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A Teaching Practicum Course and its Effects on International Teaching Assistants' Discourse Intonation

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Abstract

This report [1] focuses on four upper-intermediate and advanced English language learners being supported as international teaching assistants (ITAs) at a research university in the U.S. [1] Learners had little experience using English in extended speech, and little grasp of Discourse Intonation (DI), which is how a speaker uses the pausing and prosodic system of English to communicate. In order to increase the learners' experience using extended speech to teach in authentic settings, and to improve their ability to use DI, the author arranged a teaching practicum course in collaboration with the departments of math, mechanical engineering, and physics. The four learners engaged in once-a-week explicit instruction on DI, twice-a-week DI focus-on-form listening tasks, four teaching simulation tasks, and once-a-week guest teaching sessions in their departments for fourteen weeks. The combination of instruction, tasks, and teaching practicum experiences were intended to help learners develop explicit DI knowledge, and to provide opportunities to proceduralize DI knowledge, in other words, the ability to use DI in teaching. Data suggest that all learners developed explicit DI knowledge, but only two of them developed some degree of proceduralized DI knowledge. The report ends with the suggestion that explicit and procedural DI knowledge likely have layers of development within them. Suggestions for discipline-specific tasks to develop learners' explicit and proceduralized DI knowledge are given.

Key words: English pronunciation, Discourse Intonation, second language pronunciation learning, STEM teaching, graduate student teaching practicum courses, explicit and procedural knowledge in second languages, second languages for professional communication

Introduction

International Teaching Assistants (ITAs) are international graduate students who are supported by teaching undergraduate courses in their areas of study (Ford, Gappa, Wendorff, & Wright, 1991; Gorsuch, 2013; 2016; Griffee, Gorsuch, Britton, & Clardy, 2009; Smith, Byrd, Nelson, Barrett, & Constantinides, 1992). At the institution in which this study took place in 2017, ITAs were from Bangladesh, Brazil, China, Colombia, India, Iran, Korea, Mexico, Nepal, Spain, Russia, Taiwan, and were enrolled in graduate programs in applied linguistics, biology, chemistry, economics, family counseling, mathematics, mechanical engineering, music, nutrition, petroleum engineering, physics, and Spanish. In 2016, 239,838 international students were offered graduate admission to U.S. universities, 35% of all admissions offers made (Okahana, 2017). The majority came from countries in which English is not widely used. ITAs are responsible for the learning of many North American undergraduates (Chiang, 2011; Gorsuch & Sokolowski, 2007; Kaufman & Brownworth, 2006). In many respects, ITAs make undergraduate education possible (Gorsuch, 2011a; Williams, 1992). Without ITAs, most chemistry, math, and physics departments could not offer enough sections of undergraduate labs to accommodate undergraduate student demand.

For professional purposes then, ITAs must teach using English, their L2 (Cardillo, 2002; Gorsuch, 2011a; Kaufman & Brownworth, 2006). It can be argued that ITAs are high-intermediate to low-advanced learners in that they have some control over L2 lexis and syntax (see, however, Levis, Muller Levis, & Slater, 2012). At the same time, many have little experience using their English in extended talk (Gorsuch, 2011a; 2013). One emerging focus of ITA need has been Discourse Intonation (DI), which is the use of thought groups (an element of spoken fluency), prominence (sentence level stress, an element of prosody), and tone choices (sustained rising, level, and falling tones at ends of thought groups, another element of prosody) for communicative purposes (Brazil, 1997). DI is used to package information units; emphasize and differentiate ideas; begin, continue, and end utterances; begin and end topics; and express authority and social relationships (Pickering, 1999, 2001, 2010). Evidence suggests that the ability to use DI is essential for ITAs' success as classroom communicators (Anderson Hsieh & Koehler, 1988; Gorsuch, Meyers, Pickering, & Griffee, 2013; Hahn, 2004; Pickering, 1999; Wennerstrom, 2000). Nonetheless, for a variety of reasons, DI features are learned late, and with difficulty (Gorsuch, 2011a, 2011b, 2013; Hirst & DiCristo, 1998; Pennington & Ellis, 2000). This report is an account of ITAs' learning of this spoken grammar in a still rarely-used instructional setting, that of an authentic teaching practicum, hereafter known as ESL 5212.

DI and ITAs

Many ITAs lack experience using English in extended discourse (Gorsuch, 2008; Petro, 2006), and learning to use English to teach is a major challenge for them (Gorsuch, 2008; Heidish, 2006; Saif, 2006). The DI system used in North American English is not familiar to them (see for example Anderson-Hsieh & Koehler, 1988; Gorsuch, 2011a, 2011b; Levis et al, 2012; Pickering, 1999; Wennerstom, 1998, 2001). Eight participants in an ongoing study from Bangladesh, China, and Sri Lanka report they have never studied DI or pronunciation while studying English in their home countries. For a thoughtful review of changing pronunciation standards in the context of World Englishes, as opposed to North American, Australian, or British English, see Dimora (2018).

Learning discourse intonation

How DI is learned has not been described in detail. Broad developmental stages have been suggested where L2 learners either "have" DI (fluency and prosody) or "do not have" it (e.g., Pickering 1999; Wennerstrom 1998, 2001). This may leave educators without few ideas past explicit instruction, which is likely to develop explicit knowledge only (Freed, 1995; see also Ellis, 1997 for commentary on tradeoffs between learners using explicit knowledge and its effect on their rates of speech, one measure of spoken fluency). Prosody is an abstract system, and hard to apply to language use (Pennington & Ellis, 2000; Zampini, 2008). Explicit knowledge is used consciously and with effort. Thus it is in scripted tasks, or single-sentence type tasks, that learners can show improvement in DI because they do not have to pay a lot of attention to what they are saying (Gorsuch, 2013). When it comes time for ITAs to use planned and unplanned English, and speak extemporaneously in extended speech, they do not have the attentional resources to apply explicit DI knowledge (see Chambers, 1997; Ejzenberg, 2000; Foster, Tonkyn, & Wigglesworth, 2004; Gorsuch, 2013; Kormos & Denes, 2004; Pickering, 1999; Tavakoli, 2010, for relevant research and commentary).

It would not be a stretch of the imagination to see that typical, high-intermediate ITAs might use a great deal of planning and conscious effort to pass a teaching simulation test, and succeed in using DI to some extent for brief periods. The same stretch of imagination might reveal that once the teaching simulation is over, and ITAs must turn to unplanned, real-time, day-to-day classroom talk, they will stop using DI consistently (Lee & Gorsuch, 2012). This would be the result of a lack of proceduralized knowledge, which is knowledge that is retrieved and used without much conscious thought. Without using at least some appropriate DI, ITAs may be hard to understand. No one will quite put their finger on it, as faculty advisors and undergraduates do not know how to define or describe the perhaps hard-to-understand talk of ITAs who do not use appropriate DI (Anderson Hsieh & Koehler, 1988; Gorsuch et al, 2013; Hahn, 2004; Pickering, 1999; Wennerstrom, 2000).

Developing explicit and proceduralized knowledge

Responding to evidence that ITA preparation programs generally lacked the intensity and duration sufficient to develop ITAs' L2 abilities, Gorsuch (2013) did an intervention study. She conceptualized DI knowledge, much like any other L2 knowledge, as explicit and proceduralized. She pointed to the need for explicit instruction, but also the need for more awareness-raising and input-focused activities (Gorsuch, 2011b), and more opportunities for ITAs to proceduralize their use of DI. She posited that scripted speaking activities would showcase learners' explicit DI knowledge, and that unscripted talk would reveal whether or not learners have proceduralized DI knowledge. She found that seven learners who had explicit instruction in DI and input-based awareness raising treatments on DI features improved their explicit DI knowledge as shown in a controlled pre- and post-study speaking task (reading a passage from their field aloud). Their speech rates increased, their thought groups became slightly longer, they used more prominence, and they used more rising tones encoded in longer thought groups (Gorsuch, 2013). This suggested they were able to apply explicit DI knowledge to scripted speech.

Learners improved less when using proceduralized DI knowledge in a pre- and post-study extemporaneous speaking task (talking about their own research interests). On average, learners spoke more slowly, and the learners continued using short, truncated thought groups. They used slightly more appropriate prominence, but also slightly more prominence placed on inappropriate

syllables, as though learners were overgeneralizing explicit knowledge. They used the same proportion of predominantly level and falling tones, although on average, learners used rising tones with slightly longer thought groups. Learners' DI knowledge had apparently not been completely proceduralized. Intriguingly, learners' speech rates on both the scripted and unscripted tasks increased. This suggests that whatever knowledge learners used, they still had sufficient attentional resources to maintain a slightly faster rate of speech. The results somewhat confirmed developmental changes Gorsuch had predicted. See Table 1.

Table 1. *Possible developmental paths in extemporaneous speaking tasks*

Fluency/DI feature*	**Possible developmental paths**	
	Explicit knowledge	**Procedural knowledge**
Speech rate	Learners using explicit knowledge have slower speech rates.	Learners using proceduralized knowledge have faster speech rates.
Length of thought groups ("fluent runs")	Learners using explicit knowledge have shorter thought groups.	Learners using proceduralized knowledge have longer thought groups.
Prominent syllables per minute	Learners using explicit knowledge have fewer prominent syllables.	Learners using proceduralized knowledge have more prominent syllables.
Number of syllables per rising, level, and falling tone thought group	Learners using explicit knowledge use shorter pause thought with the three tone choices.	Learners using proceduralized knowledge have longer thought groups with the three tone choices.

**Note*. See Gorsuch (2013) for a detailed description of temporal fluency and DI analyses.

With undergraduates' learning, and ITAs' professional success at stake, it is essential to continue devising and testing pedagogical interventions which bring about improvements in ITAs' use of DI in real-time, day-to-day communication need situations (Gorsuch, 2011b, 2013; see also Pickering, 1999; Wennerstrom, 2001). Clearly, learning DI, like any other L2 feature, takes a long time, likely beyond what most ITA programs can provide, particularly in terms of developing proceduralized knowledge (Gorsuch, 2012). There are still additional, theoretically motivated interventions to use, which extend learners' engagement in L2 use, and in ways that may seem more professionally relevant to them.

Teaching practicum courses

One of these interventions can be authentic teaching practicum courses. Such courses have had a place in ITA programs since the 1990s, when many ITA educators wrestled with foundational

curricula and course types. A pivotal question emerged: If ITAs are supported in centralized courses on a campus, how would they learn to communicate in their academic departments (Gorsuch, 2006; Hoekje & Williams, 1994; Weimer, Svinicki, & Bauer, 1989)? Many ITA educators in centralized programs have opted for authenticity in instructional materials (Gorsuch, 2012), assessments (Briggs, 1994; Gorsuch et al, 2013; Smith, 1994), and teaching simulation tasks (see for example Schroeder & Kohler, 2006). Authentic materials and tasks in this context means ITAs and their instructors using topics, texts, and teaching tasks from ITAs' own academic departments, such as economics or math, for the purpose of field- and teaching-specific language learning. This sensibility has positively contributed to ITAs' learning. The same sensibility has allowed ITA educators with ESL (English as a Second Language) or adult education backgrounds to continue their ITA work without being content area specialists in science or math or art, etc. (Gorsuch, 2016).

Nonetheless, for a variety of reasons, some ITA educators have established teaching practicum courses in which ITAs have real undergraduate teaching responsibilities in their departments, under some form of guidance. The originator of one of the best-known programs, Andrea Tyler, used in-class video recordings and feedback sessions for ITA candidates to develop "self-critical awareness of the behaviors that contribute to miscommunication in their classrooms" (Tapper & Kidder, 2006, p. 17). Tyler, and others using teaching practica (see for example Gorsuch, 2006) may have stumbled onto a course logic (assumptions about how a course works to support learning) that provides enough time on task and intensity of language use needed to develop ITAs' proceduralized knowledge, whether they intended this outcome or not. It is unlikely that most ITA courses without a practicum component has enough intensity to bring about improvement in ITAs' ability to communicate in classrooms. See Gorsuch (2012) for commentary on the shortness of most ITA courses in the face of slow, fraught L2 learning processes, and ITA educators' systemic and perhaps ineffective, course-based responses to this. Typically, this has been to extend learners' engagement outside of explicit instruction classes through a variety of means, such as online language practice.

There are few published accounts of practicum courses and their effects on ITAs' L2 learning, including their use of DI, and this report bridges that gap. Four ITAs (hereafter called "learners") are focused on in this study, which took place during a fourteen-week semester at a U.S. university. Learners engaged in once-a-week explicit instruction sessions on Discourse Intonation, four teaching simulations with feedback, twice-a-week focus on form input-focused tasks, and once-a-week guest teaching sessions in their departments, which were observed and audio recorded three times during the semester. The guest teaching sessions were transcribed by the learners, corrected by the instructor and three ESL TAs, and then offered back to the learners along with written and audio feedback, and coaching sessions during office hours. Details are given below in the sections "The Teaching Practicum" and "Materials."

Research Questions

This report is part of a large-scale evaluation study, where the main focus was to gauge the worth of the practicum course. The focus for the current report is changes in learners' DI features (rate of speech; length of thought groups; appropriateness of thought groups; number of self-corrections; use of appropriate and inappropriate prominence; use of tone choices; and length of thought groups using rising, level, and falling tone choices) over the length of the course. The purpose of the research was to discern if learners' use of DI features seemed to undergo any sort of development. The research questions were:

1. What changes are evident in learners' explicit DI knowledge?

2. What changes are evident in learners' procedural DI knowledge?

Method

Participants

International teaching assistant candidates. The learners were four ITA candidates enrolled in the teaching practicum course, known as ESL 5312, English Communication for Teaching Professionals. None had passed a three-week summer workshop designed to prepare and screen ITAs prior to their teaching assignments. Out of the original class of eight students, four were excluded prior to the data analysis. By mid-semester, two of the class members had attended less than 70% of the 28 class meetings, resulting in a lack of data about them. The other two class members were teaching foreign languages. During teaching observations they used little to no English in their teaching. All eight class members were treated the same in terms of data collection during the course. The four remaining learners are described in Table 2, along with their host instructors and their undergraduate students. It is of interest that nearly all of the host instructors were non-native speakers of English, which reflects the language background of faculty members and experienced teaching assistants in those departments.

Table 2. *Study participants*

Learners' self-chosen pseudo-nyms	**First language**	**Department**	**Previous ESL courses taken at institution**	**Host instructor**	**Undergraduate course and student description**
Minho	Korean	Mechanical engineering	An intensive three-week ITA preparation workshop	Dr. W, faculty member in mechanical engineering department, a native Hindi speaker	Undergraduate course on "Statics," 35 2nd and 3rd year engineering students
Nimal	Tamil	Mathematics	An intensive three-week ITA preparation workshop	Dr. X, faculty member in math department, a native Spanish speaker	Undergraduate course on business calculus, 35 2nd and 3rd year business students

Ting Ting	Mandarin	Mathematics	An intensive three-week ITA preparation workshop	Ms. Y, an experienced ITA graduate instructor of record, a native Urdu speaker	Undergraduate course on math principles for 1st and 2nd year non-majors
Wen	Mandarin	Physics	An intensive three-week ITA preparation workshop	First Ms. Z, a lecturer in astronomy, a native English speaker and then Mr. Z, an experienced ITA graduate instructor of record, a native Mandarin speaker	For one month, a first-year astronomy lab with 20 undergraduates; for remaining 2 ½ months, a 1st year general physics lab with 25 undergraduates

One other group of participants was the ESL 5312 course instructional staff. These were the instructor and three TAs who were applied linguistics M.A. candidates. All were native speakers of English.

A few notes about the institution in which this study took place are appropriate here. This is a research university in the southwest U.S., with a combined undergraduate and graduate enrollment of 40,000 on multiple campuses. This study took place at the main campus, where the ITA summer workshop and long-semester courses accommodate up to 400 ITA candidates per year. By state law, all ITAs who come from countries in which English is not officially or commonly used must be approved to teach using three locally administered tests, including the *SPEAK* (the institutional version of the *Test of Spoken English* (ETS, 2009) and the International Teaching Assistant Performance Test V10.2 (Gorsuch, Florence, & Griffee, 2016; Gorsuch & Griffee, 2016).

The Teaching Practicum

The relevant outcomes of the teaching practicum course were:

1. ITA candidates will demonstrate explicit knowledge of Discourse Intonation by using it consciously in appropriate tasks such as read-alouds.

2. ITA candidates will demonstrate awareness of and improved performance (procedural knowledge) in Discourse Intonation.

The following "organizational chart" (Rossi, Lipsey, & Freeman, 2004) portrays the ESL 5312 teaching practicum course inputs as they occurred over time, and who had what role in interacting with these inputs. The term "function" refers to the theorized ways the course supported learners to reach the outcomes. See Figure 1.

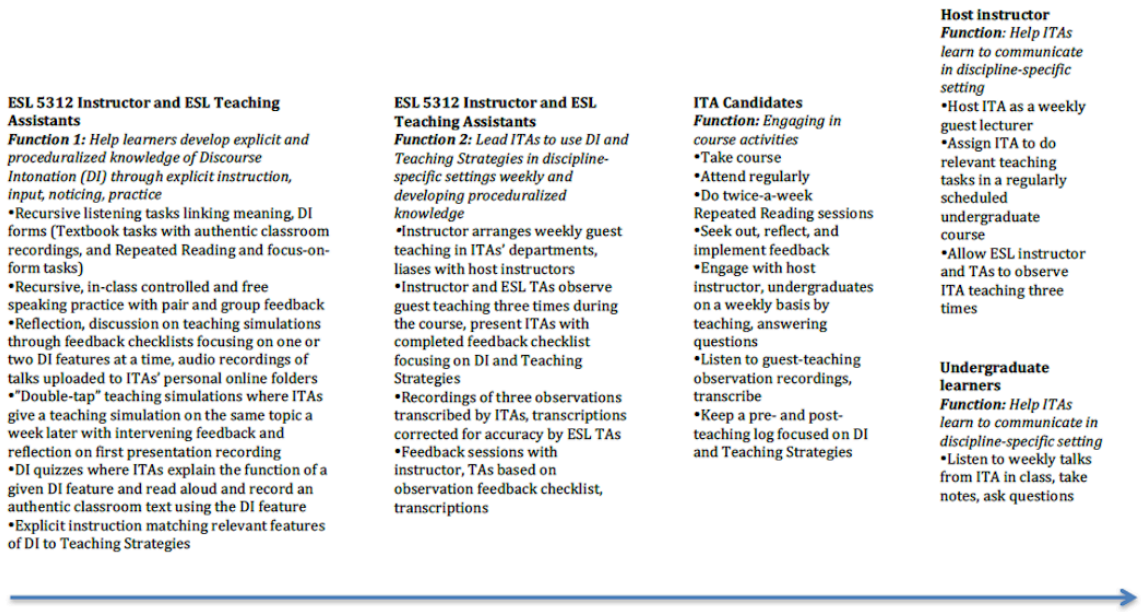

Figure 1. Organizational chart for ESL 5312

Figure 1. *Organizational chart for ESL 5312*

The orientation of Figure 1 is from left to right in terms of who does what roles. There is no implied order of importance or chronology. The ESL 5312 instructor and the ESL teaching assistants (TAs) had two functions, "Help learners develop explicit and proceduralized knowledge of Discourse Intonation through explicit instruction, input, noticing, practice," and "lead ITAs to use DI in discipline-specific settings weekly, and developing proceduralized knowledge." Each bullet point (□) under a function states how the functions were realized in the course (in other words, the tasks and activities done in the course), such as "Recursive listening tasks linking meaning, DI forms," "Recursive, in-class controlled and free speaking practice with pair and group feedback," "Instructor and ESL TAs observe guest teaching three times during the course, present ITAs with completed feedback checklist," and "Recordings of three observations transcribed by ITAs, transcriptions corrected for accuracy by ESL TAs." [2] For further details of the course tasks and activities see Table 3, particularly the "How used" column on course materials. It should be noted here that the transcriptions mentioned here were for ITAs' use only. Any transcriptions used for data analysis, described below, were made by the author.

The ITAs also had roles and responsibilities, including "Engaging in course activities" by attending regularly, seeking and implementing feedback, listening to and transcribing their guest-teaching observation recordings, and engaging with host instructor, undergraduates on a weekly basis by teaching and answering questions. The host instructor and the undergraduate students together had one function: "Help ITAs learn to communicate in discipline-specific setting." Host instructors realized the function by assigning "ITA to do relevant teaching tasks in a regularly scheduled undergraduate course," and allowing "ESL instructor and TAs to observe ITA teaching three times." Undergraduates were to "Listen to weekly talks from ITA in class, take notes, ask questions."

Materials

See Table 3 for a description of the materials used in the course, and why and how they were used. This information gives a clearer picture of the explicit instruction, and other learning activities, done in the course.

Table 3. *Description of materials for the teaching practicum course*

Material	Why used	How used
Textbook listening and speaking tasks (Gorsuch et al, 2013) (Appendix A)	• To create a basis of explicit DI knowledge of thought groups, prominence, tone choices, and speech paragraphs • To encourage development of learners' explicit and procedural knowledge of DI features through recursive listening and speaking tasks linking DI to meaning	• Textbook activities for thought groups, prominence, tone choices, and speech paragraphs were used in each weekly explicit instruction session • Learners listened to authentic classroom audio recordings, linking meaning and DI forms, and engaged in rehearsed and free speaking tasks using the DI forms
DI Checklist (Appendix B); five Likert scale items with five points for quantitative measurement	• To offer feedback to learners on DI for teaching simulation tasks and guest teaching observations • To create a focus for instruction, reflection, feedback, and practice	• During each teaching simulation task and guest teaching observation, the instructor and the three TAs for the course marked the feedback checklist and wrote additional comments • After each teaching task or host teaching session, the feedback checklists from all observers were photocopied for the learners and the four members of the instructional staff • Progress on each aspect of the DI features on the feedback checklist were noted
Audio recordings and transcripts for two "double tap" simulated teaching tasks: comparing two concepts, and presenting on a research interest	• To offer an additional source of feedback, along with the DI checklist, for the same teaching simulation tasks	• The audio recordings for the simulated teaching tasks were offered to the learners in an individualized Drop Box folder • Learners transcribed their audio recordings broadly (word by word); transcriptions were then checked and corrected by the instructor, adding words and other sounds the learner had omitted • Because the transcripts were written and revised using Drop Box, the learner had access to the corrected transcripts
Audio recordings and transcripts for three guest teaching observations	• To heighten ITAs' awareness of issues with their use of DI • To create a focus for feedback during instructor and ESL TA office hour meetings	• The audio recordings for the guest teaching observations were sent to the learners in an individualized Drop Box folder • Learners had one week to transcribe the

	• To provide a basis for self-determined "private learning" of candidates who may wish to focus on proceduralizing their use of teaching phrases or any other communication feature not anticipated by the instructor	portion of the recording where they taught; they transcribed audio recordings broadly (word by word); transcriptions were then checked and corrected by the instructor, adding words and other sounds the learner had omitted • Because the transcripts were written and revised using Drop Box, the learner had access to the corrected transcripts
Four Discourse Intonation quizzes on thought groups, prominence, and tone choices (Appendix C)	• To gauge learners' level of explicit knowledge of key DI features • To encourage learners to act on feedback and engage in pre-task planning	• Learners completed a written portion of the quizzes describing the functions and rules of DI features • Learners audio-recorded the read-aloud portions of the quizzes to Drop Box; the read-aloud portions comprised transcriptions of their talk • The instructor recorded oral feedback with a quiz grade • Learners were encouraged to re-record their work according to the feedback to increase their grade
Repeated Reading materials with audio support and focus on form recursive listening tasks (Appendix D)	• To encourage development of learners' explicit and procedural knowledge of DI features through recursive listening tasks linking DI to meaning • To offer an additional focus of feedback for office hour visits with instructor and ESL TAs	• Learners do twice-a-week self-access recursive listening tasks using a Repeated Reading procedure: 1. Complete and self-score a short-focus on form task highlighting one DI feature; 2. Listen twice to a recorded version of a 300 word, 8th grade level science text while reading the text

Procedure

The learners enrolled in the teaching practicum course, ESL 5312. The learners' department chairs were contacted to find the names of two or three host instructors for the guest teaching requirement. The host instructors agreeing to the plan were introduced to the learners. Most learners were placed within the first three weeks of the semester. The ESL 5312 class met weekly for 80 minutes of explicit instruction in DI, and to do teaching simulation tasks (see Figure 1 and Table 3). The learners went to the Language Learning Lab twice a week for a total of 40 minutes to complete required Repeated Reading Assignments (see Table 3).

Data Collection and Analyses

To answer the two research questions, audio-recorded data were collected by the author throughout the course. All audio-recordings (DI quizzes, teaching simulations, and guest teaching observations) resulted in a transcription, done by the author. While the guest teaching observation

transcriptions were based on the same audio recordings the ITAs used to create transcriptions for their own learning purposes, the transcriptions for data analysis of the teaching observations were done solely by the author without reference to the transcriptions done by the ITAs. The author listened to all audio files (DI quizzes, teaching simulations, and guest teaching observations) multiple times to achieve accuracy. See Table 4 for details.

Table 4. *Learners' spoken tasks resulting in an audio-recordings and transcripts*

Task	**Why done**
• DI quiz on thought groups • DI quiz on tone choices (1st attempt) • DI quiz on tone choices (2nd attempt after feedback from instructor) • DI quiz on prominence • Learners read aloud authentic spoken passages from the textbook (Appendix C)	To capture changes in learners' explicit DI knowledge
• Teaching simulation on comparing two concepts, attempt #1 • Teaching simulation on comparing two concepts, attempt #2 • Teaching simulation on current research project, attempt #1 • Teaching simulation on current research project, attempt #2 • Learners gave a ten-minute presentation, taking questions from the ESL instructor and three TAs. The teaching simulation tasks were designed to highlight one aspect of DI (e.g., concept comparisons highlight the need for tone choices). After the first attempt learners received verbal and written feedback on thought groups, prominence, and tone choices with special emphasis on DI feature being elicited by the task. A week later a second attempt was done.	To capture changes in learners' procedural DI knowledge
• Guest teaching observation #1 • Guest teaching observation #2 • Guest teaching observation #3 Learners guest taught in their departments at least once weekly for 15-20 minutes. They were observed three times during the semester.	To capture changes in learners' procedural DI knowledge.

The following measures were estimated by the author for all transcribed data. For fluency/thought groups: Speech rate (the number of meaningful words uttered per minute), words per thought group, percent of appropriate thought groups (thought groups judged to fall at clause and sentence boundaries), and self-corrections per minute. For prominence: Prominent syllables per thought group, and percentage of prominence used inappropriately (syllables receiving emphasis without reference to discourse need). For tone choices: Percentages of rising, level, and falling tones used; and words per rising, level, and falling tone thought groups. Finally, percentage scores were calculated on twice-weekly Repeated Reading focus-on-form recursive listening tasks on thought groups, prominence, and tone choices. This would show the extent to which learners developed their explicit DI knowledge over time. See Appendix E for a photograph of a transcript marked up for analysis.

Deciding how to display the results for data in Table 4 resulted in some quandaries. In the end,

however, learners' individual scores, and not averaged scores, were focused on. Another quandary lay in missing data for Wen and Ting Ting. Both Wen and Ting Ting had 100% attendance in the course. As the data were collected in an actual working course, some of the recordings were simply missing, perhaps victims of the constant electronic file sharing between learners, the instructor, and three TAs. In the case of Wen, there were real difficulties ensuring he had a guest teaching situation to begin with. A delay in getting his guest teaching established with a new instructor meant that a guest teaching observation in the middle of the semester could not be done. Thus, the snapshots of Wen and Ting Ting will have to be incomplete.

Results

Explicit knowledge: Focus-on-form repeated reading tasks

Participants recorded their scores on the twice-weekly Repeated Reading tasks that focused on one DI feature for each task (see Appendix C). Participants somewhat increased their ability to predict and hear DI in continuous speech. See Figure 2 (thought groups), Figure 3 (prominence), and Figure 4 (tone choices).

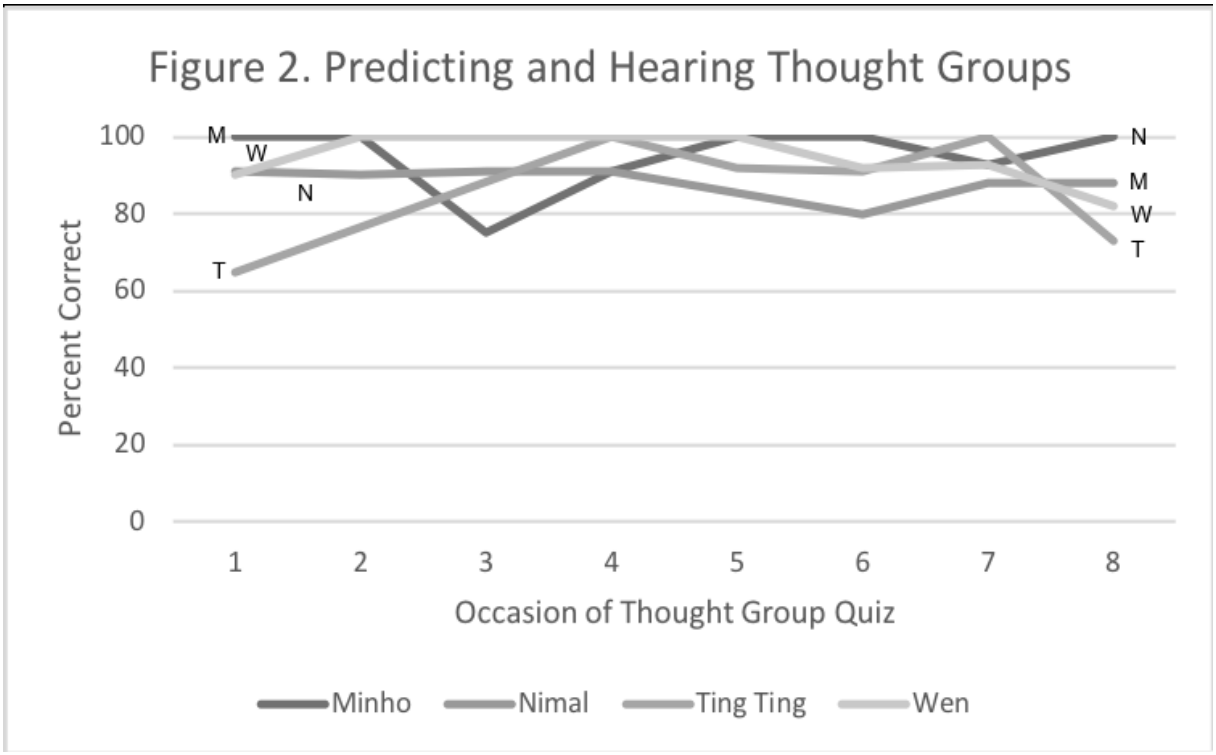

Figure 2. *Predicting and hearing thought groups*

With thought groups, all learners were fairly accurate on the tasks at the outset (Figure 2). Further, three of the learners simply fluctuated from the beginning to the end of the course, without clear trends.

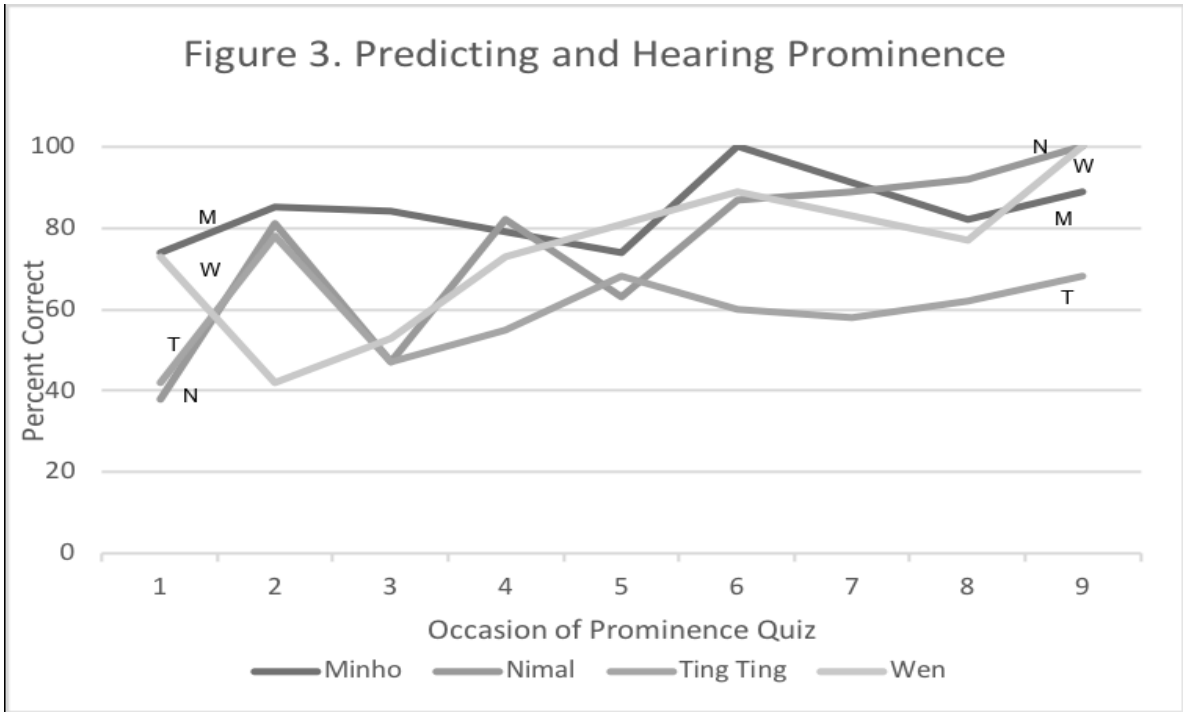

Figure 3. *Predicting and hearing prominence*

For explicit knowledge of prominence (Figure 3), learners showed more improvement predicting and hearing prominence. While learners' accuracy scores varied, they ended up better than where they started.

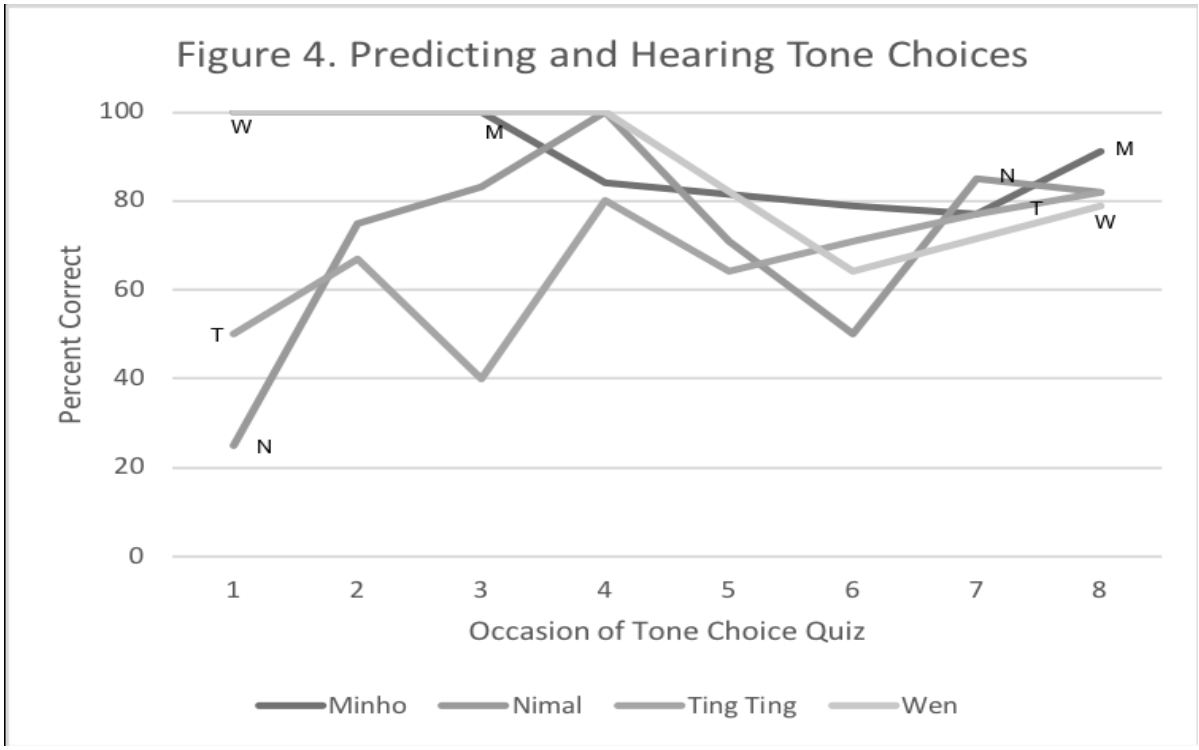

Figure 4. *Predicting and hearing tone choices*

And for explicit knowledge of tone choices, the results on the tone choice focus-on-form tasks suggested improvement for two participants (Nimal and Ting Ting). But the line graph does not show some interesting details on how another two participants (Minho and Wen) grappled with using their explicit knowledge of tone choices. Minho and Wen were generally accurate to begin with, but also consistently over-generalized their explicit DI knowledge. In four out of eight cases Minho heard multiple, additional rising and level tones that were not in the recording. In two out of eight cases, Wen also heard multiple, rising and level tones that were not in the recording. It is interesting that this phenomenon did not involve falling tones.

Audio-recorded and transcribed data

There was evidence that two learners, Minho and Wen, developed both explicit and proceduralized DI knowledge during the course. There is less evidence that Nimal and Ting Ting did. See Tables 5 (Minho), 6 (Nimal), 7 (Ting Ting), and 8 (Wen) for the audio-recorded data. The orientation is left to right. The four DI quizzes on explicit knowledge are grouped together on the left by date under "explicit knowledge." The four teaching simulations and guest teaching observations are organized by date under "procedural knowledge" in the four tables.

Minho's explicit knowledge

See Table 5. In terms of explicit knowledge growth, Minho increased his speech rate (DI quiz #1 = 60.21 words per minute, DI quiz #4 = 187.3). The length of his thought groups varied from 7.5 words per thought group (DI quiz #1) up to 11.73 (DI quiz #3), but then back down to 7.58 one week later (DI quiz #4). Minho increased his percentage of appropriate thought groups (DI quiz #1 = 86.4% appropriate, DI quiz #4 = 100% appropriate). Thus, he could talk faster on the read aloud tasks, and with better control over the grammatically determined information "packages" in the text. He sounded more fluent.

Table 5. *Minho's Discourse intonation data organized by task and chronological order*

	DI quiz #1 (9/1)	DI quiz #2 (9/29)	DI quiz #3 (10/1)	DI quiz #4 (10/6)	Guest teaching observation #1 (9/8)	Teaching simulation #1, concept comparison, 1st attempt (10/3)	Teaching simulation #2, concept comparison, 2nd attempt (10/20)	Guest teaching observation #2 (10/27)	Teaching simulation #3, research project 1st attempt (11/3)	Teaching simulation #4, research project 2nd attempt (11/10)	Guest teaching observation #3 (11/10)
	Explicit knowledge				Proceduralized knowledge						
Speech rate	60.21	193.51	206	187.3	165	170.48	118.23	204.43	172.22	152	190.41
Words per thought group	7.5	9.26	11.73	7.58	4.2	4.36	2.78	3.54	5.54	5.18	4.02
Percent appropriate thought groups	86.4%	94.7%	87%	100%	73%	81.08%	71.4%	86.7%	82.8%	72%	83%
Self-corrections per minute	0	0	0	0	6.38	3.24	5.27	4.56	9.69	7.26	4.76
Prominent syllables per thought group	0.32	1.11	0.8	0.83	0.47	0.73	0.61	0.67	0.82	1.01	0.95
Percent inappropriate prominence	0%	0%	0%	0%	0%	0%	0%	3.10%	0%	0%	1.3%
Percent rising tones	0%	5.3%	6.7%	0%	14.4%	20.3%	12.4%	21.8%	31.4%	17.2%	32.1%
Percent level tones	36.3%	26.32%	13.33%	33%	59%	36.5%	61%	24.5%	38.5%	46.2%	34.9%
Percent falling tones	63.6%	68.42%	80%	67%	26.5%	43.2%	26.7%	53.6%	32%	36.6%	33%
Words per rising tone thought group	0	15	7	0	4.35	5.13	6.29	4.67	5.85	7.19	4.7
Words per level tone thought group	7.38	6.4	18	4.5	4.28	3.85	1.32	3.68	3.28	3	2.91
Words per falling tone thought group	7.57	9.92	11.83	12.17	5.79	4.44	4.32	2.97	4.2	7.03	4.53

Minho used more prominence over time (DI quiz #1 = .32 prominent syllables per thought group, DI quiz #4 = .83), meaning that as he read passages aloud, he used more emphasized syllables, such as *I just CHECKED them and they ALL work*. At the same time, no syllables were ever given inappropriate prominence. Minho continued to sound otherwise relatively monotone over time on the explicit knowledge tasks, however. Minho used rising tones for DI quiz #2 and #3, and used them with fully formed clauses and sentences, but in baseline DI quiz #1 and DI quiz #4 he used no rising tones. He used about the same percentage of level tones and falling tones over time, and although he encoded longer falling tone thought groups over time.

Minho's procedural knowledge

In terms of procedural knowledge growth expressed in the teaching simulation and guest teaching sessions, Minho's speech rate showed an upward trend (guest teaching #1 = 165 words per minute, guest teaching observation #3 = 190.41). But his thought groups overall remained about the same length (guest teaching #1 = 4.2 words per thought group, guest teaching #3 ten weeks later = 4.02). He used slightly fewer self-corrections. Minho used more prominence over time, suggesting less monotonous sounding speech (guest teaching observation #1 = .47 prominent syllables per thought

group, guest teaching observation #3 ten weeks later = .95), for example and there is a VERtical force ACTing on point C. He rarely used prominence inappropriately.

Minho used more rising tones over time, resulting in more musical sounding speech. For guest teaching #1 he used 14.4% rising, 59% level, and 26.5% falling tones). By teaching simulation #3 he used 31.4% rising, 38.5% level, and 32% falling tones. He used rising tones encoded in meaningful clauses. He ranged from 4.35 words per rising tone at the beginning of the course to 6.29 words in the middle (teaching simulation #2), back down to 4.7 words at the end (guest teaching #3). In using a greater variety of tone choices, he remained relatively fluent sounding.

Nimal's explicit knowledge

See Table 6. For fluency measures on the DI quizzes, Nimal's speech rates stayed within a range of 181.72 words per minute (DI quiz #1) to 208 words per minute (DI quiz #2). Nimal used more appropriate thought groups on the DI quizzes over time (DI quiz #1 = 85.7% appropriate, DI quiz #4 = 100%). Nimal used more prominence on the explicit knowledge tasks at the end of the course (DI quiz #1 = .7 prominent syllables per thought group, DI quiz #4 = 1.79 four weeks later). But the interim, he dipped down to .46 and .42 for DI quizzes #2 and #3. Final DI quiz #4 focused on prominence, so his markedly higher score suggests he could use explicit knowledge to change his performance, for example *the SAMples are the chemicals you're TESTing*. He used no inappropriate prominence for the scripted DI quizzes, again suggesting he could use explicit knowledge of prominence. Finally, on tone choices, Nimal used about the same proportions of rising, level, and falling tones across all four of his DI quizzes thought to tap into explicit knowledge. The length of his different tone choice thought groups did not change.

Table 6. *Nimal's Discourse intonation data organized by task and chronological order*

	DI quiz #1 (9/1)	DI quiz #2 (9/29)	DI quiz #3 (10/1)	DI quiz #4 (10/6)	Guest teaching observation #1 (9/8)	Teaching simulation #1, concept comparison, 1st attempt (10/3)	Teaching simulation #2, concept comparison, 2nd attempt (10/20)	Guest teaching observation #2 (10/27)	Teaching simulation #3, research project 1st attempt (11/3)	Teaching simulation #4, research project 2nd attempt (11/10)	Guest teaching observation #3 (11/10)
	Explicit knowledge				Proceduralized knowledge						
Speech rate	181.72	208	207	190.06	169.62	163.35	167.6	182.33	144.25	172.89	109.67
Words per thought group	4.71	7.42	7.42	6.5	4.38	3.88	4.42	4.15	3.7	3.75	4.17
Percent appropriate thought groups	85.7%	91.7%	82%	100%	79%	75%	86%	65%	69%	79%	78%
Self-corrections per minute	0	0	0	0	3.87	0.62	1.99	0.7	2.78	0.82	1.33
Prominent syllables per thought group	0.7	0.46	0.42	1.79	0.85	0.64	0.74	0.77	0.66	0.59	0.67
Percent inappropriate prominence	0%	0%	0%	0%	7%	16%	10%	17%	3%	9%	20%
Percent rising tones	20%	25%	25%	7%	30%	28%	44%	53%	21%	50%	30%
Percent level tones	14%	13%	8%	7%	31%	38%	23%	28%	40%	30%	37%
Percent falling tones	66%	63%	67%	86%	39%	36%	33%	21%	39%	20%	33%
Words per rising tone thought group	4.46	6.5	11	11	4.66	5.64	3.64	13.93	7.09	3.89	3.97
Words per level tone thought group	3.4	5.3	3	2	4.81	2	2.77	2.35	6.72	2.5	3.23
Words per falling tone thought group	5.52	8.2	6	6	4.81	4.6	6.58	6.95	2.97	5.27	5.4

Nimal's procedural knowledge

Nimal spoke slower on the extemporaneous speech tasks than on the scripted tasks, but still within a range with no trends. On guest teaching #1 at the beginning of the course he spoke 169.92 words per minute. Teaching simulation #3 showed him down to 144.24. His third guest teaching observation and teaching simulation #4 was done on the same day, with 109.67 words per minute and 172.89 words per minute, respectively. The guest teaching session was problematic, in that his supervising instructor made a mistake and gave him a problem set to do after she had already taught it. Nimal was visibly flustered by this. Nimal used the same length thought groups over time, again, varying within a range. In terms of thought group appropriateness, Nimal varied within a range on the guest teaching and teaching simulations, between 79% appropriate for guest teaching #1, 65% appropriate for guest teaching #2 seven weeks later, and back up to 78% appropriate for guest teaching #3.

For prominence, Nimal again varied within a range. For guest teaching #1 he used .85 prominent syllables per thought group, and four weeks later on teaching simulation #1 = .64 prominent syllables per thought group. In guest teaching #3 he used .67. In extemporaneous speech Nimal used inappropriate prominence within a range across guest teaching and teaching simulations. For

teaching simulation #3, 16% of his prominent syllables were inappropriate (*first we should look at THE SIZes of the two matrices*). In guest teaching #3, 20% of his prominent syllables seemed unjustified. It seems that in order to do the teaching tasks he was given, he spoke the variety of Sri Lankan English he was comfortable with.

Nimal used more rising tones over time on his teaching simulations, apparently in response to feedback. On teaching simulation #1 in early October he used 28% rising tones, and teaching simulation #4 he went up to 50%. There was no change on his guest teaching observations, however. He used between 30% (guest teaching #1), 53% rising tones (guest teaching #2), back down again to 30% (guest teaching #3). Like all learners in the study, Nimal received feedback on his guest teaching. But by design, there were no second attempt where he could pay attention to, and use, this DI feature. Nimal encoded meaningful phrases into various tone choices (guest teaching #1 = 4.66 words per rising tone choice, 4.81 per level tone choice, 4.81 per falling tone choice). But he did not change on these features from beginning to end of the course on either extemporaneous task type.

Ting Ting's explicit knowledge

See Table 7. Similar to Nimal, Ting Ting's speech rate varied within a range without apparent trends. She varied between 131.02 words per minute, up to 158.91, back down to 127.45 on the DI quizzes. She encoded shorter thought groups over time. For DI quiz #1 she used 5.13 words per thought group, and for DI quiz #4, she used 3.64. And, unfortunately, Ting Ting used fewer appropriate thought groups on the DI quizzes with 100% appropriate for DI quiz #1 down to 76% appropriate for DI quiz #4 (*the chemicals* // *are split up into* // *samples* // *and reagents in most labs*).

Table 7. *Ting Ting's Discourse intonation data organized by task and chronological order*

	DI quiz #1 (9/1)	DI quiz #2 (9/29)	DI quiz #3 (10/1)	DI quiz #4 (10/6)	Guest teaching observation #1 (9/8)	Teaching simulation #1, concept comparison, 1st attempt (10/3)	Teaching simulation #2, concept comparison, 2nd attempt (10/20)	Guest teaching observation #2 (10/27)	Teaching simulation #3, research project 1st attempt (11/3)	Teaching simulation #4, research project 2nd attempt (11/10)	Guest teaching observation #3 (11/10)
	Explicit knowledge				Proceduralized knowledge						
Speech rate	131.03	157.05	158.91	127.45	173.49	127.7	158.85	152.35	137.82	140	.
Words per thought group	5.13	3.71	4.85	3.64	5.82	5.05	5.33	3.68	3.82	3.66	.
Percent appropriate thought groups	100%	74%	85%	76%	93%	84%	83%	94%	84.2%	87.4%	.
Self-corrections per minute	0	0	0	0	0.6	4.36	4.02	1.17	1.9	2.07	.
Prominent syllables per thought group	0.88	0.37	0.27	0.88	1.04	0.82	0.9	1	0.73	0.78	.
Percent inappropriate prominence	0%	0%	0%	0%	0%	0%	0%	0%	0%	2%	.
Percent rising tones	9.4%	2.2%	0%	0%	14%	15.1%	21.3%	38.6%	14%	12.6%	.
Percent level tones	9.4%	65.2%	55.9%	24%	23.6%	30%	22.5%	21%	26.3%	35.1%	.
Percent falling tones	81%	32.6%	44.17%	76%	62.4%	54.8%	56.2%	40.3%	59.6%	52.3%	.
Words per rising tone thought group	2	2	0	0	5.68	3.93	3.9	2.1	2.7	3.21	.
Words per level tone thought group	5.33	3.47	4.05	3.17	4.3	5.29	4.6	3.7	3.4	3.49	.
Words per falling tone thought group	5.46	4.07	6	3.79	6.43	3.98	6.6	5.21	4.26	3.88	.

Ting Ting used .88 prominent syllables per thought group for DI quiz #1, but then dipped down to .37 and .27 for DI quizzes #2 and #3. For DI quiz #4, which focused on prominence, she went back up to .88, suggesting she used explicit knowledge. The dip in use of prominence for DI quizzes #2 and #3 may be due to a trade-off of how much attention she could pay to prominence while being asked through feedback to focus on something else such as thought groups or tone choices. She certainly talked faster for DI quiz #2 and DI quiz #3, and is will be seen, she used more level tones for DI quizzes #2 and #3, even as her use of prominence dipped.

For tone choices, the explicit knowledge tasks did not elicit rising tones from Ting Ting, although she increased her use of level tones, and thus spoke more musically, within a range of level to falling tones. For DI quiz #1 she used 9.4% rising tones, 9.4% level tones, and 81% falling tones. One month later, for DI quiz #3, she used 0% rising tones, but 55.9% level tones and 44.17% level tones. She encoded shorter level and falling tone thought groups over time, with 5.33 words per level tone thought group for DI quiz #1, down to 3.17 for DI quiz #4, for example.

Ting Ting's procedural knowledge

In terms of speech rate, Ting Ting slowed down on extemporaneous tasks over time. Ting Ting used 173.49 words per minute on guest teaching #1, 158.85 on teaching simulation #2 five weeks later, and 140 words per minute on teaching simulation #4 four weeks after that. In terms of thought group length, Ting Ting used either the same or shorter thought groups over time on extemporaneous tasks. This suggests a fluency trade-off for her that did not improve. For guest teaching #1 she used 5.82 words per thought group, and for teaching simulation #4 eight weeks later she was lower at 3.66 words per thought group (*so this is the // spinner regions // now // let's do the first question*). For appropriateness of thought groups, Ting Ting varied within a range. She used 84% appropriate thought groups on teaching simulation #1, up to 94% on guest teaching #2, back down to 87.4% on teaching simulation #4 six weeks later. Her appropriateness percentages rivalled those of Nimal, but Ting Ting spoke extemporaneously in shorter thought groups, giving the impression of short, although not inappropriately truncated, stretches of speech (*SEcond // list out the outcomes // constitutes the events A and B*).

On prominence, Ting Ting remained in a range between .73 and 1.04 prominent syllables per thought group, regardless of where she was in the course. Ting Ting almost never used inappropriate prominence on any tasks.

Ting Ting used more rising and level tones on the proceduralized knowledge tasks over time, but with variations. She started out using 14% rising tones and 23.6% level tones on guest teaching #1, and finally 38.6% rising tones and 21% level tones on guest teaching #2 seven weeks later. But, without data from her third guest teaching observation, there can be no strong claim there is an overall trend. Ting Ting encoded shorter rising, level, and falling tone thought groups over time. For guest teaching session #1, she used 5.68 words per rising tone thought group, 4.3 words per level tone thought group, and 6.43 words per falling tone thought group. For teaching simulation #4, nine weeks later, she used 3.21 words per rising tone thought group, 3.49 words per level tone thought group, and 4.26 words per falling tone thought group.

Wen's explicit knowledge

See Table 8. With missing data on Wen's DI quizzes, it is difficult to make claims about changes in his explicit knowledge of DI from the audio-recorded data.

Table 8. *Wen's Discourse intonation data organized by task and chronological order*

	DI quiz #1 (9/1)	DI quiz #2 (9/29)	DI quiz #3 (10/1)	DI quiz #4 (10/6)	Guest teaching observation #1 (9/8)	Teaching simulation #1, concept comparison, 1st attempt (10/3)	Teaching simulation #2, concept comparison, 2nd attempt (10/20)	Guest teaching observation #2 (10/27)	Teaching simulation #3, research project 1st attempt (11/3)	Teaching simulation #4, research project 2nd attempt (11/10)	Guest teaching observation #3 (11/10)
	Explicit knowledge				Proceduralized knowledge						
Speech rate	134.97	.	.	135.1	146.21	145.19	149.42	.	141.3	227	141.26
Words per thought group	6.6	.	.	6.73	5.9	4.36	4.17	.	4.96	6.64	4.07
Percent appropriate thought groups	84%	.	.	100%	78%	76.7%	87.5%	.	85.8%	77.2%	84%
Self-corrections per minute	0	.	.	0	4.66	4.36	1.49	.	2.83	2.83	1.49
Prominent syllables per thought group	0.6	.	.	0.73	0.33	0.73	0.74	.	0.91	1.58	1.04
Percent inappropriate prominence	0%	.	.	6.25%	0%	0%	0%	.	0%	0%	0%
Percent rising tones	4%	.	.	5%	5.8%	11.2%	11.67%	.	16%	24%	11%
Percent level tones	12%	.	.	5%	45.4%	28.4%	23.3%	.	26%	38%	23%
Percent falling tones	84%	.	.	90%	48.7%	60.3%	65%	.	58%	38%	66%
Words per rising tone thought group	8	.	.	0	10.6	5.69	4.29	.	3.93	3.63	3.25
Words per level tone thought group	5	.	.	7	4.2	2.78	4.14	.	3.17	3.7	3.44
Words per falling tone thought group	6.76	.	.	7.05	6.92	4.86	4.15	.	4.36	4	4.43

Wen used more appropriate thought groups from September 1 (84%) to October 6 (100%), but he spoke at about the same rate (134.97 words per minute versus 135.1). He encoded about the same length of thought groups (6.6 words per thought group versus 6.73). Wen used slightly more prominence (.6 prominent syllables per thought group for DI quiz #1, up to .73 a month later). There was little difference between DI quizzes #1 and #4 in terms of his use of rising and level tones (4% rising and 12% level tones, versus 5% rising and 5% level tones). There were no changes in the lengths of his rising and level tone thought groups.

Wen's procedural knowledge

There was more improvement in Wen's procedural DI knowledge. Wen maintained generally the same speech rate over time (145.19 words per minute for teaching simulation 1 in early October, to 141.3 in early November, to 141.26 in mid-November). He also managed to maintain a certain length to this thought groups (5.9 words per thought group for guest teaching #1, up to 6.64 for teaching simulation #4 after feedback). He spoke using more appropriate thought groups and sounded slightly less truncated (guest teaching #1 = 78% appropriate thought groups [*uh there are six six of the hum // stars // in in the picture*] and guest teaching #3 = 84% [*and // if we want two*

lights // *if they up together* // *it disappeared*]). He self-corrected less over time, even in a guest teaching situation where he had no control over the topic of his talk. Overall, his fluency improved.

Wen used more prominence over time, resulting in more varied-sounding speech with more information structure. For guest teaching #1 in early September he used .33 prominent words per thought group, and nine weeks later he used 2.83 in teaching simulation #4 and 1.49 in guest teaching #3 (*we know the WAVElength* // *LAMda* // *is between these two PEAK right*). He never used inappropriate prominence. Wen also sounded more musical, using more rising tone choices over time. In September for guest teaching #1 he used only 5.8% rising tones and 45.4% level tones, but for teaching simulation #3, he used 24% rising tones and 38% level tones. One week after that he used 11% rising, 23% level, and 66% falling tones while speaking to undergraduates on a topic chosen for him by his physics host instructor. Wen did encode shorter rising, level, and falling tone thought groups over time. For teaching simulation #1 he encoded 5.69 words per rising tone thought group, 2.78 per level tone, and 4.86 per falling tone. For teaching simulation #4 he used 3.63 words per rising tone thought group, 3.7 per level tone, and 4 per falling tone.

Discussion

The results of this study were mixed. See Table 9 for an overview:

Table 9. *Overview of results*

	Minho	**Nimal**	**Ting Ting**	**Wen**
Explicit knowledge tasks (listening–Repeated Reading: Learners' ability to predict and hear DI features in continuous speech)	**Fluency** (thought groups only): No change	**Fluency** (thought groups only): No change	**Fluency** (thought groups only): Heard more	**Fluency** (thought groups only): No change
	Prominence: Heard more	**Prominence**: Heard more	**Prominence**: Heard more	**Prominence**: Heard more
	Tone choices: Heard less; over-generalized on rising and level tones	**Tone choices**: Heard more	**Tone choices**: Heard more	**Tone choices**: Heard less, over-generalized rising and level tones
Explicit knowledge task (read alouds–DI quizzes: Learners' ability to use DI features)	**Fluency**: More fluent	**Fluency**: No change	**Fluency**: Less fluent	**Fluency**: No change
	Prominence: Used more	**Prominence**: Used more	**Prominence**: No change	**Prominence**: No change
	Tone choices: No change	**Tone choices**:No change	**Tone choices**: Used more level tones	**Tone choices**: No change

Procedural knowledge tasks (teaching simulations, guest teaching)	**Fluency**: More fluent **Prominence**: Used more **Tone choices**: Used more rising and level tones	**Fluency**: No change **Prominence**: No change **Tone choices**: No change	**Fluency**: Less fluent **Prominence**: No change **Tone choices**: Used more level tones	**Fluency**: More fluent **Prominence**: Used more rising and level tones **Tone choices**: Used more rising and level tones

It is difficult to detect shifts in temporal fluency and DI use in continuous speech over time, particularly with a small sample size and diverse learners (L1s, disciplines, etc.). But there are patterns. Thinking of DI in terms of explicit and procedural knowledge helps interpret them.

Basic fluency may need to come first

First, learners may need to have a basic general fluency to begin with to demonstrate procedural knowledge growth using prominence and tone choices. In other words, they have their speech rates, thought groups, thought group appropriateness, and self-correction rates worked out to the extent they are not spending most of their attentional resources on mapping out syntax and selecting words. It may be at this level that putting learners into weekly guest teaching sessions (intensive, authentic practice) may have the greatest effect. Minho and Wen may have been at this point. In order to use prominence, learners have to know what basic syntax and words they are using, fast enough, in order to make discourse-level decisions to use prominence, again, in real-time processing. It may be the same with tone choices. If learners are not struggling hard to think of what to say at the clause- and sentence-level, they can formulate discourse-level plans, perhaps using explicit or procedural knowledge, to "hold the floor" by using rising or level tones, or signaling they are done by using falling tones. It is notable that both Minho and Wen maintained relatively long rising and falling tone choice thought groups (Tables 5 and 8), suggesting they could make, and carry out, discourse-level plans.

In this author's early days of working with DI, she believed that thought groups would be learned first, then prominence, then tone choices. Later, she thought this presumption was merely an artifact of being a materials writer. In other words, just for textbook writing purposes, a chapter on thought groups had to come first, then prominence, then tone choices. In terms of explicit knowledge learning, those DI features were easier for learners and teachers to conceptualize in that order, but this did not indicate that actual learning would proceed this way. Based on this supposition, the author believed explicit knowledge could be built upon all three features. And, that professionally relevant practice would lead to procedural knowledge on all three features. However, the results of this study have returned the author to her initial position. Learners may not improve on prominence and tone choices if they are still struggling with basic fluency (thought groups).

It is true that Nimal had some degree of fluency in English. He had been educated in English from childhood. He spoke an established English variety with its own conventions of packaging information units and assigning prominence. He could apply explicit DI knowledge of North American and British English varieties, as shown in his repeated reading listening task scores. Yet how can his lack of progress on the DI quizzes, teaching simulations, and three observed guest

teaching sessions be explained? It may be that extemporaneously, he could not apply his explicit DI knowledge. No proceduralization had taken place. It can be argued that the English varieties used by speakers from other parts of the world should be accepted. Yet this learner failed multiple performance tests required by the university. Multiple listeners could not comprehend him. This leaves an uncomfortable educational, vocational, and linguistic conundrum that has yet to be answered.

Ting Ting started out with a lower basic fluency than the other three learners. In terms of just predicting and hearing DI as explicit knowledge, she improved (Table 9) but when she had to speak in scripted speech or extemporaneously, no improvement in prominence could be seen. She did use more level tones. But her spoken fluency *declined*. She spoke in shorter thought groups. This suggests she used explicit knowledge, and not procedural knowledge. While Ting Ting may have benefitted professionally from guest teaching, it does not seem the practicum helped her gain procedural knowledge of DI.

There are tradeoffs with DI knowledge and spoken fluency

As predicted by Ellis (1997) in the context of learners getting instruction on new grammatical forms, learners in the current study traded off their DI knowledge and their spoken fluency. Discourse intonation is an abstract grammatical system and as a result is difficult for learners to apply to specific speaking situations (Pennington & Ellis, 2000). It is Minho's data that added a nuanced picture of trade-offs he made between his temporal fluency (speech rate) and the course-generated task demands to incorporate DI features into extemporaneous talk. On the concept comparison talk, 1st attempt, he spoke 170.48 words per minute, and used 4.36 words per thought group. His thought groups were 81.08% appropriate, and he self-corrected at a rate of 3.24 per minute. He used only .73 prominent syllables per thought group (Table 5). On his 2nd attempt a week later, after getting feedback on the lack of one DI feature, his diversion of attentional resources became apparent. His rate of speech dropped to 118.23 words per minute, and his thought groups shortened to 2.78 words per thought group. Only 71.4% of his thought groups were appropriate, and he made more self-corrections at 5.27 per minute. He used fewer prominent syllables per thought group (down to .61), and he used fewer rising tones. This time, his level tones, on average very short (1.32 words per thought group), predominated at 61% of all tone choices used. This suggested many truncated and monotonous sounding thought groups. This is remarkable, in that the 1st and 2nd attempts were on the same topic. He knew the content.

In the second cycle of teaching simulation talks, Minho showed less destabilization in the 2nd attempt after feedback, using slightly fewer syllables per thought group and fewer appropriate thought groups, but then using fewer self-corrections (from 9.69 per minute down to 7.26). He also used more prominence (from .82 to 1.01 prominent syllables per minute)(Table 5). His fluency did not stay low, as it did with Ting Ting with her across-the-board shorter thought groups (Table 7). Minho's case suggests that his procedural knowledge had developed by the time the second teaching simulation came up. The trade-offs were still there, but less. The destabilizations and trade-offs present in learners' audio-recorded data suggests that for some learners, the feedback apparatus in the course logic was effective (Figure 1, Table 3, Appendix B).

Overgeneralization and DI knowledge

A final pattern in the study is that explicit DI knowledge for prominence and tone choices can be overgeneralized, just like any other newly learned language form such as a verb tense. Whether or not learners overgeneralize with these features may tell us something about their development of explicit DI knowledge. Both Minho and Wen overgeneralized their explicit DI knowledge of tone choices while doing focus-on-form listening tasks (Figure 4). Perhaps Minho and Wen were testing their explicit knowledge. Of the four learners, Minho and Wen improved the most using DI features in extemporaneous speaking. This argues for a continued role for explicit instruction in DI, and for a role in explicit knowledge in the development of procedural knowledge.

Ting Ting did not overgeneralize in the listening tasks, nor did Nimal. This may have been for different reasons. Ting Ting had a lower level of language development, even in listening. In a comparison of averaged listening scores, Ting Ting got lower scores than Minho and Wen, even though she improved internally over time (Figures 2, 3 and 4). Her average thought group scores were 86.83% correct, her prominence scores were 59.78% correct, and she predicted and heard tone choices at 66.38% accuracy (compare with Minho: 94.88%, 84%, and 90.14%; and Wen: 94.63%, 72.43%, 88.6%). How could she overgeneralize features she was still having trouble perceiving or understanding on a conceptual level? In Nimal's case, the lack of overgeneralization may have been a case of interference from a dominant spoken language. This interference may have conflicted with his development of explicit knowledge, which may be evidenced by overgeneralizing explicit DI knowledge. Nimal's listening scores were only slightly higher than Ting Ting's (thought groups = 88.43%, prominence = 70.78%, tone choices = 71.38%; Figures (Figures 2, 3 and 4).

Implications

1. Consider that explicit DI knowledge has stages of development, such as basic and intermediate.

2. Consider that different activities, treatments, and tasks will develop explicit DI at different levels. Listening activities at the sentence level such as those found in the course textbook, and recursive, repeated listening activities using continuous, extended speech such as that found in the Repeated Reading tasks may be useful to develop different levels of explicit knowledge of DI.

If participants had no Repeated Reading tasks to do, they would be left with the prospect of learning to hear, or not hear, DI in naturally occurring speech around them. To the extent that heard speech was comprehensible, then participants may have been able to discern prominence and tone choices when they were not otherwise engaged in comprehending others' speech for interpersonal and academic purposes. The Repeated Reading task texts, however, were by design comprehensible. The textbook and focus on form Repeated Reading tasks in the current study may have provided an important means for learners to think through and develop a basic explicit DI knowledge.

3. Consider having learners read continuous, extended texts aloud and having them re-read after feedback, and reflection on that feedback.

4. Consider that teaching simulations may be most effective when they are "double tap" (the presentation is given, learners get focused feedback, and the presentation is given again after reflection time).

Because learners are more familiar with the content they need to talk about the second time around, they may have more attentional resources to plan DI use and succeed using it. This may be an important means of developing a more intermediate explicit knowledge and basic procedural DI knowledge.

5. Consider that teaching simulations, which are commonly used in ITA preparation programs, and guest teaching once a week, are different in their demands. Learners with lower basic fluency may do better with teaching simulations. Lower basic fluency learners may be able to cope but may not develop procedural knowledge quickly in largely unplanned, authentic use situations presented by guest teaching. Guest teaching sessions may propel growth in DI in learners with higher basic fluency.

Two arguments underpin implication #5. First, time on task for once-a-week guest teaching may be more than even twice-a-week simulated teaching can be. With eight or more ITAs in an ESL-focused class meeting twice a week not everyone is going to be able to do teaching simulations in the same class meeting. More time on task means more learning (Center for Open Educational Resources and Language Learning, 2010; Griffee et al, 2009). The learners spent an average 29 minutes speaking during teaching simulation tasks across the semester, versus 133.25 minutes during the guest teaching sessions. Thus, learners in this study spent more time engaging in monologic and interactive talk in the guest teaching sessions. These estimates do not include time learners spent planning their talk, nor observing the host instructor, which was from one to three hours per week.

Second, learners' comments suggested that they had little control of the topics they talked about in the guest teaching sessions, meaning that their planning processes were fully engaged, weekly, for the whole semester. Participants were perhaps concerned about their DI, but they were, in addition, concerned with how to explain concepts, how to draw complicated figures on blackboards and explain them, and how to solve math problems under the gaze of students and the host instructor. Participants had to stretch their knowledge to accomplish the tasks in self-assigned ways.

6. Consider using explicit knowledge and procedural knowledge as an organizing principle for course and materials design.

Given previous research results (Gorsuch, 2013) and the results of the current study, and given the constraints of formal instruction that will never have enough time and intensity for the outcomes we wish, it makes sense to consider learning DI in terms of explicit and procedural knowledge. It may help to consider the course inputs (Figure 1, Table 3, Appendix A, Appendix D, and Implications #1 – #5) in terms of how they may develop different levels of learners' explicit and proceduralized DI knowledge. See Figure 5.

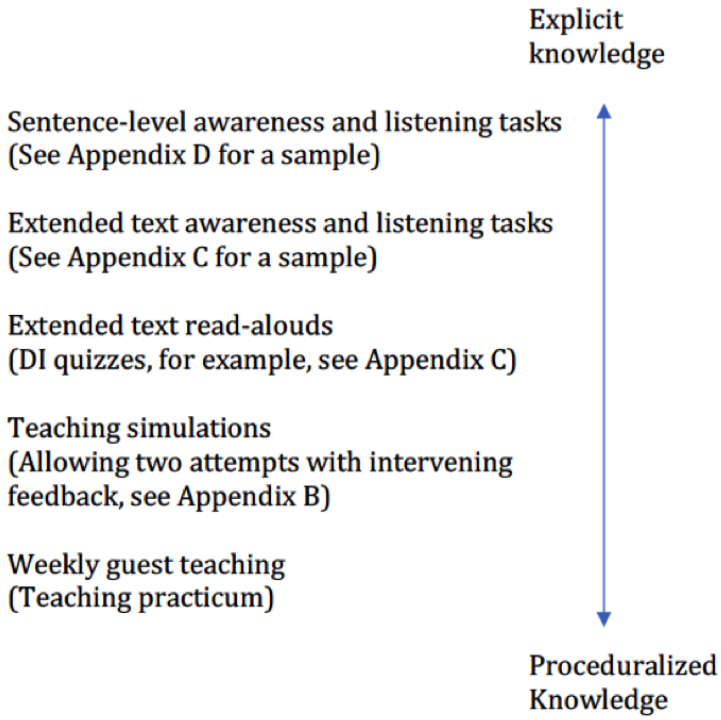

Figure 5. *Tasks used in the study and DI knowledge type they may develop*

It is possible to design instruction, materials, and practice opportunities based on this model. The results of the current study suggest that in many respects the course design, with its recursive textbook and focus-on-form listening tasks, weekly authentic language use opportunities, simulated teaching tasks, and feedback, was effective to develop some learners' basic and intermediate explicit knowledge, and procedural DI knowledge.

Limitations and Future Research

More complete data, taken more consistently across learners, are needed for future studies. With more complete during- and post-course data across learners, certain trends might be seen more clearly, such as learners' speaking rates picking up, using more prominence, and using more varied tone choices with longer thought groups in extemporaneous tasks. Any of these suggest the development of procedural DI knowledge (Table 1).

There are no apologies for a small sample size. This is not experimental research and there is no null hypothesis to reject. The phenomena being captured here are complex with many data points. If there is a weakness here, it is in the data being incomplete, and the study not being carried out an additional semester. Even if the course did not continue, the four ITAs could have been monitored for an additional semester as they took their places as college instructors. An additional semester of study would go beyond whether learners were getting into the rudiments of proceduralized DI knowledge.

Finally, there is the question of whether one semester of instruction and practicum work is long enough to learn DI well enough to use with ease and automaticity. It probably is not. One 2012 report tracking an ITA revealed that although she had had coursework on prominence, and passed

a high-stakes performance test on the basis of adequate prominence use, she did not use prominence afterwards in her teaching. When she felt the need to emphasize ideas to her undergraduate learners, she did so by repeating words instead of using prominence, thus sounding disfluent (Lee & Gorsuch, 2012). So, on one hand she explicitly understood the discourse strategy of emphasizing information (the meaning), and could even map it on to extended speech. On the other hand, she did not apparently proceduralize this knowledge. She never got past some level of explicit knowledge.

Conclusion

This report added to the literature on teaching practica for non-native English-using graduate students who are to be supported as instructors in undergraduate math, mechanical engineering, and physics courses. These young professionals are at a key moment in their early careers, as they learn to teach and act on the global stage in their second language. As noted early in the study, there is a consensus that a knowledge of Discourse Intonation (DI) is likely indispensable to their success to communicate effectively. This report also portrayed DI as explicit and procedural knowledge, showing that a course can be designed to develop both. The weekly guest teaching sessions were probably a keystone for the two more fluent learners to proceduralize their DI knowledge and propel their development as speakers of English for professional purposes. Finally, a model for designing courses, materials, and tasks based on the presumption of explicit and procedural knowledge was presented.

Notes

[1] This report is part of a large course evaluation study. The full report is available at: Gorsuch, G. (2017). An evaluation of a teaching practicum course for international teaching assistants. Unpublished manuscript.
Available: https://www.researchgate.net/publication/312940166_An_Evaluation_of_a_Teaching_Practicum_Course_for_International_Teaching_Assistants

[2] One reviewer wished to know how ITAs were coached to transcribe their audio recordings. ITAs were provided with an anonymous, brief sample audio and sample transcription as examplars. The ESL instructor and TAs commented on and offered feedback on the transcriptions in office hours during the early part of the course. Some of the feedback focused on discrepancies between what was on the recording and what was on the transcription, including word order discrepancies. Other feedback focused on learner awareness of pauses and "false starts." To be sure, this represents an under-explored aspect of the course logic.

About the Author

Greta Gorsuch has been teaching EFL, ESL, and applied linguistics for over 30 years in Japan, the United States, and Vietnam. She is interested in reading fluency, speaking fluency, second language testing, and evaluation. Her articles in *System*, *Language Teaching Research*, *Language Teaching*, and *Reading in a Foreign Language* are widely read and cited internationally. She hopes this means her writing is useful to other working teachers.

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Appendix A

Textbook samples (Gorsuch et al, 2013)

Listen to each sentence below. Decide the best meaning implied by the use of prominence.

Example:

3.9
Students hear:
The pH reading of a solution is USually obtained by comparing unknown solutions to those of known pH.

What is implied here?

__X__ but SOMEtimes we need to use other ways.
_____ and there are SEVeral ways of doing so.

3.10
Students hear:
TA: So, you're telling me that you're stuck on this problem. What would you do first to solve it?
Student: I would start with the Chain Rule.

1. What is implied here?

_____ But maybe YOU wouldn't!
_____ This is what I THINK
_____ But I CAN'T do so because I don't know how.

Appendix B

Sample of Repeated Reading Focus-on-Form Task

Less Ice, More Seawater (Part 4)
by E. Sohn

As you listen the first time, underline words that you think have prominence (higher pitch, longer syllable, perhaps louder volume). FINALLY, listen a second time to check. What does the speaker mean by using prominence on those words?

The new findings provide a better starting point for scientists studying future sea level rises. Such predictions are still difficult to make, since the new study shows that changes in the ice sheets vary widely from year to year.

The work has some scientists calling for a similar, far-reaching study of Earth's glaciers. "The next step is to take this comprehensive approach to ice in the rest of the world," said W. Tad Pfeffer, a glaciologist at the University of Colorado Boulder.

Appendix C

Sample Discourse Intonation (DI) Quiz
Discourse Intonation Quiz #1 Directions: First, draw in // where you think a pause ought to be. Then, record the passage and upload your recording to your Drop Box.

How to teach. / The first step is to capture attention. / You have to direct and focus the students on the learning experience. / Step 2 is to inform learners of objectives. / This creates expectations of success / as well as the outcomes they can get / from the learning experience. / Step 3, / stimulate recall of prior learning. Remind students of what they know and put it into context. Step 4 is to present the content. Now most topic experts mistakenly start here with the information students need, but steps 1 through 3 lay the groundwork for step 4 to work. Step 5—provide guidance. Help the students to their own context and need. Step 6—elicit performance. Create a framework in which students practice using the content. 7—provide feedback. Assess and correct the students and highlight achievement. 8—push towards retention. Suggest pathways for students to generalize from the new knowledge and apply it to other situations. Then, you've taught.

*How to Teach by Robin Nydorf, lifetime teacher, high school tutor, communications & research consultant, researcher. Source: http://www.oneminutehowto.com

Appendix D

DI and Teaching Strategies Checklist

DI and Teaching Strategies Checklist

Name of ITA candidate: _____
Dept. _____
Date: _____
Course and location: _____

Discourse Intonation Assessments

1. ITA candidate uses thought groups effectively.

   1 2 3 4* 5
   *Listeners generally not aware whether thought groups used.

2. ITA uses transitional phrases effectively to provide cohesion (First, second, OK, my next point is)

   1 2 3 4* 5
   *Listeners can follow the logic of the talk.

3. ITA uses prominence.

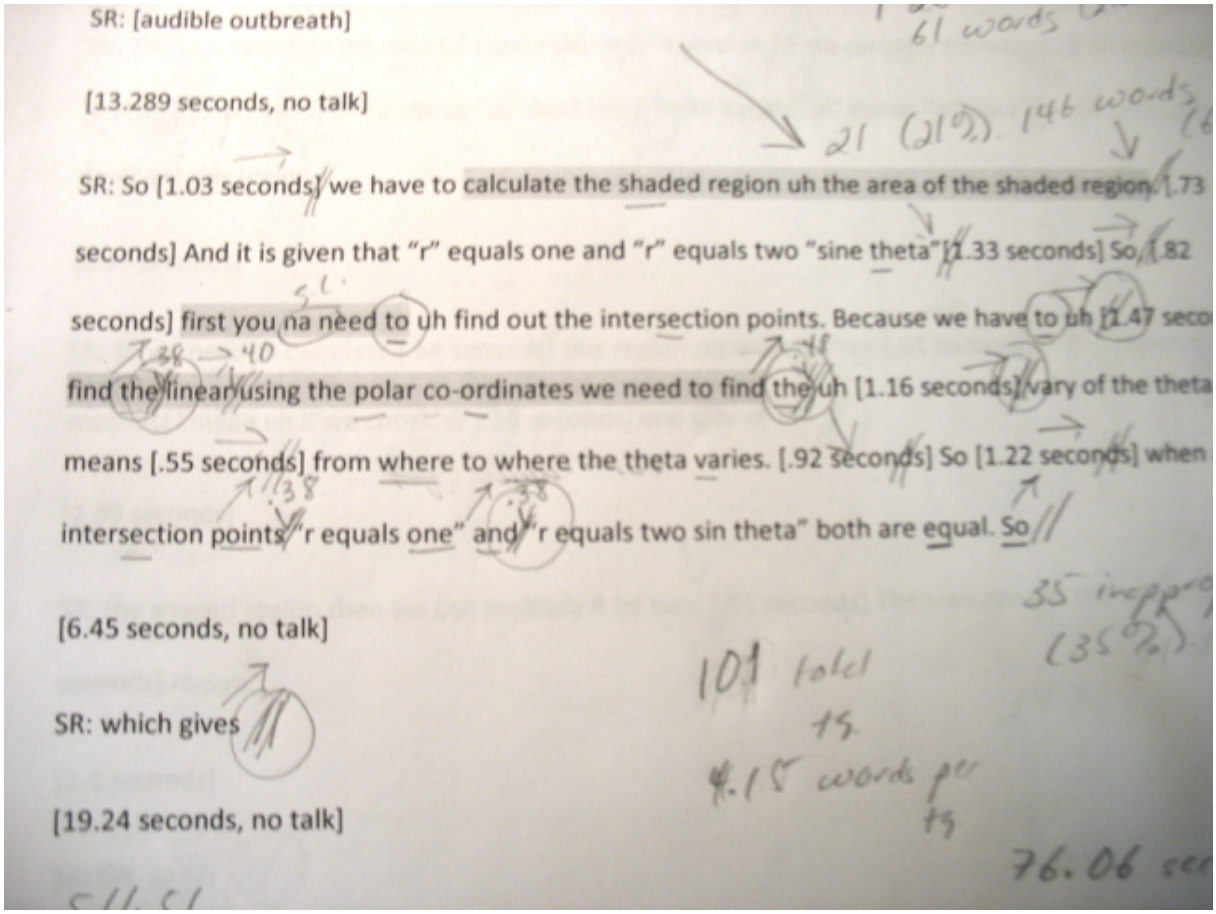
   1 2 3 4* 5
   *Listeners aware of important words.

4. ITA varies tone choice so as to produce a variety of rising and falling tones; not a monotone.

   1 2 3 4* 5
   *Not all rising tones, not all falling tones.

Appendix E

Marked up transcript sample for data analysis


SR: [audible outbreath]

[13.289 seconds, no talk]

SR: So [1.03 seconds] we have to calculate the shaded region uh the area of the shaded region. [.73 seconds] And it is given that "r" equals one and "r" equals two "sine theta" [1.33 seconds] So, [.82 seconds] first you na need to uh find out the intersection points. Because we have to uh [1.47 seco find the linear using the polar co-ordinates we need to find the uh [1.16 seconds] vary of the theta means [.55 seconds] from where to where the theta varies. [.92 seconds] So [1.22 seconds] when intersection points "r equals one" and "r equals two sin theta" both are equal. So

[6.45 seconds, no talk]

SR: which gives

[19.24 seconds, no talk]