

YES/NO-QUESTION INTONATION OF
NATIVE SPEAKERS AND INTERNATIONAL TEACHING ASSISTANTS
IN ACADEMIC DISCOURSE

By

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By

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This study investigates *Yes/No-Question* intonation as used by three English native speaking teaching assistants (NSTAs) and three international teaching assistants (ITAs) in an attempt to answer two questions: (1) to what extent is intonation pertinent within the context of an academic research laboratory, and (2) can intonational measurements of a specific speech act such as asking questions be used as a tool in measuring a speaker's interlanguage development? The ITAs were native speakers of Chinese, a tonal language, and all participants were instructors of a beginning chemistry laboratory at a major American university.

In order to answer the latter questions, ITA *Yes/No-Question* intonation was compared to that of the NSTAs in an attempt to measure non-native speakers' interlanguage development over a three month period. This study found little difference in *Yes/No-Question* intonation between the two groups based upon utterance syntax (i.e., question vs. statement). Rising intonation was not a reliable factor in signaling the status

of an utterance as a question for the NSTAs, with only 58% of *Yes/No*-Questions displaying an utterance-final rise. Thus, although the ITAs applied slightly fewer rising boundaries (54%), the inconsistency with which this factor was applied by the native speakers allowed no basis for measuring interlanguage development.

Concerning the first research question, a knowledge of speech domain (chemistry laboratory) revealed itself as an important factor for successful communication. Based on these findings, this study emphasizes the importance of recognizing language variation across discourse domains and considers how this may be pertinent to language education programs. Particularly vital is an orientation towards field-specific linguistic training and a maximization of contact with undergraduate students for ITA training programs.

INTRODUCTION AND BACKGROUND

This thesis focuses on discourse intonation as it relates to *Y/N*-Questions in face-to-face interaction in an academic setting. In the past, intonation has often been overlooked in discourse analytical research despite its recognized implications in interpreting conversational meaning (Brazil 1997; Wennerstrom 2001; Chun 2002). This study will investigate to what extent question intonation is pertinent within the context of an academic research laboratory. In addition, although not a primary focus, this study considers whether intonational measurements of a specific speech act such as asking questions be used as a tool in measuring a speaker's interlanguage development.

Intonation, narrowly defined, describes a "variation in pitch movement" (Brazil 1997) and is recognized for its role in structuring discourse as well as its rapport-building functions. The importance of intonation is widely recognized on an interdisciplinary level as a significant factor in speech production and perception. Wherever one finds normal human speech, intonation is present, and in fact, without it speech would be monotonous and boring. (Brazil 1997; Herman 2000; Pickering and Wiltshire 2000; Botinis et al. 2001; Pickering 2001).

However, some researchers suggest that the role of intonation, particularly for *Yes/No* Questions (*Y/N*-Questions), may be overrated. "It seems highly likely . . . that a number of other factors contribute to an utterance having question-status in actual discourse. Facial expression and gestures are obvious candidates; the preceding linguistic context is bound to be important; other prosodic factors, such as pitch range, pauses,

loudness and tempo might be relevant”(Geluykens 1987). The rules which apply to discourse also vary in accordance with many factors, one of which is setting (Schiffrin 1994; Boxer 2002). Furthermore, when one or more of the participants is a Non-Native Speaker (NNS), elements ranging from differences in prosodic nuances to cultural and conversational norms may influence the conversation. There is a strong need for research that attempts to distinguish the various ways in which intonation, syntax, and conversational action work together in forming how an utterance is to be interpreted by a listener (Ford and Thompson 1996; Wennerstrom 2001; Boxer 2002; Chun 2002).

From these observations comes the major focus of this study: to attempt a better understanding of how intonation may or may not be pertinent within a particular context—in this case, the framework of academic discourse of NNSs. Following Shen (1990) and Wennerstrom (1998), this study was conducted by investigating the speech from speakers of L1 Chinese, a tonal language, when speaking a non-tonal, stress-timed L2 such as English, because intonation is applied differently in these languages. In Chinese, for example, pitch is distinctive at the word level and belongs to the lexical representation of a word. In English, on the other hand, pitch distinctions are generally made at the sentence level and are not lexically distinctive. Although Chinese speakers do utilize intonation to some degree, it is less frequent than in English, as elaborated upon in section I.B (Abercrombie 1967; Chun 1982; Juffs 1990; Pierrehumbert 2000).

Unique to this research in regard to intonational studies is its ability to analyze interlanguage development of the NNS participants’ intonation. Interlanguage (IL), first proposed by Selinker in his 1972 article “Interlanguage,” refers to a learner’s language as it exists somewhere between the L1 and L2 and its various stages of development. ILs are

considered to be systematic natural languages along every step of their development, and are a central issue to second language acquisition studies (Selinker 1972; Eckman 1996; Gregg 1996; Sorace 1996). The basic nature of this study has the ability to consider various shortcomings in current research on the subject of prosody and IL, namely: the contributions of prosody and importance of discourse domains should not be ignored by IL studies (Wennerstrom 2001), and IL development of intonation over a period of time (Wennerstrom 2001; Chun 2002). Thus, inherent in the design of the study itself, a secondary objective considers IL: can intonational measurements of a specific speech act such as asking questions be used as a tool in measuring a speaker's IL and IL development?

The first section of this paper begins with an evaluation of why studying intonation is important from an applied perspective, followed by an analysis of how intonation functions in both English and Chinese, and concludes with an overview of the notational method used for this research. The second section discusses the methodology employed, and the third section presents an analysis of the data. In the fourth section of this paper, a discussion of the results with implications for future research are offered.

Practical Necessities of Studying Intonation

Many major universities in the United States use a range of language proficiency tests such as the Test of Spoken English (TSE) to measure the proficiency of their potential International Teaching Assistants (ITAs). However, evidence concerning the accuracy of such tests in evaluating an ITA's prospective classroom performance is conflicting, with many researchers arguing that the oral skills necessary to teach in a classroom cannot be separated from the context of practice, especially since skills which may be appropriate in one setting may not necessarily carry over to another

(Hoekje and Williams 1992; Yule and Hoffman 1993; Douglas and Selinker 1994; Wennerstrom 1998; Yook and Albert 1999). The language required to successfully lead a group discussion or lecture, for instance, is not always applicable in other settings such as during office hours or in the laboratory, where one-on-one interaction is more common.

For this reason, an emphasis on the context in which oral skills are used has received particular attention in recent ITA research. For these non-native speakers, an understanding of context and role may be a more viable goal than NS-like competence. Since contextual roles of interlocutors vary from culture to culture, attaining an understanding of the interactive norms for a particular society are equally a part of language acquisition as are grammar and phonology (Hoekje and Williams 1992; Douglas and Selinker 1994; Wennerstrom 2001). Concepts such as situational “communicative competence” and “contextualization” as put forth by Hymes and Gumperz respectively, are viewed as a central part of language learning. Douglas and Selinker (1994) suggest that an adjustment of “communicative competence” may be necessary so as to include additional domains such as work and life-story. Nonetheless, there is relative agreement among researchers involved with ITA studies that knowledge of appropriate domain language is essential and must become part of a speaker’s linguistic and cultural identity. Failure to accurately acquire or utilize such competence can have harmful results on an L2 learner’s academic progress. For this and similar reasons, ITA language courses are frequently designed to teach sociolinguistic discourse competence as well as compensatory strategies rather than improve language skills through grammar activities. These courses often focus on the use of different prosodic elements, discourse markers, backchannelling methods, Socratic methodology, etc

(Hoekje and Williams 1992; Smith et al. 1992; Alexson and Madden 1994; Davies and Tyler 1994; Douglas and Selinker 1994; Gumperz 1999; Jenkins 2000).

One element of prosody often included in ITA instructional materials is intonation. Several studies such as Davies and Tyler (1994), Wennerstrom (1998), and Pickering (2001), as well as others, have focused on intonation in ITA discourse. In an examination of NS/ITA dialogs, Davies and Tyler found that frequent interruptions on the part of the NS resulted from discrepancies between the Chinese ITA's use of prosodic intonation and NS expectations. In the end, the researchers observed improvements in the ITA's interactional skills which they attributed not to the ITA's sudden learning of the "linguistic code" but rather to a "pragmatically oriented teaching methodology" (217) similar to that described above. Employing explicit negative feedback in ITA training was found to have positive effects on the acquisition of this linguistic code.

In her 2001 study, Pickering compared tone choice used by six NSs and six ITAs in the introductory presentations of a beginning science lab. The ITAs differed from the NSs in that they used more level tones and a smaller number of rising tones, demonstrating a lack of an ability in exploiting "tone choice to refer to established common ground between themselves and their students" (247). These differences led to increased distance between the ITAs and their students. Pickering suggests that students' negative judgments about the ITAs were a likely result of these tone choices since tone plays an important yet unconscious role in discourse.

As a standard for analyzing tone choice, Pickering applied Brazil's 1997 model. This model attempts to create a freestanding framework for intonation independent of syntax or semantics. Brazil views any model of intonation as inherently bound to the

“here-and-now” of an utterance whereby “each of the oppositions in the meaning system is to be thought of as an occasion for setting up *ad hoc* categories in light of the speaker’s apprehensions of how things presently stand between them and a putative hearer”(Brazil 1997, xii). Thus, as Brazil continually reminds the reader throughout his text, the *context of interaction* is one of the most important factors in this model, helping to determine the “communicative value of each different intonation choice” (25).

In her 1998 study on ITA intonation, Wennerstrom also used an approach based upon the work of Brazil and others, some of whom are discussed in more detail below. As Wennerstrom describes, this study was designed to evaluate “the ability of intonation to convey grammatical meaning at the lexical, utterance, or discourse levels” (4). Wennerstrom’s results were consistent with those of Shen (1990), finding a transfer effect from their L1 on Chinese speaker’s L2 English intonation and suggesting that low-level learners were not yet aware of the “meaning potential available in final phrase boundaries in English” (21), though the more proficient language learners used intonation at the discourse level in similar ways as the native speakers. While all ITAs in Wennerstrom’s study had received the same instruction concerning intonation, they displayed varying degrees of intonational accuracy when compared to the target models. These varying levels of interlanguage development lead Wennerstrom to conclude that although there seems to be no “lock-step order of acquisition” (21) for intonation, this prosodic characteristic may nonetheless be taught.

Since the 1990s, publishers have demonstrated a new awareness for the importance of prosody, and thereby intonation, in ESL (English as a Second Language) textbooks (Wennerstrom 2001). This new generation of texts focus less on segmental phonology

and more on discourse as whole. Wennerstrom herself is an advocate of such an approach, suggesting in the final pages of her 2001 book *The Music of Everyday Speech* that “discourse-analytic approaches to the study of prosody are exactly what is needed today” (262). She also contends that certain Gricean notions of pragmatics may need a re-evaluation, taking intonation into account. Wennerstrom bases this assertion on the observation that the illocutionary force of an utterance is often closely tied to prosody: When the lexicogrammatical structure and intonation of an utterance are at odds, intonation carries the illocutionary force. Intonation may be detachable, but not cancelable.

Another advocate of intonation training in the second language classroom, Chun (2002), also views intonation as important to discourse analysis. She suggests four distinct categories for intonation: grammatical, attitudinal or affective, discourse function, and sociolinguistic. Like Wennerstrom, Chun believes that discourse analysis would benefit by incorporating intonation into its model, as would other areas of linguistics such as psycholinguistics, sociolinguistics, and pragmatics.

Dedicating over 100 pages to practical applications for teaching intonation in the classroom, Chun’s (2002) book offers useful material to the language instructor. “Recent work in second language acquisition and applied linguistics . . . strongly support (at least in theory) the teaching of discourse intonation” (xv). According to Chun, students may become better communicators by learning how to perceive and apply discourse intonation. ITA programs such as the one described by Davies and Tyler (1994) have already demonstrated the benefits of prosodic awareness training.

Current views of intonation in discourse tend to consider intonation as having “some measure of redundancy” (47). That is, intonation serves as a supplemental cue to the intended meaning of linguistically coded information. Moreover, the form and function of intonation have no one-to-one correspondence. Oft times a speaker’s intentions, the function of an utterance, or context in which it occurs have greater influence upon intonation than formal structural or phonological rules assert. Such observations have been the impetus for shifting the focus of intonation studies to a more interactive, discourse analytic approach.

Central to many discourse analytic approaches—particularly Interactional Sociolinguistics and Ethnography of Speaking—is the discourse domain. The domain is one factor which influences the indeterminacy or variation of an interlanguage. Understanding the diverse ways interlanguage may differ within a particular setting may help researchers better understand variations in other settings because without careful attention to IL discourse genres, second language acquisition studies may be misinterpreted (Hoekje and Williams 1992; Douglas and Selinker 1994; Nunan 1996). The state of a learner’s IL becomes evident through production (Sorace 1996). Thus, since intonation is a meaning-bearing system of English that serves a cohesive, grammatical function (Wennerstrom 1998; Botinis et al. 2001; Pickering 2001), it is suited for studies concerning IL discourse domain and development.

Functions of Intonation in Chinese and English

English intonation has been and continues to be the most described of any language (Fox 2002). Many features of English intonation have been heavily described and are recognized as being able to convey speaker emotion and the illocutionary force of an utterance. In fact, certain intonation contours are applied so frequently that Wennerstrom

(2001) dubbed them “intonational idioms”. Included here would be an utterance-final fall to indicate independence from subsequent utterances or a rise for indicating an interrogative. Nonetheless, these are only tendencies and may vary greatly depending on a variety of factors such as speaker attitudes and emotions, the speech act itself, or the situational context. Recall Geluyken’s claim, as mentioned previously, that in some cases the role of intonation may be exaggerated.

The fact that intonational distinctions “are often not discrete, but constitute a gradient” (Fox 2002, 270) is a unique characteristic of this prosodic feature. In addition, there is little dispute among researchers that intonation in English is meaningful—another characteristic setting it apart from other prosodic features such as stress and rhythm. Yet however much (or little) is understood about the functions of intonation in English, these functions are by no means universal. The few universalities which have been observed, such as rising pitch in questions and a falling pitch for statements, are too general to be useful. Because many linguistic researchers previously disregarded intonation—considering it to have paralinguistic or non-linguistic functions and thus lying outside the realm of linguistic research—it will take decades until a better understanding of intonation within a single language is achieved, and even longer until a cross-linguistic understanding begins to take shape (Botinis et al. 2001; Fox 2002).

Compared to intonation languages such as English, French, and German, research concerning the functions of intonation in tonal languages such as Chinese has been limited. Unlike in intonational languages, tonal languages utilize *tone*—varying levels of frequency within a speaker’s pitch range—at the phonemic level. Chinese has four commonly identified tones: a level tone, a rising tone, a falling-rising tone, and a falling

tone, also referred to as tones 1 through 4 respectively. A $\frac{1}{2}$ 3rd tone (or tone 5) consisting of a half fall-rise has also been identified by some researchers, as well as a neutral tone which has no underlying tone. For the first two tones, *pitch level* or *key*, the height of the pitch contour, seems to be the most essential characteristic. For the second set of tones, the distinctive characteristic is the actual pitch contour or shape. Particles, which generally have a neutral tone, may display a range of pitch patterns depending on syntax and function (Abercrombie 1967; Chun 1982; Tso 1990; Fox 2002).

Chun (2002) describes intonation as having a “crucial role in Mandarin Chinese” (39), used for expressing attitudes, emotions, and topic development similarly as in intonational languages. Different keys may be used to convey certain attitudes. For example, in Chinese, an attitude of questioning or uncertainty may be expressed by the speaker’s use of a higher register; in intonational languages, such attitudes are generally expressed through an utterance-terminal rise in pitch. In other words, Chinese tends to utilize the key of an entire utterance to express emotion while intonational languages, specifically English, give the necessary clues utterance-finally (Chun 1982; Shen 1990).

Yet even if key is the primary signal for expressing emotional content in Chinese utterances, intonation does exist and plays some type of role in production of the language. Perhaps one of the most crucial points for any study dealing with intonation in Chinese is how the tonal system interacts with intonation, particularly within questions. Essentially, there are three possible positions which may be taken (Shen 1990): 1) the intonational contour modifies the suprasegmental tonal categories beyond recognition, 2) intonation does not affect word tones, and 3) only the final syllable of an utterance undergoes perturbation. Positions (2) and (3) are the more generally accepted options,

since studies have shown that the tones in Chinese do in fact remain intact, though perhaps somewhat modified (Shen 1990). The intonation-tone interaction has been compared to small ripples on a large wave, with the syllabic tone “rippling” through the large wave of sentence intonation. Occasionally, the ripples are larger than the wave (Chun 1982; Ladd 1996). It is this interplay between tone and intonation which has often been cited as the source for the common phonetic characteristic of *downdrift* found in sentence-level intonation of various tone languages. Downdrift is also known as *declination*, *catatheis*, or *downstep*, a gradual lowering of pitch across the length of an intonational phrase resulting from a decrease in air pressure in the speaker’s lungs.

As noted by Shen (1990), “pitch shapes do exist in Chinese and undergo phonemic functions at the sentence level,” so it is not “beyond their linguistic competence” when Chinese listeners of an intonational language “perceive and categorize the rising and falling pitch contours” (129). Nonetheless, identification and application require quite different linguistic abilities. Simply because a Chinese speaker can identify intonational contours does not indicate that this same individual can likewise produce them. In fact, this is exactly what Shen discovered in her 1990 study of Chinese speakers learning L2 French. She also observed that when Chinese participants of her study did apply the expected final rise on French questions, they often “hypercorrected” by rising higher than the native speakers or producing fall-rise pattern. This was attributed to the phonological filter, which prevented the speakers of an L1 tonal language from producing accurate suprasegmental articulation in an L2 intonational language. Similar conclusions were reached by Chun (1982) who looked at the intonation contours used by Chinese speakers of L2 German and L2 English, Wennerstrom (1998) who looked at ITA lecture

intonation, and by Juffs (1990) who looked at Chinese speakers' word stress in L2 English.

Let us briefly summarize what is known about intonation in Chinese. To begin with, pitch serves as a signal for both stress and tone. Intonation, which is based on pitch, may also be used to signal sentence focus and prominence. Chinese uses different keys to represent attitudes and emotions, but intonation alone is not used for such purposes as it is purported to do in intonational languages. Morphological and syntactic markers are commonly used to aid pitch in expressing the meaning of an utterance. Unmarked interrogatives do exist and are generally higher in pitch than their marked counterparts or statements. Occasionally, some questions in Chinese have displayed rising terminal intonation much as those in English, particularly those ending with particles. Since the tone of most particles is neutral, these items assume a rising intonation when occurring at the utterance-final position in questions (Chun 1982). Yet all things considered, the similarities between tone and intonation languages may be stronger than their differences, for as Ladd claims: there "is no essential difference of phonological type" for intonation, but rather the differences observable in pitch contours "is simply a *consequence* of the functional difference" (1996, 148)

My personal experiences teaching Chinese speakers in L2 English are similar to some of the studies mentioned in this section: Chinese speakers may be able to identify intonation in English but they cannot necessarily produce it freely. Such an observation could perhaps be compared to the English learner who can write a grammatically flawless essay yet is unable to speak a single coherent sentence. Thus, as mentioned previously, one focus of this study is to look not only at *how* Chinese speakers of L2 English use

intonation, but also whether there is any evidence of interlanguage development toward more native-like standards.

Intonation Analysis

Linguistic study of intonation is less than a century old. As Fox (2002) explains: “there was little understanding of the nature and structure of intonation before the rise of the major structuralist schools of linguistics in the second quarter of the twentieth century” (273). Since that time, intonation has slowly but steadily earned more interest within the field. More recently, Pierrehumbert’s 1980 Ph.D. dissertation is widely considered to be the “single most influential work in the field of intonational phonology” (Botinis et al. 2001; Fox 2002, 280). Pierrehumbert’s contributions to intonation studies will be discussed later in this section. Let us first review relevant background information and terminology.

Intonation, pitch, and prosody are often used interchangeably, and often “linguists themselves disagree on terminology” (Wennerstrom 2001, 17). Prosody encompasses aspects of speech such as intonation, timing, and stress. While intonation and pitch both correspond to the movements of the *fundamental frequency* (F_0) of an acoustic signal, pitch, unlike intonation, is able to signal stress or tone. F_0 is the number of cycles in air pressure variations experienced in one second. Botinis et al. (2001) define intonation as “the combination of tonal features into larger structural units associated with the acoustic parameter of voice fundamental frequency or F_0 and its distinctive variation in the speech process” (264). Thus, F_0 is a physical property of speech; pitch is the “psychophysical” correlates of F_0 (Ladd 1996, 7); both intonation and stress use pitch linguistically.

The intonation contour which spans the entirety of an utterance is commonly known as the *intonational phrase*, or IP. Each IP can have one or more *intermediate*

phrases, also known as an ip. The right edge of an ip is marked by a *phrase accent*, which may be either high (H-) or low (L-) in a speaker's pitch range. Due to the nature of English, however, these pitch accents never occur alone. They are always accompanied by a *boundary tone*, which may similarly be either high (H%) or low (L%) in a speaker's pitch range. The % diacritic represents the end of an ip. Four possible combinations of pitch accents and boundary tones are defined:

1. L-L%: represents a very low point in a speaker's pitch range
2. L-H%: the final ip concludes with a low phrase accent, followed by a high boundary tone
3. H-H%: represents a point very high in a speaker's pitch range
4. H-L%: a low boundary tone is raised to a high (H-) tone. Also known as "plateau contour" because of the tone's level appearance.

The phrase accents above mark the edge of an ip. In addition to a phrase accent, each well-formed ip contains one or more *pitch accents*, which mark the stressed syllables with which they are associated.¹ There are five types of pitch accents, the most frequent of which, in English, is the **H*** (Jilka et al. 1999). The * is used on the tone which is associated with the stressed syllable. The five pitch accents are:

1. **H***: occur high in a speaker's pitch range
2. **L***: occur low in a speaker's pitch range.
3. **L*+H**: represents a low on the stressed syllable, followed by a sharp rise to the upper level of a speaker's pitch range. Often referred to as "scooped accent".
4. **L+H***: represents a high on the accented syllable, preceded by a rise from low in the speaker's pitch range. Often referred to as "rising peak accent".
5. **H+!H***: represents a step down on the accented syllable from high in a speaker's pitch range, yet accented syllable is still considered high

In the pitch inventory proposed by Pierrehumbert in her 1980 PhD dissertation, there were originally seven pitch accents. Today, five pitch accents are recognized.

¹ Ladd (1996) coins the term *core tone* to distinguish lexical tone from *pitch accent* and edge tones (phrase accent). "It may be useful to coin the term *core tone* . . . core tones in Chinese are part of the phonological shape of morphemes, whereas in English they signal intonational 'sentence accent' on selected words of a phrase, yet edge tones in both languages are intonational" (148-49).

Because it was never empirically observed, H^*+H was eliminated. The original H^*+L has been replaced by $H+!H^*$, which more accurately represents pitch since the downstepped tone ($!H^*$) is still in the upper half of a speaker's pitch range. Additionally, the accent H^*+L has been “replaced in a similar way by a regular monotonal high pitch accent followed by a downstepped monotonal pitch accent ($H^*...!H^*$)” (Jilka et al. 1999: 89). In other words, the sixth pitch accent was somewhat superfluous and has thus been replaced by two H^* accents, the second of which is downstepped, as represented by the $!$ diacritic. The elimination of H^*+L from the pitch accent inventory also seems logical considering that two combinations of this pitch accent with one of the four phrase accents corresponded exactly to two H^* -phrase accents combinations; in a sense, H^*+L and H^* were merged (Pierrehumbert and Hirschberg 1990; Ladd 1996; Jilka et al. 1999; Botinis et al. 2001).²

In 1992, a group of American researchers interested “in establishing a common system to indicate prosodic features in labeled computer corpora of speech” (Ladd 1996, 94) adopted the system described above for labeling intonation. Commonly referred to as ToBI (from Tone and Break Indices), this system was heavily based upon Pierrehumbert's model. A main goal in the development of this system was to ensure inter-transcriber agreement, which it has done. Although primarily developed for English, the ToBI system has since been adapted to other languages (Ladd 1996; Jilka et al. 1999).

Intonation is known to convey information about a speaker, the speaker's mood, attitudes, information status, and so forth. To a large extent, research on English intonation has attempted to identify meanings associated with certain intonational tunes.

² $L+L^*$ is not a possible pitch accent. I have found no discussion or reasons for this, though it is most likely because of redundancy and overlap with the plain L^* .

For example, according to Pierrehumbert and Hirschberg (1990) “the most common use of **L+H***” is to “mark a correction or contrast” (296). A **L** phrase accent with a **L** or **H** boundary tone is generally considered “neutral declarative intonation”. The typical interrogative contour is **L* H-H%**, though the **H* L-L%** of declaratives may also be used with *Wh*-Questions. *Y/N* Questions—the primary focus of this paper—typically display a final rise to the upper half of a speaker’s pitch range (e.g. **L* H-H%**).

However, such final rises may also indicate a relational “forward-looking” importance to succeeding phrases in that a speaker wants the hearer to “interpret an utterance with particular attention to subsequent utterances” (Pierrehumbert and Hirschberg 1990, 305). Expanding upon this observation, Hobbs (1990) notes: “an other-directed quality . . . is not what the **H** boundary tone signifies directly. Rather, it is derivative on the openness that is conveyed. There is more to be said, and it just happens that the hearer is the one who must say it” (320). Schiffrin (1994) adds that final rises may convey uncertainty or even an encouraging attitude.

Indeed, intonational contours are “notoriously slippery” (Pierrehumbert 2000, 20). It is thus often difficult to separate stylistic and dialectal variation from true categories. For instance, in contrast to North American varieties of English, polite *Y/N* Questions in RP English may carry the tune **H* L-H%**. Geluykens (1987) questioned the reliability of rising intonation for identifying what he called queclaratives, essentially an elaborate term for *Y/N* Questions having the syntactic form of a declarative statement. He concluded in his study that “rising intonation contributes somewhat to question-recognition, irrespective of the precise form of the rising contour” (490). This study—although conducted before the introduction of ToBI—suggests that the **L* H-H%** contour

considered typical of Y/N Questions may be “overestimated” (493). Intonation may at times be superseded by pragmatic cues, the preceding linguistic environment, or other prosodic elements. In her investigation of Chinese native speakers learning L2 French, Shen (1990) made similar observations: although the pitch patterns of the L2 French speakers did not always adhere to the expected French norms, NS French listener’s understanding was seldom affected.

METHODOLOGY

Data Collection

The participants of this study were three female speakers of L1 Chinese.¹ All were working as instructors in a beginning chemistry laboratory at a major American university. The participants were filmed as part of the regular course requirements in an ITA training program at the university between the fall of 2000 and spring of 2002. Formal English training ranged from 10 to 17 years for the participants; they had all spent less than half a year (0 to 5 months) in the United States before assuming their teaching assignments. In addition to the three L1 Chinese participants, three English NSs instructing the same beginning chemistry course were also filmed to serve as a control group and basis for intonational comparison.

Before assuming their teaching assignment, all future teaching assistants at this university who are non-native speakers of English must take the Test of Spoken English (TSE). Those who pass with a score between 45 and 50 out of a possible 60 may be assigned to an instructional position in either a classroom or laboratory but are additionally required by state law to participate in the ITA training program. Those with a score over 50 are not required to participate and generally do not, although this option is open to them. Individuals who score below 45 are not permitted to assume instructional

¹ When questioned concerning their dialect of Chinese, one participant claimed to have learned the Mandarin dialect at home and another the Shanghai dialect; the third stated “[I speak] no dialect. I speak standard Chinese.” Most likely, the third speaker uses some form of the Mandarin dialect, the one upon which the official language of China is based (thus, “standard Chinese”). However, for the purpose of evaluating L2 English intonation by speakers of an L1 tone language, the term “Chinese” should suffice.

duties. Therefore, the participants in this study all received a score between 45 and 50, placing them at what should be somewhat equal levels of L2 proficiency.

The video data used in this study were **not** collected for the sole purpose of this study. Instead, the data were released by the ITAs to the linguistics department at the end of their participation in the training course and stored for future research purposes. In this manner, the data presented here represent an infrequent addition to intonational studies: the participants had no knowledge that their speech would be used in a study. These participants were, in other words, not originally “participants” at all, but rather graduate students fulfilling course requirements. This is extremely natural and therefore preferable data (Wennerstrom 1998; Boxer 2002).

Observer’s Paradox is reduced to the greatest extent legally possible without deceptive methods, particularly as the respective semester progressed and the participants become accustomed to the presence of their language tutor in the classroom. Former and current participants in the ITA training program have agreed with this claim, remarking that their instructor’s presence becomes less intrusive—at least for themselves—with each subsequent video session. Although systematic observation as in this study is known to reduce the effects of Observer’s Paradox (Nunan 1996), Boxer (2002) cautions that no researcher can ever be certain Observer’s Paradox is truly overcome in an experiment’s design.

Nonetheless, the structural design of a chemistry laboratory is quite different from that of an ordinary classroom, and the presence of video equipment may be slightly more intrusive. For instance, whereas in a classroom the video equipment may generally be set up in an out-of-the-way back corner of the room, the chemistry lab is a large gymnasium-

sized room housing approximately six different sections of chemistry courses. Each section consists of a main lab station with raised podium for the course instructor and two aisles of student lab stations. The sides of each aisle contain four to five adjacent stations. The stations are not divided, and students are able to view the work and listen to the conversations of their peers. While some lab activities require pair work, others demand students work independently. Inevitably, however, with several chemistry lab sections housed in one room, background noise permeates the atmosphere with conversation, centrifuge equipment, active water and gas pipes, and clinking glass apparatus. In such an environment, locating an inconspicuous site for video equipment is a virtual impossibility.

ITAs in the training course are filmed on average bi-weekly, totaling approximately six taped sessions per semester. After each session, the ITA is encouraged to view the recording in preparation for a conference the following week with the course instructor. Conferences generally include an analysis of the ITA's overall teaching performance, tailored to the specific needs of each individual ITA. For example, while some ITAs may require special instruction in responding to questions, others may need assistance in organizing lecture material, using appropriate discourse markers, or applying a Socratic methodology.

Three main criteria regulated the selection of participants for this study: 1) all participants should be of the same sex in order to avoid possible variation², 2) all participants should be teaching the same course, 3) all participants should be native speakers of a tonal language (Chinese). Following these criteria, a total of four possible

² Shen (1990a) found influence from this factor to be minimal or random.

participants were found; the first three from semesters closest to the start of this study were chosen.

Transcripts were made from the first 20 minutes of three selected video-taped sessions for each of the participants. Since the time span between video shoots often varies for a variety of reasons, the first and last sessions that were closest to the beginning and end of the semester and the middle session that best represented a midpoint between the two were selected. For example, the first participant was filmed in the fall of 2000, with the first video session being filmed half-way through the second month of the semester. The subsequent sessions followed 42 and 62 days after the first. The second participant was filmed near the beginning of the second month of the spring semester in 2001. The subsequent video shoots used in this study followed 35 and 63 days after the first. The third participant was filmed at the end of the first month of the spring semester in 2002. The subsequent sessions followed 28 and 77 days after the first. Although these times are not equal, they are prime representatives of the participants' possible linguistic development during the semester of their participation in the ITA course.

The three NS participants were filmed only one time each for approximately thirty minutes. Since this group was intended to serve as a control and interlanguage development was not an issue, one video session was deemed sufficient. However, because of the single filming, Observers Paradox was likely more influential. Indeed, comments such as *And he can hear you!* (referring to the camera operator) and *For a research project . . . I volunteered* were noted on several occasions. Similar instances did occur in the ITA data, but were more limited both times. In one case, the ITAs' tutor assisted the ITA with attaching the microphone to her lapel at the start of the video

session; in the second case, the tutor mutters to the camera operator *I think we're in the way here*. In fact, more instances of the participants acknowledging the researcher and/or camera operator were noted for the three 20-minute NSTA video sessions than for the nine 20-minute ITA video sessions.

Data Analysis

Each video cassette was transferred to a digital format for transcription and data analysis. The first twenty minutes of each selected video session was then transcribed. Transcription was stopped at an interlude nearest 20 minutes for each session. Therefore, transcriptions range from 20.13 minutes to 21.10 minutes in total length. The transcription and data analysis processes were the same for both the ITAs and the NSs.

During transcription, particular attention was given to pauses as well as extralinguistic elements such as facial expression and gestures. These were potentially crucial to the identification of questions in the video sessions; intonation, often a factor in identifying *Y/N*-Questions (Geluykens 1987; Smith et al. 1992; Schiffrin 1994; Grant 2001), could not be used as a criterion because it was the focus of this study. Due to this dilemma inherent in the study itself, other criteria had to be applied. These included researcher intuition as well as a detailed analysis using an interactional sociolinguistic approach as described by Schiffrin (1994). To eliminate possible bias, three linguistics undergraduate students were trained in the basics of Schiffrin's approach and asked to evaluate the transcripts, identifying any and all *Y/N*-Questions.

Interactional Sociolinguistics (IS) comes from the work of John Gumperz and Irving Goffman out of the fields of anthropology and sociology, respectively. Central to their work is the belief that, despite shared grammatical knowledge of a language within a speech community, different messages may nevertheless be produced and understood.

Meaning is situated; in other words, the meaning of an utterance cannot be interpreted without an analysis of the conversation in which it is embedded because a current utterance creates a range of potential contexts for subsequent utterances. In this way, IS allows for variation within a *speech community*, any human collective having regular interaction and sharing verbal signs that distinguish it from similar collectives (Schiffrin 1994). The speech community for this study is a beginning chemistry laboratory and thus requires different interactional skills than would a composition class, for example, or a mathematics discussion section. “Discourse in an ordinary classroom or discussion section tends to be highly context embedded . . . [but] discourse in the lab is not actually as context embedded as it appears: Questions tend to be disconnected, interrupted and unpredictable rather than part of an extended dialogue in which context has been developed” (Myers 1994, 85-6). For an ITA, the laboratory presents challenging linguistic situations.

In her sample analysis demonstrating an approach based on Ethnography of Speaking, Schiffrin (1994) mentions: “Most scholars who study questions find them difficult to define, and they often note a number of criteria (syntactic, intonational, lexical, semantic, functional) by which to do so . . . the criteria themselves seem to fluctuate in importance: what seems important to recognition of a question in some instances is not important in others” (181). This observation also pertains to the IS approach applied in this study and exemplifies the necessity of triangulating the data with research assistants.

The undergraduate research assistants were instructed to identify potential *Y/N*-Questions based on syntactic and conversational cues. Syntactic cues were primarily

utterances with a verb in initial position, having the form of a question such as *Can you understand it?* or *Is it not over here?* Some utterances which were not syntactically complete were included if there was “an overt or directly recoverable predicate” (Ford and Thompson 1996, 143) and echo questions of three or more syllables such as *The stockroom?* were also included. Identifying *Y/N*-Questions with the syntactic form of a question was more straightforward than identifying *Y/N*-Questions with the syntactic form of a statement. Nonetheless, all utterances, regardless of their syntax, had to adhere to other criteria as well in order to be included in the final analysis.

The response of the questioner’s interlocutor was a principal cue as to whether or not an utterance was a question. Since the direct locutionary force of all questions is to elicit a response which may or may not be verbal (Schiffrin 1994), acceptable responses included non-verbals such as a head nod or the student writing in their lab manual after being asked to do so (i.e., *Can you write down?*). Modifications of *yes* and *no* answers such as *Yeah*, *Yes* or *M-hm* were also accepted. In addition, deviations from binary positive/negative responses indicating that an utterance was understood as a question (i.e., *We’re about to* or *I left it at home*) were considered acceptable. With such utterances, the research assistants were instructed to subject them to a simple test: could this utterance logically be answered with a simple *yes* or *no*? If so, the utterances were included in the analysis; others were discarded.

Several utterances elicited no response from the questioner’s interlocutor but were used in the analysis because the “situated meaning” (Schiffrin 1994) indicated that they were intended as questions. Indicators included the questioner offering wait time to her interlocutor, the questioner answering her own question, and repetition or restatement of

the original question. Tag questions (i.e., *did you, okay, and right*) and other potential questions less than three syllables in length were excluded from the analysis, as were utterances identified as requests. Despite the precautions taken to include exclusively *Y/N*-Questions in the evaluation of the data, utterances of differing illocutionary force (i.e., rhetorical questions and information-seeking questions) nonetheless entered the analysis. In many cases, the rhetorical status of an utterance is clear through the context, and cases of uncertainty could have been excluded from the data through triangulation. However, data triangulation through interviews would likely have forced the participants to guess at the reasons for their behavior since much of the video data for the ITAs was already over two years old when this study began. Therefore, no attempt was made to isolate rhetorical and information-seeking *Y/N*-Questions from one another, though these factors are discussed where applicable.

The findings of the research assistants and those of the researcher were then correlated. Only items independently recognized by three or more of the evaluators as *Y/N*-Questions were used in the final analysis. Since the bottom and top line of pitch measurements were made only in regard to each utterance itself, those with fewer than three syllables did not offer sufficient data for comparison. Considering all these criteria, a total number 208 *Y/N*-Questions were identified (139 *Y/N*-Questions from the 9 ITA video sessions and 69 *Y/N*-Questions from 3 NS TA video sessions).

Regardless of a question's function in the discourse, if its form demanded a *yes* or *no* answer, the question was included in the analysis even if the respondent(s) did not answer with such. As Schiffrin (1994) reminds us, "not all interrogatives actually seek information from a respondent" (150). For example, the question *Do you write down?*

occurs in the middle of an ITA's announcement to the entire class and therefore naturally goes unanswered, yet it was included because the question format requires a *yes* or no response. Utterances which generated an answer equivalent to a simple *yes* or *no* (i.e., *uh-huh* or a nod) were included in the analysis. However, several instances of *Y/N* Questions which elicited silence from the respondent were also included when the question was syntactically and/or discourse organizationally identifiable as such. Utterances which included instances of overlapping speech of more than a syllable were omitted from the data. Likewise, utterances which could not accurately be transcribed with confidence due to ITA pronunciation, volume, interference, or otherwise were not included in the analysis, even though intonation is generally "immune" to such disturbances (Botinis et al. 2001).

Pitch analyses were carried out using Kay Elemetrics' Computerized Speech Lab (CSL) model 4400. After preliminary speech samples consisting of continuous speech segments of 10-15 seconds from each speaker were evaluated, a scale of 0 to 350 Hz was determined sufficient for measuring intonation in this study. In most cases, ToBI transcriptions were added according to visual pitch assessments. The contours of longer utterances often appeared "crunched" together. Therefore, latter half of utterances longer than 2.0 seconds were edited and an additional pitch contour of the second half was generated in order to allow a clearer, more accurate analysis.

This study is primarily concerned with the end tones of utterances. *Y/N*-Questions typically demonstrate a rise on the "last stressed syllable of the final thought group" (Chun 1982; Smith et al. 1992, 99; Grant 2001). In ToBI transcription, a syntactic *Y/N*-Question is usually identified by a **L* H-H%** pitch contour. Although additional

combinations of pitch accents (**H***, **L+H***, etc.) are possible and potentially convey differing illocutionary forces, central to this study is the importance and consistency with which a final rise may or may not be applied by both native and non-native speakers. Thus, for the purposes of this study, both the high-rise, **H-H%**, and low-rise, **L-H%**, boundary tones were accepted. This methodology adheres to Schiffrin (1994) who does not distinguish between the two, and Wennerstrom (2001) who states that “rising intonation” may refer to either a low or high-rise.

Identifying “the last stressed syllable of the final thought group” posed perhaps the most complicated problem of potential inconsistencies for this study. Although these were easily identifiable in a majority of data represented (i.e., *Have I checked this before?* or *You guys doing okay?*), several utterances were ambiguous. For instance, the final stressed syllable in the utterance *Have you checked that shelf?* could be placed on either *that* or *shelf* depending upon its situated meaning in the interaction. Moreover, Juffs (1990) found in an oral reading task performed by Chinese speakers of English that most errors were associated with word stress placement. This finding adds another complicating factor to stress identification in the NNS data. Namely, if the speaker has applied word stress in a manner deviating from NS norms, how should the “last stressed syllable” be accurately identified? Two options exist for resolving this dilemma: (a) use Interactional Sociolinguistics (IS) as discussed earlier to identify stressed syllables as they would be expected in NS-NS interaction, or (b) identify the last stressed syllable of the final thought group through phonological analysis. The former, option (a), was used because of time constraints and, as mentioned previously, this study is primarily concerned with the boundary tones of utterances, which display a rise (**L-H%** or **H-H%**)

or fall (**L-L%** or **H-L%**) regardless of the pitch accent associated with them. Thus, it was assumed that items were stressed where syntactically and contextually appropriate.

RESULTS

Previous intonation studies involving native speakers have found that some individuals performed according to predicted norms (Chun 1982; Wennerstrom 1998; Pickering and Wiltshire 2000) while others did not perform as theoretically expected (Geluykens 1989). Because of such discrepancies, a logical starting point for this study would be an analysis of NS performance. In this analysis, the three native speaker participants are referred to as NSTA-A, NSTA-C, and NSTA-L, based on the first initial of their names; similarly, the non-native speaker participants, all of whom are ITAs, are referred to as ITA-HF, ITA-JW, and ITA-YY.

Table 3-1. Final boundary tones observed for NS data

NSTA-A		NSTA-C		NSTA-L	
Boundary Tone	# of Qs	Boundary Tone	# of Qs	Boundary Tone	# of Qs
L-L%	1	L-L%	8	L-L%	1
L-H%	0	L-H%	1	L-H%	3
H-H%	4	H-H%	26	H-H%	6
H-L%	2	H-L%	10	H-L%	7
Total:	7	Total:	45	Total:	17
Rising intonation	4/7	Rising intonation	27/45	Rising intonation	9/17
%	57%	%	60%	%	53%

Of the 69 *Y/N*-Questions identified for the NSs, only 40 questions displayed a final rise of either **H-H%** or **L-H%** (Table 3-1), resulting in a combined mean of 58% questions with a final rise. NSTA-A had 4 of 7 questions with a final rise (57%), NSTA-C had 27 of 45 questions with a final rise (60%), and NSTA-L had 9 of 17 questions with a final rise (52%). Though the mean of *Y/N*-Questions ending with rising intonation here

is larger than the 33% found by Geluykens (1987) from a corpus of 60 utterances, this number is still merely 8% over half. No misunderstandings between the speaker and hearer were observed for the segments involving NSTA *Y/N*-Questions. Thus, although a small majority of *Y/N*-Questions identified for the NSs do conclude with a final rise, this phonological cue cannot be the only one utilized by the speaker or hearer when identifying an utterance as a question. Such an observation is not new, yet important because the present study is one of the few utilizing naturalistic data to arrive at this conclusion (Geluykens 1987; Wennerstrom 2001; Chun 2002).

As with the NSs, the total number of *Y/N*-Questions found for each ITA participant varied between them as well as between each of their consecutive video sessions. For ITA-HF, a total of 36 *Y/N*-Questions were identified, with 8 questions in video session #1, 9 questions in session #2, and 19 questions in session #3. ITA-JW had a total of 49 *Y/N*-Questions, with 16, 18, and 14 questions in each respective video session; ITA-YY had a total of 55 *Y/N*-Questions, with 28, 7, and 20 questions in each respective session. Because of variation in the number of questions identified for each ITA, values were converted to percentages. Results are displayed in Tables 3-2 – 3-4.

Table 3-2: Final boundary tones observed for ITA-HF data

Boundary Tone	Video 1 # of Qs	Video 2 # of Qs	Video 3 # of Qs	Total
L-L%	1	1	7	9
L-H%	1	1	1	3
H-H%	3	4	6	13
H-L%	3	3	5	11
			Total:	38
Rising intonation	4/8	5/9	7/19	16/36
%	50%	56%	37%	44%
	<i>sd = 9.7%</i>			

Table 3-3: Final boundary tones observed for ITA-JW data

Boundary Tone	Video 1 # of Qs	Video 2 # of Qs	Video 3 # of Qs	Total
L-L%	2	5	2	9
L-H%	0	0	0	0
H-H%	10	11	8	29
H-L%	4	2	4	10
			Total:	51
Rising intonation	10/16	11/18	8/14	29/49
%	63%	61%	57%	59%
	sd = 3.1%			

Table 3-4: Final boundary tones observed for ITA-YY data

Boundary Tone	Video 1 # of Qs	Video 2 # of Qs	Video 3 # of Qs	Total
L-L%	6	1	3	10
L-H%	3	0	0	3
H-H%	10	3	14	27
H-L%	9	3	3	15
			Total:	55
Rising intonation	13/28	3/7	14/20	30/55
%	46%	43%	70%	55%
	sd = 14.7%			

Comparing the results of final rises for the ITAs to the mean of 58% for the three NSs, we see that there is little overall difference between them. For instance, in the first two video sessions ITA-HF differed by no more than 8% compared to the NS mean, with 50% and 56% of her questions displaying a final rise. The mean for ITA-HF's third video session differed more, with only 37% of her questions displaying a final rise. The combined mean for all three sessions was 44%, a difference of slightly more than 10% compared to the NSs. Data show that the final mean values for the remaining ITAs differed even less from the NSs, with a mean of 59% for ITA-JW and a mean of 55% for ITA-YY. These values represent differences of only 1% and 3% from the NS average.

When these observations of final rises are combined with the six pitch accents found in the data (Table 3-5), the Pearson correlations are strong ($r > 0.82$). This suggests that the mean value relationships between the NS and ITA data are relatively reliable, indicating once again that speakers and listeners understand the question status of an utterance from cues other than intonation alone. Unlike in the NS data, however, some misunderstandings between speaker and hearer did occur in the transcript segments involving *Y/N*-Questions in the ITA sessions. These instances will be evaluated in more detail later in this section. For now, let us first take a brief look at the role of syntax.

Table 3-5 Percent of *Y/N*-Questions with Rising Intonation¹

Pitch Accent	Boundary Tone	NSTAs	ITAs Video 1	ITAs Video 2	ITAs Video 3
L*	H-H%	20%	10%	6%	2%
L*	L-H%	2%	2%	00%	2%
(!H*	H-H%	30%	25%	46%	49%
(!H*	L-H%	2%	5%	3%	00%
L+H*	H-H%	00%	5%	00%	00%
L*+H	H-H%	1%	00%	3%	2%
H+!H*	H-H%	00%	2%	00%	00%
	r =		0.932154	0.86539	0.822396

Table 3-6 shows the relationship between the syntactic form of the NS utterances and the rising boundary tones (**L-H%** and **H-H%**). The gray shaded row represents the number of utterances with a rising boundary tone (N=40) and their percentage in regard to the total number of *Y/N*-Questions for the NSs (N=69). We see that the percentage of utterances with a final rise in each category is 1% (N=1) for those with the syntactic form of a statement, 51% (N=35) for those with the syntactic form of a question, and 6% (N=4) for those with no predicate or which were echoic in nature (“Other”). The next row down represents the percent of rising boundaries from the percent totals for each

¹ Pitch accents **H*** and its downstepped counterpart **!H*** have been combined into **(!H*** since their distinction would serve little value to this study.

utterance type. In other words, only 9% of the 69 *Y/N*-Questions identified for all NSs had the syntactic form of a statement. The checker-shaded row shows us that 1% of these had a rising boundary. In the same manner, 51% of the *Y/N*-Questions with the syntactic form of a question had rising boundaries; of the 6 echoic *Y/N*-Questions, they represent 6% of the total with a rising boundary. It should be noted that the Pearson correlation value for the syntactic statements compared to the total is rather weak ($r = 0.255452$). For the syntactic questions and echoic utterances, however, the Pearson correlation values are strong with $r = 0.988049$ and $r = 0.980465$ respectively. The percent of syntactic questions with rising boundaries (51%) and of echoic utterances with rising boundaries (6%) are quite dissimilar. Although it would therefore seem that for NS data syntax plays a major role in determining the intonational contour of an utterance, the disparities in the amount of data for each category do not allow for true comparisons to be made. The role of syntax remains indeterminate.

Table 3-6 Relationship between NSTA utterance syntax and rising boundary tones

Boundary Tone	Statement	Question	Other	Total:
L-L%	N=1 1%	N=9 13%	N=0 00%	N=10 15%
L-H%	N=0 00%	N=4 6%	N=0 00%	N=4 6%
H-H%	N=1 1%	N=31 45%	N=4 6%	N=36 53%
H-L%	N=4 6%	N=13 19%	N=2 3%	N=19 28%
r =	0.255452	0.988049	0.980465	
Rising Boundary:	N=1 1%	N=35 51%	N=4 6%	N=40 58%
Total:	N=6 9%	N=57 83%	N=6 9%	N=69 100%
% of RB in total:	1%	51%	6%	

Analyzing the relationship between intonation and syntax for the ITAs, the results more similar (Table 3-7). The probability that a *Y/N*-Question with the syntax of a statement will have rising intonation is 17%; the probability that a *Y/N*-Question with the syntax of a question will have rising intonation is 31%; the probability that *Y/N*-Questions of other utterance types will have rising intonation is 6%. Yet despite these observations, the fact that 17% of the syntactic statements exhibit a final rising boundary is of little assistance in determining the status of an utterance because, as with the NSTA data, the data here include only those statements identified as *Y/N*-Questions by the research team and do not take the remainder of the three hours video data into account, most of which could be syntactically identified as statements. Moreover, the discrepancies in the percentages of syntactic statements with rising boundaries between the two groups could become more similar if additional data were to be collected for the NSTAs, who currently have only 1/3 the video data compared to the ITAs. For both

Table 3-7: Relationship between ITA utterance syntax and rising boundary tones

Boundary Tone	Statement	Question	Other	Total:
L-L%	N=10 7%	N=13 9%	N=5 3%	N=28 19%
L-H%	N=2 2%	N=4 3%	N=0 00%	N=6 4%
H-H%	N=21 14%	N=39 28%	N=9 6%	N=69 50%
H-L%	N=4 3%	N=28 19%	N=6 4%	N=38 26%
r =	0.89557428	0.97301799	0.96181615	
Rising Boundary:	N=23 16%	N=43 31%	N=9 6%	N=75 54%
Total:	N=37 26%	N=82 59%	N=20 14%	N=139 100%
% of RB in total:	17%	31%	6%	

the NSTA and ITA data, a higher percentage of syntactic questions with rising boundaries would have presented results more in concordance with modern English text and grammar books (Smith et al. 1992; Celce-Murcia and Larsen-Freeman 1999; Grant 2001), yet this was not the case.

Indeed, neither the NS nor the ITA data demonstrated that *Y/N*-Questions could be reliably identified by intonation alone. Recall that only 58% of the NS data and 54% (combined mean) of the ITA data displayed an utterance-final rise. Syntax could not be determined a significant factor in deciding intonation, particularly for the NSs. The lexical items found in the utterance-final position seemed to have little influence over the intonation contour utilized by the speaker. That is, the number of syllables and voicing characteristics of the final syllable exerted little influence over the intonational contour realized by the speakers. In order to confirm this assertion, let us take a look at a few minimal pair utterances.

Table 3-8: NSTA-C Minimal pair utterances (*okay*)

	Pitch Contour	Utterance
1.	L* H-H%	Ya'll doing okay?
2.	L* H-H%	Jeanie, you doing okay?
3.	H* L-L%	You doing okay?
4.	L+H* H-L%	You guys doing okay?
5.	L* H-H%	You guys doing okay?
6.	H* H-H%	Kristin, ya'll doing okay?
7.	H* H-H%	Y'doing okay?
8.	L* H-L%	Thomas, ya doing okay?
9.	H* H-H%	Genevieve, ya'll doing okay?
10.	H* H-L%	Keith, ya'll doing okay?
11.	H* L-L%	Christine, ya doing okay?
12.	H* H-H%	Ya'll doing okay?
13.	L* H-H%	Ya doing okay?
14.	L* H-H%	Andrew, ya'll doing okay?

NSTA-A had only 7 *Y/N*-Questions and no minimal pairs. The data for NSTA-C and NSTA-L, on the other hand, yielded four minimal data sets (utterances of identical or

similar form) each. Beginning with NSTA-C, the first set of minimal pairs involved the lexical item *okay* in the utterance-final position. As seen in Table 3-8, 9 of the 14 occurrences displayed a final rise (**H-H%** or **L-H%**), whereas 5 of the 14 utterances displayed plateau or falling contour (**H-L%** or **L-L%**). Items (9), (10), and (11) exemplify most succinctly the variation in utterance-final pitch, where each displays a different boundary tone, **H-H%**, **H-L%**, and **L-L%** respectively. Although these examples all carry a **H*** pitch accent, variation occurs in this regard as well in item (14), which has a **H-H%** boundary tone but a **L*** pitch accent. The illocutionary force is essentially the same for all utterances in this data set—issued by a highly active TA monitoring the progress of her students—yet they differ in that items (1), (5), (12), and (13) appear to have been rhetorical in nature because the TA asks the question and then immediately proceeds to ask another question without waiting for a response. (See transcripts 3-1 to 3-4 below).

Transcript 3-1: NSTA-C (3-8 (1)) *Ya'll doing okay?* L* H-H%

1 [TA leaves, goes to main lab station
where Students 2 and 3 waiting]
TA: Ya'll doing okay?
You all aren't copying my answers,
5 are you?
6 Student 2: (3) Can I write these down?

Transcript 3-2: NSTA-C (3-8 (5)) *You guys doing okay?* L* H-H%

1 [TA leaves, goes to Students 11 and 12 at adjacent
lab station]
TA: You guys doing okay?
(1) Gavin, you all good?
5 Student 12: I think so.
6 TA: Good.

Transcript 3-3 NSTA-C (3-8 (12)) *Ya'll doing okay?* H* H-H%

- 1 [TA turns to Student 14, standing at her lab station]
 TA: [to Student 14] Ya'll doing okay?
 Ya'll got the next one?
 4 Student 14: So, this is H3O-plus

Transcript 3-4 NSTA-C (3-8 (13)) *Jamie, you doing okay?* L* H-H%

- 1 [TA moves to Student 17 at adjacent lab station]
 TA: Jamie, you doing okay?
 You need an okay?
 4 Student 17: Um, . . .

A brief glance at the rhetorical utterances in these transcript excerpts seems to reveal a positive trend that can be related to their illocutionary force: they all display a high-rising (**H-H%**) boundary tone. However, by comparing these four utterances to others in Table 3-8, we see that illocutionary force is not a factor. For instance, although the rhetorical items (1), (5), and (13) share a **L* H-H%** pitch pattern, non-rhetorical items (2) and (14) also share this pattern. The same holds true for rhetorical utterance (12), which shares pitch patterns with utterances (6), (7), and (9).

Similar variation of utterance-final intonation is evident in Table 3-9. These examples correspond in that they adhere to the pattern of a stressed syllable followed by the lexical item *it*, or σ *it*, and items (1) through (3) correspond highly in form and in illocutionary force. In this set, two utterances display a **H* L-L%** intonational pattern and two display a **H* H-L%** intonational pattern. Nonetheless, they correspond insofar that they have a **H*** pitch accent on the stressed syllable and ultimately conclude with a plateau or falling boundary tone. All of the *Y/N*-Questions in Table 3-9 receive an answer from the TA's interlocutors.

Table 3-9 NSTA-C Minimal pair utterances (*σ it*)

	Pitch Contour	Utterance
1.	H* L-L%	D'ya'll check it?
2.	H* H-L%	Ya'll checked it?
3.	H* H-L%	Did you check it?
4.	H* L-L%	Did you get it?

Of the data in Table 3-9, none conclude in a rising boundary tone. The data here and in Table 3-8 differ in both number of syllables under analysis and voicing characteristics. While the data in Table 3-8 find the pitch accent and boundary tone on the final syllable of the utterance, the data in Table 3-9 find the pitch accent on the penultimate syllable followed by the boundary tone on a voiceless-ending syllable. However, the data are similar in that they demonstrate variation within minimal data sets of relatively equal illocutionary force.

Yet not all minimal pair utterances from NSTA-C vary. For example, the pair in Table 3-10 correspond exactly in both pitch accent and boundary tones. The minimal pair sets in Table 3-11 also correspond, all ending in an utterance-final rise reaching to the upper-half of the speaker's pitch range. Variation, however, may be noted between the **H*** and **L*** pitch accents.

Table 3-10. NSTA-C Minimal pair utterances (*got it*)

	Pitch Contour	Utterance
1.	H* H-L%	Ya got it?
2.	H* H-L%	You guys got it?

The illocutionary force of the utterances in Table 3-11 differ slightly, yet their boundary tones are nonetheless the same. Item (1), for example, was spoken at a high volume as an announcement to the class. No one directly answers this question, though a student nearby immediately beckons the TA for assistance. Item (2), which displays the

Table 3-11 NSTA-C Minimal pair utterances (...”OK”)

	Pitch Contour	Utterance	
1.	H* H-H%	Is anybody ready for that first	“OK”?
2.	H* H-H%	Are you ready for your	“OK”?
3.	L* H-H%	Do you need an	“OK”?
4.	L* H-H%	You need an	“OK”?
5.	L* H-H%	Jenny, you ready for that first	“OK”?

same intonational pattern as (1), is used rhetorically by the TA, as evident through the fact that she does not wait for a response, but instead proceeds without delay to ask another question (see Transcript 3-5 below). Items (3) - (5) all seem to carry a similar

Transcript 3-5: NSTA-C (3-11 (2)) *Are you ready for your “OK”?* H* H-H%

- 1 Student 6: [unclear]
 TA: L Are you ready for your “OK”?
 Ya’ll check the other stuff?
 Student 6: Yeah, we checked the other stuff.
 5 TA: Okay.

illocutionary force, as well as similar intonational patterns: **L* H-H%**. As with the rhetorical utterances in Table 3-8 (Transcripts 3-1 – 3-4, above), this may initially be interpretable as support for the influence of illocutionary force on the intonation of an utterance. However, the variation for items of similar illocutionary force in Table 3-8 still exists, as does variation in items of similar illocutionary for NSTA-L, as discussed for Table 3-12 (below).

The minimal pair data for NSTA-L was more limited, and they corresponded little in their pitch contours. The minimal pair utterances for this TA are compiled in Table 3-12. In each set of pairs, one utterance demonstrates a high-rising boundary (**H-H%**) and one displays a falling or plateau boundary (**L-L%** or **H-L%**). The exact minimal pair utterances (3) and (4) correspond with a downstepped pitch accent (**!H***), but differ slightly in their illocutionary force. Whereas (3) is uttered at the beginning of NSTA-L’s interaction with a student, (4) is the last item spoken by NSTA-L before taking leave

Table 3-12 NSTA-L Minimal pair utterances (various)

	Pitch Contour	Utterance
1.	L* L-H%	Were you at the doctor and stuff ?
2.	H* H-L%	You get morning sickness n stuff ?
3.	!H* H-H%	You alright ?
4.	!H* H-L%	You alright ?
5.	H* L-L%	Does that make sense ?
6.	H* H-H%	Does that make sense ?
7.	H* H-L%	Do you know where the [george] sulfate is?
8.	H* H-H%	D'ya know what chloride is?

from a student and returning to the main lab station. Like (3) and (4), exact minimal pair utterances (5) and (6) correspond in their pitch accent (**H***). However, contrary to (3) and (4), this set of pairs has a similar illocutionary force—that of checking a student's comprehension when explaining chemical processes.

These NS minimal pair data sets serve as additional evidence that the syntactic status of an utterance as a statement, question, or echoic response is not a reliable predictor of its intonational contour. The exact minimal pair sets from the two NSs exhibit some correspondence, yet not enough to forecast their intonational contour through either illocutionary force or syntax. In one instance illocutionary force may play a role (examples (3) and (4)), yet in another instance the intonation contours of the exact minimal pairs (examples (5) and (6)) differ even though the illocutionary force is the same. A similar lack of predictability based on syntax is observable in the 19 minimal pair utterances of the ITA data. Let us consider a few examples.

In Table 3-13, for instance, 3 of the 5 utterances correspond exactly with a **H* L-L%** pitch contour ((1), (4), and (5)), and a fourth occurrence of same utterance, (3), is similar in that it demonstrates a high pitch accent followed by a falling, or in this

Table 3-13: ITA-HF Minimal pair utterances (... *what I'm saying?*)

	Pitch Contour	Utterance
1.	H* L-L%	Do you know what I'm saying?
2.	H* H-H%	Do you know what I'm saying?
3.	!H* H-L%	Do you understand what I'm saying?
4.	H* L-L%	Do you know what I'm saying?
5.	H* L-L%	Do you know what I'm saying?

case a plateau/falling, boundary tone (**!H* H-L%**). However, in one example, (2), the high pitch accent is followed by a high-rising boundary tone: **H* H-H%**. Moreover, this instance differs in its apparent illocutionary force (see Transcripts 3-6 - 3-10, below). After speaking utterance (1), the ITA provides the student with 5 seconds of wait time before proceeding to ask another question concerning the chemical processes they are discussing. Utterances (3), (4), and (5) all receive an immediate response from the ITA's interlocutor such as *Yeah* or *Right*. The high-rising utterance, (2), on the other hand, is spoken near the end of a lengthy pre-lab presentation to the class and seems to serve more as a rhetorical discourse marker rather than an actual question. The ITA does not wait for a response from any of her interlocutors, but rather continues speaking and immediately proceeds to rephrase her previous explanation of the material.

Transcript 3-6: (3-13 (1)) *Do you know what I'm saying?* H* L-L%

- 1 ITA: When you add acid,
your pH will h- be change.
Yes?
So, you better to check it again here.
- 5 You know what I'm saying?
(5) Um, I mean, you add drops of HO₂, right?
- Student 3: Yeah.
- 8 ITA: And . . . you test to find the pH.

Transcript 3-7: (3-13 (2)) *Do you know what I'm saying?* H* H-H%

- 1 ITA: So, when you use this solution,
t-, to test the kinide,
you should add more //six// than ammonium.
Do you know what I'm saying?
- 5 First, neutralize this acid.
- 6 Then, you canno-, you can got precipitate.

Transcript 3-8: (3-13 (3)) *You understand what I'm saying?* !H* H-L%

- 1 ITA: It's different.
It's kinide test.
Student 3: Okay.
ITA: You understand ... what I'm saying?
5 Student 3: [Yea.
ITA: [looking at paper]
7 So, it's . . .

Transcript 3-9: (3-13 (4)) *Do you know what I'm saying?* H* L-L%

- 1 ITA: But you don't know
whether you have copper.
Student 5: Okay.
ITA: [Do you know what I'm saying?→
5 Student 5: Right.
ITA: → Because calcium can cover potassium.
7 Student 5: Yeah?

Transcript 3-10: (3-13 (5)) *Do you know what I'm saying?* H* L-L%

- 1 ITA: you then add the mole.
To prece-, precede all the . . .
You know what I'm saying?
Student 5: [Yeah.
5 ITA: [reading again]

Thus, illocutionary force may be a possible explanation for at least part of the variation observed here, with intonation serving to distinguish between rhetorical and information seeking questions.

Yet while illocutionary force may seem to be a viable cause for explaining the examples in Table 3-13, it is still unable to explain all instances of variation in the minimal data sets. If we consider a set of data from ITA-JW (Table 3-14), we will notice that utterances (1), (2), and (4) have a **H* L-L%** contour, or low-falling pattern; (5) likewise exhibits a fall with a plateau/falling boundary (**H* H-L%**). Unlike the other examples in this set, (3) has a high-rising boundary tone. Yet if the data in this set were to be categorized according to illocutionary force, (3), (4) and (5) would be grouped

together—all are used by the ITA to check her interlocutors’ comprehension, and they elicit an unhesitated response. The illocutionary force of utterances (1) and (2) is somewhat different. These questions are used by the ITA to initiate an interaction with a student while proctoring the laboratory. So, at least for the examples in Table 3-14, it seems that illocutionary force does not necessarily correspond to the ITA’s applied intonational pattern: those which correspond per illocutionary force—(3), (4), and (5)—do not correspond in their intonational contours, while those with differing illocutionary forces do.

Table 3-14: ITA-JW Minimal pair utterances (... *question(s)?*)

	Pitch Contour	Utterance
1.	H* L-L%	Steve, you have a question?
2.	H* L-L%	Any questions?
3.	H* H-H%	Any other questions?
4.	H* L-L%	Any questions?
5.	H* H-L%	Any questions?

This lack of concordance between intonation, illocutionary force, and syntax may be observed in numerous other examples of the minimal data sets. Perhaps the most notable observation to be gained regarding intonation and illocutionary force is that all items considered “rhetorical” display a high-rising (**H-H%**) boundary, yet such utterances are few and therefore of questionable value. A detailed analysis of every minimal data set would be repetitious, revealing little new information, and hence not fruitful to this discussion; the minimal sets are compiled in the Appendix. Moreover, it should be noted that the data in the Appendix also include transcript numbers and time indices for each utterance. These were removed from Tables 3-1 – 3-14 of this section for clarity. The indices, however, provide some important insight, particularly for ITA-HF and ITA-JW, and should not be overlooked. The transcript numbers and time indices for several data sets show that not all utterances occurred during the same video session.

Each of the three video sessions for ITA-HF supplied at least one utterance to the data in Table 3-13. Although there is a difference of approximately three months between video session 1 and video session 3, the same low-falling boundary (**L-L%**) may be found in utterances from each session. The utterance from the second video session, which took place circa one month between the two, has the “standard” high-rising boundary (**H-H%**) of English *Y/N*-Questions as defined by most literature (Pierrehumbert and Hirschberg 1990; Smith et al. 1992; Grant 2001; Wennerstrom 2001; Chun 2002). Thus, despite the seeming approach toward more “native-like” intonation for *Y/N*-Questions from video session 1 to video session 2, the ITA applies plateau/falling and low boundary tones again in the third video session. Such observations, nonetheless, may be irrelevant because NSs themselves, as established at the beginning of this section, do not appear to consistently apply a high-rising boundary to their *Y/N*-Questions.

In the three hours of ITA video data numerous instances of misunderstanding or miscommunication surfaced, though few of these were related to *Y/N*-Questions, the object of this study. The primary instances of misunderstanding demonstrate the influence of *indirect (or implicit) negative evidence* from an interlocutor on the ITA’s use of intonation. “Negative evidence refers to the information about what is incorrect in the language produced by a learner and what is needed to make a correction to align the learner’s language with the target language” (Gass 2002, 170-71). The transcript data from ITA-YY reveal three instances of negative evidence having a positive influence on the NNS’s use of discourse intonation. Let us first consider Table 3-15 and the data in Transcripts 3-11 – 3-12 (below). In this set, (1) was uttered with a low-falling boundary tone, typically indicative of a statement (Pierrehumbert and Hirschberg 1990; Smith et al.

1992; Schiffrin 1994; Brazil 1997; Grant 2001; Wennerstrom 2001; Chun 2002). After a brief wait time of circa 1.5 seconds and no response from her interlocutor,

Table 3-15: ITA-YY Minimal pair utterances (*You can't find it?*)

	Pitch Contour	Utterance
1.	!H* L-L%	You can't find it?
2.	H* H-H%	You mean, you can't find it?
3.	H* L-L%	You can't find it?

the ITA restated the same utterance, (2), this time applying a high-rising boundary. The student responded with *Yeah* to this second inquiry, and both interlocutors subsequently proceed to search for the missing chemical. It seems likely that the student did not answer the ITA's first question either because she did not hear it or because she did not identify it as such—the match between syntax (that of a statement) and intonation (that of a statement) signaled to the student that no response was necessary. Several minutes later, the ITA repeated the utterance, (3), to another student with problems similar to the previous student's. The pitch contour of this utterance more closely resembles the contour of the misunderstood utterance, (1), than its high-rising counterpart, (2). Nonetheless, (3) received a response from the ITA's interlocutor while (1) did not. In this case, the syntactical/phonological mismatch does not seem to have yielded misunderstandings.

Transcript 3-11 (3-15 (1)) ... *can't find it?* !H* L-L%

(3-15 (2)) ... *can't find it?* H* H-H%

- 1 ITA: Sodium acid.
It should be in this lab.
- Student 1: [inaudible]
- ITA: Yo-, you can't find it?
- 5 (1)You mean, you can't find it?
[Student 1 and ITA walk to lab station]
- 7 Student 1: Yeah . . .

- Transcript 3-12 (3-15 (3)) ... *can't find it?* H* L-L%
- 1 ITA: You need, you needn't, you needn't-
 Student 4: [inaudible] . . . the first one. Right?
 ITA: Yeah. It should be your solution.
 Student 3: Yeah.
- 5 ITA: You needn't two from here.
 Student X: [inaudible]
 ITA: You can't find it?
 Student 4: Mm-mm.
- 9 ITA: [looking for chemical] Sodium acetate . . .

Another example of negative evidence resulting from intonational/phonological mismatches having a positive influence on the ITA may be found in Table 3-16 and Transcript 3-13. Similar to the previous example, the ITA restates the question after a wait time of several seconds. In (1) the ITA applies a plateau/falling boundary; in (2), she applies a low-rising boundary. Although neither adheres to the strictest definition given

Table 3-16 ITA-YY Minimal pair utterances (... *use water?*)

	Pitch Contour	Utterance
1.	H* H-L%	You wanna use water?
2.	H* L-H%	You will use water?

to English *Y/N*-Question intonation—most of which generally imply a high-rising boundary on *Y/N*-Questions—(2) nonetheless exhibits a final rise and did in fact receive a response from the ITA's interlocutor. This coincides with assertions put forth in earlier studies that either type of rising intonation (**L-H%** or **H-H%**) may be considered sufficient, regardless of the height or level to which it may extend within a speaker's pitch range (Geluykens 1987; Hobbs 1990; Ladd 1996; Wennerstrom 2001; Chun 2002; Fox 2002).

Transcript 3-13 (3-16 (1)) *You wanna use water?* H* H-L%
 (3-16 (2)) *You will use water?* H* L-H%

- 1 Student 3: then point-5 of . . .
 ITA: [You will use water?
 (5) You will use water?
- 4 Student 3: No.

The data in Table 3-17 and Transcript 3-14 demonstrate a similar occurrence of ITA-YY changing misunderstood falling intonation upon repetition—however, only slightly. In this case, the pitch accent changes from **!H*** to **L***, the pitch accent traditionally associated with *Y/N*-Questions (Pierrehumbert and Hirschberg 1990; Wennerstrom 2001; Chun 2002). Upon repetition, the boundary tone changes little—the

Table 3-17: ITA-YY Minimal pair utterances (... *later?*)

	Pitch Contour	Utterance
1.	!H* H-L%	You will do this later?
2.	L* H-L%	Y-, you will d-, do this part later?

repeated utterance maintains the level/low-falling boundary (**H-L%**) seen in (1).

Nonetheless, the student apparently understands and responds to the restated *Y/N*-Question. In addition, the restated utterance, (2), demonstrates stuttering on the part of the ITA. Despite her stuttering, the ITA's interlocutor understood the utterance and offered a response.

Transcript 3-14 (3-17 (1)) *You will do this later?* !H* H-L%
 (3-14 (2)) Y-, you will d-, do this part later? L* H-L%

1 ITA: Have you done this?
 Student 5: No.
 ITA: Oh. Okay.
 You will do this later?

5 Student 5: What?
 ITA: Y-, you will d-, do this part later?

8 Student 5: Right. [inaudible]

Having analyzed the minimal data sets for both the NSs and the ITAs, this study uncovered little congruence between intonation, syntax, and/or illocutionary force of the utterances. For both the NS and ITA data, a large percentage of utterances with the syntax of a question did display final rising intonation (51% and 31% respectively), yet with almost 50% of the syntactic questions for the NSs having no final intonational rise and almost 70% for the ITAs, this amount is not reliable in predicting the intonation of an

utterance based on syntax and contradicts many ESL instructional materials. Although illocutionary force may explain variation in utterance final intonation for the data in Table 3-13, it fails to account for variation in the other data sets. The absence of utterance final rises did not seem to hinder the understanding the NSs' interlocutors, but some miscommunication did arise between the ITAs and their interlocutors when there was a mismatch between intonation and illocutionary force, which resulted in rare cases of implicit negative evidence having a positive effect upon a learner's speech production.

DISCUSSION

This study of ITA *Y/N*-Question intonation considered the following research question: to what extent is intonation pertinent within the context of an academic research laboratory? In addition, the nature of this study also allowed for a secondary investigation into how intonational measurements of a specific speech act such as asking questions may be used as a tool in measuring a speaker's interlanguage development? The first question relates to how intonation may or may not be relevant within the framework of academic discourse, particularly that of a beginning chemistry laboratory. The second area of interest arose primarily from the nature of the study itself, which encompassed a three month period and was thereby suited to an investigation of interlanguage intonational development.

Beginning with the secondary objective concerning whether or not intonation may be used as a tool for measuring interlanguage development, the findings of this study indicate that intonation, at least for *Y/N*-Questions, may not be a reliable measurement. First of all, only 58% of the utterances identified as *Y/N*-Questions for the three NS participants of this study (Table 3-6) displayed a rising utterance-final boundary. This finding is at odds with discussions on intonation by many modern text books for learners of English (Smith et al. 1992; Grant 2001; Chun 2002), as well as at odds with standards applied in other reference studies and materials for prosody (Pierrehumbert and Hirschberg 1990; Celce-Murcia and Larsen-Freeman 1999; Wennerstrom 2001; Chun 2002). On the other hand, however, this finding corroborates the results of Geluykens'

(1987) research, who found that rising intonation was not the only means by which listeners identify an utterance as a *Y/N*-Question. Geluykens ultimately concluded that “there is no simple correlation between question-form and rising pitch” (1989, 572). Wennerstrom summarizes Geluykens’ findings as follows: “intonation, though certainly one cue to speaker intention, was not always given priority in the interpretation of direct versus indirect illocutionary force ... pragmatic factors can override the intonational cues in the interpretation of speech acts” (2001, 149).

Although on occasion Geluykens’ findings have been acknowledged by other researchers, their potential impact have largely been ignored, and additional studies regarding the relationship between intonation, illocutionary force, and pragmatics are virtually non-existent. Filling some of these gaps, the present study strengthens Geluykens’ observation that intonation alone is not the only basis used by listeners in identifying questions. In numerous examples for the NSs (Tables 3-8 - 3-12), we saw how minimal data sets of utterances with similar illocutionary force displayed differing intonational contours. In other words, despite the similarity in illocutionary force of the utterances, some had a final rising boundary while others had a flat or falling boundary, yet the utterances were nonetheless understood as questions to be answered by the speakers’ interlocutors. Not all questions seek information from the respondent, but the fact that an answer was given supports that the utterances were understood as such.

For the utterances displaying a level or falling boundary, other factors besides intonation must have influenced the listeners to respond. Geluykens cites facial expressions and gestures as “obvious candidates,” as well as “the preceding linguistic context” and “other prosodic factors, such as pitch range, pauses, loudness and tempo”

(1987, 491). Unfortunately, the camera's view was often obstructed by the typical activity of the laboratory, and facial expressions and gestures were not consistently visible in the data. Other prosodic elements may have influenced the speakers' interlocutors to respond. A broad survey of the data indicates support for this possibility in that the NS participants seem to lengthen the final stressed syllable of the *Y/N*-Questions in a large portion of the utterances. This observation, primarily based on researcher intuition, is an area for future research regarding *Y/N*-Questions and corresponds to the findings of Srivasan and Massaro (2003), who found that questions had a longer final-syllable duration than statements. Thus, illocutionary force, as interpreted through the surrounding linguistic context, remains the most reliable source for additional analysis. We will return to this aspect shortly.

Considering the variation in *Y/N*-Question form and intonation contours for the NSs, using intonation as tool in measuring the interlanguage of NNSs is rendered unproductive. Wennerstrom (1998) cited *paratone*, the expansion and compression of pitch range at the beginning and end of discourse topics, as being the primary difference between native and non-native speech. The present study found that a mere 58% of NS *Y/N*-Questions ended with a rising boundary, compared to 53% for the ITAs. However, a refinement of the statistical analysis may be necessary because of differences in the number of questions identified for each group of participants—the NSTAs almost half as many *Y/N* Questions (N=69) compared to the ITAs (N=139) despite having only 1/3 the video data. Yet it is unlikely that such a refinement would result in statistically significant differences (cf. Geluykens 1989) for the final values since a rather high percentage of rising boundaries for the NSs (< 90%) would be necessary in order to offer a sufficient

basis of comparison. Thus, whereas certain elements of prosody such as paratone may lend themselves to interlanguage studies, the high variability of *Y/N*-Questions makes them unsuited for such research.

The near correspondence of rising boundaries from the total number of *Y/N*-Questions identified between the NSTAs (58%) and the ITAs (54%) could be interpreted as evidence of the ITAs having attained native-like proficiency for this prosodic function. This conclusion is unlikely, however, in light of the fact that the data from the NNS participants was collected as part of their regular course work in an ITA training program. As discussed at the beginning of this paper, ITAs who score 50 or above (out of a possible 60) are exempt from the ITA training course; those with a score between 45-50 are required by state law to participate in the training program. The validity of tests such as the TSE, SPEAK, or TOEFL as instruments for measuring ITA classroom performance is controversial, and most fail to include prosody as an essential component for evaluating proficiency (Hoekje and Williams 1992; Crookes and Davis 1993; Chun 2002). Nonetheless, despite any controversy, a score between 45-50 represents less than nativelike proficiency for spoken English.

In addition to their participation in an ITA training course, the misunderstandings observed between ITA-YY and her NS interlocutor serve as supplementary evidence of a non-NS level of proficiency. The data in Tables 3-16 and 3-17 demonstrate the ITA adjusting the intonation of her utterances after receiving implicit negative evidence from her interlocutor. The first utterance of these sets ends with a level or falling boundary tone; upon repeating the utterances, the ITA applies a rising boundary tone. In each case, the repeated utterance receives a response from the ITA's interlocutor while the first

utterance of the set does not. Comparable instances of miscommunication do not occur in the NSTA data, suggesting that the NSs utilized additional interactional and contextual cues to support the illocutionary force of their utterances while the ITAs did not. In other words, the ITAs had not achieved a NS-level of proficiency. It should be noted that although the miscommunication mentioned here occurred only with one ITA (ITA-YY), all ITAs had scored between 45-50 on the SPEAK, had studied English between 10-17 years before arriving in the United States, and none had been in the U.S. longer than 6 months before assuming their position as a chemistry instructor. A similar level of proficiency may thus be assumed for all three NNSs¹.

These observations of implicit negative evidence in naturally occurring NS-NNS conversation are unusual. They represent a form of negotiation whereby “NNSs modify their output in response to signals of incomprehension or miscommunication ... the NSs revealing the TL form-meaning relationships in the process” (Long 1996, 448). However, not all learners may be able to attend to such evidence. Davies and Tyler (1994) suggest that “learners are too busy thinking about what to say next and figuring out their interlocutor’s message” (204) to be able to concentrate on negative feedback. Furthermore, although the ITA-YY immediately adjusts her intonation to adhere to the illocutionary force of her utterance, the negative evidence she receives does not have a lasting effect on her use of intonation: several minutes after having adjusted her intonation, she repeats the same utterance with the identical falling boundary she had originally used—the same boundary which had been misunderstood only moments before. This corresponds to previous studies concerning negative evidence in L2, which

¹ ITA-YY, the ITA to whom the instances of miscommunication are attributed, had studied English for 15 years before arriving in the U.S. and began her teaching assignment immediately upon arrival.

have shown that negative evidence may have positive effects on a learner's production, albeit only temporary. Whether negative evidence can have permanent effects on L2 acquisition is questionable (Davies and Tyler 1994; Long 1996).

This flip-flop in ITA-YY's use of intonational prosody may also be the result of *fossilized variation* (Schachter 1996)—the production of errors and non errors in similar linguistic environments. It may also be attributed to the so-called *U-shaped development* of interlanguage, which likewise acknowledges the often instable accuracy with which NNSs produce an L2 (Nunan 1996). Unfortunately, the examples involved in this study are too limited for either option to confidently describe them, iterated by the fact that the NS participants demonstrated an almost equal amount of variation in their production of *Y/N*-Questions. Instances of miscommunication are the main difference between the NSTA and ITA data, suggesting that the NSs utilized cues other than prosody to express the intended illocutionary force of their utterances.

In summary, the results of this study indicate that intonation, at least for English *Y/N*-Questions, cannot be used as a tool for measuring interlanguage development of NNSs. The syntax and use of utterance-final rises and falls varied to only a slightly lesser degree for the NS participants compared to the ITAs. With merely 58% of NS *Y/N*-Questions displaying a rising boundary, a reliable standard for contrasting non-native speech cannot be established. That is, neither syntax nor utterance status (i.e., a question) are reliable predictors of an utterance's intonation in NS speech, and thus, neither may serve as an accurate predictor of an utterance's intonation in NNS speech. Although intonation is not a random event, factors other than syntax or status influence the intonational realizations of English utterances.

Turning now to the primary research question of this study, the data suggest that framework of an academic setting plays an important role in the production and comprehension of discourse intonation. Recognition of language variation across discourse domains is important to ITA educational programs, and therefore also central to this study. Douglas and Selinker (1994) emphasize that changes in ILs within one domain may not carry over into another. In other words, L2 communicative competence in one domain does not mean that the language learner is equally able to communicate in another. The ITAs of this study were—with minor miscommunications—relatively successful in asking questions in the laboratory, the domain of their field. However, these same NNSs may have difficulties asking questions in other situations in which they maintain a less authoritative role such as staff meetings or service encounters. Thus, L2 education has recently placed greater significance on sociolinguistic and sociocultural competence (Chun 2002).

The results of this study suggest that focusing awareness on intonation in L2 education is not completely misguided if conducted within contextualized situations. “By examining the discourse our students will need to use in real life, we can see which features of pronunciation might be particularly important for them to master” (Goodwin 2001, 118). In this regard, native-like production of question intonation may be less integral for chemistry instructors than contrastive intonation or recognition of intonational meaning. As we saw with the NSs, their use of falling or level intonation on *Y/N*-Questions had little effect on their interlocutor’s interpretation of the utterances. That is, the illocutionary force of their utterances were understood because of the shared context of interaction. Although laboratory discourse may not be as context-embedded as

a classroom or discussion, the interlocutors nonetheless recognize their shared environment and the assumptions associated with it. Myers (1994) cites undergraduate students' lack of framing for questions as one example of the contextual assumptions they bring to the laboratory. In a similar regard, the large proportion of NS *Y/N*-Questions exhibiting falling or level intonation may be another expression of shared assumptions. Thus, the instructors, understanding their role as TA, do not have to mark each *Y/N*-Question with rising intonation to distinguish it as such; and the students, understanding their role as the learner, do not require the additional prosodic cue to perceive that they need to respond. Both parties understand the asymmetry of their roles (Schiffirin 1994).

The ITAs may benefit from knowing these assumptions that students bring to the lab. The data in Tables 3-6 and 3-7 show the number of rising boundaries compared to syntactical form; these are summarized more concisely for present purposes in Table 4-1 (below). The table shows that while the ITA data had 41% utterances of non-question syntactic form, the NSTA data had only 17%. Of these utterances, approximately 56% displayed a rising boundary for the ITAs and less than half (42%) displayed a rising boundary for the NSTAs. This represents approximately 23% and 7% of utterances for

Table 4-1: Summary of syntactic form (statement vs. other) and rising boundaries for NSTAs and ITAs

	ITA		NSTA	
	statement	other	statement	other
total	37/139 27%	20/139 14%	6/69 9%	6/69 9%
sum=		41%		17%
rising boundary for category	23/37 62%	9/20 45%	1/6 17%	4/6 67%
sum=		56%		42%
rising boundary from total	17%	6%	1%	6%
sum=		23%		7%

each group with rising boundaries. Yet despite the fact that more ITA *Y/N*-Questions with the syntax of statements had rising boundaries than those of the NSTAs, it was utterances from this category which were misunderstood, as discussed in Section 3 (Tables 3-15 - 3-17). The possible reasons for the misunderstandings could be numerous, ranging from hearing deficiencies of the ITA's interlocutor to misplaced word stress or general confusion. However, it is also probable that the ITA was unable to properly utilize available contextual cues of the speech situation to promote the intended illocutionary force of her utterances, thus hindering the student's comprehension. In other words, intonation and illocutionary force were at odds with one another. Illocutionary force may be expressed through intonation, but in many cases it functions as what we may call an "illocutionary-reserve," serving to carry illocutionary force when other cues fail (Geluykens 1987; Wennerstrom 2001). It is therefore likely that neither contextual or intonational cues were sufficient in indicating the question-status of these utterances.

How intonation contributes to the illocutionary force of an utterance is a central question in many intonational studies. According to Geluykens (1987), the *felicity conditions* proposed by Searle (1969), "play a decisive role in the recognition of an utterance with declarative form as a question, but that rising intonation by itself is virtually without impact. However, if pragmatic cues are not sufficiently strong to determine speech-act status, intonation can (but will not necessarily) act as a cue for determining question status" (Chun 2002, 70). In their discussion on lexical conjunctions (i.e., *and*, *but*, *therefore*, etc.) Halliday and Hasan (1976), claim that prosody does not only provide information about the status of such conjunctions, but may at times even operate in lieu of the conjunction. Thus, being part of the phonology of English,

intonation aids in locution and can carry illocutionary force, although the extent to which the two interact may vary according to the actual speech situation or speech act (Geluykens 1987; Schiffrin 1994; Brazil 1997; Pickering 2001; Wennerstrom 2001; Chun 2002).

Approaching the instances of miscommunication from this direction, it is probable that the students misunderstood ITA-YY's utterances (i.e., *You can't find it* and *You will use water*) because neither intonation nor other contextualization clues of the speech situation provided sufficient information for them to interpret the utterances as requiring a response. The NSs used declarative syntax for *Y/N*-Questions more sparingly (less than 20%) than the ITAs (40%), and when they did use them, these utterances were understood by their interlocutors as questions. Thus, whereas the NSs demonstrate an ability to properly balance intonation and contextualization clues, the NNSs struggled with this relationship. In the majority of instances, the students understand the symmetry of their roles in this educational encounter, much as the subjects of Schiffrin's (1994) analysis on question and answer pairs understand their roles during a service encounter at a library information desk. In a similar manner, this corresponds with Myers' (1994) observations regarding the "shared context" of classrooms and educational laboratories.

An important factor in Interactional Sociolinguistic studies is the *situated meaning* of an utterance, a rough equivalent for "surrounding linguistic context" and a primary concept for Schiffrin's analysis of service encounters. Brazil (1997) uses the term *context of interaction*. The context of interaction was important to this study in several ways. First, *Y/N*-Questions had to be identified according to their surrounding context. This being the case, the questions should not be considered in isolation. Secondly, the primary

research question of this study was concerned with the relevance of the setting—that of a beginning chemistry laboratory at a major American university. Any study of intonation should consider the context in which it occurs, since a presupposed context may exercise some influence over the intonation applied by a speaker (Wennerstrom 2001). Limited in their context, the examples discussed above concerning the proportion of rises and falls in the NS and NNS data do consider the situated meaning of the utterances. Due to the disproportional amount of data between the ITAs and the NSTAs, however, such conclusions should be cautiously received until similar, expanded investigations involving other speech acts or types of questions have been undertaken.

Field specialization appears to be an important aspect. Where, for instance, the ITA might be able to successfully communicate in a laboratory where their interlocutors expect questions, the same individual may experience greater communicative difficulties in another setting or speech situation. Discourse domains may serve as contexts for IL development, or as Douglas and Selinker (1994) observe: “numerous studies in recent years ... have shown phonological, morphological, lexical, syntactic and pragmatic variation with regard to task, linguistic context, processing factors, social norms, and changes in interlocutor, topic and function” (229-30).

The lack of utterance-final rises on much of the NS data likely result from the speakers' attitudes toward the situation, similar to those often cited for tag questions. For example, a falling or low boundary would be expected on the question *It's cold today, isn't it?* when a NS of American English anticipates a positive response. A rising utterance-final boundary, on the other hand, would indicate speaker uncertainty of the answer to be received (Geluykens 1989; Hobbs 1990; Smith et al. 1992; Brazil 1997;

Celce-Murcia and Larsen-Freeman 1999; Grant 2001). Yet for NNS who may not be able to properly utilize the contextual cues from the situated meaning of their utterance, these distinctions of phonological meaning may not be readily available or even known. Many ITA programs have recognized the value of combining training with context by placing trainees in natural settings, allowing them to tune their interactional skills in domains respective to their instructional duties. The importance of domain-specific knowledge may be observed in numerous examples of linguistically fluent ITAs who are nonetheless unsuccessful in the classroom (Hoekje and Williams 1992; Davies and Tyler 1994). In this regard, specializing ITA training programs with field-specific courses based upon the type of course an ITA will be instructing may benefit NS/NNS interaction in these settings. Yet applying such an approach to ITA training solicits a basic question underlying training programs of this nature: is comprehensive communicative competence to be sacrificed for situationally-specific competence?

The type of intonation used for a sentence or question by NSs of English depends largely on the type of situation involved. Despite certain tendencies, there is no one-to-one correspondence between intonation and function, confirming Brazil's (1997) prediction of "that variations other than those in pitch may be of greater operational importance to the language-user in some or even in many cases" (3). Perhaps this is why language tests such as the SPEAK or TOEFL have yet to incorporate interactive social skills of language into their proficiency guidelines. Indeed, results from such tests have shown little correspondence to actual classroom performance for many ITAs, with evaluations based on mini-teach presentations ultimately serving as more accurate predictors (Hoekje and Williams 1992; Crookes and Davis 1993; Chun 2002). Moreover,

training through situational context increases opportunities for interaction between NS and NNSs at a university, an aspect frequently lacking despite its benefits for both parties involved. ITAs have expressed strong desires to interact more frequently with NS, but their behavior is often at odds with their desires. When, in fact, interaction does take place, miscues can result in cross-cultural miscommunication, leaving interlocutors with false impressions and frustration. Thus, cultural awareness should be an integral element for any ITA training course, and perhaps language education in general (Paine 1990; Hoekje and Williams 1992; Zimmerman 1995; Jenkins 2000).

In conclusion, this study contributes several significant elements to intonational phonology and sociolinguistic research. We have seen, perhaps contrary to many expectations, that *Y/N*-Questions with the form of syntactic statements do not necessarily display utterance-final rising intonation more frequently than syntactic question. Ford and Thompson (1996) cite intonation as a factor that aids listeners in knowing when they may speak or take their turn in a conversation. Thus, although low or falling intonation may signal to a listener that the speaker has completed their turn, how does that person know to *answer*? The intonation-syntax relationship seems to have become slightly more complex through the findings presented here.

This study has found that *Y/N*-Question intonation cannot be used as a reliable measurement in determining IL of NNSs of English because even NSs themselves fluctuate greatly in their usage of the oft-cited rising intonation of questions. The context of interaction or speech situation were cited as primary factors for this indeterminacy. Field-specific or situational-specific communicative competence should therefore be a major component of certain language training programs, depending upon the program's

and student's goals. This holds particularly true for ITA training programs, which have the ultimate goal of successfully incorporating their language learners into the authoritative role of university instructor.

APPENDIX
NSTA AND ITA MINIMAL DATA SETS

ITA-HF

Tr. #	Time	Pitch Contour	Utterance
1	14.20	L* L-H%	Does that answer your question?
2	33.17	H* H-L%	Okay, so far do you have any questions?
2	38.29	H* H-L%	Do you have any questions?
3	00.39	H* L-L%	Any question?
3	09.29	H* H-H%	Any question?
3	12.25	H* L-L%	Any other question?
3	13.08	L* H-L%	Any other question?
3	18.42	H* L-L%	Any other question?

ITA-HF

Tr. #	Time	Pitch Contour	Utterance
3	06.31	!H* H-L%	Do you know why?
3	13.30	!H* H-H%	Do you know why?

ITA-JW

Tr. #	Time	Pitch Contour	Utterance
1	00.36	H* L-L%	Steve, you have a question?
2	11.56	H* L-L%	Any questions?
3	12.14	H* H-H%	Any other questions?
3	19.38	H* L-L%	Any questions?
3	20.40	H* H-L%	Any questions?

ITA-JW

Tr. #	Time	Pitch Contour	Utterance
1	03-60	L+H* H-L%	Can you give me your syllabus?
1	03.52	L+H* H-L%	Can I see your syllabus?

ITA-JW

Tr. #	Time	Pitch Contour	Utterance
1	08.03	H* H-H%	Is that right?
1	13.31	!H* H-H%	Is that right?
1	14.42	H* H-L%	Is that right?

ITA-JW

Tr. #	Time	Pitch Contour	Utterance
1	19.29	H* H-H%	Can I write here ?
2	08.36	H* L-L%	Do you need "OK" here ?
2	09.11	H* L-L%	Do you see any bubbles here ?

ITA-JW

Tr. #	Time	Pitch Contour	Utterance
3	01.58	H* L-L%	Any questions about this part?
3	09.22	H* H-H%	Any questions about this part?
3	20.06	H* H-H%	Any questions for this part?

ITA-JW

Tr. #	Time	Pitch Contour	Utterance
2	01.42	H* H-H%	... lab five before you s-, uh, write your scheme ?
2	04.13	H* L-L%	Did you write your scheme ?

ITA-JW

Tr. #	Time	Pitch Contour	Utterance
3	11.19	H* H-H%	Any questions about kinide ?
3	13.17	L+H* H-L%	Any questions about kinide ?

ITA-YY

Tr. #	Time	Pitch Contour	Utterance
1	00.39	!H* L-L%	You can't find it?
1	00.41	H* H-H%	You mean, you can't find it?
1	03.04	H* L-L%	You can't find it?

1

ITA-YY

Tr. #	Time	Pitch Contour	Utterance
1	00.58	L* H-H%	Have I checked this?
1	05.09	H* H-L%	Can you check this?
1	01.05	H* H-L%	Have I checked this for you ?
1	07.54	L* H-H%	Have I checked this be- fore ?
1	10.27	H* H-L%	Have I checked this for you ?

ITA-YY

Tr. #	Time	Pitch Contour	Utterance
1	01.51	H* H-L%	You wanna use water ?
1	01.55	H* L-H*	You will use water ?

ITA-YY

Tr. #	Time	Pitch Contour	Utterance
1	04.36	!H* L-L%	You already know the pH of these three?
1	15.14	!H* H-L%	Do you know the pH of these three?

ITA-YY

Tr. #	Time	Pitch Contour	Utterance
1	03.55	L* H-H%	Have you finished this part?
1	04.02	L* H-H%	Do you know how to do this part?

ITA-YY

Tr. #	Time	Pitch Contour	Utterance
1	06.59	H* H-L%	Do you under- stand ?
1	07.11	H* L-H%	Can you under- stand it?
2	15.23	H* H-L%	So, do you under stand this?

ITA-YY

Tr. #	Time	Pitch Contour	Utterance
1	16.54	L* H-L%	You will do this later ?
1	16.57	!H* H-H%	You wil do this part later ?

ITA-YY

Tr. #	Time	Pitch Contour	Utterance
2	09.45	L+H* H-H%	Do you have any questions now ?
3	05.18	H* H-H%	Do you have your scheme now ?

ITA-YY

Tr. #	Time	Pitch Contour	Utterance
3	01.29	L* H-L%	Do you have your assignment here ?
3	07.34	H* H-H%	Have you seen bubble here ?
3	18.14	H* H-H%	Do you have your scheme here ?

TA-C

Time	Pitch Contour	Utterance	
00.33	L* H-H%	Ya'll doing	okay?
02.35	L* H-H%	Genie, you doing	okay?
02.54	H* L-L%	You doing	okay?
04.19	L+H* H-L%	You guys doing	okay?
05.10	L* H-H%	You guys doing	okay?
05.16	H* H-H%	Christine, ya'll doing	okay?
05.55	H* H-H%	Doing	okay?
06.55	L* H-L%	Thomas, ya doing	okay?
07.07	H* H-H%	Genevieve, ya'll doing	okay?
07.22	H* H-L%	Keith, ya'll doing	okay?
11.17	H* L-L%	Christine, ya doing	okay?
14.19	H* H-H%	Ya'll doing	okay?
15.54	L* H-H%	Ya doing	okay?
16.44	L* H-H%	Andrew, ya'll doing	okay?

TA-C

Time	Pitch Contour	Utterance
01.20	H* H-L%	Ya got it?
03.57	H* H-L%	You guys got it?

TA-C

Time	Pitch Contour	Utterance
07.16	H* L-L%	D'ya'll check it?
14.39	H* H-L%	Ya'll checked it?
17.08	H* H-L%	Did you check it?
17.18	H* L-L%	Did you get it?

TA-C

Time	Pitch Contour	Utterance
10.03	H* H-H%	Is anybody ready for that first "OK"?
11.26	H* H-H%	Are you ready for your "OK"?
15.56	L* H-H%	Do you need an "OK"?
16.45	L* H-H	You need an "OK"?
18.35	L* H-H%	Genie, you ready for that first "OK"?

TA-L

Time	Pitch Contour	Utterance
01.20	L* L-H%	Were you at the doctor and stuff ?
01.35	H* H-L%	You get morning sickness n stuff ?

TA-L		
Time	Pitch Contour	Utterance
01.00	!H* H-H%	You alright?
14.59	!H* H-L%	You alright?
TA-L		
Time	Pitch Contour	Utterance
10.05	H* L-L%	Does that make sense?
19.52	H* H-H%	Does that make sense?
TA-L		
Time	Pitch Contour	Utterance
17.26	H* H-L%	Do you know where the [george] sulfate is?
19.37	H* H-H%	D'ya know what chloride is?

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BIOGRAPHICAL SKETCH

Jason J. Litzenberg was born on June 6, 1973, to Sue and Dennis Litzenberg in Ft. Wayne, IN, USA. The family moved to Florida in August of 1978, where Jason and his brother, Kevin, attended school. Jason graduated in June, 1991, from Jupiter Community High School in Jupiter, FL. In August of the same year he began his studies at the University of Florida (UF) in Gainesville, FL.

Soon after graduating from UF in August, 1995, with a B.A. in English literature, Jason attended a language-immersion program, *Leipzig Kommt*, in Leipzig, Germany. Jason's time in Germany did not end with the completion of this program, but instead continued for several years as he pursued a M.A. (equivalent) in German language education (*DaF—Deutsch als Fremdsprache*) at the Herder Institute at the Universität Leipzig. While completing his degree in *DaF*, Jason worked as an English language instructor at *FAE* (Fachinstitut für Angewandtes Englisch).

In August, 2000, Jason returned to Gainesville, FL to earn a degree in Applied Linguistics/TESOL and assumed a teaching position at ASE (Academic Spoken English). This thesis is the culmination of his research at this institution in completion of the requirements for a M.A.