	avg	5	4	3	2	1	Total	Sx ²	Sx	Z value
ITA-1	4.457143	151	66	19	7	2	245	0.67541	0.821833	
ITA-2	4.469697	333	217	37	4	3	594	0.475471	0.689544	
TA-2	4.471572	174	104	11	8	2	299	0.565464	0.751974	
TA-1	4.506655	674	374	59	16	4	1127	0.48286	0.694881	
ITA-1	ITA-2									-0.21049
ITA-1	TA-2									-0.21164
ITA-1	TA-1									-0.72624
ITA-2	TA-2									-0.03614
ITA-2	TA-1									-1.05426
TA-2	TA-1									-0.72843

Table 23: Question 5 Analysis by ITA or TA

	avg	5	4	3	2	1	Total	Sx ²	Sx	Z value
ITA-1	4.53304	145	62	16	4	0	227	0.497797	0.705548	
ITA-2	4.511111	344	206	28	4	3	585	0.448935	0.670026	
TA-2	4.475083	177	103	11	7	3	301	0.583544	0.7639	
TA-1	4.497832	681	394	55	17	6	1153	0.49674	0.704798	
ITA-1	ITA-2									0.403031
ITA-1	TA-2									0.901659
ITA-1	TA-1									0.547747
ITA-2	TA-2									0.692579
ITA-2	TA-1									0.383625
TA-2	TA-1									-0.46733

Table 24: Question 6 Analysis by ITA or TA

	avg	5	4	3	2	1	Total	Sx ²	Sx	Z value
ITA-1	4.576763	165	56	15	4	1	241	0.520124	0.721197	
ITA-2	4.304274	270	237	69	4	5	585	0.592191	0.769539	
TA-2	4.371237	179	80	20	12	8	299	0.93219	0.9655	
TA-1	4.511091	690	352	61	19	5	1127	0.512976	0.716224	
ITA-1	ITA-2									4.839358
ITA-1	TA-2									2.829562
ITA-1	TA-1									0.904135
ITA-2	TA-2									-1.042
ITA-2	TA-1									-5.39889
TA-2	TA-1									-2.33973

Table 25: Question 7 Analysis by ITA or TA

	avg	5	4	3	2	1	Total	Sx ²	Sx	Z value
ITA-1	4.039301	96	78	29	20	6	229	1.134414	1.065089	
ITA-2	3.854281	146	231	143	4	25	549	0.94588	0.972564	
TA-2	4.093023	124	115	36	18	8	301	1.004651	1.002323	
TA-1	4.219275	547	369	145	56	14	1131	0.874	0.93488	
ITA-1	ITA-2									2.264332
ITA-1	TA-2									-0.58998
ITA-1	TA-1									-1.97648
ITA-2	TA-2									-3.35605
ITA-2	TA-1									-7.3062
TA-2	TA-1									-1.96921

Table 26: Question 8 Analysis by ITA or TA

	avg	5	4	3	2	1	Total	Sx ²	Sx	Z value
ITA-1	4.36214	133	76	25	7	2	243	0.711288	0.843379	
ITA-2	4.242735	236	269	71	4	5	585	0.571116	0.755722	
TA-2	4.352159	152	114	26	7	2	301	0.622237	0.78882	
TA-1	4.440708	621	406	86	14	3	1130	0.505339	0.710872	
ITA-1	ITA-2									1.911181
ITA-1	TA-2									0.141225
ITA-1	TA-1									-1.11175
ITA-2	TA-2									-1.98348
ITA-2	TA-1									-5.24725
TA-2	TA-1									-1.76588

Table 27: Question 9 Analysis by ITA or TA

	avg	5	4	3	2	1	total	Sx ²	Sx	Z value
ITA-1	4.066116	106	68	51	12	5	242	1.032955	1.016344	
ITA-2	3.88764	156	198	160	4	16	534	0.88041	0.938302	
TA-2	3.98	116	101	50	27	6	300	1.096589	1.047181	
TA-1	4.094607	493	340	221	66	11	1131	0.944139	0.971668	
ITA-1	ITA-2									2.320187
ITA-1	TA-2									0.967427
ITA-1	TA-1									-0.32007
ITA-2	TA-2									-1.26818
ITA-2	TA-1									-4.15306
TA-2	TA-1									-1.71034

Table 28: Question 10 Analysis by ITA or TA

	avg	5	4	3	2	1	total	Sx ²	Sx	Z value
ITA-1	4.526749	161	58	16	7	1	243	0.605686	0.778259	
ITA-2	4.413851	312	225	47	4	4	592	0.523869	0.723788	
TA-2	4.506711	181	97	13	4	3	298	0.540359	0.735091	
TA-1	4.501773	676	363	71	15	3	1128	0.488018	0.698583	
ITA-1	ITA-2									1.942631
ITA-1	TA-2									0.305363
ITA-1	TA-1									0.380622
ITA-2	TA-2									-1.78769
ITA-2	TA-1									-2.42221
TA-2	TA-1									0.104204

Here we have made 60 comparisons, so to maintain an overall confidence level of 95% we apply the Bonferroni adjustment $\alpha = .05 / 60$ with $|z| > 3.34$.

There seems to be some significance in all questions except questions 4, 5, and 10 again. Once again one might be tempted to draw conclusions from this analysis. But even this model cannot account for all the dependence that is occurring due to the fact that there could be significant variation between individual TAs within each group. Thus we implement a two-way factorial analysis of variance (ANOVA).

The standard two-way factorial ANOVA [25] statistical model (non-additive) is

$$y_{ijk} = \mu + \alpha_i + \beta_j + \alpha\beta_{ij} + \varepsilon_{ijk} .$$

Where y_{ijk} is the adjusted mean score for an instructor, μ represents the aggregate average score of all the TAs on a given question, α_i is the effect of the TA type ($i = 1$ for native TAs or 2 for international TAs), β_j is the effect of having the course or not ($j = 1$ for having the course or 2 for not having the course), $\alpha\beta_{ij}$ is known as the effect due to an interaction between the two factors, and ε_{ijk} the random error term. So β_1 is μ minus the aggregate average score of the TAs who took the course. $\beta_2, \alpha_1,$ and α_2 are calculated in similar fashion. The value of $\alpha\beta_{ij}$ is similarly calculated using the aggregate average scores of the students in each appropriate intersection. Thus if $\mu = 3.75$ and $\beta_1 = 0.35$, then a student who has attended the course will observe (on average) an average evaluation score 0.35 higher than all TAs combined.

The goal is to determine if β_1 and/or β_2 (whether or not a TA has taken the course) is significantly different from 0. If we can't distinguish them from 0 (that is, they fall within the margin of what we would expect due to chance), then we would say that we have insufficient evidence to conclude that the course has any effect.

Even this model fails to take into account one important detail for it assumes that the responses of all the students of all the TAs in a given group are independent. Unfortunately, this is not the case. Each TA has a number of responses represented in the data set. For example, one of the TAs has a total of 47 responses for Question 1. These 47 responses are not independent because they all come from students who were in the same class. The easiest way to make this adjustment is to add a factor to the model that represents the effect of the TAs themselves on the evaluations from their classes.

Before presenting the model to account for the effect of the TAs, there are two aspects of the factor that differ from the other two factors already included (the TA type and course factors). Firstly, the factor is known as a *nested* factor (as opposed to a *crossed* factor). Two factors are said to be *crossed* if each level of one factor appears with every level of the other factor. For example, the two factors α_i and β_j are crossed because we have at least one observation at every one of the 4 possible combinations of the levels of the two. (Letting the α_i and β_j represent the respective sets of TAs we have $\alpha_i \cap \beta_j$ is non-empty for all i,j .) A factor is said to be *nested* if levels of the factor appear uniquely with only one level of another factor. ($\alpha_i \cap \beta_j$ is disjoint from $\alpha_{i'} \cap \beta_j$ for all $(i,j) \neq (i',j)$.) The second aspect is that the TA factor is also a *random* factor (as opposed to a *fixed* factor). A factor is said to be *fixed* if the levels observed for a factor are all that the experimenter is interested in studying, in our case α_i and β_j . A factor is said to be *random* if the levels observed represent a random sample of a much larger population of possible levels and the larger population is really of interest. In this case, the TA factor is random because it is of interest to apply the results of this analysis to *all* TAs that come to the Math Department and not just the 48 that appear in the analysis.

The full model for this analysis (with assumptions) is presented as follows:

$$y_{ijkl} = \mu + \alpha_i + \beta_j + \alpha\beta_{ij} + \gamma_{k(ij)} + \varepsilon_{ijkl}.$$

The random error ε_{ijkl} is assumed to be normally distributed with mean 0 and common variance σ_ε^2 . The effect of the TAs themselves, represented here by $\gamma_{k(ij)}$ is assumed to be a random variable within each group that is normally distributed with mean 0 and common variance σ_γ^2 with its group. The statistical software package SAS was used to conduct the analysis. The code necessary to fit the above model (for question 1 – the remaining questions are similar) to the data is as follows:

```
PROC GLM DATA=evalq;
  TITLE 'Question 1';
  CLASS tanum type course;
  FREQ numq1;
  MODEL response = type course type*course tanum(type*course);
  RANDOM tanum(type*course) / TEST;
```

Tables 29 and 30 shows the results of the two-way ANOVA model, question by question, of the course effect and the TA type effect. If p (p-value) $< .01$, it is considered “highly significant”, if $.01 < p < .05$ it is considered “significant”, if $.05 < p < .1$ it is considered “marginally significant”, and if $p > .1$ it is “not significant”.

Table 29: 2-Way ANOVA Analysis—Course Effect

Question	p-value	Significance
1: Overall Instructor Effective	0.1153	Not
2: Instructor Available	0.0287	Yes
3: Stimulated Learning	0.0608	Marginally
4: Treated Students Fairly	0.1781	Not
5: Treated Students With Respect	0.1881	Not
6: Encouraged Questions	0.0024	Highly
7: Presented Material Clearly	0.0658	Marginally
8: Emphasized Major Points	0.0790	Marginally
9: Went Beyond Information in Text	0.0254	Yes
10: Demonstrated Knowledge	0.1893	Not

Table 30: 2-Way ANOVA Analysis—TA Type Effect

Question	p-value	Significance
1: Overall Instructor Effective	0.7418	Not
2: Instructor Available	0.5322	Not
3: Stimulated Learning	0.7437	Not
4: Treated Students Fairly	0.3930	Not
5: Treated Students With Respect	0.1674	Not
6: Encouraged Questions	0.2546	Not
7: Presented Material Clearly	0.3107	Not
8: Emphasized Major Points	0.6269	Not
9: Went Beyond Information in Text	0.8348	Not
10: Demonstrated Knowledge	0.6765	Not

It is also worth noting that there is no significant effect for any question due to the interaction between the two factors α_i and β_j as represented by $\alpha\beta_{ij}$. Also, as one would expect, the effect the TAs themselves within each group, $\gamma_{k(ij)}$, is highly significant for each question with all p-values less than 0.0001.

This clearly shows that the course is having some effect, while the type of TA, international or native, has no measured effect on the TAs course evaluations.

3.2 Qualitative Data

3.2.1 Interviews

In order to gain more understanding of how the TAs perceive the course, Author A interviewed 23 TAs who had taken the course in 2000 to 2004 of which, 14 were males, 9 females, and 2 ITAs. A copy of the interview form can be found in the Appendix. [A.6] These interviews were audio taped in order to accurately interpret their responses. A hard copy of the Author A's notes and the audio tape were given to the Author B, who then evaluated them independently. Author A and Author B ranked the interviews 1-5, where 5 was highly positive and 1 was highly negative. The authors then discussed their evaluations and came to conclusions about the interviews. Table 31 shows the overall conclusions of the interviews.

Table 31: Breakdown of Interviews

Rank	# of interviews
Highly Positive: 5	4
Positive: 4	9
Neutral: 3	6
Negative: 2	3
Very Negative: 1	1

Author A also interviewed the other two instructors of the pedagogy course in order to gain a better understanding in the differences between the courses. A copy of this interview form can be found in the Appendix. [A.7] Author A reviewed his notes and audiotape of the interview and then gave a copy of his notes and the audiotape to Author B, who then used the same form to record his notes concerning the interviews.

In order to evaluate the interviews more accurately the authors evaluated the interviews based on term, in conjunction with the corresponding instructors' interviews. For the sake of naming our interviewees the following convention will be used; if the student is male, he will be referred to as BBob, short for Billy Bob, if the student is female, she will be referred to as BSue, short for Betty Sue, followed by a 3 digit number, the first number refers to which student interviewed and the last two digits refer to the term in which they took the course. For example, BBob101 refers to a male interviewed first from the 2001 class.

3.2.1.1 Interviews for the Fall 2000 Course

The interviewees from the fall 2000 course were BBob100, BBob200, and BBob300. BBob100's interview was highly negative (rank: 1), while BBob200 and BBob300's interviews were positive (rank: 4). All three are experienced TAs with significant teaching experience.

When asked whether the course had affected their attitudes toward teaching or their teaching practice, BBob100 said the course had no effect on his attitudes or his teaching practice.

I got nothing out (of the course) that I didn't have coming in.

Referring to teaching practice he declared the course

...didn't change anything...Case studies not practical, they were way out there.
Both BBob200 and BBob300 noted that their attitudes were affected by the course, but in opposite ways. BBob300 gained more confidence.

...got good practice in front of peers.

Whereas BBob200 became more humble.

When I started I was pretty arrogant, (the instructor) took me down a few notches, which was a good thing.

Both BBob200 and BBob300 said that the video tape lesson greatly affected their teaching practice. Whereas BBob200 referred to changes in Faculty-Student Relation issues.

I became more patient (with respect to students) and to expect more questions.

BBob300 cited changes to his mechanics.

...thought about, was I writing on the board and presenting the material in a clear way.

With regard to the most or least beneficial content, BBob100 said the most beneficial topic was the grading exercise (referring to a case study).

...graded on the assumption that wrong is wrong, I got pounced on by the group, realized I needed to relax a little more. (with respect to grading)

Interestingly this suggests a possibly unrecognized change in attitude on his part. The least beneficial for him was the video tape lesson.

...thought it would be useful but it wasn't... students in class asked really stupid questions...other students were being smart asses.

However BBob200 felt the video tape lesson was the most beneficial.

...single handily the most important thing in the course.

BBob200 had no response to the least beneficial, only to say that it was too long ago to remember. BBob300 refers to mechanical issues and building more confidence as the most beneficial topic in the course. He disagreed with BBob100, saying the least beneficial was the case study involving grading.

Everyone had their own way of grading, it didn't change them. We talked about it and everyone stayed the same.

All three thought the goal was to prepare TAs to teach. When asked whether they thought that goal was achieved BBob100 said no while BBob200 and BBob300 said that it did. However, BBob300's response was intriguing due to the fact that he used the present tense.

I think it does, some people have a natural gifting, but it really helps those that don't have that gift. It gets communication going between TAs.

They all watched their video and reiterated things they stated before. BBob100 observed that he didn't see anything he didn't already know. BBob200 said he became more conscious of the image he was portraying and BBob300 said that it was a good experience and observed there were mechanical issues that he needed to work on.

All three believed the course to have been required, but BBob100 added an intriguing comment given that he was so negative about the course.

I wanted to teach right away, it's a big deal to take a pedagogy course.

About what was lacking in the course, BBob100 said there was no practical preparation and referred to adding more of the *things we do everyday* (as an instructor). BBob200 wanted more discussion of issues involving discipline problems and how to handle them, and BBob300 wanted more guidance with respect to the standards an instructor require before passing students on to the next course.

In concluding the interview BBob100 reiterated his negative view point on the course and his disdain towards Author B, the instructor of the course. BBob200 said that he was *a better teacher as a result* and had no other comments. BBob300 called the course a *good learning experience* and again mentioned the confidence he gained through taking the course. His final comment pertained to the juxtaposition of particular content.

WebCT should be discussed at the beginning, so that it could be used in our classes or at the end so that it is fresh on their minds to use during the spring.

The instructor (Author B) recalls never being sure he had the right mix of instructor versus student input and student interaction. He felt uncomfortable with his handling of the critiques of the video tapes, the group discussions, and especially the case studies. He believes that he talked far too much and at times stymied what should, and could,

have been very productive class discussions. However, he did feel at the time that he had good rapport with the students and recalls being disappointed with the end of course teaching evaluations of the class.

The comments from the end of course teaching evaluations were not available because the forms changed the following term and could not be located.

3.2.1.2 Interviews for the Fall 2001 Course

The interviewees from the fall 2001 course were BBob101, BBob201, and BBob301. BBob301's interview was negative (rank: 2), while BBob101 and BBob201's interviews were neutral (rank: 3). BBob101 is an older, more mature TA who was a junior high teacher. BBob201 also had some teaching experience before taking the course. Due to their tenure within the department, all have gained a significant amount of teaching experience.

When asked whether the course had affected their attitudes toward teaching or their teaching practice, all three responded to no effect on their attitude. BBob101 and BBob201 said that their attitude was set due to prior teaching experience.

(BBob101) Didn't affect my attitude, pretty upbeat and optimistic... I'm old and set in my ways anyway

(BBob301) How to teach a math course was based on my experience as an undergrad.

BBob201 said that the grading case study affected his practice.

...more lenient in my grading...more patient with students

BBob101 and BBob301 said that the course didn't affect their practice.

(BBob101) Opened my eyes about how others do things but didn't let those ideas affect me.

(BBob301) Exposure to pedagogy didn't change my approach to anything.

With regard to the most beneficial content BBob101 and BBob201 mentioned the grading case study.

(BBob101) ...hesitation...*We only met half a dozen times. Can't really remember, didn't cover a lot of material... grading case study remember as much as anything. Sticks in my mind the most.*

BBob101 thought nothing seemed pointless and everything would be helpful at some time, while BBob201 listed some specific topics as least beneficial.

...times we talked about searching for teaching jobs, research articles. Our class I guess was more of an introduction to grad school and the Chair (instructor).

BBob301 said that watching others teach was the most beneficial, however not everyone presented and those who did were not video taped. He said that the least beneficial were the readings.

All three thought the course achieved its goal but each perceived the goal of the course quite differently. BBob101 said that the goal was

(BBob101) *...to be more effective teachers, to give us some techniques and some methods and ideas...Yes, I did learn a couple of things. Good just to talk about teaching. That's what the whole class was*

(BBob102) *To introduce students to grad school and to the math department.*

(BBob103) *Introduce incoming TAs to the structure of teaching math at this university.*

There was no video tape lesson for this term and all said that the reason for taking the course was that it was required.

About what was lacking from the course all three responded with *things they're doing now*. BBob101 and BBob201 stated specific content that the course covers.

(BBob101) *Do a video tape and give a lesson of some sort. Didn't have to get up and do anything. All classes now are required to do that, to the best of my knowledge. We didn't have to do anything, no practice in improving what we do.*

(BBob201) *What they're doing now, having lessons on how students learn, dealing with students, video lesson, how to deal with complaints and false accusations, how to deal with parents and administration*

In concluding the interview BBob101 and BBob201's response to the course's worth was indifferent.

(BBob201) *Yeah, I guess so*

(BBob101) *Yes, even though I didn't go that often, learned some stuff*

(BBob301) *To be honest with you no. The exposure didn't change my approach to teaching.*

BBob101 was the only interviewee to offer any other comments regarding the course.

Since it's required it should count toward your degree.

When interviewing the instructor, the department chair, for this term we not only gain insight into the dynamics of this particular course but also to the administration's viewpoint of the course.

The Chair believed the goal of the course was to prepare graduate students to go into the classroom and teach. He was noncommittal, when asked if the goal of the course was achieved.

It's difficult to judge...I don't have enough data to answer...several times we didn't meet because of colloquium and other chair duties... probably wasn't the best person to teach the course. I guess we only met 60-70% of the time. Only taught the course once, I think that's the kind of course you need to teach more than once. I would say my performance was mediocre, their (TAs) benefits were less than they could be.

With regard to materials he used and the typical class, the chair noted the TA handbook [11, 12], Krantz book [13, 14], and various articles Author B had given him as well as some he had found on his own. It appears to Author A and Author B that structure was not viewed as an important aspect of the course, due to the chairs statements regarding a typical class.

Impossible to do (describe a typical class) because it varied greatly. Some days went over case studies, student interaction, my roll was minimal. Some days I would present material or demonstrate a concept I wanted to get across and some days I had them prepare lectures. No such thing as a typical class.

With regard to what worked and what didn't work well, the chair noted that the case studies worked best while the articles weren't well received by the students.

...probably the best experiences were the case studies...may have worked best because it didn't require that they prepare for class. I gave the students a reading list, they weren't diligent about it. How do you discuss an article that the students

didn't read... the articles were more of a philosophical and theoretical nature. I don't think that's the most important thing for an inexperienced teacher to deal with. They don't have a context for which to place that...I think there was a perception that the students didn't take the course seriously. They thought the course wasn't a high priority, that's probably my fault.

About teaching the course again he said,

...try to create a class of a more interactive nature, where they could practice what we talked about... I wouldn't be enthusiastic about teaching it again because you don't get the same satisfaction out of that as you do a content specific course

In conclusion of the interview he (the Chair) noted the importance the course plays within the department in how it deals with various issues concerning higher administration and dealing with complaints from students and their parents. He also noted that it puts new TAs in contact with one another.

It's very important... in the eyes of the administration we have to respond to complaints from higher administration, parents, and students and they want to know what the qualifications are of these graduate students. It's important to point to a program that provides some sort of preparation even though it's not verifiably acceptable, we say oh no we don't just throw them to the wolves...have a professional responsibility and responsible to students and parents to put good teachers in the classroom

With regards to whether the department's perception makes the course harder or easier to teach he said that it doesn't influence that aspect of the course but did note that:

...faculty don't really teach it because it takes an extra effort and it doesn't take that kind of thought to teach calculus. Here you have to really think about what you want to achieve and don't have a template to use. It's not your typical math class. The faculty probably don't realize the importance of it but anybody in this office does (referring to the department's main office).

There was only one comment from the end of course evaluations.

(the chair) was very relaxed about this subject. He recognized that a lot of the material was common sense and that is refreshing to hear from a professor. He rocks

3.2.1.3 Interviews for the Fall 2002 Course

The interviewees from the fall 2002 course were BSue102, BSue202, and BSue302. BSue302's interview was neutral (rank: 3), while BSue102 and BSue202's interviews were positive (rank: 4). BSue202 is an older ITA, while BSue102 and BSue302 are traditional graduate students. However, BSue102 had previous college teaching experience as a TA. At the time of the interview all had at least two years teaching experience due to their tenure within the department.

In regards to attitude changes BSue102 and BSue202 recognized a change and BSue302 did not. BSue102 perceived teaching more seriously as it became more of a profession. BSue202 and BSue302 noted that teaching was harder than they thought it would be.

(BSue202) Whenever I had a problem, place to ask questions for help... changed a lot, not what I expected, not always bad or anything, but different.

(BSue302) Don't know that it affected it... at first thought I though it was going to be easy, not as easy to get people to learn

About changes in their teaching practice BSue102 wasn't sure the course had an impact because she still prepares to teach in the same manner as before. BSue202 and BSue302 admit to the course's affect on their teaching practice. BSue202 learned the 4 to 1 rule when making exams and BSue302 said that her teaching practice was affected significantly.

(BSue202) to make the first test I didn't know what to do, how many questions, so I asked the class for suggestions. They said 80 minute exam should do in 20 minutes or so.

(BSue302) Quite a bit... thought everybody would learn by example...try to incorporate different styles... make students do examples in class. If they just watch me do it then they're not going to learn.

The interviewee's responses to the most beneficial content varied. BSue202 noted that the course was conducive to meaningful discussions because of the relaxed atmosphere.

(BSue102) Videotape, watching yourself teach even though you don't like to do it.

(BSue302) *Different ways students learn...needs more methods of teaching, should talk more about how to teach. I think that it could be a really could course.*

Their answers to the least beneficial content also varied, but BSue102 disagreed with BSue202 and said that the discussions were the least beneficial. BSue302 said that some of the case studies weren't relevant but did note that the grading exercise was helpful.

(BSue102) *...no closure to the discussions (lack of time), all gray not necessarily a right answer, maybe that's the point there are gray areas...colloquium took time away from course.*

(BSue202) *Maybe not least beneficial, just wished I would have learned how to enter grades, meaning of W and WF, rules for dropping courses*

All three perceived the course goal differently but agreed that it achieved their perceived goal. However, BSue302 wasn't sure what the goal was.

(BSue302) *Don't know we did so many different types of things... maybe an overall introduction to teaching, a place to talk about teaching... yes if it's just a general knowledge.*

(BSue102) *To make you a more effective teacher...yes but don't think some of the students took it seriously, knowing this really hurt discussions*

(BSue202) *To give new TAs without teaching experience a place to ask questions...yes think so, teaching and taking (real math) classes, gives us a little break.*

The interviewees recognized the importance and usefulness of the videotape, although BSue102 and BSue302 thought it was weird watching themselves but did notice room for improvement. BSue202 didn't remember doing a videotape but Author B (the instructor) does. She did remember the videotaped lecture she conducted in the international workshop.

When asked why they took the course, BSue102 and BSue302 were a little wishy-washy on whether the course was required or not. BSue102 and BSue202 agreed that with their course load that they probably couldn't handle much more "real math" courses.

(BSue102) *made to I think, but didn't mind I really didn't want to take another math class.*

(BSue202) *...not stress like taking other math classes, not much work*

(BSue302) *Required, well not required, but they say everyone takes it.*

They were very specific when asked what was lacking from the course. BSue202 and BSue302 mentioned that mechanical issues need to be addressed more. (BSue202: board work, BSue302: writing lesson plans) BSue102 asked that specific documents regarding university policies be provided as part of the literature for the course.

With respect to the course's worth, both BSue102 and BSue202 agreed that the course is worthwhile, but BSue302 was hesitant in her response but ultimately thought the course lacked the mechanical aspects of teaching in order to be worthwhile.

(BSue102) *Yes, recommend everyone to take it even professors.*

(BSue202) *Yeah I think so, nice place, not much work, but still ask questions and get help. Didn't learn a lot about education and teaching, but some of the discussions were heated and fun.*

(BSue302) *No, needs more specific things...how to teach...learned some things, could have been better, came out a better teach...50:50 course not great, not awful.*

The comments from the end of course evaluations were:

I really enjoyed the class, it was a nice break from math all the time. Thanks.

I enjoyed the course tremendously. It was good that there were many unplanned teachable moments.

I think the people who have participated in the International teaching Assistant Workshops during summer has already done most of the things similar to this. I think this class taking 3 hours a week is too much for the material. If it was a once a week one hour would be better.

I found that the class could help me, while teaching. The instructor was good, but easy to get of subject. Overall he taught the class well.

This class was beneficial for understand what is expected out of me as a TA. It was also nice to be able to ask questions about subjects unfamiliar to the first year grad students. Also nice to see others point of view in teaching.

Very useful for new TA's.

(Instructor) was very thorough & was considerate of our concerns. Class discussion was always good!

I think if we are required to take this class it should count toward credit graduation. I like the case studies & private statements. Both allowed for my voice to be heard.

Good job. Enjoyed the discussions, particularly concerning the case studies. As a first time TA, this class has been helping me. I enjoyed heated discussions between students and between (instructor) and students. (Instructor) treated us not only as students but also colleagues.

Useless, 3 credits way too much.

I really liked how we began every class with question and then also did the 1-minute papers. This way no one had to feel embarrassed by any question they had. I felt the group discussions were really beneficial.

I like the videotape and comments after the student give the short talk. It is a good way to improve teaching skills.

Maybe talk a little more on grading assignments.

I did learn some good things, but I felt I got more out of actually teaching and learning on my own. But, overall the class was enjoyable and a positive experience.

?not sure?

3.2.1.4 Interviews for the Fall 2003 Course

The interviewees from the fall 2003 course were BSue103, BSue203, BBob303, BBob403, BSue503, and BBob603. BSue103, BBob403, and BBob503's interviews was highly positive (rank: 5), while BSue203 and BBob303's interviews were positive (rank: 4) and BSue503's interview was neutral (rank: 3). BBob403 is an older TA who returned to college for the purpose of becoming a college professor. BSue103 has her teaching certificate and took the course again the following fall, while the others have minimal teaching experience. It should be noted that Author A was also a student in this course.

In regards to attitude changes BSue103, BSue203, BSue503, and BBob603 said the course was relaxed and eased their apprehensions about teaching. BBob403 was the only interviewee from this term to state that his attitudes hadn't changed.

(BBob403) *I went in wanting to be a teacher, that goal was not changed.*

(BBob303) *It (course) opened my eyes, college was easy for me, I had never really stepped back and see from a teachers view... responsible for presenting the material in a manner that can be learned in the easiest manner.*

(BSue103) *It made me a little more calm. I was worried about teaching students the same age or older... talking to fellow students, knowing we're in the same boat.*

(BSue503) *Don't know. At the time I was just grading not teaching, next semester either. It was more of a therapy session, more meaningful for those teaching.*

Four of the interviewees noticed changes in their teaching practice, while the other two saw no effect on their teaching practice. The two that saw no effect were BSue103 and BSue503, however BSue103 reiterated the fact that the course made her more comfortable teaching and that it gave her an outlet for questions. BSue503's negative response was due to the fact she had no students to discuss and felt left out of the discussions. BBob303 and BBob403 referred to the course affecting their mechanics. Both mentioned the videotape as the main resource for noticing their mechanical shortcomings.

(BBob303) *...that I need to project my voice and talk slowly*

(BBob403) *...better classroom technique. Tape and critique very helpful*

BSue203 referred to the grading case study and noted how all the TAs came up with very different answers. BBob603 noticed some techniques used in the course and tries to apply them to his own classes.

(BBob603) *...how to break up into groups. Course gave a good model...videotape was cool but presentations to peers not the same as teaching... I implement different learning styles but need to do it more.*

The interviewees responded by a margin of four to two that the most beneficial content in the course was the case studies, however out of the four only two referred to the same case study. BSue203 and BBob603 referred to the grading case study as the most beneficial. BSue103 referred to the case studies in general, while BBob303 referred to those that deal with Faculty-Student Relations.

(BBob303) *...dealing with the controversy of teaching and to protect your ass*

BBob403 and BSue503 thought other topics to be the most beneficial.

(BBob403) *...seeing the different styles of learning, but one class doesn't make you an expert.*

(BSue503) *Discussions of problems people were having*

The interviewees' responses to the least beneficial were varied. Only two mentioned the same thing. BSue203 and BSue503 said that the articles were the least beneficial, while BSue503 did note that she didn't read a lot of them.

(BSue103) *Sometimes the discussions got a little carried away and outrageous especially in the fall '04 class. (Author B, instructor for fall'04, noted that there was a difficult student in her group)*

(BBob303) *...lack of studying practice of teaching... we're all smart enough to know how to present the material.*

(BBob403) *discussion on campus life, no real bearing on teaching.*

(BBob603) *videotape, talking in front of peers not the same as students, can't get away with stuff in front of peers. Better to videotape one of the recitation sessions. That would have been awesome.*

The interviewees' perceived the goal of the course four to two as a therapy session for new TAs. BBob303 and BBob403 were the two that perceived the goal differently. BBob303 thought the goal of the course was to improve teaching, while BBob403 thought the goal of the course was to prepare TAs for the job. All believed that their perceived goal was achieved.

(BSue103) *Prepare you to teach, to make you more comfortable and let you know that your not alone... course is a good example of how the department really*

cares about its' TAs. I heard horror stories about how they hand you a book and say go teach.

(BSue203) To have a place where we talk about teaching, get you comfortable, kind of catching ground for problems.

(BBob503) To help out people, give better idea of what to expect. If you're teaching it's a good support group.

(BBob603) For me, getting the first year teaching jitters out. Kind of teaching psychiatrist.

When asked about the videotape only three said they watched the whole thing. BSue103 and BBob403 said the videotape was helpful in revealing the things they needed to improve upon. BBob303, BSue503, and BBob603 said that it wasn't the same as teaching to students and they were more apprehensive presenting in front of their peers. Author A believes this to be the direct result of the instructor's opinion. The instructor expressed this opinion several times in class before the videotape lessons were to be given. In terms of why they didn't watch their videotape:

(BSue203) I didn't have a TV, had to give the tape back.

(BBob303) I know I did bad. I'm the type that wants encouragement. I hate watching myself.

(BSue503) I watched only the first couple of minutes... you can only watch yourself say um so many times before you have to turn it off.

In regards to the reason for taking the course BSue203, BBob303, BBob403, and BSue503 implied that the course was required. BBob603 said that he wanted to teach at the college level and that it was important to know how to teach. Since BSue103 took the course twice, fall 2003 and fall 2004, we were very interested in her response to this question.

(BSue103) the first time, I had originally signed up for four hard classes, dropped one and took pedagogy because the chair recommended I take it. The second time, good course. I hadn't taught yet the first time, now I had my own class and used it as an outlet, someone to talk to about how my class was going. I also needed the hours.

When asked what was lacking from the course BSue103 and BBob403 said that the course was sufficient and that nothing could be added to improve the course. BSue203 and BBob603 noted that it would be more effective if the videotape took place in an actual class they were teaching. BBob303 mentioned that it would be beneficial if a mentoring program was implemented to supplement the course, while BSue503 recommended that requiring the students to observe an experienced TA teach and discuss those observations in class.

With respect to the course's worth and the interviewee's comments, all thought the course worthwhile to some extent.

(BSue103) Yes, this course helped me gain confidence and feel more comfortable teaching college... second course seemed more structured. (Instructor) gave us a list of things to be covered each day. Case Studies the same, but discussed more.

(BSue203) Well, I couldn't handle a whole lot more real course work anyway and I needed 13 hours. But it doesn't count towards my degree. If I were smarter and could handle more courses it probably would have bothered me that I had to take it...laid back and gave us the opportunity to really discuss what's going on with teaching.

(BBob303) Yes, because it opened my eyes to some issues. No, because solutions to certain case studies was mostly common sense. I think it would be a waste of time if you had teaching experience.

(BBob403) Yes, I came out with new information and good references.

(BSue503) Sure, little less nervous...we also discussed how to find an advisor that was the most informative thing. Kind of gave me an idea of what I'm supposed to be doing here. I would have been lost my first year without it.

(BBob603) Yes, like therapy for teachers...good course, we don't get feedback from the faculty evaluations. Wish there was a Pedagogy II with more of an emphasis on teaching in front of class.

In order to gain more insight into the dynamics of the course Author A interviewed the instructor, a tenured faculty member. The instructor's goal was to make graduate students more comfortable teaching and also to make them more effective. He believed the course goal to have been achieved.

I think it helped out a lot, one of the difficulties is the lack of confidence. The grad students I've talked to who haven't taken the course seem real unsure of themselves, especially their first year teaching.

The materials used were Friedberg's case studies [10], Rishel's TA Handbook [11], and Felder's article on learning styles [18]. The instructor noted that he received the article by Felder from another faculty member who gave a talk on educational issues affecting universities and said that it affected him the most.

It changed the way I thought of things, often we have a very narrow view of our subject.

His description of a typical class mirrors what the students have said.

Seems like I'd go in and ask if anyone had any questions or issues. I saw my job as not only as to help their teaching but deal with being a grad student...try to put being a grad student in perspective. Usually we'd talk about issues people were facing. Then we'd work through a case.

In regards to what worked and what didn't work well the instructor said the things that worked well were the learning styles and the grading case study. He said that they were surprising to the students and thus might affect the way they do things. Although he didn't mention specific topics that didn't work well, he did have a few telling comments.

Sometimes I pontificated too much. Had real trouble making the course more interactive, part of the problem some students were tired...the fact that I don't think it should be a hard nose for credit course, on the other hand we said everyone gets an A made some people think that its not that important. People who were engaged and said I'm going to learn something really got something out of it.

About teaching the course again he said,

Maybe I'd try to address the problem of making the course more interactive. Maybe get the students to present more stuff rather than me run the course. Try to get the students to do more and talk less. I think I talked way too much.

In conclusion of the interview, he stated that the department's perception of the course is irrelevant and that it doesn't affect the teaching of the course. He also reiterated the fact that he views the course as important because it helps the TAs become more confident. He did however recommend moving it to the summer or as an intensive two

week course. Author A, being in his course, recalled the fact that he stated this course was harder to teach than a regular class and asked him to clarify those comments. He had two reasons for this.

If you teach a course over and over one theory says you get better. If I teach a course I haven't taught before, I study harder than the students. Its also a different kind of style, much more something you would find in the social sciences.

There was only one comment from the end of course evaluations.

I think the class was very valuable, especially since this year was my first year to teach. It was helpful to have this class to come discuss problems or ideas in my teaching. I think (instructor) did a great job

3.2.1.5 Interviews for the Fall 2004 Course

The interviewees from the fall 2004 course were BBob104, BSue204, BBob304, BSue404, BSue504, BBob604, and BBob704. BBob704's interview was highly positive (rank: 5), BSue404, BSue504, and BBob604's interviews were positive (rank: 4), BBob104 and BBob304's interviews was neutral (rank: 3), and BSue204's interview was negative (rank: 2). BBob704 is an ITA, who had some teaching experience in his native country. The others are native TA's with no experience teaching.

In regards to attitude changes only BSue204 expressed no change in her attitude and expressed no interest in teaching. BBob304 and BSue404 also expressed no interest in teaching but did note that they might enjoy teaching a bit more now, but BSue404 also said that the course made her feel more comfortable teaching. BBob704 referred to the fact that he isn't teaching but did state that he became more serious with respect to grading and that he is no longer afraid of teaching.

(BBob104) It readjusted my expectations, gave some structure about what the reality of teaching would be like.

(BSue504) I feel more privileged to teach students the same age...at first I hated it, still intimidated. I realize now it's not just giving out info, but communicating with people.

(BBob604) Made me think about teaching differently, now more professional.

Since the interviewees have not taught yet, they were asked how the course would affect their teaching. BSue504 and BBob604 referred to the videotaped lecture and noticed things they will try to improve upon. BSue204 and BBob304 said that the course had no effect because they haven't taught yet.

(BBob104) *made me think about setting the tone for class and made me think through issues of professionalism versus approachability.*

(BSue404) *I learned that I have the authority to gain control of class...became more comfortable using teaching skills.*

(BBob704) *...gained more devotion to subject and how to present topics to students with different backgrounds.*

All the interviewees except BBob104 mentioned a case study as the most beneficial topic. BSue204, BSue404, and BBob704 referred to the grading case study as the most beneficial. The other case studies mentioned involved cheating, harassment, and meeting students outside of class. BBob604 referred to the case studies but also noted that learning administrative and university policies were very helpful. BBob104 was the only student not to mention the case studies specifically.

(BBob104) *how to handle yourself...different learning styles...talked about questions that might come up.*

BSue404 and BBob704 said that there was nothing unbeneficial. BBob604 also said that nothing was useless but that they spent too much time on grading. BBob104 had the most telling response.

(BBob104) *A lot of days, just argued over opinions. Some would dominate and basically shut down discussions.*

(BSue204) *...the reading articles, non helpful in general.*

(BBob304) *topics to be a teacher, not interested in teaching...topics like being on time don't need to be covered.*

The interviewees perceived the goal of the course in a variety of ways and yet all agreed that the course achieved its goal. Only BSue204 was a little unsure of its achievement.

(BBob104) *to prepare us to represent the department and university as educators and to set standards...yes, I came out with more knowledge and understanding.*

(BSue204) *to expose us to different styles of teaching, how to handle students, other TAs and faculty...some we definitely covered those topics, still don't know how to handle myself in all situations.*

(BBob304) *Teach you how to teach...yes, most part of it, everything we talked about was useful to teaching.*

(BSue404) *To get an overview of what to expect as a TA and to gain confidence teaching...yes, know better now how to handle certain situations.*

(BSue504) *To give us more confidence teaching...yes, I gained more confidence and it's ok to make mistakes.*

(BBob604) *To get us ready to teach at the college level...yes thought it did a good job of doing that.*

(BBob704) *To produce better teachers, not just teach but implicate moral values and present material beyond the requirements.*

With respect to the videotaped lecture BBob304, BSue504, and BBob704 said that they didn't watch the video. BBob304 didn't feel watching the video would help and also reiterated the fact that he has no interest in teaching. BSue504 didn't watch the video because she feels self conscious, but did note that she probably will watch the video before she teaches. BBob704 didn't have a VCR, but did express interest in watching the video. BSue404 and BBob604 agreed that the student critiques were helpful in identifying mechanical issues, referring to speaking to the blackboard. BBob104 and BSue204 thought the student critiques weren't helpful because they got good responses to their teaching but weren't confident in their personal assessment.

When asked why they took the course only BBob704 did not mention that the course was required. BSue204, BBob304, BSue404, and BBob604 simply replied that the course is required.

(BBob704) *New here, I didn't know the teaching policies and thought it would be useful.*

(BBob104) *Had to, I didn't know it didn't count until half way through. If I had known I wouldn't have taken it. I could have gotten the knowledge in an orientation.*

(BSue504) *Required, but I'm glad I took it, learned some stuff I didn't know I needed. I didn't want to take it since it doesn't count.*

BBob104, BSue204, and BBob304 said that there was nothing lacking from the course because there was an ample opportunity to voice any concerns and ideas the student had. BSue504 simply had no response. The others had a few comments listed below.

(BSue404) *Maybe some more role playing in groups*

(Bob604) *Make the topics of the presentations something we would teach someday. (Author B, instructor, required all topics to be related to pre-calculus)*

The interviewees were split on whether the course was worthwhile. BBob104 and BBob304 said that the course wasn't worthwhile because it doesn't count towards their degree.

(BSue204) *No, I don't feel I learned that much as far as how to teach. I think you learn to teach by teaching.*

BSue404, BSue504, and BBob604 just responded that the course was worthwhile.

(BBob704) *Yes, other than case studies, got good exposure to general literature in education.*

Only four of the interviewees offered any comments. BSue204, BSue504, and BBob604 had nothing further to add about the course.

(BBob104) *Too early, course load was fair, he (instructor) didn't expect us to show up and not do anything but at the same time didn't put too much on us.*

(BBob304) *Other than it was at 8 a.m. it was a good course, did learn a lot just not interested in teaching.*

(BBob704) *If they had a Pedagogy II, I would take, maybe more helpful.*

The comments for the end of course evaluations were:

It's very helpful to my future job as a TA to teach in class. Thank you.

This course was very helpful in getting ideas about how to structure my classes. Thanks!

I have learned so many things from this class because I am not an experienced teacher. I enjoyed group discussions and teaching on the board. I wish we would talk more about technology. Have a good holiday season!

I enjoyed this class.

I really enjoyed this class, felt like I learned many helpful ways to improve my teaching. I also felt like we were given a lot of useful resources to continue to help me be a better teacher.

(Instructor) is the most patient instructor I have ever encountered, even with obnoxious students! I learned a great deal about being an effective teacher in this class. 100% practical information! Thanks!

I like this class in general. I like the class atmosphere where it is very laid back. We get to share our different views and opinions on teaching!

Really enjoyed the class. Learned a multitude of techniques and aspects of pedagogy that I will always use in my future teaching. The articles and case studies were also very helpful and I will always keep them as references. The best part of the class was the practical teaching. Thanks for a great class!!

In the sheets of paper and/or papers that you hand out, graphical or black box representation will help the students. You are the best "teacher", I think I have ever had.

In-class discussion was valuable to obtain input for our classes; some of the readings were good, but others were too wordy (tried to hard to use big vocabulary)

This class was very helpful for my career. I think (Instructor) treated all students with respect . . . cause there was one student that always had to say something. I would have told him to leave.

CHAPTER IV CONCLUSION

4.1 Surveys

Of the 44 TAs who had taken Pedagogy, 59% returned the survey, while only 17% of the 35 who had not taken Pedagogy returned the survey. This fact in itself suggests that taking Pedagogy made the TAs more likely to respond to a survey regarding teaching, and could be viewed as an indication of the course having an impact on their attitudes with respect to teaching.

The survey results suggest that the current teaching culture within the ranks of our TAs places about equal weight on practical attributes and on philosophical attributes. However it also suggests that TAs who had not taken Pedagogy place more emphasis on practical attributes. With one exception, class of 2002, the students from the Pedagogy classes successively place more and more emphasis on philosophical attributes, with the 2004 class giving significant priority to philosophical attributes. This could provide more evidence of a possible effect on their attitudes.

4.2 Student Evaluation of Course and Instructor

From the analysis of the end-of-term student course evaluations we conclude that their students' perceptions were not measurably effected by whether the TA was a native or international. TAs who had taken Pedagogy were perceived by their students to be much more likely to welcome and encourage questions and comments than were the TAs who had not taken Pedagogy. TAs who had taken Pedagogy also were viewed as more likely to be available for out-of-class consultation and more likely to present information beyond the text. Finally, the TAs who had taken Pedagogy were seen as somewhat more likely to stimulate student learning, present the information clearly, and emphasize the major points and concepts.

4.3 Interviews

The overall rating from the interviews with the TAs who had taken Pedagogy was somewhat disappointing, 3.52 on a 5 point scale. However the rankings from the interviews with TAs who had taken the course in 2002, 2003, and 2004 were considerably better than those from 2000 and 2001.

It is clear from both the viewpoints of the TAs in the course and the instructors teaching the course in the first two years, that Pedagogy got off to a rocky start. This can be attributed to several factors, probably the most significant being the instructors' lack of experience teaching such content in such an environment, and the fact that the course was not a recognized part of the teaching culture within the existing TA community. Both instructors, Author B and Chair, never really felt completely comfortable with teaching the class, and the TAs taking it in 2000 had no reinforcement from their colleagues since no previous TAs had taken such a course.

The video taped lectures being shown and critiqued in class was very intimidating to some of the TAs in the 2000 class and probably contributed too an overall negative attitude towards the course. Video taping was not used at all in the 2001 class. Dismissing a significant percentage of the classes (as much as 50% of all Thursday classes for the 2001 class) so that the TAs could attend the colloquia (and in the case of the 2001 class so the instructor could attend to other duties) negatively impacted the course. Not only did it send the signal that the course was not taken seriously by the department, but also there was insufficient class time to give adequate attention to the case studies and other class discussion. In effect the TAs were not given enough interaction with their colleagues in order to create and refine their own teaching philosophies and practices.

Even with all the negatives, there were still some signs that Pedagogy was having a positive impact on some of the TAs attitudes and practice, with one TA developing more humility while another gained more confidence. Even the most negative of all TAs admitted to becoming more relaxed. The videos affected teaching practice with respect

to basic mechanics. However all three TAs claimed that their teaching practice was based on their previous experiences and unaffected by the course.

It was probably natural that the instructor of the 2001 class, the department chair, focused more attention on issues of classroom conduct that tend to adversely affect the student teaching evaluations and garner complaints from students and parents. He viewed the goal of the course to be to prepare the TAs to go into the classroom and teach. The TAs perceived the purpose of the course was to introduce them to graduate school and the structure of teaching at this university.

In 2002 the instructor, Author B, was much more relaxed with the material but still was too quick to intercede in the discussions. It also became clear to both the instructor and many of the TAs that the colloquia took too much time away from the course. The TAs began to view the course more as a place to talk about teaching and provide a pleasant break from their hardcore math courses, and they began to believe that the course was simply something that everyone took. They felt that their attitudes were dictated by their previous experiences, but the video tapes were helpful. Nevertheless on the end-of-term course evaluations two of the TAs commented that three hours a week was too much to devote to the course. In this, and the two courses leading up to it several TAs complained about the lack of attention paid to nuts and bolts issues involved with teaching.

The 2003 course was viewed by the TAs and the instructor primarily as an outlet for discussing issues and problems that might arise, as a therapy session in the words of two TAs. The instructor's stated goal was to make the TAs more comfortable and effective as teachers. Even though the course was almost entirely devoted to class and group discussions, the instructor still felt like he talked far too much. Overall the TAs felt the course relieved apprehensions and made them more confident. The case studies seem to have the most impact on attitudes and the video had the greatest effect on teaching practice.

The Pedagogy course taught by Author B in 2004 met every day and was much more structured, in the sense that the instructor had a carefully thought out game plan for every

class, even though the actual class periods were driven almost exclusively by the TA discussions. Some of the TA attitude changes involved becoming more comfortable with their role as teachers and adopting a more professional approach to thinking about teaching. The case studies were the primary impetus for change of attitudes and the video tapes for the changes in teaching practice. The comments on the TA end-of-term course evaluations were all very positive.

The interviews seem to indicate that the Pedagogy course has become generally well received and valued by the majority of the TAs. However there are some persistent negatives. There is concern that the three graduate credit hours coming from the course do not show up on official degree plans and hence do not count towards their degrees. Also, the assigned readings are not appreciated by several of the TAs. This is probably related to another negative; namely, some TAs still do not take Pedagogy seriously.

4.4 Final Summary

The authors believe the Pedagogy class has had a positive impact on the TAs level of confidence as evidenced from the many references to such from the interviews and from the fact they are more likely to encourage their students to ask questions and make comments in class than are the TAs who have not taken Pedagogy. That they are more likely to present material beyond what is in the text gives additional evidence in support of this belief. The TAs who have taken Pedagogy being more likely to be accessible outside of class and more likely to stimulate learning indicates an impact on the more philosophical attributes. Their teaching practice seems to have been impacted by their being better able to present information clearly and being better able to emphasize the major points and concepts.

We believe that Pedagogy has finally found its identity and has become an acceptable part of the departmental culture. While the very nature of the course requires that it continue to evolve to meet the ever changing demands of the local situation, there are some things that should remain constant. It should be guided by the instructor but driven by the TAs, for it is critical that the TAs develop their own teaching philosophies and

learn to reflect on their own practice. The course should provide a model but never dictate a model. The TAs' motivation should be internal and never driven by external factors such as grades. Of course this means there will always be some TAs who take little away from Pedagogy, but we believe the vast majority will retain much of the value from the course. Finally, Pedagogy will always be a major challenge for the traditional mathematics instructor to teach.

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APPENDIX

1. Selected topics to be considered

Selection of Topics to be considered

Content Knowledge and Preparedness	Unable to answer the questions raised by the students.	
	Not being able to explain what we intend to say	
	Being blank when in front of the class.	
	Knowing the info + plan	
Pre-class Preparation	Knowing the info + plan	
	Structure: lesson plans, being on track	
	Spending time working through the text	
Professional Relationships	Behavior: firm + consistent, how nice/strict	
	Relationships w/ uncooperative students	
	Relations w/ students, faculty, and administration	
	What is the proper amount of distance to keep?	
	How to encourage those that are struggling to come for extra help	
Class Room Mechanics	Speaking in front of groups	
	Working/teaching at the board	
	Practice teaching with technology	
	How to keep students attention	
	How to include humor in the classroom	
	Dealing with problem students	
Evaluation Issues	How to make a grading rubric	
	Homework	
	Quizzes	
	Exams	
	Class attendance	
	Makeup issues	
	How to determine the holes in a student's education (background)	
Cheating	How to deal with cheating	
Learning/Teaching Theory	Balancing teaching versus understanding	
Personal Motivation	Lack of interest in teaching	

2. Definition of Teaching

Definitions of Teaching/Teacher

Teacher-a facilitator of knowledge (not only in your subject, but with life skills), a motivator, an encourager.

Teaching: preparing and presenting information to others for the purpose of learning.

Teaching is not only the art of imparting knowledge, but also inspiring students to raise their own standards to achieve above and beyond their original goals.

Facilitating the learning and understanding to promote the general well-being and future success of the student.

How can we possibly hope to live up to the above expectations?

3. Survey of the selected topics to be considered

Selection of Topics to be considered

Rank each of the following topics as to the extent you feel it has been addressed in this class, using the following scale

1 (not at all)

2 (touched on but needs quite a bit more attention)

3 (covered but would like to see some more on it)

4 (adequately covered)

5 (well covered, don't need to see any more on it)

Content Knowledge and Preparedness	Unable to answer the questions raised by the students.	1	2	3	4	5	
		1	4	9	2		3.75
	Not being able to explain what we intend to say	1	2	3	4	5	
		2	4	5	5		2.81
Pre-class Preparation	Being blank when in front of the class.	1	2	3	4	5	
		3	6	4	2	1	2.5
Pre-class Preparation	Knowing the info + plan	1	2	3	4	5	
		3	5	3	5		2.63
Pre-class Preparation	Knowing the info + plan	1	2	3	4	5	
		1	5	1	8	1	3.19

	Structure: lesson plans, being on track	1 9	2 4	3	4 3	5	1.81
	Spending time working through the text	1 11	2 2	3 3	4	5	1.5
Professional Relationships	Behavior: firm + consistent, how nice/strict	1 1	2 1	3 3	4 5	5 6	3.88
	Relationships w/ uncooperative students	1	2 1	3 3	4 7	5 5	4.00
	Relations w/ students, faculty, and administration	1	2	3 4	4 6	5 6	4.13
	What is the proper amount of distance to keep?	1	2 1	3 3	4 7	5 5	4.00
	How to encourage those that are struggling to come for extra help	1 3	2 4	3 3	4 6	5	2.75
Class Room Mechanics	Speaking in front of groups	1 5	2 1	3 5	4 4	5 1	2.69
	Working/teaching at the board	1 2	2 5	3 6	4 2	5 1	2.69
	Practice teaching with technology	1 2	2 2	3 2	4 7	5 3	3.44
	How to keep students attention	1 6	2 8	3	4 2	5	1.88
	How to include humor in the classroom	1 9	2 6	3 1	4	5	1.5
	Dealing with problem students	1	2 2	3 5	4 6	5 3	3.63
Evaluation Issues	How to make a grading rubric	1 1	2 1	3 3	4 3	5 7	3.69
	Homework	1 2	2 2	3 2	4 5	5 5	3.56

	Quizzes	1	2	3	4	5	
		1	3	2	4	6	3.69
	Exams	1	2	3	4	5	
		4	1	4	7		3.88
	Class attendance	1	2	3	4	5	
		2	6	5	2	1	2.63
	Makeup issues	1	2	3	4	5	
		5	3	5	2	1	2.44
	How to determine the holes in a student's education (background)	1	2	3	4	5	
		7	6	1	1		1.73
Cheating	How to deal with cheating	1	2	3	4	5	
		1	6	7	2		3.63
Learning/Teaching Theory	Balancing teaching versus understanding	1	2	3	4	5	
		5	8	3			2.88
Personal Motivation	Lack of interest in teaching	1	2	3	4	5	
		8	2	4	1	1	2.06

Is there anything not on this list that you would like to see covered?

Rating per survey

3.71 3.56 3.46 3.43 3.39 3.32 3.14 3.07 3.00 2.96 2.86 2.82 2.61 2.14
1.96 1.96

overall rating 2.96

4. Mini lecture critique form

Mini Lecture Critique

Name of Lecturer: _____

(From the Texas Tech University Student Evaluation of Course and Instructor)

Please respond to the questions below by marking the appropriate oval. The ovals form a rating scale of 5 (strongly agree) to 1 (strongly disagree).

The instructor stimulated student learning.	(5)	(4)	(3)	(2)	(1)
... welcomed questions and comment	(5)	(4)	(3)	(2)	(1)
... presented the information clearly	(5)	(4)	(3)	(2)	(1)
... emphasized the major points and concepts	(5)	(4)	(3)	(2)	(1)
... demonstrated knowledge of the subject	(5)	(4)	(3)	(2)	(1)

(Specific for these mini lectures)
Comment on strengths of the presentation.

Comment on weaknesses of the presentation.

5. Survey to all TAs

Dear colleagues,

Below is a small survey, which I am conducting for my masters thesis. I would greatly appreciate your input. When you complete the form please put the form in my mailbox.

Sincerely,
Jason Froman

List the top five characteristics of an effective teacher.

- 1.
- 2.
- 3.
- 4.
- 5.

Did you take the pedagogy course?
If “yes” when?

6. Interview form to TAs who have taken the Course.

Interviews of students who have taken the pedagogy course.

Name of TA: _____ Date and time of interview: _____
Term in which TA took the course: _____

(To be read at beginning of each interview) We are trying to determine how the Pedagogy course (MATH 5360) has effected our TAs beliefs and practice with regard to the teaching of math to college students. The purpose of this interview is to seek your opinion about some issues related to this endeavor. The results of our study will appear in a Masters Thesis and possibly in a journal article. No individual will be identified in either the Thesis or the possible journal article. By agreeing to this interview you are granting us permission to use data obtained from it in the thesis and possible article. In order to accurately interpret your responses we wish to audio tape this interview. Do you agree to allow this interview to be audio taped?

(If “yes” start audio taping, if “no” make note that audio recorder remained off.)

In what ways, if at all, did taking the pedagogy course affect your attitudes about teaching math to college students?

In what ways, if at all, has the pedagogy course affected your teaching practice?

What topics or content in the course do you believe to have been the most beneficial?

What topics or content in the course do you believe to have been the least beneficial?

What do you think was the goal of the course and do you think it achieved that goal?

Did you watch your video tape lesson?
if “yes” what was your assessment? If “no” why not?

Why did you take the course?

Is there anything you think should be in the course that was no there?

Do you believe you got your money’s worth out of the course?

Other comments?

7. Interview form to Instructors of the Course.

Interviews of professors who have taught the math pedagogy course.

Name of Instructor: _____ Date and time of interview: _____
(To be read at beginning of each interview) We are trying to determine how the Pedagogy course (MATH 5360) has effected our TAs beliefs and practice with regard to the teaching of math to college students. The purpose of this interview is to seek your opinion about some issues related to this endeavor. The results of our study will appear in a Masters Thesis and possibly in a journal article. No individual will be identified in either the Thesis or the possible journal article. By agreeing to this interview you are granting us permission to use data obtained from it in the thesis and possible article. In order to accurately interpret your responses we wish to audio tape this interview. Do you agree to allow this interview to be audio taped?

(If “yes” start audio taping, if “no” make note that audio recorder remained off.)

In your opinion, what was the goal of the course? Did it achieve that goal?

What resources/materials did you use?

How would you describe a typical class?

What worked best? Why do you think they did?

What did not work well? Why do you think they did not?

If you taught the course again, what would you change?

In your opinion what is the department’s perception of the course?
Does this perception make the course easier or harder to teach?

Other comments.

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