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AN ANALYSIS OF STUDENT-INITIATED DISCOURSE
IN THE COLLEGE MATHEMATICS CLASS

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LEARNING THROUGH NEGOTIATION: AN ANALYSIS OF STUDENT-INITIATED DISCOURSE IN THE COLLEGE MATHEMATICS CLASS

By

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ABSTRACT

LEARNING THROUGH NEGOTIATION:
AN ANALYSIS OF STUDENT-INITIATED DISCOURSE
IN THE COLLEGE MATHEMATICS CLASSROOM

By

Mary Anne Loewe

The use of international graduate students to teach American students in the university has been the subject of some debate. Universities need the international teaching assistants (ITAs) to teach the rising undergraduate enrollment in freshman courses, while parents complain that their children are not receiving an adequate education. Studies have shown that most of these protests center in the mathematics departments, where the students complain of ITAs with poor English and an inability to adequately answer student questions.

This study examines the way American students negotiate the content of the course in what is apparently a difficult speech event. It expands upon already existing research in conversational analysis to describe a particular classroom discourse pattern -- the student-initiated interaction sequence -- and provide a possible framework for future analysis of classroom discourse.

One hundred twenty three student-initiated sequences were isolated from 18 hours of observation and audiotaping of six American and Chinese first year mathematics teaching assistants. These sequences were analyzed for (a) overall

structure and function, and (b) amount and function of their embedded negotiation structures. The appearance of these sequences and their embedded structures was contrasted in the American and international TA classes in order to provide a description of the negotiation strategies used by students in the classes of international TAs.

The findings revealed no differences in the American and international TA data in terms of the overall structure of the student-initiated sequences or the number of turns taken to successfully negotiate a resolution to the students' question. Differences did emerge, however, in terms of the functions of the student initiations and the kinds of embedded negotiation structures. The students corrected and disagreed with the international TAs less, made less use of alignment talk such as accounts and conversational repair, and made less repair involving course content in the ITA classes.

These results have ramifications for both ITA and freshman orientation programs and raise questions regarding what is considered successful interaction in the college mathematics class.

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TRANSCRIPTION NOTATION

(...) Pauses are marked with a series of dots. The length of the pause is not strictly relevant to this study, so the measurement has not been included. Long pauses such as those for writing on the board are marked as such.

[ ] Utterances that were not audible are marked with square brackets. Attempts to fill in those blanks will have the approximations within the bracket.

( ) Empty parentheses indicate the observer's interjections or alternate descriptions such as nonverbal behavior.

[Single brackets indicate overlapping speech or interruption.

St: Indicates student is speaker.

TA: Indicates teaching assistant is speaker.

St_2: Use of a subscript indicates that the speaker is not the same student as the one initiating the interaction.

Other

Transcripts follow generally accepted punctuation rules where possible. A period indicates a fall in intonation with a brief pause as would generally be considered a sentence ending. A question mark indicates a rise in intonation at utterance end, in generally accepted question intonation.

Stutters, repetitions and pause fillers such as uh and ah are represented. However, standard spelling for pronunciation is used throughout. Contractions such as can't and don't are represented in the way the students used them.

The complete explanations of problems are not written out if there was no continuing discussion of the problem.

Samples of transcribed discourse taken from other sources follow those sources' notations.

Introduction

Many freshman mathematics students contend that it is difficult to learn the material and earn high grades in classes that are taught by international teaching assistants (ITAs). Bailey (1984) refers to a "groundswell of complaints from students and parents" (p. 6). Guneskera's research findings (1988) suggest that perhaps as many as half of the American students may hold negative opinions of their international TAs. Students cite linguistic, cultural, and teaching problems as contributing to the difficulty they experience in class.

The students' complaints call into question the relationship the students have with their teaching assistants and therefore the quality of the education they receive. These complaints indicate that students' expectations are not met when they enter classes taught by international teaching assistants, that the course content is less successfully learned in those classes, and that, as a result, students may choose different means by which to learn mathematics rather than negotiate successful communication with their TAs.

When the interaction in conversations becomes problematic, the participants normally negotiate both the content and the meaning of the message by making use of

various types of alignment talk such as conversational repair, accounts, and other metatalk (Stokes and Hewitt 1976). It has been suggested that in any problematic interaction, the responsibility for the success of the interaction falls to the person with the more power. For example, in parent/child interaction, more repair is conducted by the parent; in teacher/student interaction, more repair is conducted by the teacher; in NS/NNS interaction, more repair is conducted by the native speaker (McHoul 1990). This raises the question of who will take this responsibility when there is a contradiction in power, as in a classroom when the native speaker is a student.

This study examines how American students negotiate content and meaning with the TAs in their mathematics classes. It is a description of the students' uses of questions and repair strategies over a three-day period in the mathematics recitation sections of three American and three Chinese teaching assistants. Secondary analyses (such as attendance patterns) are also discussed as necessary to clarify the data. One hundred twenty-three student-teacher audiotaped question/answer sequences were taken from the 18 hours of observation and analyzed for the following features:

1. overall structure and function
2. number and function of negotiation features

The first goal was to describe the overall structure and function of the question/answer sequences and their embedded negotiation structures. The second goal was to determine the

students' negotiation strategies by contrasting the appearance of these sequences and their embedded structures in American (ATA) and international TA (ITA) classes. Because communication is assumed to be more difficult in ITA classes, the expectations were that (a) students would ask different kinds of questions of the international TAs and (b) more negotiation of the students' questions would take place in the ITA classes.

The findings confirmed that the students in the international teaching assistants' classes did participate differently in the negotiation of content and meaning than did those in American TA classes. Attendance was lower in two of the ITA classes; students made use of fewer assertions to correct or disagree with the ITAs; the ITAs and their students employed less repair, and it appeared to be at the surface level, to reference and utterance, rather than to the presuppositions underlying the students' questions. Chapter 1 discusses the basis of the students' complaints about ITAs and offers a rationale for the use of students' questions as guides to classroom processes; Chapter 2 reviews the classroom discourse analysis literature which provides the theoretical framework for the study; Chapter 3 describes the methodology; the findings are discussed in Chapters 4 and 5; and Chapter 6 concludes with suggestions both for further research and for ITA and undergraduate training programs.

Chapter 1: Students' Questioning as a Guide to Classroom Processes

Factors Contributing to Students' Complaints

When freshmen enter a large university system, they enter a school situation that may be very different from the one they were accustomed to in high school. The class sizes are larger; the work load is heavier; the students carry more responsibility for their learning. In the mathematics department, the students face additional challenges when they find themselves in classes with tightly controlled syllabi, taught by teaching assistants who often have limited teaching experience. Often these teaching assistants are from foreign countries. Many freshman mathematics students contend that it is difficult to learn the material and earn high grades in the classes taught by the international teaching assistants (ITAs). The source of trouble most often cited by the students is the ITAs' difficulty with English, but there are also other contributing factors. The international TA "problem" is more complex, having roots in pedagogical and cultural as well as linguistic factors.

Pedagogical Factors

While every department hiring international TAs has seen student complaints, in the departments of mathematics, the

number of students and ITAs, as well as the number of students with failing grades, further contributes to the students' complaints about international teaching assistants (Orth 1983, Bailey 1984).

Michigan State University's mathematics department serves over 20,000 students (10,000 in the freshman mathematics series) each fall. Table 1.1 below indicates the number of sections offered for each course during 1989-1990, a typical academic year.

Table 1.1

Sections of Entry Level Math Courses

	Semesters		
Math Course	Fall 89	Winter 90	Spring 90
Elementary Math			
Level 1	9	4	1
Level 2	37	16	6
College Math			
Level 1	78	44	22
Level 2	11	39	22
Applied Math			
Level 1	11	22	20
Level 2	58	11	6
Total # of Sections	204	136	77

Typically, when students arrived as freshmen, they were required to take a mathematics placement exam. Those who did not achieve a passing score were placed in Elementary Math 1 or 2, the high school refresher courses. They were required to take that course regardless of the requirements of their major. Most students, however, placed into College Math.

Students who entered the system at Elementary Math 1 may have had to take Elementary Math 2 also before they entered College Math. Once they completed the remedial requirement, or if their placement score was high enough, they may have opted for either of the two-term freshman mathematics series, Applied Math 1 and 2 or College Math 1 and 2. The College Math courses taught Algebra and Trigometry; Applied Math dealt mainly with the application of mathematical principles in business. It was often taken by business majors who needed a single term of mathematics. Applied Math 2 was an accelerated course covering the same material in one term that College Math 1 and 2 covered in two. It was also possible for someone to take one term of College Math 1 and continue on to Applied Math 2 instead of College Math 2.

While the Department of Mathematics offers an undergraduate major, most of the students enrolled in mathematics need only the freshman level courses to satisfy the requirements of their majors. Business, nursing, and engineering are among the majors having freshman mathematics as one of their prerequisites, requiring a course grade of at least 2.5 for successful completion. The average grade earned

by students in the College Math series at the time of the study was under 2.0. The failure rate was approximately 20% (Rittenberg 1988).

According to Jacobs (1988), 45% of mathematics recitation sections nationally are taught by TAs, and of those, 1/3 are taught by international graduate students. As many as 1/3 of the doctoral degrees awarded nationwide in mathematics and computer science go to foreign students (Byrd 1988). At Michigan State University in Fall 1988, the mathematics department offered assistantships to 12 new international graduate students out of the 86 hired overall at the university[1]. Many of the international graduate students who are assigned teaching duties have never taught before. Of nine ITAs interviewed by the Michigan State University's ITA Program in 1988, four had previous experience; of the three international participants in the current study, only one had previous experience[2]. These TAs have the same difficulties as any new teachers in presenting theory. The international teachers, however, also need to know the terms and explanations for the mathematical concepts and functions in English and cannot draw on their past educational experiences as the American TAs do to help them meet the students' expectations. (Wieferich 1989).

In addition to lacking teaching experience, the international teaching assistants are placed in a teaching situation that restricts their freedom and time to experiment with their skills. Each freshman math course is supervised by

a faculty member who is responsible for course content and for the teaching assistants teaching in them. Of the 76 sections of the College Math series which were offered in the quarter during which this study began, 4 were taught by advanced teaching assistants or faculty members. The other 72 were taught by 9 faculty members who supervised 8 teaching assistants each. Each faculty member taught 8 sections in a large lecture which met 2 days each week; 2 days each week the lecture broke into 8 recitation sections which were taught by teaching assistants. The syllabi for these mathematics recitations and all the tests were determined by the faculty members (See Appendix A for a sample syllabus, test and homework assignment sheet.) The teaching assistants only had to review the lecture material with the students in the recitation, and answer questions. Each TA taught 2 recitation sections, each under the supervision of a different faculty member. The TAs followed the sometimes conflicting instructions of the supervising faculty, and the time constraints limited any choices they may have had in conducting their classes. These TAs were rated by the students as if they had full control over what transpired in their classroom.

Cultural factors

The international teaching assistants and students have different expectations regarding the role of the teacher, regarding not only the teaching methods used, but also the relative power relationship that is established between the

student and teacher. In Asian countries such as the Peoples' Republic of China, the authority of the teacher is primary. Students rarely ask questions in class when they do not understand the material (Paine 1986; Gass et al. 1988), nor do they question the validity of the information they receive. This is quite different from the American classroom where students routinely interrupt the instructor for clarification or discussion. Additionally, in the United States, students are taught critical thinking skills from a young age (Angeletti 1990; Strother 1989), and it is acceptable for students to challenge their teachers on the material presented. While international graduate students are told of the cultural differences they will encounter in the American classroom, their previous school experiences make the transition difficult. Some make this transition more easily than others, depending in part on how well they tolerate ambiguity and how flexible they are in defining their roles (Smith 1993, Smith and Simpson 1993, Ruben and Kealy 1979).

Linguistic factors

Both students and the ITAs themselves report that the ITAs suffer from fluency and pronunciation problems and have difficulty understanding the colloquial English used by the undergraduate population (Bailey 1984; Rittenberg and Wieferich 1988; Anderson 1990; Bresnahan 1993). Some studies center on discourse organization as a source of trouble, suggesting that the misuse of discourse level markers that signal the ordering or relative importance of information adds

to the difficulty in comprehending (Rounds 1987; Tyler, 1988 and 1992). Others focus on appropriate lecturing style (Rounds 1988; Douglas and Myers 1989 and 1990; Byrd 1992). Student complaints are supported by the fact that a large percentage (the MSU Office of Planning and Budget reported 62% percent at Michigan State University in 1990) of the international teaching assistants originate from Asian countries (Bresnahan 1993). The emphasis in the English classes in their home countries is placed on grammar and reading rather than on speaking and listening skills. Their difficulty with speaking and listening skills may account for Asians describing themselves as introverted and preferring to deal with concepts instead of people (Torkelson 1992).

International graduate teaching assistants dealing with the above issues meet American students who are new to college life in general and to the work load in particular. These undergraduate students generally have limited experience with people from ethnic backgrounds different from their own and so are not accustomed to taking responsibility for the success of an NS-NNS interaction[3]. Because of the great need for teachers at the undergraduate level, the international graduate students often have been placed directly into the classroom upon arriving in the United States, without the benefit of preparatory training[4]. First-time international teachers in an irregular teaching situation have been encountering first time college students and neither have been adequately prepared for the experience.

Pertinent Research

Research regarding students' claims that subject mastery is more difficult in ITA classes than in American TA classes is sparse, although there appears to be a correlation between students' performance and the ITA's oral proficiency. Jacobs (1988) concluded that the oral proficiency of the ITA made a difference in the performance of the students, although her attempt to correlate students' end of semester test outcomes with the nationality of the teaching assistant proved inconclusive.

Research by Williams and Marenghi suggest that ITAs' perceived unintelligibility actually may be the result of native speaker inability to process nonnative speaker speech. In an examination of the planned and unplanned speech of Mandarin and Korean speaking teaching assistants, Williams (1990) found more marking in the planned speech of the ITAs than in their unplanned speech; she also found, however, that native speakers were understood better than the nonnative speakers even though they did not make more use of discourse markers. Marenghi (1986) compared the questions asked by international and American students in a linguistics lecture. She found that clipped forms of questions such as those commonly used by American students were not understood when used by international students.

Some researchers have looked into other potential reasons for the students' negative reactions to international teaching assistants. Bailey (1982) found that students not sharing the

major field of study with the ITAs gave them a poorer end of term evaluation than those students who shared a major field with the international TA. Ainsworth (1986) and Sardokie-Mensah (1991) both discuss the ITA/student relationship in terms of understanding and responding to cultural differences in behavior and expectations in the college classroom. Finally, Bresnahan (1993) attempted to draw a relationship between the negative messages American students receive regarding international TAs and the attitudes of these students toward ITAs. She determined, however, that while positive messages regarding foreigners did have an impact on the attitudes of Americans, negative messages did not. Eisenstein (1983) and Ryan (1983) both correlated the negative judgments held by native speakers regarding non-native speaker phonology, syntax, lexicon and intonation to judgments about the non-native speaker's socio-economic class or ethnic group.

The other research notwithstanding, most of the concern surrounding international teaching assistants has been focused on the development of programs to help international teaching assistants become more intelligible to American undergraduate students, although a major complaint has been that second language acquisition research has not sufficiently measured the level of oral proficiency that should be attained by the ITA in order to be considered an effective teacher (Ard 1987, 1989). Mellor (1988) offered suggestions on ways for ITAs to help improve their spoken English with lttle or no extra time spent in practice. Stevens (1989) suggested using drama to

improve segmental and suprasegmental features of ITA pronunciation. Others are more hi-tech, offering suggestions for the use of video (Axelson 1990) and computer-assisted pronunciation work (Stenson 1992). Discipline-specific research has been conducted in the language used by teachers in chemistry and mathematics (Anderson-Hsieh 1990). Douglas and Myers (1989, 1990) have researched the language of chemistry lab teachers, offering an analysis of errors in the language used by chemistry ITAs as well as suggestions for improvement.

This study contributes to discourse level research such as the NS-NNS research conducted by Tyler (1988 and 1992), Blum-Kulka (1989), and Gumperz (1977) who consider discourse level features such as the appropriate use of discourse markers, the perception of speech acts such as requests, and the interference of the NS system of conversational inference as factors that contribute to communication problems.

Students' Questions as Guides to Classroom Processes

The situation in which the ITAs and students find themselves makes the achievement of quality education difficult. Several questions present themselves:

1. What is the nature of the interaction between the TAs and their students?

2. How does student participation in ITA classes differ from that taking place in classes taught by their American counterparts?

3. What, if any, conclusions can be drawn regarding the strategies the students employ to understand the ITAs' presentation?

This study addresses these concerns by looking at the questions students ask in class. Even though studies suggest that as much as 80% of classroom interaction is initiated by the teacher (Dillon 1990), an analysis of students' questions offers an insight into the students' learning processes and the instructor/student relationship by giving information regarding the success of the communication process.

Questions as Guides to Students' Thought Processes

As guides into the students' learning processes, questions allow the teacher to determine the point at which students have arrived in their knowledge of the subject matter and to adjust the teaching accordingly -- before formal evaluation affects their grades. As Dillon (1986) notes, any student question involves an underlying set of presuppositions that gave rise to the question (p. 333). The experienced teacher attends to these presuppositions first. If the presuppositions are invalid, revealing some underlying misunderstanding of the material, the specific question goes unanswered in favor of remedying the error in the presupposition. If the presuppositions are found valid, the question is answered, possibly giving rise to another question. Through these question/answer sequences, the teacher follows the student's thought processes.

Questions as Guides to the Nature of the TA-Student Relationship

The teacher's treatment of student questions can affect the teacher/student relationship because of the importance the

student places on the negotiation process. How well teachers answer their students' questions may be determined by the level of the teachers' subject matter knowledge. According to a study conducted by Carlson (1988), subject matter knowledge affected teachers' (a) length of responses, (b) factual content of responses, (c) relating of material to students' personal lives, (d) use of humor, and (e) use of metatalk. Analyzing student questions effectively for indications of student misconceptions and using that knowledge in teaching is addressed by Dillon (1986), Flannery (1989), and at the college level, Aldridge (1989). In a study conducted by the ITA Program at Michigan State University, the second most cited source of trouble for the students (after the TAs' English) was the teachers' inability to explain problems adequately (Rittenberg and Wieferich 1988). They indicated that ITAs either discouraged clarification questions, or they simply recopied the problem rather than address the student's specific concerns. These practices created frustration, supporting the students' negative views of the process as a whole, the ITAs in particular, and possibly their fears of being able to master the material.

The number of student questions may signal the level of involvement achieved by the students in class. If students lose the courage to ask questions in class because of inappropriate responses, their level of involvement with the material decreases (Marzano 1989) and the communication process breaks down. Dillon (1986) points out that if

students lose confidence in their ability to learn the material in the context of the class, then their desire lessens, the feeling of needing to know -- at least in that situation -- is lessened (p. 336). Students could undertake to master the material, if at all, through other means such as friends or help room, rather than attendance in class. As the students quit participating, perhaps even attending, the teacher-student relationship is damaged. The teaching assistant cannot determine the extent to which the students have mastered the material, and therefore cannot adjust class time accordingly. The communication process has been undermined.

Pertinent Research

Pertinent classroom interaction research focuses mostly on the teachers' use of questions and those studies focusing on student interaction tend to be limited to classes in preschool to 12th grade. While, at the college level, emotional and educational maturity may account for some differences in the interaction patterns, this research in elementary and high school does offer some insight into the functions of student-generated questions, their importance for the students, and their role in curriculum planning.

Ralajthy (1984) holds that students can improve their retention of expository materials through self-questioning. Kenzie (1991) describes the development and improvement of study skills of handicapped students through the use of student-generated questions. Gillespie (1991) summarizes

other research into student-generated questions in secondary level content area reading classes.

Several studies suggest that classroom atmosphere in large part determines whether the students feel comfortable in asking questions in class (Ortiz 1988). Pizzini (1991) suggests that small-group, problem solving formats might allow for more student-generated questions than teacher-directed activities do. At the college level, shyness and gender have been cited as factors. Beins (1988) describes how shy students were encouraged to ask questions in freshman psychology classes by being allowed to write them on paper. Pearson (1990, 1991) found females asked fewer questions in classes taught by males.

Finally, it has been suggested that the international status of the TA has an effect on the types and number of questions asked in class. Katchen (1984) studied student-initiated question/answer sequences similar to those appearing in this study. She found that in comparison with American TAs, students asked fewer questions of the international teaching assistants but asked more Yes-No questions of them. Her conclusions imply that the students accommodated to the situation by requiring less interaction from the ITAs in class.

Much more work is needed at the college level to determine the type of interaction that takes place between the faculty and students in the various disciplines. This study is a beginning look at the interaction in freshman

mathematics. Only after a complete examination is completed will ITA trainers know the discourse standards in these classes and really be able to assist the international teaching assistants in meeting their students' needs and expectations.

In summary, as students enter a freshman mathematics course, they appear to be entering a novel situation, not only because it departs so much from their high school experience, but because they often face teachers whose language use and classroom expectations differ from their own. The freshman mathematics system in the Department of Mathematics is highly structured and tightly controlled, leaving little room for the teaching assistants to learn their craft and adding fuel to the complaints the students already had about the international teaching assistants. The analysis of the students' use of questions and negotiation strategies serves to define, in part, the kind of interaction taking place in mathematics classes. From this it is possible to determine how students negotiate content and meaning in classes where communication is considered to be difficult, i.e. in those taught by international teaching assistants.

Chapter 2: Theoretical Framework

Conversation Analysis

Question/Answer Sequence Structure

This study follows along the line of Sinclair and Coulthard (1975), McHoul (1990) and others who use conversational analysis as a basis for classroom interaction research. The question/answer sequences presented here stem from the basic structural unit of the conversation, termed the adjacency pair. The adjacency pair sets up the turn-taking process by selecting the next speaker and arranging for transference of the floor. It is two utterances long, each one produced by separate successive speakers (Sacks 1972). The first utterance belongs to a group of first pair parts and requires as a response the second utterance, belonging to the group of second pair parts. Examples of adjacency pairs are Greeting-Greeting, Question-Answer, Complaint-Justification or Apology.

Tsui (1989) proposes a basic conversational unit that is tripartite, in which the initiator's second turn may be eliminated. This occurs in interaction where the two participants are especially close or where the initiator does not accept the response but does not wish to continue with a disagreement, as in the following where A does not wish to

debate politics with B.

A: I hope Smith gets in.
B: I voted for Jones.
A: silence

Demand Ticket

Nofsinger (1975) expands the adjacency pair structure by postulating a "demand ticket" which can (a) get the attention of the intended partner, (b) give the speaker's role to the person who uttered it, (c) switch the speaker's role from one to another, and which (d) obligates the initiator to make some statement and obligates the acceptor to listen (p. 3). This demand ticket is a type of conversational "ticket," such as a comment about the weather or the conversational partner's name, that Sacks postulated is used to open conversations. It differs somewhat from Sacks' ticket in that it is coercive in returning the floor to the speaker:

(2.1) A: Yuh know something?
B: What?
C: It's time for lunch. (Nofsinger p. 2)

In the above, person A's "Yuh know something?" requires the response "What?" from person B, which in turn requires the return of the floor to person A.

Alignment Talk

Within these sequences other interaction sequences are often inserted, serving to expand upon the initial utterance (Schegloff 1972). For example,

(2.2) P_1: How do I get to your place? (1)
P_2: Where are you now? (2)
P_1: I'm at home. (3)
P_2: Well, take your road to . . . (4)

These embedded or insertion sequences can last a number of turns before an answer is finally given. Linde and Labov (1975) discuss the distribution of a proposition across more than one turn in these sequences. In the above example, the embedded sequence appears in lines 2-3. In order to give an adequate answer, P_2 needs clarification before giving the answer.

Jefferson (1972) proposes the misapprehension-clarification side sequence as a type of embedded sequence.

(2.3)	P_1:	If Percy goes with Nixon,	(1)
		I'd sure like that.	(2)
	P_2:	Who?	(3)
	P_1:	Percy. That young fella that uh -	(4)
		his daughter was murdered. (1.0)	(5)
	P_2:	Oh ye:ah. Yeah.	(6)

Lines 3-5 contain the embedded sequence in this case. The misapprehension results in the question on line 3 and is clarified in the answer beginning on line 4. Both of the above are examples of alignment talk (Stokes and Hewitt 1976). When conversations do not go as planned, people attempt to determine why and how things have not worked out. They attempt to sort out exactly where in the interaction the misalignment occurred.

Repair

Conversational repair (under which category side sequences fall) is one type of alignment talk. Repair can be made to the proposition or to the surface structure and can be handled in a number of ways (Schegloff 1972):

(2.4)	self-initiate/ self-repair	P_1: Turn right . er .	(1)
		I mean left at the	(2)
		next corner.	(3)
(2.5)	self-initiate/ other-repair	P_1: Turn left . uh .	(1)
		I mean	(2)
		P_2: right?	(3)
		P_1: Yea. At the next	(4)
		corner.	(5)
(2.6)	other-initiate/ self-repair	P_1: Turn right at the	(1)
		next corner	(2)
		P_2: Right? You sure?	(3)
		P_1: I mean left at the	(4)
		next corner. Yea.	(5)
(2.7)	other-initiate/ other-repair	P_1: Turn right at the	(1)
		next corner.	(2)
		P_2: You mean turn left	(3)
		at the next corner.	(4)
		P_1: Yea. That's right.	(5)
(2.8)	third party repair	P_1: Turn right at the	(1)
		Shoprite.	(2)
		P_2: Is that after the	(3)
		Sunoco?	(4)
		P_1: What?	(5)
		P_3: He wants to know	(6)
		where the Shoprite	(7)
		is.	(8)
		P_1: Oh, yea. It's right	(9)
		there after the	(10)
		Sunoco Station.	(11)

In (2.4), the speaker realizes a misstatement and corrects it. In (2.5), the hearer fills in the correct word after the speaker has initiated the repair. In (2.6) and (2.7), the repair is initiated by the second person in the conversation and carried out either by the original speaker (2.6) or the originator of the repair (2.7). The last is an example of a third party offering assistance to the other two principle participants and was discussed by Schegloff as a type of other-initiate/other-repair. Self-repair was considered to be preferred over other-repair because of the greater frequency

of occurrence. Other-initiate repair generally yields self-repair.

Accounts and Metatalk

In addition to repair, other types of alignment talk pertinent to this study include the use of accounts and metatalk such as formulations and framing devices. Accounts include such structures as disclaimers, apologies, excuses and justifications (Potter and Wetherall 1987). Disclaimers are pre-initiation utterances (pre-accounts) that are stated to ward off an anticipated negative reaction. Statements such as "I'm no sexist, but . . . " followed by a negative statement about women would fall into this category (p. 77). Apologizing is self explanatory. Studies conducted by Schlenker and Darby in 1981 indicate that apologies were the preferred response to a situation where some offense was given. The more serious the transgression, the more elaborate the apology that was expected (Potter and Wetherall 1987).

Excuses and justifications assign responsibility for an action that was considered wrong or bad. The user of an excuse admits that the action or previous utterance was wrong, but denies responsibility by blaming some external agent for the behavior. The user of justification does not deny responsibility for the action or the utterance, but denies that it was wrong in this particular situation. An example of an excuse for being late for work might be that the alarm did not go off, while a justification for hitting someone's car in the parking lot might be that the wronged person had parked

incorrectly (Potter and Wetherall 1987).

Other alignment talk includes the use of metatalk such as formulations and linguistic framing devices. Heritage and Watson (1979) define formulations as the "practice of saying-in-so-many-words-what-we-are-doing" (p. 124). That is, formulations summarize, explicate, or furnish the gist of a previous utterance in a conversation in progress, as in the following interview excerpt (Ragan 1983):

(2.9)
I: When are you available for employment? (1)
A: I'm available for employment uh in town (2)
I could start sooner because I wouldn't (3)
have to move. (4)
I: Yeah. (5)
A: Out of town I could start as soon as (6)
June (7)
I: Okay. (8)
A: But it would be fine with me if I could (9)
start in the middle of July or the (10)
beginning of August. (11)
I: Want to take some time off, is that (12)
A: That's right. I've been going to school (13)
for about five or six years and I'd (14)
like to take a little vacation before (15)
starting full time. (p. 162) (16)

The interviewer (I) uses the formulation on line 12 to draw a conclusion about A's motive in giving a date of mid July to begin work. According to Ragan, those in the power situation, such as I above, use more formulations.

Linguistic framing devices are utterances that introduce or clarify specific properties of speech. Utterances such as "I just mean . . . " or "I said . . . " fit into this category, as well as utterances that refer to the process itself such as "That's it for now . . ." indicating that the process has ended.

Classroom Interaction

Question/Answer Sequence Structure

Exchange structures similar to the adjacency pair have been found in classroom interaction, although generally as they describe teacher-initiated interaction. Sinclair and Coulthard (1975) postulate a tripartite structure:

(2.10) T: Initiation
St: Response
T: Feedback (p. 21)

The teacher asks a question, gets a response, and then evaluates the response, as in the following.

(2.11) T: What is the capital of Michigan?
St: Lansing.
T: Right.

In some instances, however, such as lecture classes or during explanations, students are not required to respond. This would modify the above sequences in this manner:

(2.12) T: Initiation
St: (Response)

Berry (1981) suggests that a teacher's feedback may not always be required following a student's response, further modifying the tripartite structure in this way:

(2.13) T: Initiation
St: (Response)
T: (Feedback)

Pupil-elicit exchanges were analyzed by Sinclair and Coulthard (1975) to have the simple structure

(2.14) St: Initiation
T: Response

Berry (1981) also supports this analysis, discussing the dipartite structure in terms of moves taking place between a

primary and seconday knower.

(2.15) St: What is the capital of Spain again?
T: Madrid.

While students, who are secondary knowers in the class situation, might respond to the teacher's answer with "Oh," it is not obligatory. They would not necessarily evaluate a teacher's response.

Alignment Talk

Kasper (1985) adapted Schegloff's (1972) analysis of repair use to classroom interaction. Using the repair structure of (a) self-initiated/self-completed repair, (b) self-initiated/other-completed repair, (c) other-initiated/other-completed repair, and (d) other-initiated/self-completed repair, she found that the use of repair was dependent on the type of course in which the interaction was taking place. The repair in language courses was overwhelmingly to the learner's utterances. There were no instances of self- or other-initiated/other completed repair of the teachers' utterances at all. Any self-initiation of the teachers' utterances were self-completed. The preference was for other-initiated/self-repair (p. 203).

In content courses, as in non-educational discourse, the preference was for self-initiated/self-completed repair by both the teacher and learner. The preponderance of self-repair conducted by the teacher made it unnecessary for other-initiated repair of the teachers' utterances (p. 213).

McHoul (1990) used the same repair schema to analyze the

use of repair in classroom talk. He found the preponderance of the repair to be other-initiated/self-conducted repair on the student's talk. That is, the teacher not only initiated and completed repair on the students' talk, but more often, initiated repair and witheld correction, giving the student space instead in which to make the correction.

Two studies have focused on how student signal non-comprehension to the teacher. Kendrick and Darling (1990) concluded that how students signalled incomprehensibility was dependent on class size and class type. Jordan and Fuller (1975) found two main strategies: a focused directive which gives the teacher a yes/no choice or requests a specific short answer, or a focused non-directed question which focuses the teacher but does not require a specific answer. It is the difference between a and b below:

(2.16) a. When you say that you're talking about World War One aren't you? or How many stages did you say there were in the Dewey model?

b. I don't understand what you mean by author intention. (Kendrick p. 935)

In summary, this report expands upon already existing research in conversational analysis by Schegloff (1972), Sinclair and Coulthard (1975), Nofsinger (1975), Stokes and Hewitt (1976), Heritage and Watson (1979), Ragan (1983), and and in classroom interaction by Kasper (1985) and McHoul (1990) to describe a particular classroom discourse pattern -- the student-initiated question/answer sequence -- and provide a possible framework for future analysis of classroom

interaction. At the same time it contributes to the overall knowledge base regarding the functions of student questions at the college level and the repair strategies employed to ensure successful communication.

CHAPTER 3: Methodology

Subjects

The purpose of this study is to describe student negotiation patterns in mathematics recitation sections. The information was taken from interviews, departmental documents, observation and audiotape transcript.

Preliminary interviews with the Director of Undergraduate Studies and the administrative assistant yielded all of the information regarding the structure of the department and its policies for hiring and training of teaching assistants. The names of prospective participants were chosen from lists of current TAs furnished by the department and were approached based on the following criteria:

1. All should be newly hired first- or second-term teaching assistants. This was based on the assumption that more complaints would arise from classes taught by newly hired, less experienced TAs, and that these were the TAs who most often met college freshmen in freshman mathematics.

2. All should be assigned to freshman mathematics recitation sections. Newly hired TAs who passed the Department of Mathematics interview were most often placed into a freshman mathematics recitation section. TAs who were assigned to their own section had substantial teaching

experience, either as a TA within the department or as a teacher outside of the university. Additionally, the freshman mathematics sequence was the most student-populated sequence in the department. The assumption was that most of the complaints arose from this course sequence due to the large student population.

3. There should be an equal number of American and Chinese teaching assistants. The largest ITA population in the department was from China, and the Chinese had the reputation of being less proficient in oral English due to the methods of language teaching employed in their native countries.

The study was limited to six teaching assistants, three American and three Chinese who met the above criteria, signed consent forms (see Appendix C) and provided information of their educational and professional backgrounds, goals, and strengths and weaknesses. Their profiles appear in Appendix D. Each TA's class was visited four times. The first was to explain the study and obtain the students' consent; the rest were for observation and audiotaping. Any students who missed the initial explanation received one during the subsequent visits.

Observations

The observations were all scheduled at approximately the same time during the second half of the term in order to control to some extent for type of classroom activity. Students received the results of tests in each of the TAs'

classes. Most TAs also reviewed for tests during one observation. During one class, however, the last twenty minutes was preserved for a quiz that only that TA (MATA 3) gave.

Each of the participating TAs received code names at the outset to assure anonymity. These code names consisted of an M or F denoting the gender of the participant, ATA or ITA denoting international status and a number assigned solely to create a numerical order in which to list the participants. Therefore, for example, FATA 1 indicated a female American TA designated as number 1 and MITA 5 indicated a male international TA designated as number 5.

The classrooms themselves were typical American classrooms. Each room had seven to eight rows of approximately eight moveable desks each. The audiotape equipment included three portable cassette tape recorders with internal microphones. One was placed on the teacher's table, the microphone supplemented by a PZM conference microphone to allow for maximum movement by the teaching assistant. The other two recorders were placed on either side of the room, approximately in row two seat two and row six seat six. This guaranteed a complete class recording. The only microphones used for these were the recorders' internal microphones. The observations took place from two locations within the class: in a front seat on one side and a back seat on the other side. This was to reduce any interference with the concentration of any particular students in the class. During each visit, the

notes reflected attendance patterns, all the teacher and student initiated interaction, and boardwork (see Appendix E for a sample page of notes).

Three main reasons motivated the decision to observe and audiotape rather than videotape. First, audiotaping provided for accurate, complete data on the interaction between the teaching assistant and the students and also allowed for a more detailed linguistic analysis after the taping session. Observation allowed for focus on non-verbal behavior and boardwork during the class period.

Second, a primary concern was the comfort of the teaching assistant and the students, in order to limit the interruption of the class' routine. In order for videotaping to be maximally effective, the class would have had to have been moved temporarily to a classroom already set up for that purpose, with equipment run by a person trained to do so. Because the three observational visits per class accounted for roughly one week's worth of meeting times for each, it was not only difficult to correlate the TAs' schedules with the schedule of availability of the room, but the disruption caused to the class proceedings by relocating the students to a new site would have been excessive. All of the TAs were first year Ph.D. students. None had American teaching experience, and only one had taught in his home country. None were accustomed to being observed while teaching.

Another concern was the much discussed "observer's paradox" (Labov 1972). This is the term coined to explain the

phenomenon where the quality of the data is somehow affected by the presence ofthe observer. During videotaping sessions conducted by the staff of the International TA Program, students tended to act self consciously in front of the camera, even when notified that the teacher was the main focus. Some turned to see the reaction of the camera operator or to see if something had been captured on tape. They also whispered their answers and limited the number of questions they asked in class. After class, there was a line of students wishing to ask their questions individually and off camera to the TA. Repeated experiences of this kind contributed to the decision to keep intrusive equipment to a minimum.

Analysis

The tape for each class was transcribed and reviewed first to isolate the student-initiated exchanges. These exchanges were considered to begin when a student made any utterance directed at the teacher, either interrupting the teacher's explanation or in response to a request for questions; they were considered to be complete when the question or utterance was answered and resolved. The analyzed data do not include questions and sequences such as (3.1) and (3.2), both of which were considered to be TA-initiated sequences.

(3.1) TA: . . . Next I want some of you to put your solutions [approaches students pointing and giving problems numbers].
St: What do you want me to do? Write it up there?
TA: Yea. Write up here and uh this one.

(3.2) [TA approaches to have student put a problem on the board.]
St: I didn't get it right.
TA: Ok.

The first appeared to be an insertion sequence with a student attempting to repair an interaction initiated by the TA. This differed from some of the interaction analyzed here because this interaction was only between the TA and one student, as opposed to being between the TA and the entire class with one student making a request or assertion. The second appeared to be a response to a non-verbal request made by the teacher. Neither of them reflected student-initiated interaction.

Each of the 123 isolated student-initiated sequences received a code number reflecting the code name of the TA and the numerical order in which it appeared over the three day observation period. For example, [FATA 1.1] indicates sequence number one appearing in the classes taught by FATA 1, while [MITA 5.1] refers to sequence number one in the classes taught by MITA 5. These codes serve as a numbering system for the sequences and appear at the end of each of the examples cited in this report to identify the origin of the example.

The framework for the principal analysis was adapted from the framework already existing in conversational analysis and in classroom interaction research as discussed in Chapter 2. Each sequence was coded for function as either a request-to-do-problem (RP), assertion, request for confirmation or information, or phatic language. The first utterance of the

sequence, excluding demand tickets and presequences determined the category assignments. In cases where the student's utterance alone did not indicate its function, the surrounding context, including the TA's answer and any subsequent exchange, provided the additional clues. These sequences are discussed in terms of the frequency of their appearance in the data in Chapters 4 and 5.

A sequence was considered to be a request-to-do-problem sequence if the student only asked for a problem from the homework or test to be solved on the board, without any other specific indications of trouble. These requests elicited problem solutions that were performed for the entire class, rather than one person.

Assertion sequences began with a student's statement of opinion. They functioned as corrections or disagreements. In the initial statement in the request sequences the student asks either requests confirmation of an understanding or answer or requests an explanation. Finally, phatic language was defined as language used to preserve or change the TA/student relationship. The jokes and challenges were placed into this category. Jokes alerted the TA to the students' attitude in class and eased tensions. The sequences categorized as challenges contained questions that, because of their nature, were difficult to answer. They often began with a phrase such as "How am I supposed to know...?" These questions, again, apparently alerted the TA of the students' displeasure with some aspect of the course rather than request

any specific information or disagree with a particular answer or process.

The framework for the analysis of the repair structures was adapted from the repair organization suggested by Schegloff (1972) and later used by Kasper (1985) and McHoul (1990) to the following five part organization:

1. teacher-initiated/teacher repair: the teacher initiated and completed repair on the student's utterance.

2. teacher-initiated/student repair: the teacher initiated a repair on the student's utterance, but the student carried it out.

3. student-initiated/student repair: the student initiated and conducted a repair to the teacher's utterance.

4. student-initiated/teacher repair: the student initiated a repair to the teacher's utterance, but the teacher carried the repair out.

5. third party repair: repair initiated or carried out by a person other than the student involved in the interaction.

Although the argument can be made that all student assertions and requests are forms of repair, only the repair structures that were embedded within the main sequences were analyzed in this manner. This analysis gives information regarding the negotiation necessary for the success of these sequences, rather than for the success of the class interaction as a whole.

The focus of this five component organization structure is on other-repair, that is, repair conducted or initiated by someone other than the speaker. The overwhelming preference for self-initiated/self-completion of repair by both the

teacher and the student was assumed. In describing the negotiation of this interaction, the interest was in the aspects which caused trouble for the other person in the interaction and how this trouble was managed.

The framework for the analysis of the other alignment talk came directly from the theoretical base which was discussed Chapter 2. The definition of formulation is the same as that used by Heritage and Watson (1979); the definition of linguistic framing devices is the same as that used by Tyler (1988) in her study of NNS intelligibility to NS.

Tabulations

Chapter 4 is devoted to the tabulation of the frequency and function of student-initiated sequences and their embedded structures. The totals for each feature appear in both raw numbers and percentages wherever possible and are contrasted in the American and international teaching assistant classes. The initial results appear in the first three tables which deal with the frequency and function of the sequences in general. Table 4.2 gives the average number of sequences per class and the percentage of sequences that functioned as request-to-do-problems. This table separates the RP sequences from the rest of the data. The references to the number of sequences in the subsequent discussions do not include these sequences. The frequency of use of the three main types of sequences is computed in Table 4.3, and the frequency of use of the four types of requests appears in Table 4.4.

The second principal analysis involved the interior negotiation structures of these student-initiated sequences. Based on the conversational analysis framework already discussed, the embedded sequence analysis arose from the data. These sequences were also examined in terms of function and frequency of appearance in ATA and ITA classes. This negotiation (or alignment talk) was further categorized into repair (of utterance, reference, and content), accounts (including disclaimers, justifications, and excuses), and other metatalk (formulations and framing devices).

Four tables are devoted to the description of the frequency and type of alignment talk used by the students and TAs. Pertinent tabulations are again presented in averages and percentages for ATAs and ITAs. Table 4.5 analyzes the use of repair according to the repair responsibility discussed earlier. The instances of repair were counted and the totals are presented in percentages out of the total number of repairs.

The next two tables (Table 4.6 and Table 4.7) describe the use of the three types of repair (to question, to reference, and to content) by initiator. The ATA and ITA totals appear in both raw numbers and percentages out of the total number of their respective instances of repair.

The final tabulations reflect the use of other types of alignment talk employed by the TA and the student (Table 4.8). All of the figures appear in raw numbers with the percentages of their appearance out of the total number of sequences.

A secondary tabulation, discussed first, presented itself as it became apparent that it may have a bearing on the data. This was of the attendance patterns in each of the classes observed (see Table 4.1). The wide fluctuation of the attendance numbers in the data forced the discussion of the relationship between attendance, the use of alignment talk, and the students' strategies for learning mathematics.

In summary, this is a qualitative study conducted to determine differences in the patterns of student negotiation in the classes of American and international teaching assistants. There were six participating TAs, three American and three Chinese. Each were observed and audiotaped on three separate occasions, yielding 18 hours of data. Two primary analyses were conducted: the function and frequency of appearance of student-initiated sequences and that of their embedded alignment talk sequences. One secondary analysis is discussed (attendance) because of its relevance for the rest of the data. The framework for these analyses arose from the collected data and is based on previous conversational analysis work as discussed in Chapter 2. All the tabulations are presented and discussed in the following chapters in both raw numbers and percentages.

Chapter 4: Findings

In completing a description of student-initiated negotiation patterns in mathematics recitation sections, two components of the speech event are taken into account here. The discussion begins with a account of the attendance patterns. In this set of data, there is evidence that the attendance may have a bearing on the amount and kind of interaction taking place in class. Second, this chapter includes an analysis of the appearance of interaction sequences according to structure and function. Along with this discussion is an examination of the use of embedded sequences in terms of repair and other forms of alignment talk. Finally, comparing the occurrences of these structures in American TA and international TA classes illustrates the difference in the kind of negotiation the students engaged in in these classes.

Attendance

Mathematics recitation sections met three times per week. Students who registered for a math lecture/recitation class offered at a given time were assigned to a recitation section, and their names appeared on the class list for that section. Generally, the TAs did not take attendance in a recitation, and although approximately 30 students were

assigned to a given section, the actual number of people attending varied from 0 to over 30 as students chose alternate sections to attend. Attendance patterns in a given class might be illuminating; often if students are not attending a particular section, they have either chosen not to participate in the classroom content negotiation for that subject area or they may be "voting with their feet," expressing dissatisfaction with a particular TA's instructional method or ability. Attendance levels, then, might provide clues as to the level of communicative success in that section, the relationship that has evolved between the teaching assistant and the students, and the students' attitudes toward that particular recitation section. They may also have a bearing on the kind of interaction that takes place between the TA and the students who do attend (see Table 4.1).

Table 4.1

Average Attendance per TA over Three Day Observation

	Observations			
	First	Second	Third	Average
ATA	18	21	20	19
ITA	14	12	12	12

In Table 4.1, attendance is given in averages for the ATAs and ITAs for each day of the observation period. The

three American teaching assistants showed similar attendance records, with an average attendance of 19 students. There was wider variation in attendance among the students in the international teaching assistants' classes. The attendance levels of MITA 5 and MITA 6 were substantially lower than the rest of the TAs (MITA 5's most attended class had only 9 students), making the attendance average for the ITA classes only 12 students. While it is not possible to conclude from these data that attendance is consistently lower in all ITA classes, the lower attendance may have a bearing on the number and function of student-initiated sequences.

Structure of Student-Initiated Sequences

The overall structure of student-initiated sequences contains smaller sequences that serve to gain the floor for the speaker, focus the direction of the conversation, repair any misunderstandings or mitigate any conflict in the interaction. The model that emerges from the collected data is the following sequence.

demand ticket sequence
(presequence)
initiation
(embedded alignment sequences)
response
(resolution sequence)

Demand ticket

Because of the size of the group and the conflicting demands on the teacher's attention, students generally began any interaction with an attention getter or demand ticket. The demand ticket as it appears in the classroom is similar to

that proposed by Nofsinger (1975) in that it requires a response from the teacher which in turn requires a further move by the student. Demand tickets may be nonverbal as in a raised hand or change in posture, or verbal as in

(4.1) St: Wait...When you graph that, what'd you (1)
how'd you plug it into the calculator? (2)
[FATA 1.16] (3)

In line 1 above, the wait served as a demand ticket and was accompanied by a half-raised hand. In this case, it was incorporated into the student's main question with a pause between it and the sequence initiation. In others, the demand tickets formed their own sequences.

(4.2) St: Say that again? (1)
TA: No solution. Because you see b should (2)
be bigger than a. From this graph b (3)
should be bigger than a. Right? (4)
St: Right. (5)
TA: All right. So we [see] there no (6)
solution. You have to check formally, (7)
uh, to to do that to do that thing (8)
right. Now. How to do it formally. (9)
St: I'm just confused because in the book (10)
it says b is less than h which is a (11)
sine beta then there is no solution. (12)
[MITA 5.4]

The initial question the student asked in (4.2) functioned as the demand ticket, getting the teacher's attention and switching the speaker's role to the student. The TA responded to the literal interpretation of the question and repeated and clarified the last part of his explanation. He would have been within normal discourse expectations just to focus on the student and ask him what the area of confusion was. As it was, the student asked his real question after the explanation, in line 10.

Evidence for the existence of a nonverbal demand ticket can be taken from the data where there is linguistic confirmation of its existence.

(4.3) St: I just wanted to say that uh he's going (1)
kinda quick through this stuff in lecture (2)
you know and we're trying to keep up (3)
[writing it down] and not catching a lot (4)
of this stuff so I hope I learn a lot in (5)
here (laugh) SERIOUSLY! [FATA 1.2] (6)

(4.4) St: I just didn't know where you got it from. (1)
[MATA 2.4]

The students' use of the word just in the above two examples indicated that they had both been acknowledged nonverbally, in these cases because of raised hands. In other cases, teacher acknowledgment may result from changes in posture or facial expression.

Evidence that the demand ticket might be mandatory can be seen in sequences where there were no apparent verbal or nonverbal occurrences.

(4.5) St: You can also take the sixth root, can't (1)
you? (2)
TA: Pardon me? [FITA 4.11] (3)

(4.6) St: What was the high? (1)
TA: What? [MITA 5.13] (2)

When demand tickets are not used, confusion may follow and the students may be required to ask their questions a second time.

The teacher is required to respond, verbally or nonverbally, to the demand ticket, even if the student does not always wait for the acknowledgment as in (4.1). When students' hands go unacknowledged, the students feel

uncomfortable, just as the participant in a conversation feels discomfort if a greeting goes unacknowledged.

Presequence

The presequence is an optional component of the exchange sequence. Similar to the conversational presequence, it is a way of opening an interaction. The presequence differs from the demand ticket in that it not only gains the floor for the student, but also (a) orients the teacher to a particular area of misunderstanding that the student has or (b) allows the student to solidify his or her question by talking through the problem. The existence of this feature may explain the confusion that teachers sometimes feel over what the students are actually asking. Evidence for the presequence can be seen in the following two sequences observed in the data:

(4.7)	St:	I'm lost. What're you trying to figure out?	(1) (2)
	TA:	Ok. I'm trying to find out what c is.	(3)
	St:	Why don't you just use the law of sines to find angle a then use the law of cosines? [FATA 1.19]	(4) (5) (6)
(4.8)	St:	I don't understand. Isn't that a?	(1)
	TA:	This is this is a and this angle from here to here approximately. Oh don't let my drawing confuse you. Taking the two	(2) (3) (4)
	St:	You said b didn't overlap a [MATA 3.27]	(5)

In each of the above sequences, the student's main question came after the presequence was completed. In the first example, the student had either really lost the train of a rather lengthy explanation or was expressing impatience with it. First she established the focus of the discussion, then offered her correction to the TA's procedure. In the second,

the student first alerted the TA to the reference point in question, then disagreed with the procedure.

Resolution Sequence

The appearance of a resolution sequence, at the end of the question/answer sequence, indicates that the problem that had precipitated the initial question has been successfully addressed. They are sequences in that there often is an exchange of concluding remarks between the TA and student as the explanation draws to a close, and possibly a 'helpful hint' or concluding remark from the TA after the student has acknowledged understanding. In these data the sequences were both verbal and nonverbal, sometimes containing only a check for understanding by the TA (Ok?) Examples of both nonverbal and verbal resolutions appear in the following excerpts from exchanges:

(4.9) St: You know the k minus one? Where'd you (1)
get the minus one right there? Is it (2)
one minus one? (3)
TA: K times one. Then thirty seven. Ok. (4)
(points and underlines answer on the (5)
board -- student nods and writes (6)
something down.) [FITA 4.10] (7)

(4.10) TA: Yea. You can do that. (1)
St: Comes out the same. (2)
TA: Yea. You can do that. X minus one, will (3)
be . . . Yea you can do that. You have (4)
answer? Ok? That's a good idea.. (5)
[FITA 4.11]

(4.11) TA: Here? Yea. I will multiply by two plus i (1)
squared and this two together. I feel (2)
this will be easier. (3)
St: Oh. All right. (4)
TA: Ok? [FITA 4.16] (5)

The first example, (4.9), illustrates a nonverbal acknowledgment on the part of the student in the form of a nod. Other acknowledgments may be as subtle as a questioning look from the TA. The second and third examples (4.10 and 4.11) were both verbal resolution sequences. In (4.10), the TA was checking for understanding; in (4.11) both were participating verbally. Resolution sequences appeared in 44% of the 102 question/answer sequences (not counting request-to-do-problem sequences): the American TAs used them 42% of the time and the international TAs 44% of the time.

Frequency and Type of Sequence

Requests-to-do-Problems

The results of the tabulations of frequency and types of student-initiated Q/A sequences begin with Table 4.2. It presents for both the American (ATA) and the international TAs (ITA) the average number of student initiated sequences recorded per class and the percentage of those sequences that were requests for the TA to explain specific mathematical problems from the homework or quiz. The total number of request-to-do-problem sequences was subtracted subsequently from the rest of the data, and all other tabulations are computed based on the balance or 102 sequences.

These request-to-do problem (RP) sequences were separated from the data for two reasons. First, the initiators were generally written on the board at the beginning of the class period and therefore were not part of the verbal interaction of the class. Those asked during class were not treated as

question/answer sequences by the TA nor by the student, but rather as topic initiations. Sometimes the number of the problem was added to the already existing list; other times the problem was immediately discussed. Either way, once the explanation was begun, it ceased to be an explanation given for a particular student. Unless a lengthy discussion evolved regarding a certain process, the teacher did not check the clarity of the explanation with the one who had requested the problem. It became a class lesson. Second, because these were class lessons, it is possible that the explanation structure is different from the structure used to explain the process to one student. It is possible, for example, to explain a given mathematical problem simply by writing the procedure on the board, saying very little aloud to the class. A fine analysis of the difference in group explanation structure and individual explanation structure is beyond the scope of this study.

Table 4.2

Average Number of RP Sequences

	Sequences	
	Average	Request-to-do-Problem
ATA	24	13
ITA	17	24

The overall number of student-initiated sequences for the three observations was fairly uniform across five of the teaching assistants. The range for those five classes extended from 22 to 27 sequences, averaging 24 sequences per class for the American TAs and 17 sequences per class for the international TAs. The most obvious deviation was in the class of MITA 6 where students initiated interaction only five times during the entire observation period.

The percentage of interaction that was request-do-problem varied widely among the teaching assistants, from 0 in the classes of FATA 1 to 35% in the class of MITA 5. On the average, 20% of the student questions were requests-to-do-problems. The comparison of the American TAs with the international TAs in Table 4.2 shows that interaction in the classes of international TAs included a higher percentage of requests to do routine problem solving than it did in the American TAs' classes (24% to 13%). This supports Katchen's (1984) findings that students ask more request-to-do-problem questions of international TAs and suggests that the students may have been accomodating the ITAs by giving them topic initiations rather than negotiating one on one with them.

The balance of the student-initiated question/answer sequences had three main functions: for the student to assert his or her own ideas regarding the mathematical concepts or procedures (assertions), for the student to request further information or clarification (requests), or for the student to establish or change the TA/student relationship (phatic

language). The relative appearance of these sequences in the ATA and ITA classes is presented in Table 4.3. Figures are given for ATA and ITA classes, by function, in both raw numbers (n) and percentages (%) out of their respective number of sequences.

Table 4.3

Average Number of Sequences by Function

	Function of Sequences					
	Assertions		Requests		Phatic	
	n	%	n	%	n	%
ATA	18	28	44	69	2	3
ITA	3	8	31	82	4	10

Out of the 102 sequences that form the basis for this analysis, the overwhelming majority (75) in both sets of data were request sequences. Phatic or social language appeared the least in both sets of data. There were differences in the use of the structures in the ATA and ITA classes. Students in the ATA classes used assertions more often (28% of the 64 ATA sequences to only 8% of the 38 ITA sequences) and the students in the ITA classes used requests (82% to 69%) and phatic language (10% to 3%) more often. These differences may be attributed to the functions of these sequences.

Assertions

The assertion sequences found in the data fell into two categories: corrections and disagreements. The determination was based on the first utterance of the sequence, unless it involved a verbal demand ticket or presequence, in which case the first student utterance after the TA's response to the demand ticket/presequence was used.

Assertions functioning as corrections

(4.14)

FATA 1

1.5 Would the hypotenuse be the square root of two?
1.11 Isn't that the other way around?
1.18 Wouldn't the reason why eight, why it has to be less than eight is cuz if it was longer than eight and had two value it would [could] be on this side, and then if it were longer than that it would be on this side, and you can't have it?

MATA 2

2.12 They wanted us to do it by graphics.
2.13 You're not going to do forty three?
2.14 They have two pi.
2.15 Is that the square root of nine?
2.19 Wouldn't that be a right triangle?
2.20 That's not on there.

MATA 3

3.15 You mean that's forty five degrees.

FITA 4

4.12 We didn't have to do that one.

These assertions took both interrogative ("Isn't that the other way around?") and declarative ("They wanted us to do it by graphics.") form. The interrogatives generally were in the form of negative questions, indicating perhaps a polite or formal structure, except for number MATA 2.15 ("Is that the

square root of nine?"). The possible illocutionary force of this utterance could have been (a) correction, (b) request for clarification of writing on board, (c) confirmation of an answer, or (d) expressed surprise over an unexpected answer. Looking at the context for clarification, in this instance, the indicated reference point on the board was not the square root of nine. A paraphrase might be "Isn't that supposed to be the square root of nine?" This was taken as a correction by the teacher ("I'm sorry.") and, it seems, was intended as such by the student. There was no indication that the student was experiencing any confusion and the reference was not to any answer, but was to an intermediary step in the problem solution.

All of these corrections addressed some utterance or procedure made by the instructor. Either the TA was doing the wrong problem, skipping a problem, adding wrong, or getting the wrong answer. They were immediately recognized as corrections.

Assertions functioning as disagreements

(4.15)

FATA 1

1.19 Why don't you just use the law of sines to find angle a then use the law of cosines?

MATA 2

2.8 Ok, the the one plus tan of x is equal to secant two over four. It doesn't apply when everything's squared cuz I
2.16 It looks like you're adding two pi to me.
2.18 Wouldn't that be a right triangle?
2.21 You could've just took half of eighty nine degrees to get that angle

MATA 3

3.11 In the middle one, wouldn't x be squared, too, then? Because
3.26 Just real quick. You can use a quadratic on trig function, but you can't distribute them? That doesn't make much sense.
3.27 You said b didn't overlap a.

FITA 4

4.19 Couldn't you, um, couldn't you just like graph it?

MITA 6

6.2 Wouldn't it be from negative one to zero instead of from negative infinity? Cuz how would you have negative infinity if it's square

These utterances also took both interrogative and declarative form. Numbers MATA 3.11 and MITA 6.2 are examples of the interrogatives. Again, the use of "Wouldn't it be . . . ," as a polite form appears. They both can be paraphrased easily into declaratives (MATA 3.11 "In the middle one, x should be squared, too, then." and MITA 6.2 "It should be from negative one to zero instead of from negative infinity.") while keeping the original illocutionary force.

The declaratives were often two utterances long (see numbers MATA 2.8 and MATA 3.26). The first indicated the reference, the second indicated the disagreement ("It doesn't apply . . . " and "It doesn't make sense..") There were two main reference points for these utterances: disagreements over an explanation that the TA was giving that the student had completed a different way (MATA 2.8 and MATA 2.22) and a general disagreement over the procedure (FATA 1.9, MATA 2.16,

MATA 3.11, MATA 3.26, FITA 4.19, MITA 6.2).

Requests

The vast majority of student initiated sequences were requests. They fell into two main categories based on preferred response: confirmation and request for information. The preferred response for the requests for confirmation is agreement which can be delivered with a one word answer. The dispreferred response, however, requires an explanation. In cases where the function of the utterance was not immediately apparent, the context of the sequence was considered. There were three types of information questions, those requesting yes-no, one word answers, and longer or fuller explanations.

Requests for confirmation

(4.16)

FATA 1

1.6 You don't have to take it any farther than that do you? Cuz [ ]
1.12 So you don't want an exact answer?
1.13 You use radiens mode?
1.17 The ten was given?
1.20 If you just used the law of sines, would it be wrong?

MATA 2

2.1 Can you just use eight then?
2.5 So on the test, if we just wrote down cotangent of theta and then
2.7 Can you always do that? When you have an equation like that?
2.17 That's all I have to write is pi k?

MATA 3

3.8 That's in feet?
3.12 Can you multiply one plus sine x over cosine x by [ ]? Cuz . . . Oh. It'll cancel out.

3.13 Is that the answer then?
3.17 Would it work if you just put the top sixty minus forty five. Where could just do one half minus one over square root of two and just solve that? Instead of doing that long
3.22 Would you start off with cosine two, you know?

FITA 4

4.4 Can you just factor it though?
4.7 So you do that with all the complex factors?
4.8 So are you allowed to do it like the first part or no?
4.9 So if that was like on a test we could put x plus one cubed and get it right?
4.11 You can also take the sixth root, can't you?
4.16 Does it matter that you multiply those two together as opposed to like uh two plus i squared [ ]?

MITA 5

5.6 This one right here? When b is less that a then there's no x right?
5.9 To get side c, uh, you use alpha I mean a squared plus b squared equals c squared?
5.18 Could we, uhm, just just take r r one times r two and take the absolute value of z one

These utterances were requests for confirmation of (a) a procedure that the student had completed that was different from that demonstrated on the board (FATA 1.20, MATA 3.12, MATA 3.17, MATA 3.22, FITA 4.4, FITA 4.8, FITA 4.11, FITA 4.16, MITA 5.6), (b) a method or answer that the student wanted to confirm as correctly heard or understood (FATA 1.6, FATA 1.13, FATA 1.17, MATA 2.1, MATA 3.8, MITA 5.9, MITA 5.18), and (c) the completeness of the explanation (FATA 1.12, MATA 2.5, MATA 2.7, MATA 2.17, MATA 3.13, FITA 4.7, FITA 4.9). In each of the utterances, the students had methods or answers in mind for which they wanted confirmation.

Requests for Information

(4.17)

Yes/No Questions

FATA 1

1.23 When we [do the test] will he give us a diagram do you think?

MATA 2

2.23 Do you think the test'll have uh proofs of uh

MATA 3

3.1 Is it curved?

MITA 5

5.5 Is this on the test?
5.11 He curving any [of these]?
5.23 Is the eight root of fifty the same as the square root of fifty to the one fourth?

MITA 6

6.3 Are you going to give us an example?

Short Answer Questions

FATA 1

1.1 What're we supposed to put down for six?
1.4 Can you just give us the answer for number four?
1.10 What mode should we be in for our calculator?
1.21 What's s?
1.22 What number was that?

MATA 2

2.6 So when we solve these we going to use um equations or you want graphics?

MATA 3

3.2 What's the average?
3.14 What was two?

FITA 4

4.2 What was the range you used?
4.15 What section are we on?

MITA 5

5.7 What was the average?
5.13 What was the high?
5.14 In our section or overall?

Longer Explanation

FATA 1

1.3 Is there a couple of different ways to go about doing this? Cuz I didn't do it that way.
1.7 How do you know that? Cosine theta equals cosine two minus theta?
1.8 Explain where you get the three pi over two again?
1.9 Where'd you get the five pi over three again?
1.14 Why'd you choose radiens?
1.15 Do you graph, um, the top equation you have or do you graph sine three x equal y?
1.16 Wait. When you graph that what'd you how'd you plug it into the calculator?

MATA 2

2.4 I just didn't know where you got it from.
2.10 I lost you over one point sine x one plus sine x over sine x. There right there.
2.18 How do you know that, that one angle is forty five degrees?

MATA 3

3.4 When you give partial credit, is there some specific thing that you
3.7 Wait. How'd you get the five point two four.
3.16 [ ] where you came up with sixty over four. I can understand how you got the fifteen after that. You got pi over three times one fourth.
3.18 I got it, but where'd you get negative the square root of [ ]?
3.20 I don't understand how you got . . . yea, that right there. That's the part I don't understand. How can you
3.21 Can you finish that one?
3.23 How do you know when you're when you've made it to the last step?
3.24 Why?

3.25 On number fifty-nine, how come in the back of the book it says it's the arctangent of fifty over i? I just seem to get tangent of fifty over i.

FITA 4

4.1 Um. For my graph on number fifteen, I have two places greater than five hundred and you only put only one point down.
4.3 I don't understand how you used you used ten not twelve.
4.6 I don't understand what you're doing over there.
4.10 You know the k minus one? Where'd you get the minus one right there? Is it one minus one?
4.17 How's there two complex?
4.18 How'd you know when it'll be a double double root?
4.20 What if it was degree three?
4.23 Why'd you use the five times? Five times thirty five?

MITA 5

5.4 I'm just confused because in the book it says b less than h which is a sine beta. Then there is no solution.
5.19 On number twenty nine, I got the right answer, but I don't understand why the second one is square root of thirteen and the cosine of what angle equals two k pi.
5.20 What would you do if it said find exactly theta?
5.22 Ok. Now graph the now graph the root.

MITA 6

6.1 How did you get the one third?

These questions were divided into three main categories: those seeking a yes/no answer, a one word answer, and those requesting longer explanations. There were seven yes/no questions. The short answer requests focused on specific information such as a certain number, range, or variable value. In many instances (see numbers MATA 2.6, FITA 4.8, MITA 5.23) the TA was given a choice of answers ("Do you want x or y?") stressing the interest in a short answer.

The balance of the questions were requests for longer

explanations. They asked how to, what if, and why. Table 4.4 contains a comparison of the kinds of requests made in American and international TA classes.

Table 4.4

Types of Requests

	Types of Requests							
	Confirm		Yes/No		SA		LA	
	n	%	n	%	n	%	n	%
ATA	14	32	3	7	8	18	19	43
ITA	9	29	4	13	5	16	13	42

Out of the 75 request sequences in these data, 44 occurred in the ATA classes and 31 in the ITA. Table 4.4 contains the breakdown of the requests based on the students' preferred responses: confirmation, yes/no, short answer (SA) and long answer (LA). The figures are given for ATAs and ITAs in both raw numbers (n) and percentages (%) out of their respective number of requests. By far the type of request appearing most frequently was the request for longer explanations (LA). Nearly half of the requests in both the ATA and ITA classes were of this type. The next most widely used type of request was the request for confirmation, which appeared in nearly 1/3 of the request sequences for both the ITA and ATA classes. These data do not support the

hypothesis that students ask questions of the ITAs that require shorter answers. They made fewer requests overall of the ITAs, but within the request category, there was surprising consistency in the frequency of appearance of the different types. The one exception was the yes/no answer request, which was used with the ITAs in 13% of their requests to only 7% with the ATAs. These questions dealt largely with procedural matters such as how tests were graded and it may be the case that students ask more procedural questions of ITAs than they do of ATAs.

Phatic Language

The rest of the utterances appearing in the data were assigned the comprehensive label of phatic language. This classroom dialogue between the teacher and student serves a social function to maintain or change the relative power relationship that has been established. In these data it took the forms of complaints, jokes, and challenges.

Complaints

(4.19)

FATA 1

1.2	St:	I just wanted to say that uh he's going	(1)
		kinda quick through this stuff in	(2)
		lecture, you know, and we're trying to	(3)
		keep up [writing it down] and not	(4)
		catching a lot of this stuff. So I hope	(5)
		I learn a lot in here. (laugh) SERIOUSLY	(6)
	TA:	I hear everything in terms of sine and	(7)
		cosine. You see in this figure this	(8)
		tangent of u plus v formula? I that'll	(9)
		show up in....	(10)

There was only one complaint over the three days. This

complaint was against the professor for the course. Complaining in this manner in the recitation section served two purposes. It (a) alerted the TA to the extent of the student's confusion, and (b) put the responsibility for clarifying the material on the TA. There was no sense that the student expected that the professor would or could change anything to meet the needs of this student. The TA addressed both purposes. The answer that was elicited was a very basic "rule of thumb." By responding in this manner, the TA acknowledged that the student was deeply confused and accepted responsibility for helping the student succeed. This created an "ingroup" situation between the TA and recitation class against the professor, putting the responsibility for the student's success on the TA, but also acknowledging that the TA could fulfill the student's expectations. It is not unusual for the TA and student in recitation to form an ingroup against the supervising professor (see Rounds 1987 for a discussion of the use of certain linguistic features to form an ingroup in mathematics recitations).

Challenges

(4.20)

FITA 4

4.5 Isn't there an easier way to do it than using u?

MITA 5

5.8 How did we how're supposed to know we were supposed to put that down. I mean it didn't really say, you know, put both solutions down.

MITA 6

6.5 Now like on twenty one where you got the negative one point seven one, you said to use the [trace key]. Now

Three questions functioned as challenges in the data. They were categorized as such because they were not disagreements over a particular answer or procedure, but rather were complaints over a seeming impossibility. In number FITA 4.5, the student felt that the procedure proposed was too difficult to apply. In the next two examples, the students questioned that possibility of ever getting the correct answer with the information given by the TA. In number MITA 5.8, there was not enough information given on the test for the student to succeed, and in MATA 6.5 the student felt that using the calculator key recommended by the teaching assistant would not yield the correct answer.

Challenges such as these are difficult for the TA to address. They aren't assertions; the student in number FITA 4.5, for example, did not know there was an easier way to solve the problem. These were open ended questions that did not indicate a specific area of misunderstanding but put the responsibility on the TA for the student's failure. They challenge the TA's authority or ability to help the student succeed. The international teaching assistants were the only ones challenged in this manner.

Jokes

(4.21)

MATA 2

2.2 St: Can we have that in writing?
TA: After the exam.

MITA 5

5.12 St: What's he gonna drop a test?
TA: (Laugh)

There were two jokes over the three days of observation. The first occurred during the explanation of the upcoming test. The TA had assured the class that a certain procedure would be followed and the student asked for the assurance in writing. He wanted to be sure the TA could be held to that promise. Everyone in class treated this utterance as a joke, yet it revealed the students' level of anxiety over the test. By answering the way he did, the TA was playing along with the joke.

The second example was treated as a joke only by the TA. This was because the question was rhetorical. The students all knew the answer. This student had performed very poorly on the test and the joke was a way of indicating his anxiety over his overall grade in the course. None of the students laughed at the question -- they snickered and murmured -- revealing that they all shared the anxiety and were perhaps hoping that there might be some recourse available to them to improve their grades. By laughing, the TA ignored the sarcasm, avoided explaining to the students departmental policy that they already knew, and avoided creating more of a

conflict than there already was.

Use of Embedded Sequences

The students' initiations were often responded to within one turn or one turn followed by student acknowledgment.

(4.22) St: Would the hypotenuse be the square root of two?
TA: Yes. Thank you. [FATA 1.5]

(4.23) St: Where'd you get the five pi over three again?
TA: Uhm. This equals two pi minus pi over three and that's six pi over three. It's always nice to connect this in terms of three so I have six pi over three and it's really straightforward.
St: Oh. Ok. [FATA 1.9]

The number of turns taken to complete a given Q/A sequence in these data ranged to 18. This suggests that students did negotiate with their TAs toward successful communication. The average number of turns per sequence per TA ranged from 3.7 to 6.2 with the overall average for the TAs being 4.6 turns. Both the high and low end of the continuum appeared in the international TA sequences with the average number of turns per sequence nearly identical (4.1 to 4.5) in the ATA and ITA classes. The range also crossed genders and experience levels. The simple two turn question/answer sequence does not exist in the mathematics classroom. Negotiation was consistently conducted between the student and the teaching assistant regardless of the national status of the teaching assistants. Example (4.24) on the following page illustrates the level of complexity possible in student-TA interaction sequences.

Within this larger sequence, there were five sequences, one of which was embedded within other embedded sequences. The main sequence began on line 1 with the student's vague statement about being lost. As the TA attempted to address the student's concern, he began to walk the student through the problem and initiated the the first embedded sequence (lines 6-8). During the second embedded sequence of this type (line 9), the student initiated a sequence to clarify the TA's question (lines 10-11) before she finally answered (line 12) and that sequence was resolved (line 14). The student's question had not been answered, though, and she began a new sequence (line 15) to clarify her reference point for the TA. This sequence ended when the question was answered (line 33) and the issue resolved (lines 34-36)

(4.24) St: I lost you over one point sine x one (1)
plus sine x over sine x. There right (2)
there. (3)
TA: Ok. This piece right here sine x over (4)
sine squared x. There's a sine of x (5)
in each of them. How many sine x's are (6)
in this one? (7)
St: One. (8)
TA: How many sine of x's are in this one? (9)
St: How many whats? (10)
TA: Sine x's. (11)
St: Oh. Sine x. But how'd you (12)
[(13)
TA: Right. (14)
St: But how'd you get rid of the one from (15)
the from the one before that? (16)
TA: Cuz we have a one plus sine x and we (17)
have a one plus sine down here. These (18)
two things are multiplied. This whole (19)
[quantity] is multiplied. (20)
St: Up. The one above. (21)
St_2: The one plus sine x minus. Yea that (22)
one right there. (23)
St: How'd you get rid of the one plus sine (24)

x? (25)
TA: Oh. I really I really didn't get rid of (26)
this one. I combined this one and (27)
this one. One minus cosine squared. (28)
[(29)
St: Oh. To get the (30)
sine. (31)
[(32)
TA: And this one came along for the ride. (33)
St: Oh, oh. Now I see. (34)
TA: All right. So I should be a little (35)
more explicit? [MATA 2.10] (36)

Types of Negotiation

Several kinds of alignment talk appeared in the classroom interaction data. Many took the form of embedded interactional repair sequences. Initiated by either the TA or the student, these embedded sequences requested clarification of an unheard or not understood utterance (question), board reference (reference), or the mathematical concept or procedure (content). Note the following examples of repair initiated by the teaching assistant:

TA-initiated repair

(4.25) Repair to Question
St: Can you finish that one? (1)
TA: Huh? (2)
St: Can you finish that one? (3)
TA: Can I? (4)
St: Yea. (5)
TA: Ok. Sure. This is a (completes (6)
problem). [MATA 3.21] (7)

(4.26) Repair to Reference
St: I just didn't know where you (1)
got it from. (2)
TA: Where I got this thing from? (3)
St: Yea. (4)
TA: Pulled it out of the book. So (5)
we (writes on board) and (6)
that's what we had to come up (7)
with. [MATA 2.4] (8)

(4.27)	Repair to Content	St: What're we supposed to put	(1)
		down for six?	(2)
		TA: On six? It was pi over three	(3)
		plus k pi. Cuz if the . . .	(4)
		the tangent has a period of	(5)
		uh pi. <u>You put down two</u>	(6)
		<u>pi</u>?	(7)
		St: No, I didn't.	(8)
		TA: Yea, cuz I . . . You got	(9)
		credit for putting down the	(10)
		right answer and then there	(11)
		was four points. The half	(12)
		of it was for getting the	(13)
		right period of pi of	(14)
		tangent so . . . If	(15)
		there are questions of the	(16)
		[ ] [FATA 1.1	(17)

The above examples illustrate the kinds of TA-initiated repair that occurred. In (4.25), the TA had begun to explain part of a problem to aid in the explanation of the student-requested problem. Once the concept had been illustrated, the TA intended to discontinue the explanation of the new problem. As he dropped it in favor of a new unit, a student requested that he continue the explanation. The TA hadn't been ready for the question. Perhaps because there had been no demand ticket, or because the reference had been unclear, or because his mind had already left the current explanation, the TA needed the student to repeat the question in order for him to understand what was being requested.

In example (4.26), the TA needed the student to indicate the number on the board to which she was referring. There was no obvious antecedent for her use of "it" so the TA did not know at what point to begin the explanation.

Example (4.27) is one in which the TA attempted to determine where in the student's process for solving the

problem lay the misunderstanding. In this example, although the student asked a fairly straighforward question ("What're we supposed to put down for six?"), by virtue of the fact that the question was being asked, the TA knew that the student must have had the wrong answer. In order to completely clear up any misunderstanding, the TA needed to determine where the student's reasoning fell short, hence the question, "You put down two pi?" A number of students had probably put that answer down, so the TA was interested in addressing that particular misunderstanding.

In negotiating the content in class, students made repairs regarding previous utterances (question), the board reference (reference), and the course content (content). The following are examples of student-initiated repair.

Student-Initiated Repair

(4.28) Repair to Question

St: Do you graph, um, the top (1)
equation you have or do you (2)
graph sin three x equal y? (3)
TA: It's your choice. I mean if (4)
[(5)
St: Which (6)
one'd be simpler? (7)
TA: Hmm? (8)
St: Which one'd be more simple? (9)
TA: This is this is going to tell (10)
you where it crosses the axis, (11)
and this is going to give you (12)
intersecting points . . . . (13)
[FATA 1.15]

(4.29) Repair to Reference

St: You're not going to do forty (1)
three? (2)
TA: Oh. I need to do forty three? (3)
Thank you. Oh that's a good (4)
one. Can I erase this one? (5)
Forty three. We have sine of (6)
the inverse tangent of x. So (7)
[(8)

St: Um. (9)
Are you on eight point three? (10)
TA: Ha. Yes I know what I'm doing. (11)
Sine squared of x minus one. (12)
So how we going to solve (13)
this? [MATA 2.13]

(4.30) Repair to Content

St: Would it work if you just put (1)
the top sixty minus forty five (2)
where could just do one half (3)
minus one over square root of (4)
two and just solve that? (5)
Instead of doing that long (6)
[(7)
TA: Instead of (8)
splitting it apart? (9)
St: Yea. (10)
TA: I'm sorry. Wait. Co . . . I'm (11)
sorry. (12)
St: Well, the cosine of sixty is (13)
one half. Right? (14)
TA: Yea. (15)
St: The cosine of forty five is (16)
one over square root of two. (17)
The cosine of (18)
[(19)
TA: Are are you doing this? (20)
Are you using like a (21)
distributive property? Are you (22)
saying that this is equal to (23)
this? (24)
St: Right. (25)
TA: No. That's not true. (26)
St: Why not? (27)
TA: Because this, um, no it's not (28)
even true in this special (29)
case...[MATA 3.18] (30)

Similar to the repair initiated by the teaching assistants, the students offered repairs to their questions, to the board reference and to the content of the explanation. In (4.28) above, the student did not receive an answer to her question. She had wanted the TA to choose a method for the student to follow. When the student was told it was a matter of choice, she amended the question in an attempt to get a definite answer.

In example (4.29), the teaching assistant had skipped a listed homework problem, so the student asked if he were intending to skip it. When he began the explanation, it was of a problem with the same number in a different section of the text. The student clarified the section reference and the explanation continued.

Example (4.30) is one in which the student volunteered to walk the TA through her thought processes as the TA had been so confused by the question as to not be able to answer at all. The student led the TA through until they came to an area that the TA identifies as problematic. The TA confirmed what he considered the student's process to be and cleared up the misconceptions.

Table 4.5

Frequency of Repair

	Repair Responsibility							
	TA				Student			
	initiated		carried out		initiated		carried out	
	n	%	n	%	n	%	n	%
ATA	25	55	11	24	20	45	34	76
ITA	24	75	10	31	8	25	22	69

Table 4.5 give the figures for the use of repair in both raw numbers (n) and percentages (%) out of their respective

number of repairs in ATA and ITA classes, according to the person assuming responsibility for the repair. There were 45 instances of the repair in the American TA sequences and 38 instances in the international TA sequences; the percentages in the ATA data are out of 45 instances, and those in the ITA data are out of 38 instances. In both the ATA and ITA data, the tendency was for the teaching assistant to initiate the repair (55% of the time for the ATAs and 75% of the time for the ITAs), and for the student to carry out the repair (76% of the time in the ATA classes and 69% of the time in ITA classes) regardless of who initiated it. The ITAs, however, both initiated and carried out a greater percentage of the repair in their classes than their American counterparts did, and the students both initiated and carried out a greater percentage of the repair in the American classes than they did in the international TA classes.

The appearance of third party or other repair was relatively rare in these data. It occurred in sequence numbers MATA 2.10, FITA 4.5, and FITA 4.12 only. Because its occurrence was so rare, it was difficult to assess whether it was significant that two sequences appeared in the ITA data to only one in the ATA data. It may be significant that only two instances of third party repair occurred in the ITA data. This is an area in need of further study.

Types of Repairs

The American and international teaching assistant classes differed in the types of repairs initiated by the TAs and the

students. Table 4.6 gives the frequency figures for the three types of repair (to question, reference, and content) initiated by the TA. The figures appear in raw numbers and percentages for the ATAs and ITAs, out of their respective number of repair instances.

Table 4.6

Types of TA-initiated Repair

	Types of Repair					
	Question		Reference		Content	
	n	%	n	%	n	%
ATA	9	36	3	12	13	52
ITA	13	52	8	.33	3	9

An examination of types of repair shows substantial differences the interaction in the ATA and ITA classes. Out of the 25 instances of TA-initiated repair in the ATA classes, 52% was conducted to the content of the course. This means that the TAs were walking the students through problems by asking them questions. The second most frequent type of repair was to the question (36%), where the TA clarified the students' questions. In the ITA classes, it appears that the type of repair initiated least by the TA was repair to course content (9%). The overwhelming amount of repair initiated was

to the students' questions (52%) or to the board reference (33%).

Similarly, Table 4.7 gives the figures for the frequency of appearance of the three types of student-initiated repair. The figures for ATA and ITA classes again appear in raw numbers (n) and percentages (%) out of their respective number of repair instances. There were 20 instances of student-initiated repair in American TA classes and 8 instances in the international TA classes; the percentages given are out of 20 and 8 respectively. In both sets of classes the majority of the repair occurred to a previous utterance (question), with the second most frequent type of repair being to course content. In the American TA classes there was less repair to question (60%) than in the international TA classes (88%) and more repair to course content (25% to 12%).

Table 4.7

Types of Student-initiated Repair

	Types of Repair					
	Question		Reference		Content	
	n	%	n	%	n	%
ATA	12	60	3	15	5	25
ITA	7	88	0	0	1	12

The tabulations from Table 4.6 and Table 4.7 suggest that the main concern in the ITA classes was with getting the message across. There was less concern for this in the American TA classes where there appeared to be more negotiation of course content.

Use of Other Alignment Talk

In these data, there were 186 instances of the use of other alignment talk (in the forms of accounts, formulations and framing devices) on the parts of the TA and the students.

In conversations, accounts, including disclaimers, apologies, justifications, and excuses, are used to explain why a certain behavior is at variance with expected or preferred behavior. In the classes observed for this study, the teachers used them when (a) giving more of an explanation than the students felt was necessary, (b) being corrected by the students, and (c) arguing for their methods of solving a problem. They were used by students when (a) asking a question they felt may not be of interest to the rest of the class, and (b) arguing for their own solution to a problem. Note the following examples of accounts used by the TAs:

Disclaimer

(4.31) St: Can you just give us the answer for number four? (1) (2)
TA: Number four. It's, uh, cotangent. So, this is number four. Let me just...The cotangent of theta plus two pi equals cotangent of theta and you can use this as...let me just set it up. This is one over tan theta plus two pi. That works out, or have cosine theta plus two pi over sine theta plus two pi. Both of those methods work out. (3) (4) (5) (6) (7) (8) (9) (10) (11)

Apology

(4.32) St: Is that the square root of nine? (1)
TA: Oh, sorry. So this equals forty five (2)
sine of theta. [MATA 2.15] (3)

Justification

(4.33) St: Can you multiply one plus sine x over (1)
cosine x by [ ]? Cuz...Oh. It'll (2)
cancel out. (3)
TA: Oh yea. It's good that you're thinking, (4)
Uhm. I have this written in my notes. (5)
So, I will finish this way. But you're (6)
right. In fact, that's what I told the (7)
afternoon class. Go home and see if (8)
you can find an easier way to do this. (9)
Nobody who did it, everybody pretty (10)
much did it this way, which surprised (11)
me cuz I thought I was...[MATA 3.12] (12)

In example (4.31), the TA mitigated any possible conflict caused by her decision to answer the student's question with a longer explanation than requested by saying she was just going to "set it up" (lines 4 and 7). The TA in (4.32) apologized for making an error that the student caught. Two justifications appear in (4.33). The TA justified his explanation by saying both that he had previously worked through the problem (lines 5-6, "I have this written in my notes.") and that no one in the other class could come up with an easier solution (lines 7-12).

The TAs' use of these accounts reflects the kind of relationship being established in the recitation sections. The use of accounts reduces the distance between the TA and the student and lessens the TA's power. It would be unlikely that these accounts would be found to any degree in the speech of the supervising professors, unless they, also, were trying

to establish closer relationships with the students.

In conversations, the hearer uses formulations to check for understanding of the message and framing devices orient the hearer to aspects of the speaker's remarks that will clarify the message. The teachers' uses of formulations and framing devices ensure success in the transmission of the intended message in class. Formulations are used to summarize or explicate an utterance previously stated by the student.

(4.34) St: Wouldn't the reason why eight, why it has (1)
to be less than eight is cuz if it was (2)
longer than eight and had two values (3)
it would [could] be on this side, and (4)
then if it were longer than that it would (5)
be on this side, and you can't have it? (6)

TA: So you're [going into] the definition, (7)
whole theory behind the triangle (8)
[(9)
St: I'm just saying, you (10)
didn't know where it came from. Isn't (11)
that why? . . . [FATA 1.18] (12)

The TA's response in line 7 to the student's question indicates where the TA feels she should begin with an explanation. The student is then free to agree with the TAs' understanding of the question, or can then initiate a clarification. In this case, the student follows it with a formulation of her own (line 10), repeating the TA's previous utterance about not knowing why a certain answer was necessary.

In non-educational discourse, the speaker's use of framing devices orients the hearer to aspects of the speaker's remarks that will clarify the message, such as "I'm just saying . . . " or "I mean . . . ," are the most important

parts of the message, such as "This is important . . . " or "Remember . . . ," or frame the process, such as "We have time . . . ' or " . . . everything works out." The TA's use of framing devices are seen in the following excerpt.

(4.35) TA: Ok. I'm going to do y equals sine (1)
parenthesis three x close parenthesis (2)
plus cosine x, and it should work out (3)
like that. Like that. Cuz you got to (4)
put the [parenthesis around it], or you (5)
could do y equals sine three x colon y (6)
equals cosine x. Uhm. Let me make one (7)
other quick note. We've got some time. (8)
I have no clue what this one looks like. (9)
This is, uh. Give an example. Sine three (10)
x sine squared of three x plus cosine x (11)
equals zero. You do the same thing. You (12)
graph it on your calculator as y equals (13)
parenthesis sine three x, um, hit the x y (14)
button, here, ok, um, ok. If I have the (15)
square here, put parenthesis around the (16)
sine or whatever, square it, that's yea. (17)
That's how they [ ] on the calculator, (18)
and so that's how you treat those. So, (19)
that's the simplest way of doing it. [ ] (20)
and then everything works out. (pause) (21)
Other questions on that? [FATA 1.16] (22)

There are a number of framing devices in the above example. Three refer to what the TA is going to say next: "I'm going to.."; "Let me make one other quick note . . . "; "Give an example . . ." The other three signal the end to a portion of the explanation.

In summary, accounts, formulations, and linguistic framing devices are tools in the TA/student negotiation process. The TA's use of accounts mitigates conflict in the class and reduces the distance between the teaching assistant and the student by changing the relative power held by the parties involved. A balance needs to be struck in their use

because excessive use of this type of talk can cause the TA to lose too much power and thus the respect of the students. Not enough use, perhaps, makes the TA seem less approachable and the content less negotiable.

By the same token, the TAs' use of other alignment talk such as formulations and framing devices facilitates the students' receipt of the message. With the formulations, the TA tells the student the conclusion the TA has drawn from the student's question. The student then indicates if the conclusion was correct or incorrect, and the TA's explanation can begin. With the framing devices, the TA signals the beginning and end of the explanations, the appearance of examples, and the relative importance of the information.

Students also use accounts in class, in the form of disclaimers, excuses and justifications.

Disclaimer

(4.36) St: This is my question. So, if no one else wants to hear then. Can you just use eight then? (1) (2) (3)
TA: Right. (4)
St: Ok. (5)
TA: Still, do it exactly. Well, first of all figure out how many feet per rotation. [MATA 2.1] (6) (7)

Excuse

(4.37) TA: . . . Sine of x, and then I have x plus y. So I replace this one with y and this one with y so I have cosine of this, sine of this. (1) (2) (3) (4)
St: Ok. Ok. (5)
TA: Sine of this cosine of this. (6)
St: Ok. I was doing it differently. (7)
TA: That's ok. Grill me. (8)
St: I was using the distributive property. (9)
[(10)

TA: Oh god. I was (11)
wondering . . . [MATA 3.21] (12)

Justification

(4.38) St: You can also take the sixth root, can't (1)
you? (2)
TA: Pardon me? (3)
St: You can also take the sixth root? (4)
TA: You mean (5)
[(6)
St: That's how they did it in the other (7)
class and that's how (8)
TA: Yea. You can do that. (9)
St: Comes out the same. (10)
TA: Yea. You can do that. X minus one, will (11)
be . . . Yea you can do that. You have (12)
Answer? Ok? That's good idea.[FITA 4.11] (13)

In (4.36), the student used a disclaimer to ward off any potential dispreferred responses by claiming the question that had been written on the board as her own and giving permission not to listen to it. Example (4.37) is an illustration of a student giving an excuse for the question that she had asked. Once the TA explained the problem to the student's satisfaction, the student offered an explanation for her confusion to the TA. "I was using the distributive property." This functioned as an excuse as there was an acknowledgment that the TA had the right procedure, while offering an explanation that seemed plausible for the way the student had completed the problem.

Example (4.38) served to justify the student's question to the TA. Before the TA had the opportunity to answer the question, the student justified her procedure with "That's how they did it another other class." Justifications also appear when the student is negotiating at length with the TA over the

correct procedure or answer as a means of saving face.

The use of formulations and framing devices in student discourse again ensured that the speaker and hearer shared the intended meaning of the message. With formulations, the student told the TA what conclusion the student had drawn from the TA's statement.

(4.39) TA: . . . I hear everything in terms of sine and cosine. You see in this figure this tangent of u plus v formula? I treat everything the easiest way sine and cosine so that'll show up in [(1) (2) (3) (4) (5) (6)
St: [So the object of a lot of this stuff [(6) (7) (8) (9)
TA: Pardon? (10)
St: The object of a lot of this stuff is [finding the easiest thing to do?] (11) (12)
TA: Yea, that's all you do. (13)
St: You pretty much have to memorize [FATA 1.2] (14)

Here, the student summarized what he believed to be the main point of the TA's answer. He told the TA what he understood from her remarks and allowed her to agree or to clarify. In this case, she agreed.

The use of framing devices served the same purpose for the students as they did for the students as they did for the TA. They referred both to the speech and to the process.

(4.40) TA: . . . To get secant of x you kind of took the square root. It'd be it would not be one plus tangent of x. (1) (2) (3)
St: What I'm saying is that I just assumed since you could do it with squared you could do it with not being squared, so I said one one plus tangent x equals secant x . . . [MATA 2.8] (4) (5) (6) (7) (8)

or

(4.41) St: I got the next step where you break down (1)
the sine of theta or cosine. I get that (2)
part. (3)
TA: Ok. Let me show you . . . Yea I was able (4)
to get it into uh a form similar to this (5)
and then I got bored with the problem (6)
Ok. So cosine two theta. . . [MATA 3.22] (7)

In (4.40) the student signalled that the TA had not understood her reasons for choosing a particular method for solving the problem. Her clarification was marked with "What I'm saying is . . . ." In the second example, (4.41), the student was referring to the process, indicating that the TA did not need to continue with the problem solution. That the TA understood this is reflected in his response "Ok. Let me show you . . . ." He understood but, for whatever reason, he decided to go ahead with a fuller explanation.

In summary, the students' uses of accounts reflect the type of relationship that exists between the students and the TA. Too much use can indicate a problem in the student-TA relationship as students become argumentative or whiny; not enough might signal a lack of the negotiation that is reflective of a productive teacher-student relationship. By the same token, student use of the other types of alignment talk such as formulations and framing devices may be an indication of the students' level of involvement as they make an effort to understand and be understood by the teacher.

The teachers' and students' uses of alignment talk other than repair differ in the classes of the American and international teaching assistants (see Table 4.8).

Table 4.8

Use of Alignment Talk

	Alignment Talk			
	Accounts		Other Metatalk	
	n	%	n	%
ATA				
TA use	11	17	101	158
Std use	7	11	26	41
ITA				
TA use	2	5	27	71
Std use	1	3	11	29

Table 4.8 summarizes the use of alignment talk. The figures are given for the ATA and ITA classes in raw numbers (n) and percentages (%) of appearance in their respective number of sequences. The percentages in the ATA data are out of 64 sequences; similarly, the percentages in the ITA data are out of 38. The tabulations for the appearance of accounts contains all the figures for disclaimers, apologies, excuses, and justifications. The other metatalk includes formulations and linguistic framing devices. Many sequences contained more than one kind of alignment talk. In MATA 2.21, the TA used a disclaimer and the student a justification in the course of their negotiation, in MATA 3.12 both the TA and the student used justifications, and in FATA 1.15 there were six instances of framing devices used by the TA in the course of her explanation.

Overall, the teaching assistants made more use of both kinds of alignment talk than the students, and the American teaching assistants made more use of it than their international counterparts. Similarly, the students in the American classes used alignment talk more than the students in the ITA classes.

Summary

This chapter analyzes student negotiation patterns in terms of attendance, the function and frequency of the student-initiation sequences, and function and frequency of the sequences within those initiation sequences. Attendance patterns differed in the classes taught by international teaching assistants. Two of the ITAs had substantially lower attendance figures (affecting one third of the classes studied). Each was a class in which other communication irregularities occurred.

The exchange sequences initiated by the student contained a number of shorter sequences that combined to form the larger sequence. The overall structure appeared to include, in addition to the traditional Q/A sequence, an obligatory demand ticket/acknowledgment sequence, an optional presequence that served to orient both the TA and the student to the problematic area to be discussed, a series of optional negotiation sequences, and a final optional resolution sequence that marked the completion of the explanation.

The main sequences of the exchange functioned as requests-to-do-problems, requests for information, assertions

or phatic language. Requests-to-do-problems (the type appearing the most often) were separated from the rest of the data because their nature suggests a TA/group interaction rather than TA/student interaction that is beyond the scope of this study. For similar reasons, the discussion of phatic language is limited. The balance of the data was analyzed in terms of assertions and requests. Students made more use of requests in all the classes; in the American TA classes they used assertions to correct or disagree with the TA more often than they did in the international TA classes. Differences also appeared in students' use of requests. The international TAs received a higher percentage of yes/no requests than their American counterparts.

Within the main initiation/response sequence appeared layers of embedded sequences, allowing the students and the TAs to negotiate a successful conclusion to the interaction. These embedded sequences serve as alignment talk and take the form of conversational repair, disclaimers, apologies, justifications, excuses, and framing devices that focus the attention of the listener. These embedded sequences appear in both American and international TA classes, with the number of turns taken to complete an exchange sequence nearly identical (4.1 to 4.5). Likewise, the initiation of these instances of alignment talk is similar, with teaching assistants initiating more use of all kinds of alignment talk than students and students carrying out more of the repair. A comparison of the ATA and ITA classes, however, revealed that the international

TAs initiated and carried out more repair than the American TAs and the students in the American TA classes initiated and carried out more repair than their counterparts in ITA classes.

Differences between American and international teaching assistants also arose in the types of alignment talk used in class. In the American TA classes, the TAs initiated more repair to the course content than to the previous utterance or to the board reference. In the ITA classes the TAs initiated more repair to the previous utterance and to the board reference than they did to course content. The students in both the international and American TA classes initiated repair to a previous utterance the majority of the time, but in the American TA classes, they initiated repair to course content approximately 25% of the time, to only 12% in the international TA classes.

Similarly, there was a significant difference in the appearance of other types of alignment talk including disclaimers, justifications, excuses, formulations, and framing devices in the two sets of data. Overall, the TAs made more use of accounts and other metatalk than the students, and the American TAs and the students in their classes made more use of them than the international TAs and their students did.

Chapter 5: Discussion of Findings

The mathematics recitation class functions as a counterpart to the mathematics lecture. Students must register for both the lecture class and the recitation in order to receive credit for freshman mathematics. While the lecture is a large and completely teacher-controlled environment, the recitation is designed to help the students get answers to the difficulties they face in attempting to solve the homework problems. The relatively small classes (30 compared to the 200 or more attendance at the lecture), the largely student-controlled problem solving format, and the use of teaching assistants are supposed to contribute to an atmosphere in which the students feel comfortable asking difficult questions and negotiating with the instructor until they understand the material. In the ideal recitation section, as in any class, students would attend regularly and participate fully, i.e. ask questions. Therefore the recitation section is a suitable environment in which to study student-initiated interaction patterns.

The Kind of Interaction in Mathematics Classes

Structure of Sequences

This study refutes the analysis of student-initiated

interaction sequences as being di- or even tri-partite question/answer structures (Sinclair and Coulthard 1975), at least in the college mathematics class. The exchange is better described as a complex series of exchange sequences embedded within each other. This analysis suggests the existence of four possible exchange sequences (demand ticket, presequence, negotiation, and resolution) in addition to the main sequence. They are sequences in that each separate initiation requires a response from the hearer. Two of these sequences can be initiated and/or responded to verbally or non-verbally: the demand ticket sequence and the resolution sequence.

Of these five possible sequences, perhaps the most deserving of further study is the presequence. It has two functions: (a) to orient both the student and teacher to the problematic area and (b) to allow the student to elicit an explanation from the TA when the student does not know how to word the question. It's appearance may be a contributing factor in some teaching assistants' difficulty in understanding what the student is asking.

The value in describing student-TA interaction in its complexity lies in TA training. New teachers need to be aware of the kind of interaction to expect in the classroom. For the international TAs the reason is obvious: most come from backgrounds that value a different kind of interaction in the class. The Americans can benefit also, however, because even though they have experienced this interaction, few know the

structure -- unless the interaction is really unexpected. They have been attending to the communication itself rather than to the type of discourse that occurs. Knowing how students will address them will ease some of the tension the TAs experience during the early stages of their professional development.

Function of Sequences

Sinclair and Coulthard's reference to the student-initiations as "pupil-elicit exchanges" rather than question/answer exchanges appears to be accurate. The students' initiations take a declarative structure as well as interrogative. In addition to requesting information, confirmation, or problem solutions, student interaction uses a substantial amount of assertions and phatic language. The students in this study corrected or disagreed with the TA, but also tried to maintain or change the relationship by joking, challenging, or complaining. In order to get a full description of the interaction in any given class, the balance that is achieved among the three kinds of initiations should be taken into account.

Use of Negotiation

The students negotiated both the content and meaning within the interaction sequences using a number of different forms of alignment talk. The most frequently used alignment talk was conversational repair. The students and the TAs initiated and carried out three main types of repair: to a previous utterance that had been unclear (question), to a

vague board reference (reference), and to a misunderstanding of the course content itself (content). This study supports McHoul's (1990) findings that the teacher initiates most of the repair allowing the students to carry it out. The students also carried out most of the repair they initiated.

Of the various other types of alignment talk, the most widely used was the framing device. The importance of NS use of framing devices in NS-NNS interaction is the subject of several studies (Tyler 1987, Williams 1990). There is currently no agreement regarding their value in assisting native speakers to understand NNS discourse; however, researchers agree that more framing devices appear in NS discourse. This study confirms those findings.

Disclaimers and other accounts appeared less frequently in the data. The TAs used all of them more often than did their students. The most likely purpose was to reduce the distance between the TA and the student.

Comparison of ATA and ITA Classes

Structure of Sequences

No difference was noted in the structure of the complex student-initiation sequences discussed above. Each of the components appeared in the data of each of the classes. The number of turns taken to resolve a given interaction was surprisingly similar in the two sets of classes. It did not take any longer to resolve a student's question in an ITA class than it did in an ATA class.

Function of Sequences

Of the three main functions taken by the student initiations, the overwhelming majority in both sets of classes was for request-to-do-problems. The ITA data contained more of these, however, than the American TA data (including a 35% appearance in the class of MITA 5). Since RP initiations are, in essence, topic initiations, it may be that the students accomodated to the international TAs by asking for the entire problem to be solved on the board rather than negotiate one on one with the TA. This supports the findings of Arthur et al. (1980) who found that in NS-NNS discourse the native speaker attempts to lighten the interactional burden of the non-native speaker. This may have been the case in the class of MITA 5, whose students complained of his having problems with English. His profile appears in Appendix D. In routine problem solving, less English is required and there is more non-verbal support (in the form of boardwork) for the TAs.

Similarly, the students initiated less interaction overall in the ITA classes than they did in the ATA classes, only 38 sequences appeared there to the 64 in the ATA data. In addition to the previously discussed ITA class which had 35% of the interaction being request-to-do-problems, another ITA (MITA 6) class only had five questions total over the three day period of observation. It is most likely that MITA 6 discouraged students' questions. It was his first term teaching, his English pronunciation was admittedly poor, and he had six years of teaching experience under a different

educational philosophy. He wrote long theoretical texts on the board and followed them with written explanations of problem solutions. While writing, his back was turned toward the students, with no pauses for interruptions until the writing was completed. His request for questions was not accompanied by eye contact. This style served him in two ways: it compensated for his English, and it was possibly closer to the style of teaching to which he was accustomed. The students responded by taking copious notes and asking few questions. Either the compensations strategies worked and there were no questions, or the students felt ill at ease with the interaction.

In the ATA data, the students used more assertions, while the students in the ITA classes made more requests and used more phatic language. The main distinction may between the use of assertions and phatic language. The students corrected and disagreed with the American TAs more, but they challenged the international TAs more. This might be an indication of the students' attitude toward the TA or their impatience with the interaction in the class.

The function of the students' requests (for confirmation and information) was based on the kind of answer the students wanted, hence the question "Can you <u>just</u> give the answer to number 4?" Based on this distinction, no really meaningful differences emerged from these data. It may be that this distinction is the wrong one. Even though the ITAs received more yes/no questions, the yes/no questions in these data were

almost exclusively procedural. It may be more appropriate to ask what topics the questions involve. If the students discuss complex issues less often with the ITAs, perhaps they indeed are attempting to lighten the interactional burden as proposed by Arthur et al. This is an area for further study.

The use of the various kinds of alignment talk was the last difference noted in the data of American and international teaching assistants. All of the TAs showed the tendencies discussed above in their initiations of repair; however, the repair that was initiated by the American TAs was more balanced among repair to question, reference, and content. Repair to content appeared 52% of the time. This was not true in the international TA data where very little repair was initiated toward the content of the course (52% was devoted to repair to question, instead). The American TAs, then, were walking the students through the problems with more frequency than the international TAs, and the main concern with the ITAs was in understanding what the students were saying. This is an expected result for the ITAs for two reasons: the ITAs report having more difficulty in understanding the students' English, and often the ITAs have been advised to use repair strategies to "buy time" in answering the students' questions.

Another contrasting feature in the ATA and ITA data was the students' initiation and completion of repair. The students in the American TA classes initiated and carried out more repair than their counterparts. This is an unexpected

finding because in interaction that is viewed as problematic the assumption is that more repair would be taking place. This apparently was not the main strategy employed by the students in the ITA classes. The repair the students did initiate and carry out was overwhelmingly to question; there was none to reference and only one to content. The students appear to have been concerned largely the receipt of the message rather than with negotiating their understanding of the content. Again, this suggests that the students limited their interaction to accomodate the ITAs.

Strategies Employed by Students

Because the numbers are small, any conclusions regarding the students' interactional strategies must be drawn cautiously. In mathematics classes in general, students use a variety of strategies including several functions of initiations and repair.

In the ITA classes, the students' strategies may include limiting the interaction. This may be true particularly in the ITA classes in which the communication patterns diverged most from the American or expected patterns, such as those of MITA 5 and MITA 6.

In both of these classes, the attendance numbers were lower. The largest class size for MITA 5 was only 9, and the largest for MITA 6 was 18, the lowest number among the American TA classes. Bailey (1984) also draws a connection between attendance and classroom interaction. The "mechanical problem solver" in her typology had lower attendance numbers.

In classes such as these where attendance is not required, students manipulate their schedules according to what they perceive will benefit them the most. Attendance varies according to the importance the planned activities hold for the students. None of the TAs that were observed had full attendance during any class period. If the interaction is too difficult, then, for the students, the probability is that some of the students will choose to get the information other places.

The number of student initiations was lower in both of those classes. Students asked for problem solutions 35% of the time in the class of MITA 5 and only asked 5 questions total in the class of MITA 6.

Within the interaction sequences, students in the ITA classes appeared more concerned with just understanding the message than arguing content. They corrected and disagreed less with the ITAs, they made more repair to question, and used fewer accounts to justify, excuse, or disclaim their procedures.

Because the study was conducted late in the semester, it is possible that limiting the interaction was not the students' initial strategy. It may be that previous attempts at verbal accomodation did not work and so they opted out of the communication process. It is also possible, at least in the case of MITA 6, that the attending students were responded to what they perceived to be the preferred interaction in the class. The teacher generally sets the tone of the

communication for the course, so that if he discourages interaction, for whatever reason, the students may respond accordingly.

It is clear that the patterns of negotiation in mathematics recitation classes differed depending on whether the TA was American or international. Less negotiation took place in the classes taught by international teaching assistants: attendance was lower, there were more request-to-do-problem sequences, students made fewer assertions to correct or disagree with the ITAs, they asked more yes-no questions, both the ITAs and students initiated less alignment talk.

Chapter 6: Conclusion

The national debate over the use of international graduate students to teach American undergraduate students continues, as first time international teachers with limited preparation clash with first time college students who have limited experience with diverse populations. Students complain that they have trouble understanding the explanations given by ITAs, or that the explanations are inadequate and the students' questions go unanswered. Students maintain that it is more difficult to learn the material in class and that their grades suffer as a result.

This study is an attempt to shed more light on the differences in the students' participation patterns in ITA and American classes. From the nature of the students' complaints, it would be expected that the pattern of their interaction in mathematics classes taught by ITAs should contain more negotiation of both meaning and content as both sides struggle to succeed in this communication process. Indeed there is more negotiation of meaning in ITA classes, even after the ITAs receive training and orientation, but less negotiation of content. There still may be discrepancies between the students' expectations in these classes and the actual interaction taking place.

As speech events, mathematics recitation classes function in much the same way as non-educational discourse. As with conversations, classroom interaction entails shared intentionality and expectations on the parts of the participants as well as negotiation. When entering into a conversation, the participants share a sense of purpose for that conversation. They expect, for example, that the other person will listen and participate, and respond to questions and statements appropriately, that is, according to the social roles they assume. By the same token, teachers and students should share a purpose for that interaction. They have expectations of each other: they expect each other to listen and participate; they expect each other to be clear in their questions and statements; they expect the language usage to reflect the social roles assumed.

Negotiation in a conversation takes place on two levels, meaning and content. In mathematics recitation classes, as in non-educational discourse, the students and teacher negotiate both the meaning and the content of the interaction. The examination of the number and types of questions, attendance patterns, and use of alignment talk in the classroom offers a preliminary account of the type of strategies that students use to facilitate communication when their expectations are not met.

Ramifications for ITA Training

As new teachers from different educational philosophies, the ITAs need to be informed of the complex nature of the

interaction that will take place in their classes. Special attention should be paid to the identification of the functions of students' questions as well as to the identification of the presequence in the students' discourse. This will help reduce some of the anxiety the ITAs feel over not knowing exactly what the student is asking.

The apparent importance of negotiation patterns in classroom interaction suggests that ITA trainers may want to include more practice in negotiation language in their training programs. International teaching assistants should be given practice explaining real mathematics problems to real students, preferably one on one. The general practice has been to emphasize microteaching at the class level, which entails explaining a problem and asking for questions. Less importance has been placed on fielding those questions due to the difficulty in modelling real student negotiation discourse.

The relatively high occurrence of repair to students' questions indicates that ITAs need more practice processing students' questions quickly and analyzing them for indications of misunderstanding. Currently, ITA trainers propose the use of utterance or reference repair as an interactional strategy designed to give the ITA more time to formulate an answer in English. Trainers may wish to provide other "buying time" strategies for the international TAs such as the use of formulations to check for understanding or the use of higher order questions to address to students who need help

determining for themselves where their misunderstanding occurs. Encouraging the ITA to state to the students that he or she needs a moment to process an answer is preferrable to suggesting the current strategy that leads the students to believe that language is more of a problem than it is. Again, more one on one interaction with students is needed to give the ITAs the appropriate practice.

Areas for further study

This study proposes a complex structure for student-TA sequences in college mathematics classes that diverges from previous analyses. Each of the proposed components of this structure is in need of further study. In particular, study of the form and function of the presequence would help new teachers in their attempt to understand their students' questions.

Additionally, this report suggests that both students and teachers initiate and complete repair to question, reference, and content. The next logical step in this area of study is the determination of the source of trouble that motivates the repair as well as the structure of the repair sequence itself.

The corpus of data for this study comes from a very small population, making it difficult to generalize these results to include all international teaching assistants. What can be concluded from these results is that in the classes taught by these three international TAs the interaction varies dramatically from that in the American TA classes, each class in a somewhat different way. Given that these TAs are all

assigned to two recitation sections, this affects 180 American students who may consider themselves to have had an unexpected experience with an ITA. That alone is significant, but in order to gain a more complete description of the variations within the ITA classes, larger ITA populations need to be studied.

Second, the data arising from the American TA classes were considered the standard from which to set parameters for normal student/TA interaction. This is not meant to imply that the American TAs are better teachers. They are also first year, inexperienced TAs. This study raises questions regarding what is considered good teaching in the university level recitation class. More background research should be conducted in successful American classes in order to form a clearer basis upon which to compare the interaction taking place in ITA classrooms. After this background information has been collected, then work with larger and more diverse populations of students and international teaching assistants will yield a more generalizable account of classroom interaction patterns and the factors that contribute to them.

NOTES ON CHAPTERS

1. Circumstances have changed in the Department of Mathematics since the data for this study were collected. For the academic year 1993-1994, only nine international teaching assistants were hired by the department. For the academic year 1994-1995, only one new international student has been offered an assistantship. As a result of the current economic climate which is making it difficult for the students to find employment, fewer students are leaving the department, so fewer are being hired.

2. This information has also changed since this study was initiated. This year, of the nine international teaching assistants hired by the Department of Mathematics, seven have teaching experience. The qualifications of the ITAs have improved.

3. There is little real information substantiating this impressionistic statement. In a preliminary survey conducted in conjunction with this study, only three out of seventy-nine students claimed to have had no experience with people from other backgrounds. Students cited exchange students at school and in their homes, as well as people in their neighborhood. The students, then, may disagree with the assumption that they do not know much about international people.

4. According to Monoson and Thomas (1993) seventeen states currently have legal requirements for ITA language training. From their survey of two hundred forty institutions, it was clear that in the absence of a legislated mandate few institutions initiated ITA training.

APPENDICES

APPENDIX A

SAMPLE DOCUMENTS FROM FRESHMAN MATH

COURSE OUTLINE

Sections 5-12

TEXT. Hestenes & Hill, *Algebra and Trigonometry,* 2nd Ed.
LECTURER.
LECTURES.
OFFICE HOURS. Mo., We., Fr. 9:00-10:00 a.m.
RECITATIONS. Tu. and Th., according to the Schedule of Classes.
HELP. Help Room for located in C-108, , will start functioning on Tuesday, April 4; it will be open from 10:10 a.m. to 2:50 p.m., Monday through Thursday and from 10:10 a.m. to 12:30 p.m. on Friday. When seeing your instructor or Help Room staff, you are expected to have specific questions (and not to ask for an entire lecture or part of one to be repeated to you). If your question concerns a specific exercise, be sure to bring your attempts to solve it. As immediately before an exam the number of students seeking help is much higher than at other times, you should try to ask for help as soon as you need it. If you wish to become acquainted with more problems, you might try to view tapes (with solved problems) that can be obtained in both the main and math library (ask for tapes for MATH , then select the one with the section desired; note that not all sections are available).
CALCULATOR. You need a "scientific calculator" that has keys for *log, ln* and *exp* functions (*trig* functions as well if you plan to take). It will be to your advantage if your calculator also has an e^x key instead of an INV key). YOU ARE FULLY RESPONSIBLE FOR HAVING A SCIENTIFIC CALCULATOR FOR ALL EXAMS AND FOR KNOWING HOW TO USE IT. If you forget to bring your calculator to an exam, you will have to work without it.
HOMEWORK. On the sheet attached, you will find a day-by-day schedule of the course as well as a list of problems from the text that you are expected to solve on your own (solutions are at the end of the text). Solutions of those problems are not expected to be turned in.
TESTS. You will have four one-hour tests and the final exam. Three of the one-hour tests will be held during the recitation periods (see the day-by-day schedule). The midterm one-hour test will be held on Thursday, April 27, from 5:20 to 6:10 p.m. (locations will be announced). The final exam will be held on Monday, June 5, from 10 a.m. to 12 noon. There will be no make-ups for one-hour tests. A justifiable conflict with the time of the final exam will excuse you from that exam; if such is the case, arrangements for the (common) make-up final exam have to be made through the Mathematics Department office located in A-212
GRADING. Every one-hour test counts 100 points and the final exam counts 200 points. You can determine your grade for any one-hour test by using the following scale:

90 to 100 - 4.0	73 to 78 - 2.5	55 to 59 - 1.0
85 to 89 - 3.5	65 to 72 - 2.0	0 to 54 - 0.0
79 to 84 - 3.0	60 to 64 - 1.5	

SYLLABUS

Thursday, 1/5	6.7	Monday, 2/13	9.6
Friday, 1/6	6.8	Tuesday, 2/14	9.6
Monday, 1/9	6.8	Wednesday, 2/15	9.7
Tuesday, 1/10	7.1	Thursday, 2/16	9.8
Wednesday, 1/11	7.2	Friday, 2/17	9.8
Thursday, 1/12	7.3	Monday, 2/20	Review
Friday, 1/13	7.4	Tuesday, 2/21	Test 3
Monday, 1/16	7.5		9.1 - 9.8
Tuesday, 1/17	8.1	Wednesday, 2/22	10.1
Wednesday, 1/18	Review	Thursday, 2/23	10.2
Thursday, 1/19	Test 1	Friday, 2/24	11.1
	6.7, 6.8, 7.1 - 7.5	Monday, 2/27	11.2
Friday, 1/20	8.2	Tuesday, 2/28	12.1
Monday, 1/23	8.3	Wednesday, 3/1	12.2
Tuesday, 1/24	8.5	Thursday, 3/2	12.3
Wednesday, 1/25	8.6	Friday, 3/3	12.3
Thursday, 1/26	8.6	Monday, 3/6	Review
Friday, 1/27	8.7	Tuesday, 3/7	Test 4
Monday, 1/30	8.8		10.1, 10.2, 11.1,
Tuesday, 1/31	8.8		11.2, 12.1 - 12.3
Wednesday, 2/1	Review	Wednesday, 3/8	12.4
Thursday, 2/2	Review	Thursday, 3/9	Review
UNIFORM MIDTERM	7:00 - 8:30 p.m.	Friday, 3/10	Review
Rooms will be announced.			
Friday, 2/3	9.1		
Monday, 2/6	9.2		
Last day to drop the course with no grade			
Tuesday, 2/7	9.3		
Wednesday, 2/8	9.4		
Thursday, 2/9	9.4		
Friday, 2/10	9.5		

UNIFORM FINAL EXAM THURSDAY, MARCH 16 10:00 - 12:00 noon

Rooms will be announced later in the term.

MATH DAY-BY-DAY SCHEDULE

The following is the projected day-by-day schedule of the course, with the exercises that you are expected to solve on your own (imediately after the corresponding lecture):

We., March 29:	2.1	p. 52	7,9,11,19,21,23,27,33,39,48,52,55.
Fr., March 31:	2.2	p. 60	7,9,15,17,19,23,29,31,33,35,37,39.
Mo., April 3:	2.3	p. 69	1,5,7,9,15,19,23,27,33,37,39,41,45,49,51, 55, 59.
We., April 5:	2.4	p. 76	1,9,13,15,17,19,29,31,33,35,37,43,47,53, 67.
Fr., April 7:	2.5	p. 84	1,5,13,17,23,25,29,31,35,39,41,47,53,55, 57.
Mo., April 10:	Review		
We., April 12:	2.6	p. 90	3,9,19,21,25,29,31,35,37,41.
Th., April 13:	**TEST 1**		**(will cover sections 2.1 through 2.5; knowledge of Chapter 1 is understood)**
Fr., April 14:	2.7	p. 96	1 - 35 odd, 39.
Mo., April 17:	3.1	p. 106	1,5,9,13,17,19,21,22,23,25,27,29,31.
	3.2	p. 116	3,9,11,13,19 - 29 odd, 35 - 45 odd, 51,59, 61,63,65,71,72,73.
Tu., April 18:	**LAST DAY TO DROP BACK TO**		
We., April 19:	3.2	CONTINUED	
Fr., April 21:	3.3	p. 124	1,5,7,9,13,21 - 29 odd, 33,37,39,41,43.
Mo., April 24:	Review		
We., April 26:	3.4	p. 140	3, 7 - 15 odd, 21,27,31,33.
Th., April 27:	**5:20-6:10 p.m.: UNIFORM MIDTERM TEST (will concentrate on sections 2.6-2.7 and 3.1-3.3, but will have one or two problems from the old material) (Locations will be announced)**		
Fr., April 28:	3.5	p. 148	3,7,15,19 - 31 odd, 35,41 - 51 odd, 55.
Mo., May 1:	3.6	p. 154	1,3,7,15,17,21,25,27,29.
	LAST DAY TO DROP THE COURSE WITH NO GRADE.		

H O M E W O R K

SECTION	PAGE	HOMEWORK
Review	44	7,15,19,21,23,25,35,39,41,45,47,49,51,55,56.
2.1	52	7,9,11,19,21,23,27,33,39,48,52,55.
2.2	60	7,9,15,17,19,23,29,31,33,35,37,39.
2.3	69	1,5,7,9,15,19,23,27,33,37,39,41,45,49,51,55,59.
2.4	76	1,9,13,15,17,19,29,31,33,35,37,43,47,53,67.
2.5	84	1,5,13,17,23,25,29,31,35,39,41,47,53,55,57.
2.6	90	3,9,19,21,25,29,31,35,37,41.
2.7	96	1 - 35 odd, 39.
3.1	106	1,5,9,13,17,19,21,22,23,25,27,29,31.
3.2	116	3,9,11,13,19 - 29 odd, 35 - 45 odd,51,59,61,63,65, 71,72,73.
3.3	124	1,5,7,9,13,21 - 29 odd, 33,37,39,41,43.
3.4	140	3, 7 - 15 odd, 21,27,31,33.
3.5	148	3,7,15, 19 - 31 odd, 35, 41 - 51 odd, 55.
3.6	154	1,3,7,15,17,21,25,27,29.
3.7	165	1,3,5 13 - 51 odd, 57 - 65 odd.
4.1	177	1 - 43 odd.
4.4	198	1 - 29 odd; also equations of asymptotes of a hyperbola.
5.1	218	1,3,5,9,13,25,27,29,35,37,41.
5.2	222	1 - 19 odd, 25,31,33,37.
5.4	233	1 - 55 odd.
5.5	239	3,5,7,11,15,17,19.
5.7	248	1 - 37 odd.
6.1	256	1,15,19,21,23,29.
6.2	263	5,7,9,11,21,25, 33 - 41 odd.
6.3, 6.4	269	Solve problems 1-15 odd,19,25,31-41 odd from 6.3 by using the method from 6.4.

APPENDIX B

ANNOTATED INTERNATIONAL TA BIBLIOGRAPHY

APPENDIX B

ANNOTATED INTERNATIONAL TA BIBLIOGRAPHY

Complete Volumes

TESOL Newsletter 20, 1986
English for Specific Purposes 8(2), 1989
Innovative Higher Education 17(3), Spr 1993

Literature Reviews

Briggs, S., Hyon, S., Aldridge, P., & Swales, J. (1990). The ITA: An annotated critical bibliography. Ann Arbor: English Language Institute Publications. 323852.

Contains a critical annotation of 137 items in three sections: 1) papers, presentations and reports, 2) dissertations, 3) manuals, textbooks and videos.

Nelson, G. (1990, March). International teaching assistants: A review of research. Paper presented at 24th Annual TESOL Convention, San Francisco. ED321535

Reviews current state of research in ITA pronunciation, effective ITA teaching behavior, and intercultural communication.

Articles/Papers

Anderson-Hsieh, J. (1990). Teaching suprasegmentals to international teaching assistants using field-specific methods. English for Specific Purposes 9(3), 195-214.

Provides a rationale for teaching pronunciation using cognitive-based field specific methods. Gives the results of using such a method with Chinese and Korean Chemistry teaching assistants.

Axelson, E., & Madden, C. (1990). Video-based materials for communicative ITA training. IDEAL, 5, 1-11. EJ465580.

Discusses the use of video-based materials to help ITAs improve their use of certain classroom discourse features.

Barnes, G. (1990, March). A bill of rights for international teaching assistants. Paper presented at the 24th Annual TESOL Convention, San Francisco. ED323792.

Lists 10 basic ITA rights and discusses how these rights protect the ITA population. Included in the list: the right to practice their own culture and teaching styles; the right to a safe wrok environment; the right to be recognized as an employee.

Boyd, F. (1989). Developing presentation skills: A perspective derived from professional education. English for Specific Purposes, 8(2), 195-203. EJ392302.

Offers course materials and description of course design of training program at Columbia University.

Byrd, P. (1991 December). Funding to attend graduate school in the United States: An update. Paper presented at the OSEAS European Conference, La Grande Motte, France. ED350890.

Report discusses the types of assistantships available, the funding in the form of tuition waiver or reduction, and the requirements for English-proficiency testing.

Byrd, P. & Constantinides, J. (1992). The language of teaching mathematics: Implications for training ITAs. TESOL Quarterly 26(1), 163-167. EJ443057.

Reports on the language used by regular faculty in mathematics.

Constantinides, J. (1989). ITA training programs. New Directions for Teaching and Learning, 39, 71-77.

Review of existing ITA programs suggests that the key to program success is the staff members who conduct the program.

Council of Graduate Students in the United States, Washington, DC. International graduate students: A guide for graduate deans, faculty and administrators. ED331418

Discusses academic, administrative, and social issues in working with ITAs including standardized testing, immigration and sponsorship.

Davies, C. (1989). Face-to-face with English speakers: An advanced training class for international teaching assistants. English for Specific Purposes, 8(2), 139-153. EJ392298.

Describes the use of one-on-one and small group interaction in the ITA program at University of Florida. Also discusses the use of videotape analysis.

Dick, R. & Robinson, B. (1993, July). Oral English proficiency requirements for ITAs in U.S. colleges and universities: An issue in speech communication. Paper presented at the Biennial Convention of the World Communication Association. ED360653.

Suggests that more work should be done to improve ITAs pedagogical skills and cultural knowledge in addition to improving speaking skills.

Douglas, D. & Myers, C. (1989). TAs on TV: Demonstrating communication strategies for international teaching assistants. English for Specific Purposes 8(2), 169-179. EJ392300.

Describes a technique for videotaping native and international TAs to teach TAs about specific, definable language skills.

Douglas, D. (Ed.). (1990). English language testing in U.S. colleges and universities. Washington, D.C.: NAFSA.

Collection of essays and research reports on the testing of ESL among foreign students in U.S. universities. Includes addresses for use in obtaining information about English language testing.

Gokcora, D. (1989 November). A descriptive study of communication and teaching strategies used by two types of international teaching assistants at the University of Minnesota and their cultural perceptions of teaching and teachers. Paper presented at the National Conference on the Training and Employment of Teaching Assistants, Seattle. ED351730.

The results of a two part study at the University of Minnesota examining the use of communication strategies of ITAs and the cultural perceptions of teaching and students. Results showed that TAs who encouraged students to ask questions in class and stimulated students to talk also asked more comprehension questions. They also showed that students and ITAs both considered reliability and encouragement to be the most important concepts in defining a good teacher.

Gokcora, D. (1992 March). The SPEAK test: International teaching assistants' and instructors' affective reactions. Paper presented at the Annual Meeting of the American Association for Applied Linguistics, Seattle. ED351731.

Results of a study conducted to determine the perceptions of ITAs and instructors toward the SPEAK Test. Some instructors voiced concern over lack of face validity and the difficulty of judging the ITAs' overall comprehensibility. There was no difference in the reactions of the ITAs.

Hill, L. (1992, October). Preparing international teaching assistants: Intercultural training from a genetics perspective. Paper presented at the Annual Meeting of the Speech Communication Association, Chicago. ED354557.

Describes an intercultural training program for ITAs at the University of Oklahoma that is designed to accomodate the diversity of the students. The framework for this program is based on an analogy of the genetic process in the combination of chromosomes.

Hoekje, B. & Williams, J. (1992). Communicative competence and the dilemma of international teaching assistant education. TESOL Quarterly. 26(2), 243-69. EJ448698.

Suggests that ITAs would be better prepared for teaching is communicative competence were stressed in ITA training programs.

Hoekje, B. (1994). Authenticity in language testing: evaluating spoken language tests for international teaching assistants. TESOL Quarterly, 28(1), 103-126.

Jain, N. (1988, February). International teaching assistant training seminar at Arizona State University. Paper presented at Annual Meeting of the Western Speech Communication Association, San Diego. ED297605.

Description of ASU's ITA training program. Class meets 3 hours once a week and focuses on language improvement, cultural issues and teaching strategies.

Johncock, P. (1991). International teaching assistants tests and testing policies at U.S. Universities. College and University, 66(3), 129-137. EJ27341.

Gives the result of a survey of 100 universities regarding test types, cut-off scores, processes for testing language proficiency and performance of international teaching assistants.

Kaplan, R. (1989). The life and times of ITA programs. English for Specific Purposes, 8(2), 109-124. EJ392296.

Discusses the basis of complaints against ITAs and describes the ITA program at the University of Southern California.

Monoson, P., & Thomas, C. (1993). Oral English proficiency policies for faculty in U.S. higher education. Review of Higher Education, 16(2), 127-140. EJ457693.

A survey of 240 institutions indicated that without a state mandate, institutions typically did not develop policies to certify the language proficiency of faculty. Seventeen states have such mandates.

Nyquist, J. (Ed.). (1991). Preparing the professoriate to teach. Selected readings in TA training. Dubuque, IA: Kendall/Hunt Publishing Co. ED332635.

Collection of 56 papers devoted to the training of teaching assistants. One section devoted to ITA training.

Rice, D. (1979). A description of a model program for orienting the new foreign teaching assistant. Washington, DC: TESOL.

Describes a model orientation program with three components: 1) oral/aural - to help develop communication skills, 2) techniques for increasing reading comprehension, and 3) a cross-cultural orientation to the US university system. Includes a sample course outline.

Rubin, D. (1993). The other half of international teaching assistant training: Classroom communication workshops for international students. Innovative Higher Education, 17(3), 183-193. EJ462784.

Designed to help the ITAs balance their roles as TA and student. Focuses on communication for participative learning and dealing with academic advisors.

Sardokie-Mensah, K. (1991). The international student as TA: A beat from a foreign drummer. College Teaching, 39(3), 115-116. EJ431474.

Domestic and foreign students should interact more to develop a reciprocal understanding of behaviors and expectations.

Sequeiro, D. & Costantino, M. (1989). Issues in ITA training programs. New Directions for Teaching and Learning, 39, 79-86. EJ396824.

All aspects of ITA training are discussed, including course versus ongoing training programs, the ITA as employee or visiting scholar, and the ITA as a teacher of minority students.

Smith, J. (1989). Topic and variation in ITA oral proficiency: SPEAK and field-specific oral tests. English for Specific Purposes, 8(2), 155-167. EJ392299.

An analysis of the performance of 38 ITAs on field specific and general topic SPEAK tests. The pass or fail recommendations for 8 of the TAs depended on which test was used.

Smith, K. (1993). A case study on the successful development of an international teaching assistant. Innovative Higher Education, 17(3), 149-163. EJ462782.

Case study of one successful ITA, focuses on the process of becoming an effective instructor in an undergraduate classroom. Emphasizes the need to clarify the student's individual linguistic, cultural, social and professional goals.

Smith, K. & Simpson, R. (1993). Becoming successful as an international teaching assistant. Review of Higher Education, 16(6), 483-497. EJ469058.

This is a multicase study that suggests that the ability to redefine personal goals to become more compatible with department imposed conditions is a factor in having a successful experience as a teaching assistant.

Smith, R. (1992). Crossing pedagogical oceans: International teaching assistants in U.S. undergraduate education. ED358810.

Discusses the problem of using, training and assessing the English of international TAs. Suggests areas for more communication research. 141 pages.

Stenson, N. (1992). The effectiveness of computer-assisted pronunication training. CALICO Journal, 9(4), 5-19. EJ464135.

Examination of the effectiveness of the IBM SpeechViewer indicated that while the students and instructors had enthusiasm for it as an instructional tool, the pronunciation of ITAs did not significantly improve with its use.

Stevens, S. (1989). A dramatic approach to improving the intelligibiligy of ITAs. English for Specific Purposes 8(2), 181-194. EJ392301.

Describes the drama based approach to communicative competence at the University of Delaware.

Thomas, C. (1993). Oral English language proficiency of ITAs: Policy, implementation and contributing factors. Innovative Higher Education, 17(3), 195-209. EJ462785.

Discusses the reponse of institutions to state mandates for oral language proficiency testing.

Torkelson, K. (1992 March). Using imagination to encourage ITAs to take risks. Paper presented at the 26th Annual TESOL Convention, Vancouver, Canada. ED349898.

Results of two personality tests administered to 35 Asian TAs: over 65% appeared introverted and over 90% preferred to work with concepts than with people. Gives ramifications for ITA training programs

von Saal, D. (1988). A University-wide assessment and training program for international teaching assistants. Journal of Agronomic Education, 17(2), 68-72. EJ382851.

Description of TA training program and the followup program from the director's and instructor's perspectives.

Williams, J. (1990 March). Evaluating ITA preparation programs: intensive versus concurrent. Paper presented at the 24th Annual TESOL Convention, San Francisco. ED332502.

Evaluation of the relative pedagogical and cost effectiveness of ITA training programs conducted before and within the academic year. Concluded that given limited resources, a concurrent program is preferrable with a possible addition of a limited summer course geared toward social and cultural orientation.

Young, Richard. (1990). Curriculum renewal in training programs for international teaching assistants. ED317067.

Reviews the history of ITA program design since the 1970s for changes in the system as a whole, in program purpose and mission, in measures of the system's performance, in resource allocation, and in system boundaries.

Yule, G. & Hoffman, P. (1990). Predicting success for international teaching assistants in U.S. universities. TESOL Quarterly, 24(2), 227-243. EJ416671.

Report of a study correlating TOEFL verbal scores of 233 ITAs with their performance reports. Those with negative reports had lower TOEFL verbal scores.

Yule, G. and Hoffman, P. (1993). Enlisting the help of U.S. undergraduates in evaluating international teaching assistants. TESOL Quarterly, 27(2), 323-327. EJ468896.

Discusses the value of using groups of undergraduate students to vote on the readiness of an ITA to assume instructional duties. Includes an example of a formal evaluation sheet.

APPENDIX C

TA AND STUDENT CONSENT FORMS

APPENDIX C

TA AND STUDENT CONSENT FORMS

TA Consent for Classroom Visitation

The goals and procedures of my participation in the project on classroom discourse have been fully explained to me.

I understand that:

The researcher will visit my class three times during the quarter and audiotape the interaction.

All data collected will be kept strictly confidential. The results of the study will not be released to any faculty member in my academic or employing department. My identity will be known only to the researcher; any identifying information will be disguised in the final report.

The data collected will be used for Ms. Wieferich's dissertation and may be used in articles, presentations and instruction along with other data collected on classroom discourse.

I am under no obligation to participate in this study. I have the right to stop participation in the study at any time and/or have any part of the research data deleted without penalty.

PLEASE SIGN BELOW

I agree to participate in the study on classroom discourse.

NAME_____ DATE _____

ADDRESS _____ PHONE _____

STUDENT CONSENT FORM

The goals and procedures of the classroom discourse project have been fully explained to me.

I understand that

I do not have to participate in this study.

The class will be visited and audiotaped three times. The focus of the study will be on the patterns of communication, not on any individual student. My identity will be completely protected in the final report. Any identifying information will be disguised.
All research data will be kept strictly confidential and will not be used by my department or others to evaluate me as a student.

I have the right to stop participating in the study at any time and/or request that any part of the research data be deleted from the study without penalty.

PLEASE SIGN BELOW

I agree to participate in the project on classroom discourse.

NAME _____ DATE _____

ADDRESS _____ PHONE _____

APPENDIX D

PROFILES OF PARTICIPATING TEACHING ASSISTANTS

APPENDIX D

PROFILES OF PARTICIPATING TEACHING ASSISTANTS

Bailey (1984) proposed a typology of teaching assistants based on her observations of chemistry and physics TAs. She arrived at five types: active unintelligible, mechanical problem solver, knowledgeable helper, entertaining allies, and inspiring cheerleaders. While she cautions that not all TAs fit into these categories, it is useful to use these as a departure point from which to profile the TAs participating in this study.

FATA 1

FATA 1 was an enthusiastic American woman who made it a point to know each of the students by name, and frequently used their names during her explanations. She walked the class through the problems, asking questions at each step of the solution process. She knew which individuals performed well on particular quiz items and asked them to help with the explanations. She corresponds to the knowledgeable helper/casual friend type of TA.

This TA was popular with her students. Her attendance rate was consistently high. There was no evidence of discomfort or frustration among the students, although she had difficulty explaining theory to the students. During the observation period she had to abandon explanations several times and let the students know that she found it difficult to discuss the reasons behind certain procedures.

FATA 1 cited difficulty in explaining theoretical applications as her main weakness; her strength was that she came from a teaching background. She agreed to submit class evaluations to me and to the department, but failed to do so.

MATA 2

MATA 2 was a male, American TA who joked frequently with the class. He walked students through explanations, asking questions at each step of the solution process. He did extra work with the students, giving review sheets for tests and conducting review sessions during the evening before the test. He corresponds to the inspiring cheerleader type of TA.

This TA was very popular with the students. He received the highest TA evaluations of the six TAs. Twenty-three out of twenty-five students rated him excellent or above average. They stated he was well prepared, helpful, enthusiastic, and a great teacher. He cited as his strength his willingness to do extra for the students; his weakness was his dwindling strength -- he had taken on too much work.

MATA 3

MATA 3 was a male, American TA who also joked with the students in class. His teaching style was interactive, involving the students as often as possible. He also provided some extra help for the students outside of class. His goal was to be an inspiring cheerleader for the class.

This TA was very shy. During his first term teaching, he spoke mostly to the board. Even during the term of this study he was nervous and his students mentioned this on the evaluations.

He received good evaluations from his class. Fifteen out of 19 evaluations rated him as above average or excellent. Students cited helpfulness and preparedness as what they appreciated the most.

FITA 4

FITA 4 was a native of China. Her teaching style was interactive. She encouraged questions and had no difficulty with explanations. She was friendly in class, but always maintained authority. She did not do any work with them outside of class at all. She joked only once during the observation period. This TA does not correspond exactly with any of the TAs proposed by Bailey. She was active, but spoke at an intelligible speed so that communication was not hindered. She had good compensation strategies, such as clear board work.

FITA 4 often made use of repair strategies when answering students' questions. A number of q/a sequences lasted more turns because she was clarifying the students' utterances. It appeared that these clarifications were strategies she used to either buy time to process an answer or to be sure of what the student was asking.

Thirteen out of 25 students rated FITA 4 as above average or excellent. They mentioned that she was difficult to understand, but that she was knowledgeable and helpful.

MITA 5

This TA was a native of China. His style approaches Bailey's mechanical problem solver, although he attempted to become more interactive. His chief behavior was solving problems on the board. His board work was clear and easy to follow. His English was very accented and the syntax was sometimes difficult to follow.

He had the lowest attendance of all the TAs. The class began with as few as two students and the rest would come in throughout the class period. It is likely that the attendance is linked to his teaching style. The attending students were angry on the first day of the observation and indicated that they felt he was poor in English and unprepared in class.

No one rated this TA as above average. Out of the 13 evaluations completed, 8 rated him as average.

MITA 6

This TA was a native of Taiwan, and was the only TA with teaching experience in his home country. He taught the recitation by writing down long theoretical explanations on the board and then reading and explaining them. He followed this by the customary problem solving activities. He was very well prepared.

MITA 6 spoke very quietly and was very accented. He had noticeable pronunication difficulties with technical terms and numbers. He received the fewest number of questions of the six, although the students indicated that they felt free to ask them. His teaching style was most likely a combination of insecurity over his speaking ability and cultural expectations.

Out of 11 evaluations he received at the end of the term, 3 rated him as above average, 7 as average. The students liked the level of detail the TA had in his explanations and his helpfulness, but indicated that he did not understand their questions.

APPENDIX E

SAMPLE PAGE OF NOTES

Students enter + write problem #5 on board

desks lined to floor as to teachers desk
one row left window - 5 per standing
desks

TP 2.58

return answer sheets ~~tests~~ taken Thursday 3:05
She knows their names

20 people 7 female no minorities

M Chatin we sposed to put down for #6

did you put down 2?

No I didn't

OK

If there are ? on grading

APPENDIX F

LIST OF REPAIR SEQUENCES

APPENDIX F

List of Repair Sequences

TA Initiated	1.3	Student Initiated	1.2
TA Repaired	3.17	Student Repaired	1.11
	4.1		1.15
	4.3		1.18
	4.8		2.8
			2.10
			2.13
			2.16
			2.18
			2.19
			2.22
TA Initiated	1.1		3.20
Student Repaired	1.2		3.22
	1.15		3.23
	1.16		3.26
	1.20		4.5
	2.4		5.23
	2.8		6.4
	2.10		
	2.17		
	3.11		
	3.17		
	3.19		
	3.20		
	3.21	Student Initiated	1.2
	3.27	TA Repair	1.7
	4.2		1.11
	4.3		1.23
	4.5		2.12
	4.6		4.8
	4.9		4.9
	4.11		4.18
	4.12		5.7
	4.13		6.5

TRANSCRIPT

INTERACTION SEQUENCES PER TA

FATA 1

1.1

St: What're we supposed to put down for six?

TA: On six? It was pi over three plus k pi. Cuz if the...the tangent has a period of uh pi. You put down two pi?

St: No, I didn't.

TA: Yea, cuz I...You got credit for putting down the right answer and then there was four points. The half of it was for getting the right period of pi of tangent so...If there are questions on the [ ]

1.2

St: I just wanted to say that uh he's going kinda quick through this stuff in lecture you know and we're trying to keep up [writing it down] and not catching a lot of this stuff so I hope I learn a lot in here. (laugh) SERIOUSLY!

TA: I hear everything in terms of sine and cosine. You see in this figure this tangent of u plus v formula? I that'll show up in

St: [So the object of a lot of this stuff

TA: [Pardon?

St: The object of a lot of this stuff is [finding the easiest thing to do?]

TA: Yea, that's all you do.

St: You pretty much have to memorize

TA: [Well, if you know like two formulas and the sine and cosine of addition ones, you're all set.

St: Really?

TA: Yea. So it should work out.

1.3

St: Is there a couple of different ways to go about doing this? Cuz I didn't do it that way.

TA: Yea. I'm I'm sure there is. What did you do? Convert this in terms of tangent? One over tangent

St: [Yea, one over tangent x, then I got

TA: [Ok, hang on a second. You have one plus tan of x over one plus tan of x and ah you clear. You combined this, right?

St: Yea, I got the common denominator.

TA: One plus tan of x ah excuse me, tan x plus one over tan of x and this is my division line. Yea, it'll work the same way cuz you get one plus tan of x over one times tan of x over one plus tangent of x and they cancel.

1.4

St: Can you just give us the answer for number four?

TA: Number four. It's, uh, cotangent. So, this is number four. Let me just..The cotangent of theta plus two pi equals cotangent of theta and you can use this as...let me just set it up. This is one over tan theta plus two pi. That works out, or have cosine theta plus two pi over sine theta plus two pi. Both of those methods work out.

1.5

St: Would the hypotenuse be the square root of two?

TA: Yea. Thank you. (completes problem)

1.6

St: You don't have to take it any farther than that do you? Cuz [ ]

TA: Actually, I do. Because I have to find all answers between zero and two pi.

St: Oh, ok.

1.7

St: How do you know that? Cosine theta equals cosine two minus theta?

TA: Ok that comes from
[
St: Why?

TA: Hmmm?

St: Why'd you do that?

TA: Ok. The...I might as well do both of them. Do you do you know that sine of x equals sine of pi minus x?

St: Yes.

TA: Ok. The same the same concept holds when I'm looking at cosine. Write this a little bigger than usual.

St: Well, how come you didn't do it on number five [ ]? Know what I mean?

TA: Ok. Uhm. When when I draw my line, ok, I draw my line through to find my points. Now I if I can [find] original cosine original sine curve and I draw my line, you know it only intersects once, so this is really the same as uh one eighty minus pi over two. And I still get still ninety degrees the same way. Now in this case, uhm, this is pi, this is two pi. Now I sort of draw some lines in through here, choose some points. Now with this point and this point they're the same they're the same function. Because the distance from here to here is the same distance as from here to here. And all I do, in this case, is I'm just gonna [ ]. If that was sine half I would have I would've done it. Uh. But when...that's why I went to the original cosine curve the original sine curve. It only intersected once so I was ok. Uhm. You can give decimal representations to these. It's not really inportant, cuz you you sort of um you just add pi, so it you want to figure out you know you can add one, three point one four to get the answer but it's not it's not essential. Ok. Thirteen.

1.8

St: Explain where you get the three pi over two again? Please.

TA: Ok. Here's uhm, I want to know when it's zero. Ok. It's zero. This is ninety degrees. Ok. Cuz if there's a zero here so ninety plus two plus one eighty, cuz it's also zero down here, gives me two seventy. But that's represented as three pi over two cuz this is uh this here is pi over two. This is pi, and this angle is pi plus pi over two, so I get three pi over two. And so it's uhm, it's easy to think of these in terms of breaking this up into four parts on this graph. This middle is pi, this is pi over two this is three pi over two. Ok. That's general. Now see this I think is a much easier method of looking at it. Just breaking it up into four cuz you can get sine the same type of a thing cuz it's zero at pi, the high point is pi over two the low point is at three pi over two, and then it's at two pi so these are the two types of methods. That that will help on this. For me I can see this a lot easier using this type of a of a diagram, but it you look at the unit circle and the [ ] the same. If anything is zero and ones this is this is nice sort of. Ya gotta get used to it depending on in high school you got it one or the other ways, and I did it this way in high school. That's why I'm very familiar with this. Some people use the other one, so different methods [ ] Can I go on?

1.9

St: Where'd you get the five pi over three again?

TA: Uhm. This equals two pi minus pi over three and that's six pi over three. It's always nice to connect this in terms of three. So I have six pi over three. And it's really straightforward.

St: Oh. Ok.

1.10

St: What mode should we be in for our calculator?

TA: We're gonna be in degree mode. It's gonna be mode four.

1.11

St: Isn't that the other way around?

TA: Yea.

St: B and c?

TA: You're right. Sorry about that. See I want to put a c here. Gamma. I just get confused with gamma. I'm sorry. Uhm.

1.12

St: So you don't want an exact answer?

TA: Well, see when you trace, you're gonna you're gonna if you're close enough on tracing, because this is such a small interval, that usually you're fairly close on stuff. You could find something like one point eight six and maybe the correct answer is one point eight one you know and you're gonna run out of if you spend a lot of time on a problem like this. On the test you're going to uh you're not gonna really have time to find out precision in here and I've been fairly lenient on, I mean, if it's close, I've been giving credit because if you can get this far, you know how to do it. And the question's really do you know how to solve this problem is really what (names supervising professor) is looking for. And so with a scale like this in radiens, you should be able to come extremely close uh at just. You know if you want to find out when there is negative and when it's positive but...I think I think I'd just graph it. Because the times when you can't when you substitute. You have something equal to a number, like equal to a constant, but if you have a this equal x, I mean I know how to substitute to do stuff, I'm going to graph it. So unless it's uh like something that we know like sine of two x cosine of two x, stuff like that, uh, I'm just not going to spend the time trying to do it algebraically. Because if I have a cosine to the first, anything to the first power means I can usually get a quadratic or a cubic of that term without sines or cosines or other things around and I can't do that here. So I can't do a nice simple substitution, so I'm going to kind of quickly graph it. Try to get as close as I can.

1.13

St: You use radiens mode?

TA: Yep.

1.14

St: Why'd you choose radiens?

TA: Because this is, uh, these numbers are more accurate because they're smaller numbers, and generally the answer you want...This is going to be periodic and you're going to have...I'm not sure what the graph looks like. But if I graph these two what's going to happen is I [ ]. Out here's the first line curve, the second one, the third one. This answer this sine cosine [ ]. I'm going to have a period I'm gonna have a periodic with pi and so just radiens is a lot simpler.

1.15

St: Do you graph, um, the top equation you have or do you graph sine three x equal y?

TA: It's your choice. I mean if
[
St: Which one'd be simpler?

TA: Hmm?

St: Which one'd be more simple?

TA: This is this is going to tell you where it crosses the axis, and this is going to give you intersecting points. So this one is simpler cuz what's going to happen, uh let me call this f of x. Ok what's going to happen is that f of x at one point. I mean this is the, uh, the shift x y button...Give me y guys. Ok, None of these is going to be less than zero. The next [ ] is greater than zero and I know I can just take a number between them. So that this is easier cuz I can tell when it's zero. Ok. But if you want to find intersection points, that's ok, but you can't go wrong finding out when is it positive when it's negative and it's zero someplace in between. And so, that's that's another way. But there's anything like, I'll just write something up, three sine two x minus x squared equals zero, you have an x squared in there and you can't do anything with that just graph it. You know graph either three sine two x equals x squared, you can do that, or go with the positive negative. But, this is actually pretty [ ], so it's [ ] fairly straightforward.

1.16

St: Wait. When you graph that what'd you how'd you plug it into the calculator?

TA: You want to graph this one or this one?

St: The top one.

TA: Ok. I'm going to do y equals sine parenthesis three x close parenthesis plus cosine x, and it should work out like that. Like that. Cuz you got to put the [parenthesis around it], or you could do y equals sine three x colon y equals cosine x. Uhm. Let me make one other quick note. We've got some time. I have no clue what this one looks like. This is, uh, give an example. Sine three x sine squared of three x plus cosine x equals zero. You do the same thing. You graph it on on your calculator as y equal parenthesis sine three x, um, hit the x y button, here, ok, um, ok. If I have the square here, put parenthesis around the sine or whatever, square it, that's yea. That's how they [ ] on t h e calculator, and so that's how you treat those. So, that's the simplest way of doing it. [ ] and then everything works out. (pause) Other questions on that?

1.17

St: The ten was given?

TA: No, I just chose it. I arbitrarily chose it. I didn't I didn't know anything, so I just chose a number. Such as ten. Nice simple numbers and so when I cross multiply...(finishes problem).

1.18

St: Wouldn't the reason why eight, why it has to be less than eight is cuz if it was longer than eight and had two values it would [could] be on this side, and then if it were longer than that it would be on this side, and you can't have it?

TA: So you're [going into] the definition, whole theory behind the triangle

St: [I'm just saying, you didn't know where it came from. Isn't that why?

TA: So I have something like this

[

St: Cuz if it were longer than that one side you couldn't put in two spots. Cuz it would bring it back to the other side of that line
[

TA: Here and I can't bring it this way. Right. It has, that's right. You're swinging your lines but I'm not. I really am not sure how to explain this thoroughly. (looks at student, both nod)

1.19

St: I'm lost. What're you trying to figure out?

TA: Ok. I'm trying to find out what c is.

St: Why don't you just use law of sines to find angle a then use the law of cosines?

TA: Uhn. Yea. That would work. Very very easily. The chapter was on law of cosine, so I tried to apply everything to law of cosine first.

1.20

St: If you just used the law of sines would it be wrong?

TA: Uh. No, no. I didn't even see it like that, (person's name). Can you
[
St: Well, I just used the law of sines to find angle a.

TA: It just happens that the top just doesn't work anyway. Hang on. It just so happens that alpha equals sine negative one point three four. This can't happen. See, I never did learn this the easy way.

1.21

St: What's s?

TA: S is the, half of the perimeter. This is when you know only three sides.

St: Oh.

1.22

St: What number was that?

TA: Uhm. Eight five number nineteen. It's talking about distances east of north and west of north. There's a nice diagram of it. That's important.

1.23

St: When we [do the test] will he give us a diagram do you think?

TA: Maybe not.

St: Maybe not?

TA: Just remember that angle of declination is measured down from the horizontal and angle of inclination is measured up from the horizontal.

MATA 2

2.1

St: This is my question. So, if no one else wants to hear then. Can you just use eight then?

TA: Right.

St: Ok.

TA: Still, do it exactly. Well, first of all figure out how many feet per rotation.

2.2

St: Can we have that is writing?

TA: After the exam.

2.3

St: How about thirteen?

TA: [no answer..TA goes on to next section]

2.4

St: I just didn't know where you got it from.

TA: Where I got this thing from?

St: Yea.

TA: Pulled it out of the book. So we (writes on board) and that's what we had to come up with.

2.5

St: So on the test if we just wrote down cotangent of theta and then

TA: [If you had a satisfactory explanation, such as simply the cotangent of theta had period pi plus shifting everything horizontal to left two pi shifts everything down exactly two cycles two period and you're right back on top of where you started, something like that, yea. So we have (continues problem)

2.6

St: So when we solve these we going to use uhm equations, or you want graphics?

TA: Uhm. I'm saying, you could probably do either way. You could, I mean this is absolutely correct way to think of it. Uhm. In the book I think they're really trying to make you use the identity. Use the equations. Uhm. But this, but this graphic approach helps you think of it, helps you come up with an answer cuz in the other book, I mean of a test, it's something that might say simplify, but you don't know what you're supposed to be aiming at. Here we have an idea graphically of what we're supposed to be aiming at.

2.7

St: Can you always do that?

TA: Yep, you cross multiply.

2.8

St: Ok, the the one plus tan of x is equal to secant two over four. It doesn't apply when everything's squared cuz I

TA: [Y o u mean you want this as secant?

St: I started out that one plus tangent x and I made that secant x. You know how that's one plus tangent x squared equals secant squared x.

TA: Right.

St: I tried it like that. I don't know if that's right or not, but I still come up with tangent x.

TA: To get secant of x you kind of took the square root. It'd be it would not be one plus tangent of x.

St: What I'm saying is that I just assumed since you could do it with squared you could do it with not being squared, so I said one on plus tangent x equals secant x.

TA: Well, this is the identity that we have. That's the identity in the book, true know solved true everything. But the secant of x which would be the square root of this number, so this is not an identity. This is not true.

St: Ok.

TA: Actually, a good way to do this (completes problem).

2.9

St: Do number six?

TA: Number six? (does problem)

2.10

St: I lost you over one point sine x one plus sine x over sine x. There right there.

TA: Ok. This piece right here sine x over sine squared x. There's a sine of x in each of them. How many sine x's are in this one?

St: One.

TA: How many sine of x's are in this one?

St: How many what's?

TA: Sine x's.

St: Oh. Sine x. But how'd you
[
TA: Right.

St: But how'd you get rid of the one from the from the one before that?

TA: Cuz we have a one plus sine x and we have a one plus sine x down here. These two things are multiplied. This whole [quantity] is multiplied.

St: Up. The one above.

St_2: The one plus sine x minus. Yea that one right there.

St: How'd you get rid of the one plus sine x?

TA: Oh. I really, I really didn't get rid of this one. I combined this one and this one. One minus cosine squared.

[
St: Oh. To get the sine.
[
TA: And this one came along for the ride.

St: Oh, Ok. Now I see.

TA: All right. So I should be a little more explicit?

2.11

St: Can you do seventeen?

TA: Seventeen. Ah, we'll do fifteen, which is a fast one.

2.12

St: They wanted us to do it by graphics.

TA: Oh they did? Ok, in that case, stick it into your calculator.

St: That's all I had to do it?

TA: Yea. Graph the first one sine t minus cosine t over cosine t plus one. That's your first function colon. Graph y equals tangent of x.

St: All right.

TA: [We] did it this way.

2.13

St: You're not going to do forty three?

TA: Oh. I need to do forty three? Thank you. Oh that's a good one. Can I erase this one? Forty three. We have sine of the inverse tangent of x. So

St: [Um. Are you on eight point three?

TA: Ha. Yes I know what I'm doing . Sine squared of x minus one. So how we going to solve this?

2.14

St: They have two pi.

TA: What they have is actually equivalent to this and uh after class if anyone wants to know how they got that I'll go over it. We just have like five or so minutes before I have to give you the quiz and uh sixty two to sixty six. See how many of those we can do.

2.15

St: Is that the square root?

TA: Oh, sorry. So this equals forty five sine of theta.

2.16

St: It looks like you're adding two pi to me.

TA: I'm adding. No I'm just adding pi.

St: Ok. You started from the first point [ ] to the third point. Isn't there two pi between there?

TA: No. This, see here's the period is pi so from here from here to here is moving down one pi. And this is pi. And that's going to two pi and that's zero it's going to pi. So everything moving exactly one period. Exactly one pi.

St: I see what you're saying.

2.17

St: That's all we have to write is pi k?

TA: That's, yea. Because that's correct. You see why it's correct?

St: Cuz if we put two in for k we get two pi.

TA: We put one in for k would be this one. Zero in for k to get this one. This is just in the first. This is just on the first cycle. Already have a graph over here. Here's pi two pi zero. Keep going. Three pi, four pi, come back this way. That's where zero, cuz we're solving this thing right here. Ok.

2.18

St: How do you know that, that one angle is forty five degrees?

TA: That, that's a good question. Uhm. Just basically because we have to use a little bit of geometry of a baseball diamond that the pitching mound is is, uh, directly (draws) in line (draws) between uh

St: [second and home

TA: Yea. Second and home. Thank you. And uh we know this. See this is a square. It's given in the beginning sixty degrees sixty degrees sixty degrees sixty degrees. And so this line bisects it. So it bisects these angles. Yea. I did say that. Thank you for pointing it out.

2.19

St: Wouldn't that be a right triangle?

TA: That's the thing. We're not sure. This is a right triangle. It may just be the way I've drawn it. I mean forty feet away from home base could be like this. I mean I'm not sure that forty foot mark is dead center. I mean we have enough information using law of cosine.

2.20

St: That's not on there.

TA: Not on there? Ok.

2.21

St: You could've just took half of eighty nine degrees to get that angle.

TA: Again, I'm not sure that thing bisects it. Maybe it does. Maybe it does cut it in half. Uhm. like this one. I, uh, ok. Maybe it does but I don't remember my geometry well enough to know that this cuts it. It probably does, but we don't really need it for this problem. Does anybody know for sure does it bisect it? To satisfy our own curiosity?

St: I tried it and came up with the same answer.

TA: Ok. Let's let's do it this way. We [ ] do it your way. So for this problem again then we just use the law of...All right a and b law of cosine c squared equals eighteen squared plus twenty six cosine of one forty one. One hundred forty one degrees. And now it's just use the calculator to figure out

St: [Oh. It's wrong. I did it wrong.

TA: Oh, ok. And you get forty one point fifty six.

2.22

St: Do you think the test'll have uh proofs of uh

TA: [identities

St: Yea.

TA: Yea. That'll be like the first thing on there.

MATA 3

3.1

St: Is it curved?

TA: I don't know the answer to that question. Ah. I believe the highest grade (interrupted by 3.2).

3.2

St: What's the average?

TA: Ninety eight. I don't know if this is going to be curved any differently. I do not know that. So, ah, check the adding, ok? Check the adding. Make sure I added yp the points. Look closely at each problem. Make sure you agree with my grading. I'm not going to be too cooperative changing grades cuz I did spend a lot of time going over each problem to see if there was some semblance of understanding. Ok. I know there are certain certain things everyone had problems on.

3.3

St: Number three? Can you do that one?

TA: Sure. (Answers 3.4 first.) Any questions of that problem? A lot of people messed up on what the angle of depression was.

3.4

St: When you give partial credit is there some specific thing that you
[

TA: I'll tell you, [name], when I grade these when I grade these papers, uh yea, he gives me a piece of paper that tells me specifically what partial credit is. Now, I will usually give more partial credit and I'm being totally serious. I give more partial credit than I'm allowed to on paper. That's because I can see lot of times what you're trying to do and I know what we've covered in class. That's why you want to come to me if you disagree with the grading of a problem. You know. come to me first and I will look at it and I will show

you exactly what kind of credit I gave you. Ok. Sometimes I'll give you a couple extra points if it looks like you're doing ok. This...All right problem three.

3.5

St: Could you do number six please?

TA: Ok. The first thing I did was draw a picture. I wanted to see what the sine the sine of x looked like (completes problem). One last step. Ok. You you were asking about partial credit. This is worth something, this is worth something, and then writing down this and this is worth something, and then writing down this and two pi is worth something. This is worth something. And these two are worth something. Ok. That's how he tells me what to do. Then I look at the whole problem and say, well they know what they're doing and give them a few extra points so take some time to memorize on page five forty eight figure eight point two point four. This triangle and another triangle to memorize.

3.6

St: Yea. Do number seven please?

TA: All right. When you see the words "within point zero one accuracy" that should tell you you can use your calculator. (completes problem) That's six point two eight minus one point eight eight. So it'll come out four point four one.

3.7

St: Wait. How'd you get the five point two four?

TA: How did I get this number? Oh, ok. I'll [explain it] better. This is uh this is two pi times the number of times the radius in inches. So this is going to be sixty two inches. Ok. That's how big around it is. And then what I did was I said, I should do this.. I said, how many feet is that?

3.8

St: That's in feet?

TA: Cuz this is in feet. Yea. That's all I did. Be careful with that kind of stuff.

3.9

St: Can you do number nine?

TA: Number nine? Ok.

3.10

St: You do eight?

TA: Nine and eight? Let me make a choice between those two. For number nine, uh, the sine...Here's how you do it.

3.11

St: In the middle one, wouldn't x be squared, too, then? Because
[
TA: No. No. When I write this, actually, all I'm doing is taking...Ok, this bit of notation here means take the cosine of something and raise it to the fourth power. Ok, in other words, ok, I'm taking, all right, I'm taking the cosine of x to the fourth and I'm just rewriting it as this. Cosine t the fourth of x. Ok?
[
St: Uh, ok.

TA: I'm not touching the x's. They're [locked inside the sine and cosine] ok. Then there I just expanded it out using that first rule. Ok. Now...

3.12

St: Can you multiply one plus sine x over cosine x by [ ]? Cuz...Oh, it'll cancel out.

TA: Oh, yea. It's good that you're thinking. Uhm. I have this written in my notes. So, I will finish this way. But you're right. In fact that's what I told the afternoon class. Go home and see if you can find an easier way to do this. Nobody who did it, everybody pretty much did it this way, which surprised me cuz I thought I was
[
St: I did it a different way.

TA: Ok. Good. Wait on it. And if it works, then that's good. Ok, my next step would be.

3.13

St: Is that the answer then?

TA: Ah. I would, this looks pretty darn correct to me. (laughter) I mean the sine squared of anything plus the cosine squared of anything is equal to one. That's a verification that that identity is true. So, yea. yea that's an even better way. This is what I'm looking for, the shortest way possible. The first way is never the shortest almost. Ok. Ahm.

3.14

St: What was two?

TA: Two was the tangent of x.

3.15

St: You mean that's forty five degrees.

TA: Uh. Yea, sorry. (changes board)

3.16

St: I [ ] where you came up with sixty over four. I can understand how you go the fifteen after that. You got pi over three times one fourth.

TA: Ok. (pause) It came from here. Watch. Um. I'm just rewriting this. I didn't start with pi over three. I started with pi over twelve. And that's, uh, that's pi over three times one fourth, ok? So, pi over three is the sixty. So it's sixty over four and then that's the fifteen. And I wouldn't've, you know, even thought to use this triangles if I hadn't looked at the examples. So it's a special type problem that uh is cooked up especially for an exercise. Any other questions?

3.17

St: Would it work if yo just put the top sixty minus forty-five where could just do one half minus one over square root of two and just solve that? Instead of doing that long
[
TA: Instead of splitting it apart?

St: Yea.

TA: I'm sorry. Wait. Co...I'm sorry.

St: Well, the cosine of sixty is one half. Right?

TA: Yea.

St: The cosine of forty-five is one over square root of two. The cosine of fifteen

TA: [Are are you doing this? Are you using like a distributive property? Are you saying that this is equal to this?

St: Right.

TA: No. That's not true.

St: Why not?

TA: Because this , um, uh, no it's not even true in this special case. Basically it's just...ok, if I could use distributive then I could say cosine theta plus beta is equal to cosine theta plus cosine beta. Ok. That would also be true

St: [That's ...we have the other identities.

TA: And not I got to I can't do that. I have to memorize this long thing. They're they're just not equal that's all. Um yea. It's just a rule. What I thought you were going to say, and this is another alternative, you could've also used, uh, I think thirty and forty-five and then you would've gotten nice nice angles that you can deal with.

3.18

St: I got it, but where'd you get negative the square root of [ ]?

TA: I got it. Ok that's that's important to know because I hate it when I disagree with the back of the book but I double and triple checked it.

St: I got positive [ ].

TA: Well, well the thing is is that they say you can can tell by looking at the at the preamble of the problem. Let's say if the sine of x is two thirds we know what that does for a unit circle. It puts the sine right about here and the angle here and here. And then they say x is between pi over two and pi. Ok.

St: Oh.

TA: Yea. See what I'm saying? if x is in this quadrant there aint no way you can have a positive cosine. I'm pretty sure that it's supposed to be minus. Ok.

St: Ok.

3.19

St: Can you do thirty?

TA: Do which?

St: Thirty seven. (several people).

TA: Thirty seven. Sure. (pause) Oh yea that is a long one.

3.20

St: I don't understand how you got...yea that right there. That's the part I don't understand. How can you
[
TA: Wait. I haven't written this part down yet.

St: Yea. [ ] Right over there on the left. How
[
TA: Here?

St: Yea. Where'd you get that?

TA: The expansion. Ok, well let's see sine of two theta, sine of two x, sine of two of anything is equal to (pause) sine x cosine x. Yea. I'm pretty sure this is correct. Cosine x.

St: All right.

TA: Sine of x, and then I have x plus y. So I replace this one with y and this one with y so I have cosine of this, sine of this.

St: Oh, ok.

TA: Sine of this cosine of this.

St: Ok. I was doing it differently.

TA: That's ok. Grill me.

St: I was using the distributive property.
[
TA: Oh god. I was wondering.

St: Sine x two theta and then taking the two theta and then expanding instead of doing that.

TA: Oh. Ok. Um. Alls I can say is very very loudly, don't distribute these things. I mean that's part of the part of the pain of trig is you have to literally memorize how to expand this. Ok. Uh, so for instance when you first learned algebra they said that this (pause) was equal to this. And they didn't tell you why. They just said it is. Well, now they're telling you that this is equal to this and they're not telling you why. Just telling you it is. Yea.

3.21

St: Can you finish?

TA: Huh?

St: Can you finish that one?

TA: Can I?

St: Yea.

TA: Ok. Ah. Sure. This is a (completes problem).

3.22

St: Would you start off with cosine two, you know.

TA: Well, I take this

St: [Right now yea I understand that. But would you start off with cosine two theta of sine two theta there? Where you 're at where you have cosine two theta, should it should it say that or...cuz before I think we had sine two theta there first.

St_2: Yea.

TA: It doesn't matter. I mean, as long as I only have them once. Ok. I mean you got your commutative and and your associative for your commutative you can rewrite it in any order. Just made sure you don't have two of anything. Ok. You know there's no set way to write it down. Do you still need me to finish it or or was that your question?

St: I I get the next step. After that I have problems.

TA: [Mm Hmm.

St: combining things.

TA: combining them and getting it to look like the back of the book?

St: I got the next step where you break down the sine of theta or cosine. I get that part.

TA: Ok. Let me show you...Yea I was able to get it into uh a form similar to this and then I got bored with the problem. Ok. So cosine two theta...

3.23

St: How do you know when you're when you've made it to the last step?

TA: When it matches the back of the book. (laughter)

St: Yea. But like on a test.
[
TA: Literally. Oh, uh, you mean on a test.

St: Yea.

TA: On the test there's no reason to even worry about that because they will always tell you when to stop. In this
[
St:
Oh.

TA: problem, well this problem wouldn't be assigned because you have to know the answer before you know you're done. Literally. Otherwise you could do this forever. You could go backwards and rebuild that and say wow look how I've simplified. You know? (laugh) So, so the point is don't worry about when you're done. Ok. Uh if they say simplify any expressions involving only sine theta that means get anything that looks like a two theta out of there. Ok. Uh. So actually, see what I should say is if this if this problem said simplify this in terms of sine theta cosine theta, I would be done after this step. Literally. I mean that would be the end of the test problem. Because I would have no I would have no cosine two theta sine two theta I would be done. I, uh, I wasn't done in this case because I didn't match the book. Ok.

3.24

St: Why?

TA: Uhm. The simplest answer I can give is because it's just the difinition of the arctangent. For an arctangent we plus in a number and it spits out an angle. Ok. So it's just the backwards. We started with the angle and took the tangent. It's just I'm working backwards. Ok?

3.25

St: On number fifty nine, how come in the back of the book it says it's the arctangent of fifty over i. I just seem to get tangent of fifty over i.

TA: Ahm, because what you end up with is this. Well, let me ask you if this is what you ended up with. Ok, when you write the triangle down, I'm just doing this for the people that have trouble doing the problem, the reason the answer looked like it did was because it said "express theta as a function of 1." So you want theta by itself. That's the reason. So they just write theta as equal to the arctangent of fifty over 1. Theta is now a function of 1. Plug in different 1's and get theta. Other than that it's just like the previous section.

3.26

St: Just real quick. You can use a quadratic on trig functions but you can't distribute them? That doesn't make sense.

TA: Oh, ok. Let me see if I can explain what's going on

St: [I know what you did. I just don't understand

TA: [Ok. I can I can show you the diffrence. Uhm. When I...that's a good question. There's an answer forming in the depths of my mind. I thought about that quite a bit because somebody in the afternoon asked me the exact same question. The same thing. Ok. This is just a god-given law of trig. Ok. It's just the way it is. Ahm. If you write them out, if you write the cosine as angle, if you write it like this (pause) basically a plus b is some angle. So I take an angle b from here to here and this is a plus b. It's the angle a plus b. Not, I haven't overlapped them I've written a then b. Now if I take the cosine of the a plus b, that's this number, this length. Now for reasons I don't know off the top of my head, this number this cosine of a plus b is not equal. Yea it kind of makes sense too because here's angle a and here's the cosine of the angel a. Ok. Pretty big number. And here's b. Here I overlapped b. I added them here I'm just going to written what b was from a standard position. Its cosine is this line

two when I add those cosine together.

3.27

St: I don't understand. Isn't that a?

TA: This is this is a and this angle from here to here approximately. Ok don't let my drawing confuse you. Taking the two

St: [You said b didn't overlap a.

TA: Huh?

St: You said b didn't overlap a.

TA: In this picture in this picture they do not. In this picture I am rotating it. In this picture I've very badly drawn an a and a bigger b. Ok. The point is is here's your cosine a and here's your cosine b. When you add them together like this you get some huge number bigger than one. By the definition of cosine. If but this can be greater than one so that's just a reason why it can be greater than one so that's just a reason why it wouldn't work. Now back to your question. I am using no that that's an intrinsic. That's an inherent property of the cosine. That I can't do that. What I was doing before was just taking taking that, and notice all I'm doing is I'm saying instead of writing cosine x. I'm going to write the letter c. Ok. Now I'm just I'm going just back to this then, so I'll substitute back. You see I'm not really using any property of the cosine. I'm just throwing it around. I'm not taking it apart and distributing it and placing it in places. Does that help? That's a good question. Uhm. I'm not sure how to answer more clearly than this. I'm not really using property of the cosine. I'm just writing the cosine as one thing. Ok? Here here's an example. What you might be thinking of is this (explains a related example on board). See what I'm saying? There's a distinction between messing with the rules of trig and using them algebraically.

St: Ok.

FITA 4

4.1

St: Um. For my graph on number fifteen, I have two places greater than five hundred and you only put one point down.

TA: You mean the part B number fifteen?

St: Uh huh.

TA: Number fifteen part A. Most of people got part A. Most of people miss part B

4.2

St: What was the range you used?

TA: Range? The range of the graph or of this?

St: Yea.

TA: The graph?

St: Yea. The graph.

TA: The graph [ ] so we will continue goes down adn here we continue goes up.

4.3

St: I don't understand how you used you used ten not twelve.

TA: Here?

St: Yea.

TA: This thirteen.

St: Oh. Thirteen. How'd you know how to use ten instead of thirteen?

TA: Ok. We need twenty six minus two x greater than zero. But we have twenty six greater than [this two x] divided by two divide by two who is thirteen. X less than thirteen. Oh we have to check this condition and this condition. Ok? The domain should satisfy this three condition. And so this [why] we get the solution from zero to ten or we can draw the graph. We can draw graph here (completes graph)- Ok? Any other questions?

4.4

St: Can you just factor it though?

TA: If...You cannot factor it. You can do the formula. Quadratic formula. Two times two, negative one, one [ ] If you don't know how to factor it, you can use the formula. Yea?

4.5

St: Isn't there an easier way to do it than using u?

TA: Pardon me?

St_2: Can you do it a different way than using u?

St: [Isn't there a different way than letting us equal x squared?

TA: This is the easiest way. You think there is another easy way?

St: Got to be.

TA: Pardon me?

St_2: It it's just confusing.

TA: Confusing. Ok. Or the other way is [is u] you can [ ] by this x square over square x square x square. Ok minus fifteen. Then you have to think about...This one is for for one unit. For unit. So this become a quadratic equation. Then you can do the factoring faster. This is to the power four and we don't have any formula.

St: Can't you just use two x squared minus five and x squared plus three?

TA: Yea. You can do that but, why I show guarantee everybody can solve for u but, if you do two x square minus five, x squared plus three, not everybody can do that.

St: Ok.

TA: You are very familiar with the factoring you can do this one. But a lot of you are just beginning. [Haven't] learn how to do the factoring right, ok? But we will get we will find that u...this is one plus...If you are very good you can do this way. If you are beginner you can follow this way. This guarantee you can solve it.

4.6

St: I don't understand what you're doing over here.

TA: Here?

St: Yea.

TA: The root of this equation will be this one. Right?

St: Mmm Hmm.

TA: Understand this one? Ok. And from there we know the root of complex. It's not real. Since it's complex, the the means the inside the [discriminany] is negative. This is the only criterion. Huh. So this one, we require this one. Actually it's four cubed less than zero. So we can write our equation. Our polynomial has this form. And the only criteria is p squred minus four cubed. Like if I pick up p is one then q is one. It'll be ok. Ok? P is one now pick up q is two. It'll be ok. It'll satisfy this [discriminant] is less than zero.

4.7

St: So you do that with all the complex factors?

TA: Yea. This one here you, uh, do the factoring, you find our [it's true] it's complex. So there are infinite many solutions.

4.8

St: So are you allowed to do it like the first part or no?

TA: This two.

St: Number one. Is that right also?

TA: I think. Yea this one also in your book. Only give you one solution.

St: Mmm hmm. But there are more ways to do it?

TA: Actually there for this one for real there is only one case. For this one there are infinite many. Yea.

4.9

St: So if that was like on a test we could put x plus one cubed and get it right?

TA: Which one?

St: The first one.

TA: Yea.

St: And it'd be right?

TA: It'd be right.

St: There's nothing to it then.

TA: Pardon me?

TA: This is for more complex.
[
St: Why go through step two when you can just scratch that off right there and be done?

TA: Yea. But I just want to explain, uh, since I don't think your book give you give you this solution. The book give you one of the solutions conditions. The second case, that's why I explain, and sometimes they will uh tell you the only one real [true] complex then you have to know how to find out the complex one if they give you more condition. Ok?

4.10

St: You know the k minus one? Where'd you get the minus one right there? Is it one minus one?

TA: K times one. Then thirty seven ok (points and underlines answer on board - student nods and writes something down).

4.11

St: You can also take the sixth root, can't you?

TA: Pardon me?

St: You can also take the sixth root?

TA: You mean

[
St: That's how they did it in another class and that's how

TA: Yea. You can do that.

St: Comes out the same.

TA: Yea. You can do that. X minus one, will be...Yea you can do that. You have answer? Ok? That's good idea.

4.12

St: We didn't have to do that one.

TA: Pardon me?

St: This wasn't on our homework.

St: (louder) We didn't have to do thirty nine.

TA: We didn't have to?
[
St: It only went up to thirty eight.

TA: Do I have to do?

St_2: It wasn't on our homework.

TA: No? Ok. Then we go on to something else. We go to four five.

4.13

St: Twenty five.

TA: Twenty five?

St: Twenty five.

4.14

St: You do seventeen before that?

TA: Ok.

4.15

St: What section are we on?

TA: Four five page two eighty three.

4.16

St: Does it matter that you multiply those two together as opposed to like uh two plus i squared [ ]?

TA: Here? Yea. I will multiply by two plus i squared and this two together. I feel this will be easier.

St: Oh. All right.

TA: Ok?

4.17

St: How's there two complex?

TA: (along with a student) Since we have three three zeroes. We have three zeroes.

St: Ok. I got it.

TA: Ok?

4.18

St: How'd you know when it'll be a double double root?

TA: Double root?

St: Double root.

TA: Ok. If this is a double root, they must [ ] triple root.

St: They must what?

TA: Ok. If this is double root?

St: Mmm hmm.

TA: Ok. This means there two zeroes here. Uh two real here. Then I have another one. Must have three zero. It's impossible. Since in in this case we can factor in its [ ] form but we cannot. And this if you have a [ ] here. Actually the complex happen here.

St: Right.

TA: Ok. Here and here. So here is a. Here is...just is conjugate. Ok?

St: Ok.

4.19

St: What?

TA: What? Complex zeroes. So we have one integer, two complex non-real. Ok. That's on problem twenty nine.

St: Couldn't you, um, couldn't you just like graph it? Find the one, and then you know there's going to be three [ ] for the other two.

TA: Uh. Yea. You can do that. From the graph you know only one [cross] here. Only one. Real. And since uh the [ ] cross x axis once so you have to you will know one for real, two for complex. Ok.

4.20

St: What if it was degree three?

TA: Degree three?

St: Yea.

TA: If...in this case degree three. Ok. We have this two complex, ok. We have two two complex then the third one will be either real or complex. Do you think it will be complex?

St: No.

TA: Should be two. It's a pair so the other one will be real.

St: So how do you find that you multiply those two together and then and then and then you factor it or

TA: [Yea.

St: factor it. Multiply those two together then what are they?

TA: Yes, well. The other way is...You know this way is real.

St: Mmm hmm.

TA: If you know this one then you can uh have...Since we have no any other information, we assume this c ok. So we have another x-c. Ok. And can be any number any real number. Ok?

4.21

St: Number seven?

TA: Number seven. Ok.

4.22

St: Fifteen.

TA: Fifteen? Ok.

4.23

St: Why'd you use the five times? Five times thirty five?

TA: [Yea. I'm just checking you.

St: Ok.

TA: Ok? (laugh) Thank you. It's five times the initial.

MITA 5

5.1

St: Thirteen?

TA: (lists on board)

5.2

St: Eighteen?

TA: Eighteen?

St: Eighteen.

TA: (lists on board)

5.3

St: I've got a problem way back in eight point two, number 11?

TA: Eleven. (lists on board) Ok. Uh Afterward we covered this section we'll do the other the other thing.

5.4

St: Say that again?

TA: No solution. Because you see b should be bigger than a. From this graph b should be bigger than a. Right?

St: Right.

TA: All right. So we [see] there no solution. You have to check formally, uh, to to do that to do that thing right. Now. How to do it formally.

St: I'm just confused because in the book it says b is less than h which is a sine beta. Then there is no solution.

TA: B is less than h. H is [ ] here.

St: Right.

TA: But even b is less than h, even b is bigger than h but less than a it still gives you no solution. What in this situation even if b bigger than h but less than a. Still no solution, right? If b is bigger than h but is is less than a, if b is here but the angle has to be here. This one. The reason is b is less than a not less than h. I

guess b is less than a. The reason is b is less than a, not b is less than h. Let's compute uh h. Can tell you more reason. Let's computed h yea. H equals a sine one sixteen degree. That's one sixteen degree that eleven on. (reading in book) angle, sine of, one is ten, that's bigger than that's less than ten. Less than b. Less than b. B is bigger than h.

St: That's why I'm confused. Because it says that b has to be smaller than h for there to be no solution.

TA: Oh. No no. Forget about this. The reason is not this. Ok. Yea. Different from the textbook. The criterion says compare b with h but here is different.

5.5

St: Is this on the test?

TA: Hm?

St: About the test. Is it like going to have story problems on it? Like these things?

TA: The previous test you shouldn't have such a kind of problem on it. The problems are usually [ ] by formula, ok?

5.6

St: This one right here? When b is less than a then there's no x right?

TA: B less than a. You can tell (reads in book) when beta is acute b less than a you have two solutions. So these things right here only so for acute angles.

5.7

St: What was the average?

TA: Forty eight.

St: Forty eight?

TA: (nods) We had some people did very good, uh, excellent. Ninety six or uh ninety five. So some students did very good.

5.8

St: How did we how're we supposed to know we were supposed to put that down. I mean it didn't really say you know put both solutions down.

TA: You compare b with uh, first you compute h. Fine. This is h. You compare b even with h. You compare h you can compute h compare with b. You know h is less than b. Ok. If h is less than b and here b is less than a right. B is less than a. So you have you have two solutions you have two solutions. There is there is a criterion in the textbook. If this condition satisfied we have two solutions.

St: Yes, but it it just said solve the triangle. I mean be more specific. You want two or you just want one.

TA: [Yea, solve the triangle. But but in this problem

St: [If I got one answer that was right, would we almost get the next one, the second solution right?

TA: Uh.

St: Why take off so many points?

TA: Just from the law of sine, right, you compute sine alpha but you have no no reason to say sine alpha a is this. Just this. It it can be this. Right. Just from this law of sine you can't you can't say that only this one [ ]. So if from this you only get one answer it mean you lose the other one. The other one. Right. So just from here you get two alphas, and uh yea there is a criterion in the but there is also you can do this. You get two alpha [ ] like this. So there is alpha, there is also alpha. Anyway this section expecially there are there are criterions to understand how how many solutions you have. So according to the grading policy you give one answer you just get sixty six points.

5.9

St: To get side c, uh, c you use alpha I mean a squared plus b squared equals c squared?

TA: No. It's not a right triangle. Instead of right triangle have the formula Pythagorean law. Ah. Formula right? I think and if and, uh, in the triangle this triangle is not right. So instead you use the law of cosine. Right. That's the uh uh case of the Pythagorean law. Not a right triangle. It's the laws of cosine.

The law of cosine special case of the law of cosine is when alpha is ninety degree so so uh cosine alpha is zero so you get just uh the right hand side. You get a squared. A squared the left left hand side. You get a squared the right hand side. A squared b squared plus c squared right.? Minus something minus something is zero so you get Pythagorean law. It's a special case of the law of cosine. And next I want some of you to put your solutions.

5.10

St: Do five?

TA: Pardon?

St: Five?

TA: (lists on board)

5.11

St: He curving any [of these]?

TA: Yea. I guess should be curved.

5.12

St: What's he gonna drop a test?

TA: (laugh)

5.13

St: What was the high?

TA: What?

St: What was the high grade?

TA: High score is what six ninety six. What'd I say? Ninety six.

5.14

St: In our section or overall?

TA: Pardon?

St: In our section or overall?

TA: In our section. [That seem] pretty high.

5.15

St: Number eleven.

TA: (lists on board).

5.16

St: Twenty one.

TA: Ok. (lists on board).

5.17

St: Thirty seven?

TA: Ok. (lists on board)

5.18

St: Could we uhm just take r r one times r two and take the absolute value of each one because the absolute value of z one
[
TA: Right. Right. That's another way to do this to do this is to to compute to compute z one absolute value from this formula squared and compute z two z two absolute value from this similar formula. Right. And multiply that and you know that theorem one cuz theorem one tells you that to get uh absolute value of z one times z two just multiply their their absolute values. Multiply their ablsolute values so that's another method. (writes on board) It's this formula so you can compute the these two these two absolute values first.

5.19

St: On number twenty nine, I got the right answer, but I don't understand why the second one is square root of thirteen and the cosine of what angle equals 2 k pi.

TA: Oh. Yea. There are two problems in this group. The first is writing the trig formula for theta between zero and 2 pi. Right. The next is general algebra for every angle. [ ] the first you got angle theta in, uh, zero. Three sixty in this interval. The next [ ] all the possible answers so that uh so uh twenty nine.

5.20

St: What would you do if it said find exactly theta?

TA: No. No this time you can't find you can't find exact solution. Why? cuz, uh, there is not a special angle. Right. So you cannot find exact solution. You just have theta over here.

5.21

St: You do twenty one?

TA: (lists on board)

5.22

St: Ok. Now graph the now graph the root.

TA: Ok. Now root, uh, so this x this number and you know that z is uh this number two cuz this is one of the cube root of three. Right. So three is just cubed. Ok. So x is this CIS cubed. And you just [theorem] by [theorem] two cubed and CIS. Here you just multiply this angle by three. By this exponent multiply this by three. So that's (pause to write) this is just eight. Right. CIS this angle is pi (writes) Ok. Trig formula of z.

5.23

St: Is the eighth root of fifty the same as the square root of fifty to the one fourth?

TA: Yea. That's the same thing. You can...this this is equal to eight. You just multiply and have many forms. The the inside just the inside is different. Suppose have one half this whole thing is one half the fourth root is supposed one fourth. You can multiply these two things. You get many forms you can multiply. This is, uh, there is probably for this formula right. There's just power four that's right.

St: But how about if you have square root of fifty to one fourth? Is that the same?

TA: Yea. Just the same. Just different forms. You can put a square up here or you can put a squre right here.

MITA 6

6.1

St: How did you get the one third?

TA: Huh?

St: How'd you get the one third?

TA: Just you can graph this function because the graph for the function is through this point through this point. Because is hard to for you to decide. Because you gotta find x is equal to one third. Is hard to find but you can use the the graph for this function to find the to find the x intercept. X equals one third. Just graph this function.

6.2

St: Wouldn't it be from negative one to zero instead of from negative infinity? Cuz how would you have negative infinity if its square

TA: [You mean negative square here but [I mean] x is very close to two but less than two. Suppose x

St: [Hmm

TA: squared equals to negative three equals to two (writes) two (writes) minus...This is (writes) in this case ok. In this case z squared equals to two minus one third. Right. That means x squared minus two equals negative one third. Right. So the reciprocal z squared minus two equals to one negative one third. So is equals to negative three. If this is negative one n, this here is negative one n over n. There is n or it would be negative infinity, ok? So this interval, because this x squared could be very near close to could be very close to two x squared. Very close to two in the axis. This means here is two x squared would be very close to two very close to two. And the reciprocal. So x squared minus two very close to zero. So the reciprocal one over x squared minus two very, very, uh, is really negative infinity. Any other problem? Just notice that notice this one because z squared could be very close to two from right side or left side. If it is from left side that means the reciprocal would be go to positive infinity. Here z squared go to two goes to two left side goes to two then the range would be from from uh left side to to negative infinity. Go zero go to negative infinity.

6.3

St: Are you going to give us an example?

TA: Yea. I will give you an example in the exercise.

6.4

St: Can you twenty three, too, please?

TA: Oh sure. (lists on board) X power five minus two x squared plus four

St: [That's twenty one.

TA: Oh. X power four minus three x square minus four x minus two over x minus three is greater than equal to two. Right? (completes problem)

6.5

St: Now like on twenty one where you got the negative one point seven one, you said to use the [trace key]. Now how's it supposed to get the exact value if it never

TA: [It's hard to find exact value

St: Just estimate?

TA: Yea, yea. Just estimate.

Bibliography

Ainsworth, C. (1986, January). The college classroom: Changing climates and cultures. Paper delivered at Regional Conference on Teaching, Las Cruces, NM. ERIC ED281411

Aldredge, M. (1989). Student questioning: A case for freshman academic empowerment. Research and Teaching in Developmental Education, 5(2), 17-24.

Anderson-Hsieh, J. (1990). Teaching suprasegmentals to international teaching assistants using field-specific methods. English for Specific Purposes, 9(3), 195-214.

Andrews, J. D. W. (1985). Strenthening the TA faculty. San Francisco: Jossey-Bass.

Ard, J. (1987). The foreign TA problem from an acquisition theoretic point of view. English for Specific Purposes, 6(2), 133-144.

Ard, J. (1989). Grounding the ITA curriculum: Theoretical and practical concerns. English for Specific Purposes, 8(2), 125-138.

Ash, B. (1992). Student-made questions: One way into a literary text. English Journal, 81(5), 61-65.

Asher, D. (1987, May). Response to literature: Student questions. Paper presented at the Meeting of the New Jersey Council of Teachers of English, Lawrenceville, NJ. ED220838

Atwood, V. and Wilen, W. (1991). Wait time and effective social studies instruction: What can research in science education tell us? Social Education, 55(3), 179-182.

Axelson, E., & Madden, C. (1990). Video-based materials for communicative ITA training. IDEAL, 5, 1-11.

Bailey, K. (1982). The classroom communication problems of Asian teaching assistants. in C. Ward and D. Wren (Eds.), Selected papers in TESOL (pp. 19-30). Monterey: Monterey Institute of International Studies.

Bailey, K. (1983). Foreign teaching assistants at U.S. universities--problems in interaction and communication. TESOL Quarterly, 17, 308-310.

Bailey, K. (1984). Foreign teaching assistants in U.S. universities. Washington, D.C.: NAFSA.

Barba, R. & Cardinale, L. (1991). Are females invisible students? An investigation of teacher-student questioning interaction. School Science and Mathematics, 91(7), 306- 311.

Belnap, N. D. & Steel, T. B. (1976). The logic of questions and answers. New Haven: Yale UP.

Blum-Kulka, S., House, J., & Kasper, G. (Eds.). (1989). Cross-cultural pragmatics: Requests and apologies. Norwood: Ablex.

Bresnahan, M. (1993). The impact of positive and negative messages on change in attitude toward international teaching assistants. Folia Linguistica, 23(3-4), 271-288.

Brinton, D. & Gaskill, W. (1979). Working papers in teaching English as a second language. UCLA, 8, 49-68.

Bouton, L. (1988). A cross-cultural study of the ability to interpret implications in English. World Englishes, 7(2), 183-196.

Brown. G. (1986). Explaining. in Handbook of communication skills. (pp. 201-222). New York: New York UP.

Byrd, P. & Constantinides, J. (1992). The language of teaching mathematics: Implications for training ITAs. TESOL QUARTERLY, 26(1), 163-167.

Cake, C. & Manasche, L. (1982, May). Improving communication skills of foreign teaching assistants. Paper presented at the 34th annual conference of the National Association of Foreign Student Affairs, Seattle, WA. ED225373

Carlsen, W. (1987, April). Why do you ask? The effects of science teacher subject-matter knowledge on teacher questioning and classroom discourse. Paper presented at the 1987 meeting of the American Educational Research Association, Washington, DC. ED293181

Carlsen, W. & Wilson, S. (1988, April). Responding to student questions: The effects of teacher subject-matter knowledge and experience on teacher discourse strategies. Paper presented at the 1988 Meeting of the American Educational Research Association, New Orleans, LA. ED294842

Carlsen, W. & Wilson, S. (1990, April). Teacher knowledge and the language of science teaching. Paper presented at the 63rd annual Meeting of the National Association for Research and Science Teaching, Atlanta, GA. ED319613

Cazden, C.B. (1970). Children's questions: Their forms, functions and roles in education. Young Children, 25, 202- 220.

Chiras, D. (1992). Teaching critical thinking skills in the biology and environmental science classroom. The American Biology Teacher, 54(8), 464-465.

Chism, N. & Warner, S. (Eds.). (1987). Employment and education for teaching assistants. Institutional responsibilities and responses. Columbus: OSU Center for Teaching Excellence.

Clark, J. & Swinton, S. (1980). The test of spoken English as a measure of communicative ability in English medium instructional settings. Princeton, NJ: ETS.

Cohen, R. & Robin R. (Eds.). (1985). Teaching at Berkeley: A guide for foreign teaching assistants. Berkeley. CA: University of California at Berkeley. ERIC

Connelly, W. (1987, March). Training GTAs to teach: Persona, personality and policy. Paper presented at the 33rd Conference on College Composition and Communication, San Francisco. ED213046

Coppedge, F. (1988). Teachers as helpers: The qualities students prefer. The Clearing House, 62(3), 137-141.

Coulthard, N. (1977). An introduction to discourse analysis. London: Longman.

Dege, D. (1981). Format and evaluation of the cross-cultural component of a foreign teaching assistant training program. Paper presented at the Annual Meeting of the International Communication Association.

Dillon, J. T. (1978). Using questions to depress student thought. School Review, 87, 50-63.

Dillon, J. T. (1979). Alternatives to questioning. High School Journal, 62, 217-222.

Dillon, J. T. (1981a). Duration and response to teacher questions and statements. Contemporary Educational Psychology, 6, 1-11.

Dillon, J. T. (1981b). A norm against student questions. The Clearing House, 55(3), 136-139.

Dillon, J. T. (1981c). To question or not to question during discussion. Journal of Teacher Education, 32(5), 51-55.

Dillon, J. T. (1986a). The multidisciplinary study of questioning. Journal of Educational Psychology, 74, 147-165.

Dillon, J. T. (1986b). Questioning. in Handbook of communication skills. (pp. 95-127). New York: New York UP.

Dillon, J. T. (1986c). Student questioning and individual learning. Educational Theory, 36(4), 333-341.

Dillon, J. T. (1990). The practice of questioning. New York: Routledge.

Dillon, J. T. (1991). Questioning the use of questions. Journal of Educational Psychology, 83(1), 163-165.

Douglas, D. (1990). English language testing in U. S. colleges and universities. Washington, D.C.: NAFSA.

Douglas, D. & Myers, C. (1989). TAs on TV: Demonstrating communication strategies for international teaching assistants. English for Specific Purposes, 8(2), 169-179.

Eisenstein, Miriam. (1983). Native reactions to non-native speech: A review of empirical research. Studies in Second Language Acquisition, 5(2), 160-176.

Eulie, J. (1988). Teaching understanding and developing critical thinking. The Social Studies, 79(6), 260-266.

Fahey, G. (1939). A study of classroom questions of high school pupils and the relation between questioning activity and various other factors of educational significance. Unpublished doctoral dissertation, University of Wisconsin.

Fey, J. T. (1970). Patterns of verbal communication in mathematics classes. New York: Teachers College Press.

Fleming, D. (Ed.). (1987). Focus on you: Proceedings of the annual conference of the Western College Reading Association Vol 15. Whittier, CA: Western College Reading Association.

Formanek, R. & Gurian, A. (1980). Why? Children's questions: what they mean and how to answer them. Boston: Houghton Mifflin.

Garfinkel, H. (1972). Studies of the routine grounds of everyday activities. in David Sudnow (Ed). Studies in Social Interaction (pp. 1-30). New York: MacMillan.

Garvey, C. (1977). The contingent query: A dependent act in conversation. in Interaction, conversation and the development of language New York: John Wiley and Sons.

Gass, S., Rittenberg, W., Wieferich, M. A., Haynes, M., & Byrd, P. (1989, March). Language and pedagogy in mathematics. Colloquium presented at the 23rd Annual TESOL Convention, San Antonio, TX.

Gburek, J. & Dunnett, S. (Eds.). (1986). The foreign TA: A guide to teaching effectiveness SUNY: ERIC.

Gillespie, C. (1990). Questions about student-generated questions. Journal of Reading, 34(4), 250-258.

Goffman, E. Replies and responses. Language in Society, 5, 257-313.

Gorham, J & Christophel, D. (1992). Students' perceptions of teacher behaviors as motivating and demotivating factors in college classes. Communication Quarterly, 40(3), 239-253.

Grimshaw, A. (1980). Mishearings, misunderstandings, and other non-successes in talk: A plea for redress of speaker-oriented bias. Sociological Inquiry, 50(3-4), 31-74.

Gumperz, J. (1977). Sociocultural knowledge in conversational inference. in M. Saville-Troika (Ed.), Georgetown University Round Table on Languages and Linguistics. Washington, DC: Georgetown UP.

Guneskera, M. (1988). The foreign teaching assistant and the office hour. Paper presented at the 22nd Annual TESOL Convention.

Harms, T., Woolever, R., & Brice, R. (1989). A questioning strategies training sequence: Documenting the effect of a new approach to an old problem. Journal of Teacher Education, 40(5), 40-46.

Heritage, J. C., & Watson, D. R. (1979). Formulations as conversational objects. in G. Psathos (Ed.), Everyday language: Studies in ethnomethodology. (pp. 123-162). New York: Irvington.

Hinofotis, Frances. (1981). Assessing the oral proficiency and testing policies at U.S. universities. College and University, 66(3), 129-137.

Jacobs, L., & Friedman, C. (1988). Student achievement under foreign teaching associates compared with native teaching associates. Journal of Higher Education, 59(5), 551-564.

Jefferson, G. (1972). Side sequences. in D. Sudnow (Ed.), Studies in Social Interaction (pp. 294-338). New York: MacMillan.

Katchen, J. (1984). Student-initiated question sequences in classes taught by American and Taiwanese teaching assistants. Unpublished dissertation, The Pennsylvania State University.

Kearsley, G. (1976). Questions and question-asking in verbal discourse. Journal of Psycholinguistic Research, 5, 355-375.

King, A. (1991). Reciprocal peer questioning for learning from lectures. Educational Digest, 57(1), 59-64.

Knapczyk, D. (1989). Generalization of student question asking from special class to regular class settings. Journal of Applied Behavior Analysis, 22(1), 77-84.

Larson, P. (1984). On TESOL: A brave new world for TESOL. Washington, DC: TESOL.

Lawrenz, F., Heller, P., Heller, K., & Heller, R. (1992). Training the teaching assistants. Journal of College Science Teaching, 22(2), 106-110.

Levinson, S. (1989). Pragmatics. New York: Cambridge.

Marenghi, E. (1986). Classroom research: Questions from the audience in a university lecture course. Unpublished dissertation, The University of Michigan.

McCann, W. (1986). A survey of policy changes: Foreign students in public institutions of higher education from 1983 to 1985. New York: Institute for International Education Publication Service.

McHoul, A. W. (1990). The organization of repair in classroom talk. Language in Society, 19, 349-377.

Mellor, J. (1988). Some steps to improve your spoken English. Knoxville: University of Tennessee Learning Research Center.

Marksberry, M. L. (1979). Student questioning: An instructional strategy. Educational Horizons, 57, 190-196.

McClellen, K. (1984). Math anxiety: Cause, impact, and challenge to black students.

McKenzie, R. (1991). Developing study skills through cooperative learning activities. Intervention in School and Clinic, 26(4), 227-229.

Meyer, W. J., & Shane, J. (1973). The form and function of children's questions. Journal of Genetic Psychology, 123, 283-296.

Mills, C. (1940). Situated actions and vocabularies of motive. American Sociological Review, 5, 904-913.

Mirj, H. van der. (1990). Question asking: To know that you do not know is not enough. Journal of Educational Psychology, 82(3), 505-513.

Mischler, E. (1978). Studies in dialogue and discourse, III: utterance structure and utterance function in interrogative sequences. Journal of Psycholinguistic Research, 7(4), 279-305.

Nofsinger, R. (1975). The demand ticket: A conversational device for getting the floor. Speech Monographs, 42(1), 1-9.

Nofsinger, R. (1991). Everyday conversation. New York: Sage.

Nolan, T. (1991). Self-questioning and prediction: Combining metacognitive strategies. Journal of Reading, 35(2), 132-139.

Nystrand, M., & Gamoran, A. (1988). A study of instruction and discourse. Madison, WI: Wisconsin Center for Education Research.

Olmo, B. (1975). Teaching students to ask questions. Language Arts, 2, 1116-1119.

Orth, J. L. (1983, March). Language attitudes and naive listeners' evaluations of speaking proficiency: The case of foreign teaching assistants. Paper presented at the Annual TESOL Conference, Toronto.

Ortiz, J. (1988). Creating conditions for student questions. Paper presented at the National Seminar on Successful College Teaching.

Paine, L. (1986, October). Teaching as a virtuoso performance: The model and its consequences for teacher thinking and preparation in China. Paper presented at the International Study Association on teacher thinking, Leuven, Belgium.

Payton, J. (1986). Questions in ESL classrooms: New perpectives from written interaction. Washington,DC: Center for Applied Linguistics.

Pearson, J. & West, R. (1990, November). An initial investigation of gender on student questions in the classroom: Developing a descriptive base. Paper presented at the 76th Meeting of the Speech Communication Association, Chicago, IL. ED324732

Peterson, P., Carpenter, T., & Fennema, E. (1989). Teachers' knowledge of students' knowledge in mathematics problem solving: Correlational and case analyses. Journal of Educational Psychology, 81(4), 558-570.

Pizzini, E., & Shepardson, D. (1991). Student questioning in the presence of the teacher during problem solving in science. School Science and Mathematics, 91(8), 348-353.

Pressley, M., Symons, S., McDaniell, M., Snyder, B., & Turnure, J. (1988). Elaborative interrogation facilitates acquisition of confusing facts. Journal of Educational Psychology, 80(3), 268-279.

Potter, J., & Wetherell, M. (1987). Discourse and social psychology. New York: Sage.

Ragan, S. (1983). Alignment and conversational coherence. in R. Craig and K. Tracy (Eds.), Conversational coherence: form, structure, strategy (pp. 157-171). New York: Sage.

Ralajthy, E. (1984). Using student-constructed questions to encourage active reading. Journal of Reading, 27(5), 408-411.

Reeves-Kazelskis, C., & Kazelskis R. (1987, November). The effects of student-generated questions on test performance. Paper presented at the Meeting of the Mid-South Educational Research Association, Mobile, AL. ED291775

Reins, B. (1988). The introductory psychology class: what students want to know. Paper presented at the Meeting of the American Psychological Association.

Riegle, R. (1976). Classifying classroom questions. Journal of Teacher Education, 27, 156-161.

Rittenberg, W. & Wieferich, M. A. (1988 April). FTAs at work: A pilot study. Paper presented at the Symposium on the Training of ITAs, University of Pennsylvania, Philadelphia, PA.

Roller, C. (1989). Classroom interaction patterns: reflections of a stratified society. Language Arts, 66(5), 492-501.

Rounds, P. (1985). Talking the mathematics through: Disciplinary transaction and socio-educational interaction. Unpublished dissertation, The University of Michigan.

Rounds, P. (1987). Characterizing successful classroom discourse for nonnative speaking teaching assistants. TESOL QUARTERLY, 21(4), 643-671.

Ruben, B. & Kealy, D. (1979). Behavioral assessment of communicative competency and the prediction of cross-cultural adaptation. International Journal of Intercultural Relations, 3, 15-47.

Sadow, S. (1983). The foreign teaching assistant and the culture of the American university class. Washington, DC: TESOL.

Schegloff, E. (1972). Sequencing in conversational openings. in J. Gumperz & D. Hymes (Eds.), Directions in sociolinguistics (pp. 346-380). New York: Holt, Rinehart and Winston.

Schegloff, E. (1972). Preliminaries to preliminaries: Can I ask you a question? Sociological Review, 50(3-4), 104-152.

Sinclair, J., & Coulthard, R. (1975). Towards an analysis of discourse. London: Oxford UP.

Smith, K. (1993). A case study on the successful development of an international teaching assistant. Innovative Higher Education, 17(3), 149-163.

Smith, K. & Simpson, R. (1993). Becoming successful as an international teaching assistant. Review of Higher Education, 16(6), 483-497.

Spires, H., & Stone, D. (1989). The directed notetaking activity: A self-questioning approach. Journal of Reading, 33(1), 36-40.

Stokes, R., and Hewitt, J. (1976). Aligning actions. American Sociological Review, 41, 838-849.

Sudnow, D. (1972). Studies in social interaction. New York: MacMillan.

Stenson, N. (1992). The effectiveness of computer-assisted pronunciation training. CALICO Journal, 9(4), 5-19.

Stevens, S. (1989). A dramatic approach to improving the intelligibility of ITAs. English for Specific Purposes, 8(2), 181-194.

Strother, D. (1989). Developing thinking skills through questioning. Phi Delta Kappan. 71(4). 324-328.

Stubbs, Michael. (1983). Discourse analysis: The sociolinguistic analysis of natural language. Oxford: Blackwell.

Tang, T., Li, P., Tang, T. & Li, N. (1987). A correlational study of students' evaluations of faculty performance and their self-ratings in an instructional setting. Paper presented at the Convention of the Southwestern Psychological Association.

Torkelson, K. (1992, March). Using imagination to encourage ITAs to take risks. Paper presented at the 26th Annual TESOL Conference.

Tyler, A. (1988). Some sources of the perception of incoherence in non-native speakers' discourse. Unpublished manuscript.

Tyler, A. (1992). Discourse structure and the perception of incoherence in international teaching assistants' spoken discourse. TESOL Quarterly, 26(4), 713-729.

Tyler, A., and Bro, J. (1992). Discourse structure in non-native English discourse: The effect of ordering and interpretive cues on perceptions of comprehensibility. Studies in Second Language Acquisition, 14, 71-86.

Watkins, K. (1983). Handling difficult questions and situations. Innovative Abstracts, 5(24).

Weimer, M. (1989). Designing programs to prepare TAs to teach. New Directions for Teaching and Learning, 39, 57-70.

Wieferich, M. A. (1989). The FTA issue: Diagnosing the communication problem. Unpublished manuscript.

Wilen, W. (1991). Questioning skills for teachers. What research says to the teacher. Third Edition. Washington, DC: National Educational Association.

Williams, J. (1990). Discourse marking and elaboration and the comprehensibility of second language speakers. Penn Working Papers in Educational Linguistics, 6(2).

Williams, J. (1992). Planning, discourse marking and the comprehensibility of international teaching assistants. TESOL Quarterly, 26(4), 693-711.

Wilson, S. (1985, November). Conceptualizing and validating teacher questioning skills. Paper presented at the 71st Meeting of the Speech Communication Association, Denver, CO.

Woloshyn, V., Wood, E., Willoughby, T., & Pressley, M. (1990). Elaborative interrogation facilitates adult learning of factual paragraphs. Journal of Educational Psychology, 83(3), 513-525.

Wong, E. D. (1991). Beyond the question/non-question alternative in classroom discussion. Journal of Educational Psychology, 83(1), 159-163.

Zahn, C. (1984). A reexamination of conversational repair. Communication Monographs, 51, 56-66.