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Authors

Crossley, Scott

Salsbury, Thomas Lee

McNamara, Danielle S.

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The Role of Lexical Cohesive Devices in Triggering Negotiations for Meaning

Scott A. Crossley
Georgia State University

Thomas L. Salsbury
Washington State University

Danielle S. McNamara
University of Memphis

The authors compare the frequency of negotiations for meaning in a natural spoken corpus to a variety of cohesive devices. The study demonstrates that a lack of cohesive devices in non-native speaker (NNS) discourse correlates to negotiations for meaning. The data comes from a year-long longitudinal study of six beginning NNSs and comprised 99 transcripts. The transcripts were coded for negotiations for meaning. Regression analyses suggested that causal cohesion and semantic co-referentiality were significantly related to the frequency of negotiations for meaning. Additionally, NNS discourse demonstrates a significant decrease in frequency of negotiations for meaning as a function of time. Taken together, these results suggest that negotiations for meaning are related to a lack of cohesive devices in NNS speech.

INTRODUCTION

The role of interaction in second language acquisition (SLA) and the interaction hypothesis (Long, 1983a, 1983b, 1994, 1996) are hotly debated topics in second language studies. Specifically, researchers are interested in supporting the central claim of the interactional hypothesis: that engaging in negotiations for meaning facilitates SLA (Long, 1996; Pica, 1994). In this study we are interested in examining the role that coherence plays in interactional discourse. In analyzing coherence, we examine the use of lexical cohesive devices by non-native speakers (NNSs) with the assumption that the use of cohesive devices is related to the coherence of NNS utterances. In this study, we test whether changes in the frequency of cohesive devices are predictive of changes in the frequency of negotiations for meaning. We focus on lexical cohesive devices because multiple studies have demonstrated that communication breakdowns are mostly prompted by lexical features and not morphosyntactic or phonological elements (Ellis, Tanaka & Yamazaki, 1994; Foster, 1998; Hatch, 1978; Mackey, Gass & McDonough, 2000; Pica, Kanagy & Falodun, 1993; Sato, 1986). In addition, we concentrate on naturalistic discourse

in this study because it has been overlooked in many traditional studies of interaction (Nakahama, Tyler & van Lier, 2001) and because theories of coherence need to be tested in spontaneous discourse (Coates, 1995).

We are most interested in investigating whether or not a lack of cohesive devices is correlated to a loss of meaning in naturalistic spoken discourse. We address this issue by computationally analyzing a year-long longitudinal corpus of six English as a second language (L2) learners for frequency of negotiations for meaning. We compare the frequency of negotiations for meaning to both time learning English and a selection of cohesive devices measured by the computational tool Coh-Metrix (Graesser, McNamara, Louwerse & Cai, 2004). Our goal is to demonstrate that coherence develops as a function of time spent learning English and that cohesive devices are related to the frequency of negotiations for meaning. We predict that increased coherence in NNS naturalistic discourse may partially be attributed to engaging in negotiations for meaning.

Negotiation of Meaning

Interactional theories of language learning hold that the conversational and linguistic modifications found in interactional conversation provide NNSs with the input needed to acquire language (Long, 1983a, 1983b, 1985, 1996). Interactional modifications that assist NNSs in recognizing and amending incomprehensible input have been termed negotiations (Gass & Varonis, 1989, 1994; Long, 1983a, 1983b, 1996; Pica, 1994). Negotiations occur when NNSs or native speakers (NSs) signal that they do not understand an utterance for lexical, phonological, morpho-syntactic, or other reasons. This leads to an opportunity to negotiate for meaning and the resulting interaction allows participants to reconsider and restructure the language that caused the initial loss of meaning. The negotiation and its interaction can lead to the introduction of new and varied linguistic input as well as new and varied output (Swain, 1985, 1995).

Various studies have been conducted to investigate the role that negotiation plays in SLA. A meta-analysis of negotiation studies reported by Pica (1994) concluded that interaction likely facilitates processes and conditions that are important for SLA. This premise is based on the notion that negotiations for meaning lead to linguistic elements being rephrased, repeated, and reorganized to assist the NNS in comprehension and thus provide additional opportunities for the learners to notice language features. However, research that shows a direct link between negotiation for meaning and SLA is difficult to locate, especially since the effect of negotiation may not be immediately measurable, but delayed (Gass, 1997; Long, 1996).

In this study, we are interested in learner output, specifically forced output as described by Swain (1985, 1995). When learners are pushed to clarify and make their output more comprehensible, they become aware of the mismatch between their own output and the target-like norms. Interactional negotiations are important because learners receive evidence that utterances may be ill-formed through signals from the interlocutor. However, the signal alone is not enough to identify to the

learner where the problem lies, and thus interlocutors negotiate until they come to some kind of resolution to the loss of comprehension. The focus is on the form of the learner's output, and through the interactional negotiations, learners are provided opportunities to rephrase, repeat and reorganize their utterances. Much current work in SLA endeavors to provide evidence (albeit indirect evidence) that this language work has developmental consequences to language acquisition (Long, 1996).

For the purposes of this study, what initiates a negotiation for meaning is also of interest. Various researchers (Pica, Holliday, Lewis & Morgenthaler, 1989; Pica, Holliday, Lewis, Berducci & Newman, 1991) have distinguished between a 'trigger' and a 'signal.' When an utterance is incomprehensible, it often serves to function as a trigger to begin a negotiation. In this sense, an interlocutor receives linguistic information that cannot be processed and this triggers a signal to the speaker that there may be a breakdown in communication. The signal is generally in the form of a clarification check, comprehension check, or confirmation check. Generally speaking, what triggers a signal is not a morphological, grammatical, or phonological element, because these usually lead to local errors, but is a lexical item, which are global and can impair communication (Ellis et al., 1994; Foster, 1998; Hatch, 1978; Mackey et al., 2000; Pica et al., 1993; Sato, 1986).

In natural discourse, common triggers are different from those found in instructional discourse. Nakahama et al. (2001), for instance, found that instructional activities contained triggers that were mostly local. Natural conversations, however, contained triggers that were more global. These global triggers generally resulted in negotiations that were longer (spanning several conversational turns), more complex, and often contained references to earlier parts of the conversation. For example, Nakahama et al. provide an excerpt from a conversation between Sumiko (Japanese L1) and Rita (English L1) in which Sumiko was discussing her roommate. Rita asks Sumiko, "Is she a student here, too?" Sumiko responds, "No, she is student... she is Size? Hopkins?" to which Rita responds, "Oh, John Hopkins?" (p. 400). Sumiko's lexical error leads Rita to return to the main topic of the conversation as well as opens opportunities for side topics. Nakahama et al. argue that such natural negotiations create better contexts for pushed output (Swain, 1985) than instructional negotiations. Nakahama et al. also argue that the negotiations that result from natural conversations also lead to longer and more complex conversational turns that indirectly aids language acquisition. Importantly, for the purposes of this study, Nakahama et al. argued that the negotiations found in conversation focus on "aspects of overall discourse or textual coherence" (p. 388).

Coherence Relations

Coherence has proven to be an important element in negotiations for meaning between NNSs and NSs (Mackey, Gass & McDonough, 2000; Nakahama et al., 2001; Pica, 1994). We argue that in naturalistic spoken discourse, a loss of coherence in the utterances of NNSs is predictive of negotiations for meaning. In making this argument we borrow heavily from theories of coherence taken from

the fields of linguistics, cognitive science, and discourse studies (Bublitz & Lenk, 1999; Graesser et al., 2004; Halliday & Hasan, 1976). These theories contend that coherence is associated with the interpretability of discourse (Anderson, 1995). In this study, we will adopt a psycholinguistic distinction between cohesion and coherence in which coherence refers to the representational relationships of a text in the mind of a reader and cohesion refers to the textual features that coherent texts are built upon. In essence, then, cohesion consists of the elements of the text, while coherence refers to the consistency of the elements as a mental representation. They are linked, though, because the more language depends on cohesion, the more coherent it will be and the easier it will be to understand (Foltz, 2007; Graesser, McNamara & Louwerse, 2003).

Thus, while coherence is not completely text inherent, it is partially text dependent (Bublitz & Lenk, 1999). Most often, it is in the form of cohesive devices of which there are many types available to a proficient speaker. These include local linguistic elements (defined as explicit markers of coherence) taken from Halliday and Hasan's (1976) research on cohesion (e.g., reference, substitution, ellipsis, conjunction, repetition, and anaphora) as well as more global measures (implicit markers of coherence) such as causal relationships (Graesser et al., 2004) and semantic similarity (Foltz, 2007). These linguistic features are important in connecting ideas to other ideas in order to develop a continuous theme as well as connect ideas with topics (Graesser et al., 2004; Gumperz, Kaltman & O'Connor, 1986). Cohesive devices allow the speaker to provide indications of coherence in a message, and they provide interlocutors with a means to interpret the message (Tanskanen, 2006). Cohesive devices also allow interlocutors to make links between pieces of discourse and conceptualize the transition of information from one section of discourse to another. Gaps in cohesion force participants to either make inferences to complete the gaps (McNamara, Kintsch, Songer & Kintsch, 1996; McNamara, 2001) or, if inferences are not possible, to negotiate meaning.

Computationally Measuring Coherence

In this study we are interested in measuring cohesive features and correlating these features to evaluations of coherence. Given that we are working with spoken utterances, we are especially interested at looking at lexical cohesive devices because errors in lexical choice are most likely to lead to a negotiation for meaning. Recent advances in various disciplines have made it possible to computationally investigate measures of cohesion that supersede surface components of language. A synthesis of these advances can be found in Coh-Metrix, a computational tool that measures cohesion at various levels of language, discourse, and conceptual analysis (Graesser et al., 2004). Using components that have been developed in the field of computational linguistics (Jurafsky & Martin, 2002), Coh-Metrix analyzes text on several dimensions of lexical cohesion including co-referential cohesion, causal

cohesion, density of connectives, and latent semantic analysis (LSA) (Graesser et al., 2004). All of these indices have been conceptually validated in multiple discourse studies (McNamara, Louwerse, McCarthy, & Graesser, in press).

Our goal is to assess whether or not there is a link between negotiations for meaning and the coherence of NNS utterances. In order to do this, we examine the frequency of NNS utterances that trigger negotiations for meaning and compare this frequency to lexical indices of both local and global cohesion taken from Coh-Metrix. We, thus, test whether lexical indices of cohesion can significantly predict negotiations for meaning. We selected four indices of cohesion (limitations imposed by the number of transcripts stopped us from investigating additional indices. See the statistical analysis section for more information). We chose two global indices of cohesion and two local indices. The two global indices were causality and latent semantic analysis. The two local indices were content word overlap and frequency of connectives. These four indices are discussed below.

Selected Indices

Causality. Causality helps to structure discourse and create a coherent model of comprehension by representing discourse situations (Zwaan & Radvansky, 1998). Causality is also relevant to discourse that depends on the causal relations between events and actions (i.e., stories with an action plot or discourse with causal mechanisms) and is also important at the sentential level in order to express causal relationships between simple clauses (Pearson, 1974-1975). In spoken speech, causal relations are necessary for speakers to make links between initial and subsequent utterances (Gumperz et al., 1986). In addition, causal links are often sufficient to predict differences in how language is judged to be coherent (Trabasso, Suh, & Payton, 1995).

Causal Cohesion is measured in Coh-Metrix by calculating the ratio of causal verbs to causal particles (Dufty, Hempelmann, Graesser, Cai & McNamara, 2005; Graesser et al. 2004). Verbs are coded as being causal by using WordNet categories (Fellbaum, 1998; Miller, Beckwith, Fellbaum, Gross & Miller, 1990). In WordNet a verb is considered a causal verb if the action or event it represents causes something to happen. Thus, a higher incidence of causal verbs such as *cause*, *make*, or *enable*, will relate to utterances that convey more causal possibility. The causal particle count in Coh-Metrix is based on a defined set of causal particles that can be conjunctives, transitional adverbs, or connectives. Examples include causal particles such as *because*, *since*, *so that*, and *as a result*. These causal particles are used to indicate relations between clauses. Together, the incidence of causal verbs and causal particles in a text relates to the conveyance of causal content and causal cohesion.

Latent Semantic Analysis (LSA). LSA is a mathematical and statistical technique for representing deeper world knowledge based on large corpora of texts. Unlike lexical markers of co-referentiality, LSA allows the tracking of words that are semantically similar, but may not be related morphologically. To determine the similarity of passage meaning, LSA uses a mathematical formula known as single value decomposition (SVD) which reduces thousands of dimensions and relationships between words to hundreds of dimensions and relationships (Landauer, Foltz & Laham, 1998) in a manner similar to factor analysis. Thus, if two words appear in the same context, and every other word in that context appears in many other contexts without them, the two will acquire semantic similarity to each other but not to the other words (Landauer & Dumais, 1997; Landauer, 2007). In this way, connections between related words develop. As an example, all component features related to *legs*, *tails*, *ears*, and *fur* are related to each other not only because of the occasions when they occur together, but, importantly, as the indirect result of the occasions when they occur with other elements (such as *animals*). How likely two words will appear in similar discourse settings allows for the plotting of their semantic similarity (Landauer & Dumais, 1997).

As a model of discourse coherence, LSA is used to track the overlap and transitions of meaning as they move across discourse by computing the semantic similarity of text segments. As discourse moves from one utterance to another, an LSA value, which ranges from -1 to 1, can be assigned to each section of text. Discourse that is highly coherent is represented by higher values (values that are closer to 1) as compared to less coherent discourse, which has lower values (Foltz, 2007). Because values range from -1 to 1, seemingly small differences in LSA values may indicate significant differences in text coherence. LSA has been applied to spoken discourse as a measure of the internal coherence of utterances and the effect of this coherence on interlocutors (Foltz, 2005, 2007; Gorman, Foltz, Kiekel, Martin & Cooke, 2003). In Coh-Metrix, LSA scores are assigned at the sentence, paragraph, and text level. For this study, *LSA paragraph to paragraph* scores were used. This is because sentence punctuation for the spoken utterances would be artificial and many spoken utterances are too short to provide proper lexical coverage. However, complete propositions were easily broken up based on turn-taking, which is recognized at the paragraph level. For the purposes of this paper, we use the terms *utterance* and *conversational turn* interchangeably, which are marked in the transcripts as paragraphs or hard returns.

Content Word Overlap. Coh-Metrix considers multiple forms of lexical co-reference between sentences. Indices of lexical co-reference measure referential cohesion, which has been shown to aid in text comprehension and has been labeled an important element of text cohesion (Kintsch & van Dijk, 1978). Lexical overlap can lead to direct language processing, while a lack of overlap can lead to the use of

inferencing strategies. Co-reference indices are also part of Halliday and Hasan's (1976) original cohort of cohesive devices and support the idea that the repetition (exact) or reiteration (related) of a word produces a cohesive effect (Taboada, 2004).

For this study, the index *content word overlap* was selected to represent lexical co-referentiality. We selected this index because studies have shown that identical lexical items are the most common form of lexical cohesion in NS spoken utterances (Taboada 2004). Also, studies have demonstrated that lexical repetition likely lowers the amount of processing needed by an interlocutor by reducing the number of choices and clarifications available. This likely allows the listener freedom to concentrate on the message (Tyler, 1994).

Connectives. As noted by Halliday and Hasan (1976), connectives play an important role in the creation of cohesive links between ideas. As well, the use of connectives in discourse relates to the density and abstractness of discourse and correlates to higher demands on working memory (Costerman & Fayol, 1997). In Coh-Metrix, connectives are measured through their density in two dimensions. The first dimension contrasts positive versus negative connectives, while the other dimension considers connectives associated with particular classes of cohesion identified by Halliday and Hasan (1976) and Louwerse (2001). These dimensions include connectives that are associated with positive additive (*also, moreover*), negative additive (*however, but*), positive temporal (*after, before*), negative temporal (*until*), and causal (*because, so*) indices. In this study, we chose to use the Coh-Metrix index that subsumes all of these connectives.

METHODS

In the current paper we seek to provide correlational evidence that forced output in natural conversations leads to an increased use of cohesive devices and a decrease in the number of negotiations for meaning. We argue that, over time, the modifications that learners make to their output as a result of negotiations impacts their production of cohesive devices. However, since cohesive devices function at the level of discourse and are thus difficult to measure, much of our support for this argument will rely on implicit evidence.

Our first research question asks whether the frequency of negotiations for meaning changes over time with the development of English proficiency. To address this question, we first determine whether there is an increase in English proficiency over time. We then test if there is a decrease in the frequency of negotiations for meaning over time. We predict an increase in English proficiency on the part of the learners that coincides with a decrease in negotiations for meaning that are signaled by the NS interviewers. Therefore, as the learners' English proficiency increases we predict that there will be less need on the part of the NS interviewers to negotiate the meaning of the NNS utterances. Our second research question addresses whether such a decrease in frequency of negotiations for meaning over

time can be predicted by an increase in the production of lexical cohesive devices. For this research question, we predict negative correlations between negotiations for meaning and cohesive devices. Thus, as learners' English proficiency increases, we predict they will use lexical cohesive devices that impact the overall coherence of the discourse, resulting in fewer negotiations for meaning.

Participant Selection

The data used in this study was collected from a group of NNS English learners enrolled in an intensive English for internationals (IEI) program at a large university in the United States. The NNSs were interviewed every 2 weeks (not including program and university breaks) over a 1-year period. These bi-monthly elicitation sessions were scheduled to coincide with the students' regular speaking class. Learners' proficiency levels were assessed upon arrival to the program, and all participants in the study tested into the lowest proficiency level, Level 1, of a 6-level program. Additionally, the learners' language acquisition was assessed through trimester Institutional Tests of English as a Foreign Language (TOEFL). The current paper reports on six of the learners in the original cohort of students. Other learners were dropped from the analysis because of large gaps in the elicitation data during the year of observation or because they did not complete the year. Each learner in the study was given a pseudonym; this paper reports on data from Marta (Spanish L1), Takako (Japanese L1), Eun Hui (Korean L1), Faisal (Arabic L1), Kamal (Arabic L1) and Jalil (Arabic L1). The participants ranged in age from 18 to 29 years old and had all successfully completed high school in their country of origin.

Interviewers were recruited from a graduate level course in second language acquisition. We anticipated that the counts for negotiation for meaning could potentially be confounded by familiarity with a specific NNS as well as familiarity with non-native speech in general (Gass & Selinker, 2001). To control for this, all NNSs were interviewed by at least four different interviewers over the course of the year. In addition, because the graduate level SLA course was offered in both semesters of the academic year in which the study was conducted, a new group of graduate students participated as interviewers in the study. This fact helped control for the NS interviewers' familiarity with NNS speech in general.

Participants (interviewers and NNSs) were given a variety of elicitation materials including emotion cards, picture description tasks, questions and topics for discussion to assist in eliciting language. The participants were also free to introduce their own spontaneous topics into the conversation. Language data was collected in naturalistic settings; that is, while interviewers came to the sessions prepared with various topics from which the learners could choose, the sessions were characterized by natural discourse. In some cases, when the scheduled elicitation session included more learners than interviewers, learners were paired with an interviewer, providing discourse data between the NNS and his or her native-speaking interviewer as well as learner-to-learner data. However, we analyze only the negotiations for mean-

ing that are signaled by the NS interviewers. Elicitation sessions generally lasted between 30–45 minutes. The sessions were tape recorded and later transcribed. A longitudinal approach was used because we sought a developmental relationship between the coherence of speech and the frequency of negotiations for meaning. A cross-sectional study would not have provided sufficient depth of analysis. Previous research has also argued that a longitudinal approach is critical to analyzing negotiations for meaning (Long, 1994; Schmidt & Frota, 1986).

Corpus

The spoken data collected from the six learners was transcribed and forms the foundation for this analysis. Descriptive data for the corpora of each learner is provided in Table 1. Each elicitation session was saved as two text files, one containing the oral production of only the learner in focus, excluding the interviewer or other learners participating in the session, and the other containing the oral production from all of the participants in that session. The text files were manually and electronically checked for spelling errors. Transcriptions in the learner-only corpora were modified to allow for precise computational text processing. These modifications included the deletion of interjections and any words that were clearly non-English words. Inaccurate forms of irregular past tense verbs, while rare, were included (e.g., *taked*, *slepped*). We also deleted all back-channeling utterances such as *aha*, *hum*, *I see*, *wow*, and *oh*. We deleted these utterances so that the NNS utterances would be comprised of an uninterrupted conversational turn marked by a hard return to facilitate text processing. All punctuation except the period and question mark was eliminated from the learner only transcriptions.

Table 1. Descriptive Statistics for Language Participant Data

Learner	Number of Meetings	Mean Words per Utterance	Mean Number of Utterances	Total Number of Negotiations for Meaning*	Utterances Resulting in Negotiations for Meaning
Eun Hui	18	21.31	52.17	238 (13.2)	25%
Faisal	13	33.42	71.08	149 (11.5)	16%
Takako	18	19.40	51.00	114 (6.3)	12%
Kamal	15	23.75	50.27	125 (8.3)	17%
Jalil	17	38.82	61.76	181 (10.6)	17%
Marta	18	33.31	63.61	128 (7.1)	11%

*Numbers in parenthesis: average for transcript

Negotiation for Meaning Frequency Counts

In order to test the hypothesis that correlations existed between negotiation for meaning and lexical cohesive values of the NNS texts, we conducted a frequency count for the number of negotiations for meaning in each transcript. Two independent raters analyzed each of the 99 transcripts. Using the methods of Nakahama et al. (2001), the two raters located signals of negotiations for meaning (e.g., clarification requests, confirmation checks, etc.) from the NS and then worked backwards from the signal to locate the trigger in the preceding NNS utterance or utterances. The triggers were classified into three basic types: 1) lexical, 2) morphosyntactic and, 3) phonological. Examples of each taken from the data in this study are illustrated in Table 2.

Table 2. Negotiation for Meaning Trigger Examples

Trigger Type	Example
Lexical	NNS: In spring, I don't know, I don't see water coming with your body? NS: You don't sweat? NNS: Sweat? NS: You don't sweat... NNS: In my country very sweat. Yes, very hot
Morphosyntactic	NNS: Where from your wife? NS: Huh?
Phonological	NNS: Aha, and there many people looked to runner [lənə], maybe Olympic or... NS: what were they learning? NNS: Running? NS: Ah, running!

In this study, the trigger was coded as producing a negotiation for meaning only in those instances in which there was a clear loss of meaning. We adapt our definition of loss of meaning from Gass and Selinker's (2001), who state that negotiations for meaning are comprised of instances when interlocutors interrupt the flow of conversation because there is a lack of understanding and Long (1996), who states that when a NNS receives feedback from an NS interlocutor that there is a lack of understanding, the subsequent negotiation work allows the NNS to modify their output revealing target-like form-meaning relations. For this study, if multiple signals resulted from the same trigger, meaning the negotiation for meaning was protracted and included more than one negotiation strategy, only the original signal was included in the frequency count. Also, if the NNS self corrected without being prompted by the interlocutor (Foster & Ohta, 2005), no loss of meaning was coded. In addition, if the interlocutor provided the NNS with continuers (Foster & Ohta, 2005) in an effort to show interest in what the NNS was saying, no loss of meaning was coded. As well, if the NNS asked for assistance in the form of a

comprehension check and was thus responsible for prompting the interlocutor to interrupt, no loss of meaning was coded. Because this study was only concerned with measuring lexical markers of coherence, phonological and morphosyntactic triggers were coded, but not included in the frequency count.

Negotiations for meaning were frequent in the data. In Table 1 we report raw scores for the total number of triggers for negotiations for meaning. These range from 114 for Takako and up to 238 for Eun Hui. We took a simple average for negotiations (total number of negotiations for meaning divided by the total number of meetings) to arrive at the number in parentheses. The average number of negotiations for meaning per transcript ranges from 6.3 for Takako up to 13.2 for Eun Hui. We also calculated the average percentage of utterances that resulted in negotiations for meaning. We divided the average number of negotiations by the average number of utterances to arrive at the percentage in the far right column of Table 1. These figures range from 11% of the utterances for Marta up to 25% of the utterances for Eun Hui. The average for all six learners is 16%. This means that, on average, 16% of all NNS conversational turns (utterances) led to a signal of miscomprehension by the NS followed by a negotiation for meaning. Many of these negotiations were protracted over several turns, so the percentage of turns that were in some way related to negotiations for meaning is, in fact, higher. We highlight this descriptive statistic in order to show that negotiations for meaning were indeed a common feature of the learners' oral discourse and worthy of study in regards to their influence on overall language development.

The interrater reliability of the two independent raters for the 99 transcripts in the corpus in coding the number of triggers, the trigger types, and the negotiation cycles was .98, indicating a high level of agreement. As in previous studies, the majority of the triggers were lexical in nature with few instances of morphosyntactic or phonological triggers (Ellis et al., 1994; Foster, 1998; Hatch, 1978; Mackey et al., 2000; Pica et al., 1993; Sato, 1986). However, as stated above, we were only concerned with lexical triggers. These triggers were given a raw frequency score, but this was normalized by the number of words in the transcript in order to control for text length differences among the transcripts. This normalized frequency was used as an assessment of the number of negotiations for meaning per transcript (here after *negotiation for meaning count*). For example, in the first elicitation session with Kamal we counted 17 negotiations for meaning. This raw score was divided by the total number of words produced by the learner (1072) in that session for a normalized frequency of .016. This corresponds to one trigger for every 63 words produced by the learner.

During the hand coding of the transcripts, we noticed that both the task and number of NNS participants in the interview seemed to play an important role in the use of negotiations for meaning. Interactions that involved visual tasks such as picture descriptions appeared to have fewer negotiations for meaning because participants were able to reference the pictures. Interactions that involved more than one NNS also tended to have fewer negotiations because interlocutors ap-

peared more likely to switch between NNSs instead of confronting an incoherent utterance. Alternatively, an NNS would respond to an NNS utterance without negotiating meaning. Thus, in our statistical analysis (see the following section for more detail), we ran two multiple regressions comparing cohesive devices and frequency of negotiation of meaning. The first multiple regression was conducted with all 99 transcripts and the second multiple regression was conducted with a subset of 59 transcripts that excludes the transcripts from the picture description tasks and sessions with two NNSs.

Statistical Analysis

Measurements of LSA, causality, content word overlap, and connectives were collected from the Coh-Metrix results for each of the 99 transcripts in the learner only corpus. The number of transcripts available (99 in this case) limited the number of predictors that could safely be used without over-fitting the model. Generally, a minimum of 20 cases of data for each predictor is considered to be accurate (Crossley, Greenfield & McNamara, 2008; McCarthy, Lehenbauer, Hall, Duran, Fujiwara, & McNamara, 2007).

To assess whether the learners' language skills were developing, a repeated measures Analyses of Variance (ANOVA) was conducted that compared the learners' trimester Institutional Test of English as a Foreign Language (TOEFL) scores to the amount of time they had spent learning the language. Next, an ANOVA was used to track the linear trend of the frequency count over the increasing temporal intervals. This ANOVA was used to test the prediction that as learners' time spent learning English increased, their need to negotiate meaning would decrease. Because all participants did not share all of the same temporal data points, the ANOVAs analyzed development on a trimester basis. This allowed for breaks in the data related to winter and spring breaks to be considered as well as missing data points resulting from participant absences. Because data was available for the first two weeks and the last two weeks for all six learners, it was included. These data points were analyzed with data from the 16th week and the 32nd week as well. The ANOVAs were supplemented with post-hoc tests of within-subjects contrasts in order to examine where in the temporal progression significant differences in output occurred.

To calculate the amount of variance that the selected Coh-Metrix variables explained for the coded negotiations for meaning, multiple regressions were conducted. The multiple regressions tested the prediction that as the frequency of the selected cohesive devices (causality, LSA, content word overlap, and connectives) increased over time there would be a corresponding decrease in the frequency of negotiations for meaning. This would result in a significant, negative correlation. Thus, the four selected Coh-Metrix variables were used as predictors in a multiple regression equation with the negotiation for meaning normalized frequency scores

as the dependent variable. To assess the assumption of independent errors caused by outliers, Durbin-Watson statistics were conducted. In order to assess the assumption of multicollinearity, coefficient analyses were conducted.

As mentioned earlier, because the raters noticed the differences in negotiations for meaning caused by the task and the number of participants, an additional multiple regression was conducted that consisted of transcripts that did not contain picture description tasks or multi-party discourse. Because the number of transcripts available decreased (to 59 as compared to 99), only three predictors were used. The remainder of the second analysis was similar to the first.

RESULTS

ANOVAs

ANOVA results comparing the trimester TOEFL scores demonstrated that the TOEFL scores were significantly affected by temporal increases $F(3, 15) = 22.78$, $p < .001$ (see Table 3 for descriptive statistics). A test of within-subjects contrasts demonstrated that the TOEFL scores from the last trimester were significantly different from scores from the first trimester, $F(3, 15) = 33.98$, $p = .002$. Additionally, significant differences in TOEFL scores were found between the first trimester and the second trimester, $F(3, 15) = 17.23$, $p < .009$. These findings provide evidence that as the learners in this study spent time studying English, their language skills increased.

ANOVA results comparing the first trimester, second trimester, and the third trimester of learning to the negotiation for meaning counts show that negotiation for meaning counts were significantly affected by temporal increases, $F(5, 25) = 10.69$, $p < .001$ (see Table 4 for descriptive statistics). Within-subjects contrasts demonstrated that the frequency of negotiations for meaning from the last meeting on the 52nd week was significantly different from the first meeting on the first week, $F(5, 25) = 12.02$, $p = .018$. Additionally, significant differences in negotiation for meaning counts were found between the first week and the 16th week, $F(5, 25) = 10.50$, $p = .023$, the first week and the 32nd week, $F(5, 25) = 12.17$, $p = .018$, and between the first week and the 50th week, $F(5, 25) = 12.50$, $p = .017$. These findings provide evidence that the number of negotiations for meaning decrease with time spent learning English.

Table 3. Mean and Standard Deviations for TOEFL Scores

Trimester	Mean of six TOEFL Scores	Standard Deviation
1	388.33	49.79
2	418.83	33.04
3	450.67	30.12
4	458.83	29.25

Multiple Regression Analysis all Transcripts

In order to estimate the degree to which the chosen independent variables (the global and local cohesive device) were correlated to the frequency of negotiations in the spoken transcripts of the NNSs in this study (the dependent variables), a multiple regression analysis was conducted. In the regression analysis, the four variables (causal cohesion, LSA, content word overlap, and connectors) were regressed against the normalized frequency count of negotiations for meaning found in the NNS transcripts. When comparing the four selected variables to the normalized frequency of negotiations for meaning, significant Pearson correlations were reported for all indices. Correlations between the normalized frequency of negotiations for meaning and the causal cohesion score were statistically significant and in the predicted direction, ($N = 99, r = -.34, p < 0.001$), as was the LSA score, ($N = 99, r = -.25, p = 0.006$), and the content word overlap score, ($N = 99, r = -.21, p = 0.017$). The frequency of connectives was also statistically significant, ($N = 99, r = -.16, p = 0.05$). Descriptive statistics for the dependent and independent variables are found in Table 5. The variables were also checked for outliers and multicollinearity. The outliers score demonstrated that there were no independent errors caused by residuals. Coefficients scores demonstrated that the model data did not suffer from multicollinearity.

Table 4. Mean and Standard Deviations for Negotiation for Meaning Frequency Counts

Week	Mean*	Standard Deviation
1	0.241	0.015
2	0.012	0.004
16	0.010	0.004
32	0.006	0.004
51	0.005	0.003
52	0.004	0.002

*The small means are the result of normalized frequency counts

In the linear regression, a significant model emerged ($2, 96 = 10.07, p < .001$). The model reported $r = .416$, and an $r^2 = .173$. Causal cohesion was a significant predictor ($t = -3.58, p = .001$) and explained 11.4% of the variance. LSA was also a significant predictor ($t = -2.64, p = .010$) and explained 5.9% of the variance. Content word overlap was not a significant predictor ($t = -.24, p = .814$) nor was density of connectives ($t = .53, p = .60$). Thus, neither was included in the final regression model. The combination of the two global indices of cohesion (causal cohesion and LSA) accounted for 17% of the variance in the frequency count for the negotiations for meaning. In other words, 17% of the variance in the negotiations for meaning can be predicted using causal cohesion and LSA indices alone.

Table 5. Descriptive Statistics

Variable	Mean	Std. Deviation
<i>Predicted</i>		
Negotiation Count Normalized by Word	0.008	0.007
<i>Predictor</i>		
Causal Cohesion	5.62	6.60
Latent Semantic Analysis	0.23	0.09
Content word overlap	0.21	0.10
Connectives	108.74	71.19

Note: N=99

Multiple Regression Analysis of Transcripts without Picture Tasks and Multiple Speakers

We conducted a second multiple regression to examine whether a stronger effect emerged if task and multiple speakers were controlled in the transcripts. Because the data for the second multiple analysis consisted of 59 transcripts, only three variables were selected. These variables were selected based on the strength of the Pearson correlations from the first multiple regression analysis. They were causal cohesion, LSA, and content word overlap. A stepwise multiple regression analysis was calculated in which these three variables were regressed against the normalized frequency count for the negotiations for meaning found in the NNS transcripts. When comparing the three selected variables to the normalized frequency of negotiations for meaning, significant Pearson correlations were reported for all indices. Correlations between the normalized frequency of negotiations for meaning and the causal cohesion score was statistically significant and in the predicted direction, ($N = 59$, $r = -.35$, $p < 0.003$), as was the LSA score, ($N = 59$, $r = -.36$, $p < 0.002$), and the content word overlap score, ($N = 59$, $r = -0.30$, $p < 0.011$). Descriptive statistics for the dependent and independent variables are found in Table 6. The variables were also checked for outliers and multicollinearity. The outlier score demonstrated that there were no independent errors caused by residuals. Coefficients scores indicated that the model data did not suffer from multicollinearity.

In the linear regression, a significant model emerged ($2, 56 = 9.06$, $p < .001$). The model reported $r = .495$, and an $r^2 = .245$. LSA was a significant predictor ($t = -2.97$, $p = .004$) and explained 13.3 % of the variance, Causal cohesion was also a significant predictor ($t = -2.87$, $p = .006$) and explained 11.2 percent of the variance. Content word overlap was not a significant predictor ($t = .34$, $p = .74$) and was not included in the model. Translated, this signifies that the combination of the two global indices of cohesion (LSA and causal cohesion) accounted for

25% of the variance in the frequency count for the negotiations for meaning. In other words, 25% of the negotiations for meaning can be predicted based on LSA scores and causality indices.

Table 6. Descriptive Statistics

Variable	Mean	Std. Deviation
<i>Predicted</i>		
Negotiation Count Normalized by Word	0.008	0.008
<i>Predictor</i>		
Causal Cohesion	5.496	6.481
Latent Semantic Analysis	0.244	0.104
Content word overlap	0.210	0.119

Note: N=99

DISCUSSION

In this study we compared the frequency of negotiations for meaning in a naturalistic spoken corpus to a variety of cohesive devices. The purpose of this study was to demonstrate the link between coherence in NNS spoken discourse and the frequency of negotiations for meaning. We based our analysis of coherence on the notion that coherence can be measured by specific cohesive devices. This notion has its critics (Brown & Yule, 1983; Cook, 1989; Stubbs, 1983; Widdowson, 1984), who argue that even though cohesion is a quality of text that can be quantified, it is no guarantee of coherence, which is a quality of discourse that varies with context and participants. Examples of cohesive, but incoherent text, have been offered in the literature. Conversely, there are coherent texts (albeit short ones) that are not cohesive. While we acknowledge the contribution of these early studies on coherence and cohesion, we offer a psycholinguistic perspective to discourse analysis as well as a corpus and computational approach that incorporates both naturalistic texts and validated indices of cohesion. In this study, we find, through a series of regression analyses, that global cohesive devices measuring causal cohesion and latent semantic similarity are significantly related to the frequency of negotiations for meaning. This finding not only provides evidence that negotiations for meaning are likely a response to a lack of coherence in NNS's utterances, but that a lack of coherence can be predicted based on semantic co-referentiality and causal verbs and particles.

This study has demonstrated that NNS discourse exhibits a statistically significant decrease in frequency of negotiations for meaning as a function of time and as a function of language proficiency (as measured by the Institutional TOEFL). The finding that (1) global cohesive devices were significantly predictive

of the frequency of negotiations for meaning, and (2) negotiations for meaning decreased significantly over time as language proficiency increased suggests that NNS speech becomes more coherent as a function of time spent studying English. An argument that posits the notion that cohesion alone is responsible for coherence is, of course, overly simplistic. We contend that cohesive devices are important features to assist in creating coherent utterances in natural discourse (Bublitz & Lenk, 1999). We also contend that listeners use cohesion devices to recognize and interpret coherent utterances (Tyler, 1994). However, cohesive devices are but one of many cues a listener can access. It should be noted that while the findings for this analysis were significant, the two global cohesive devices used only explained 17% of the variance found in the negotiation for meaning frequency count in the complete corpus and 25% of the variances in the controlled corpus. While the percentage of variance explained is low, the reported effect sizes are medium ($r = .416$ and $r = .495$ respectively; Cohen, 1992). However, there is much variance in the negotiation for meaning counts that is unexplained. This variance could be accounted for by factors such as phonology (McCarthy, 1992), prosody, other aspects of physical context, paralinguistic cues (Gumperz, et al., 1986), grammar, or structural relations (Gumperz et al., 1986; Tyler, 1994). In addition, many instances of incomprehensible data may not have lead to negotiations for meaning. This is because at certain moments, obtaining comprehensible input may not be as important as maintaining supportive and friendly discourse. Thus, NSs might have avoided entering into negotiations for meanings in order to protect the NNSs from face threatening acts (Foster, 1998). What this study demonstrates, though, is that global cohesion devices are an important, but not complete, explanation of what triggers negotiations for meaning.

Overall, this study connects global cohesive devices to the incidence of negotiations for meaning, which have been shown in prior research to have implications for language development (Long, 1996; Pica, 1994). The statistical analyses in this study have shown that there is a negative correlation between the use of cohesive devices and the frequency of negotiations for meaning. This finding demonstrates that a lack of global cohesive devices (specifically semantic co-referentiality and causal verbs and particles) in the naturalistic spoken utterances of NNSs correlates to the frequency of negotiations. That is to say, the absence of global cohesive devices likely affects the coherence of the discourse and thus its comprehensibility. Because the incidence of negotiations for meanings can be predicted by global devices of cohesion, and because the use of these devices correlates to fewer negotiations for meaning, we argue that the use of global cohesive devices is related to more coherent utterances. We must emphasize that correlation is not causation, statistically speaking. Our results only show a relationship between the use of global cohesive devices and negotiations for meaning. However, this relationship can be interpreted to support the notion that interactional negotiations provide a context in which learners can engage in the production of language that promotes language acquisition. Much of this evidence is, of course, indirect. For instance,

we know learning occurred and we know the nature of the interactions in which the learners participated. Thus, we have evidence that negotiations for meaning were frequent and involved the pushed output necessary to raise awareness of forms. As the learners' proficiency developed, the number of negotiations decreased as the rate of global cohesive devices increased. Our results, thus, show it is theoretically possible that evidence provided to the NNSs through signals of miscomprehension and the subsequent negotiation for meanings promoted the acquisition of global cohesive elements. These global elements are more opaque than local cues and thus more difficult to examine explicitly. However, we argue that the resulting extended discourse that resulted from the negotiations provided ideal contexts in which to practice and develop global cohesive devices.

To illustrate this development, we look at excerpts from the data of two learners at the beginning and at the end of the study (four excerpts in all). To demonstrate changes in global cohesion, the excerpts' corresponding scores for semantic co-referential cohesion and causal cohesion are included. Because global cohesive devices are calculated at the level of text and not at the word level, specific instances are difficult to highlight. Nevertheless, we attempt to illuminate where global cohesion is low and where it is high. The first two examples, taken from Jalil and Eun Hui's transcripts at the beginning of the longitudinal study, exhibit low semantic co-referential cohesion and causal cohesion.

Example 1 (Jalil, Week Four):

- Jalil: Oh, I like these English movies.
 NS: Ok, Jalil, tell me about English movies.
 Jalil: Yeah, just become, uh, seeing the one English movies for the, uh, one woman come the, the all the baby who is the tail...
 NS: Tail?
 Jalil: Of the birds, yeah!
 NS: Uh huh?
 Jalil: You know?
 NS: No, I don't know tail, uh
 Jalil: No! The tail of the birds!
 NS: The tail of the birds?
 Jalil: Yea, who is in the back. You know tail?
 NS: Yea.
 Jalil: Woman born the baby with a tail.
 NS: A woman gave birth to a baby with a tail?
 Jalil: Yea.
 NS: What movie is this?
 Jalil: Uh, this, uh, I don't. What is the name? Uh the "X", the "X". I don't remember.
 NS: "The X-Files"?
 Jalil: Yea, yea!

Example 2 (Eun Hui, Week Four):

- Eun Hui: Travel, I like to train alone, every on Sunday, I travel train
 NS: In Korea?
 Eun Hui: Yea, my country famous city, Jejudo, Jejudo is... this land ocean...
 NS: Aha, island?
 Eun Hui: Island, island, yea, this island is Jejudo very famous, many people visit it, another country.

Example one, containing Jalil's spoken utterances, demonstrates low semantic co-referentiality (an LSA value of .08) and moderately low causal cohesion (causal cohesion value of .16). The lack of semantic co-referentiality in the description of the child born with a tail likely corresponds to the negotiation for meaning. The negotiation for meaning is completed when Jalil includes the semantically linked word *born*, thus clearing up the earlier comprehension problem. In the second example, Eun Hui uses no causal verbs or particles and uses low semantic co-referentiality (LSA value of .17). The low semantic co-referentiality likely corresponds to the second negotiation of meaning.

We next examine transcripts from Jalil and Eun Hui in the final month of observation:

Example 3 (Jalil)

- NS: So, you've met some people who speak this language?
 Jalil: Yea, I already met a lot
 NS: Really!
 Jalil: Yea, a lot, I saw them, actually they live in mountains, inside, really inside the mountains, they have like old house, the government would like to build a new house to them, or give them money for their house, they don't want it, they say no, we like our houses
 NS: They just like their traditional ways [falling intonation]
 Jalil: And they cannot, like, they have cars, but they cannot bring it to their homes, because they don't have a road, or a way to their home, they just walking, or like camel, or they have don key.

Example 4 (Eun Hui)

- Eun Hui: Yea, he reads, he reads to our outline, how can I write it down, outline, yea, that is helpful, during story telling, it's the same, it's the same way.
 NS: Create a little outline [falling intonation]
 Eun Hui: The first we have to read some story, and then we write some the skeleton, and then we just retell.

In Example 3, Jalil discusses a cultural group in his country that is different from the mainstream culture. The words that Jalil chooses in this utterance are more semantically co-referential than in Excerpt 1 (*live, house, home, road, walk, camel, and donkey*; an LSA value of .284); in addition, Jalil uses various causal verbs and particles to make connections between his ideas (causal cohesion score of .33). It should be noted that the NS's utterance *they just like their traditional ways* was not coded as a negotiation for meaning because of the falling intonation. In Example 4, Eun Hui talks about outlining in her writing class. In this example, Eun Hui links her utterances through semantic co-referentiality (*reads, outlines, write, story, telling, and retell*; an LSA score of .29), although she doesn't strongly depend on the use of causal particles and verbs in this example to connect her ideas (causal cohesion value of .19). As before, it should be noted that the NS's utterance *create a little outline* was not coded as a signal for a negotiation for meaning because of the falling intonation.

These excerpts help to illustrate changes in the use of global cohesive features in the L2 learner's output over the course of the longitudinal study and reinforce the statistical analyses reported earlier. Both the qualitative and quantitative analyses support the notion that the learners developed more coherent speech strategies over the course of a year. In fact, significant differences in coherence patterns as measured by the frequency of negotiations for meaning triggered by NNSs were noted within 4 months of studying English in a naturalistic environment. These significant trends continued until the end of the yearlong study with NNS/NS transcripts demonstrating fewer negotiations for meaning as the study continued. Because the study controlled for familiarity effects between the NNSs and their interviewers, this result is not the product of interviewers becoming familiar with the speech patterns and discourse strategies of the NNSs, but likely the result of NNSs developing coherence strategies.

Additionally, this study provides evidence that naturalistic discourse, especially between NNS and NS, is a rich source of negotiations for meaning. Seminal work in negotiations for meaning and interactions have mostly classroom discourse and planned discourse over the naturalistic discourse used in the current study (Long, 1980, 1983, 1996; Sato, 1986; Pica, 1992; Pica et al., 1993). The preference for classroom and planned discourse is based on the belief that these types of discourse provide greater opportunities for researchers to study negotiations for meaning, especially between NNSs. The argument is that in naturalistic discourse interlocutors change topics when the conversation results in a loss of comprehension. However, as discussed by Nakahama et al. (2001), this may be the result of natural discourse containing different triggers than planned discourse. Specifically, Nakahama et al. found that planned discourses such as information gap activities contained more local triggers than global triggers. In our study, global cohesion indices were significantly predictive of negotiations for meaning, whereas local

cohesion indices were not. This finding helps to support the notion that naturalistic discourse does not suffer from a lack of negotiations for meaning, but that the types of triggers that lead to negotiations may be different.

This study also provides evidence that context (Gumperz et al., 1986) and number of speakers (Tanskanen, 2006) can influence the frequency of negotiations for meaning. The increase in the predictive power of the two cohesion variables that resulted from trimming the corpus of transcripts containing contextual variables (picture tasks) and multiple NNSs is evidence that both context and number of speakers can affect the negotiation process. In reviewing the data, this appears to be the result of NNSs and NSs preferring to use graphic information (in the case of the picture tasks) in lieu of negotiation for meaning or, in the case of multiple speakers, the lack of negotiations between NNSs and the tendency for NS to defer or ignore a loss of meaning in favor of switching the conversation to another speaker.

CONCLUSIONS

We conclude that cohesive features in NNS discourse are predictive of, but not necessarily causally related to, negotiations for meaning. Elements of increasingly coherent discourse can be tracked to the incidence of causal verbs and particles and to the semantic similarity of utterances. This finding is important to language acquisition studies because it suggests that conversation is indeed a good environment from which learners can develop greater coherence in their discourse. We argue that negotiations for meaning are a frequent and natural component in language learning and that these interactional negotiations provide pushed output that allows for the production of global cohesive devices. We contend that incoherent speech is not a matter of incoherent thought as argued by Morgan (1978), Morgan and Sellner (1980), and Green (1989), but is influenced, at least partially, by the problematic or nonnative use or nonuse of global cohesive devices. This finding, in and of itself, is important (Green & Morgan, 1981).

Like all studies, though, this study does have limitations. Although it is a longitudinal study and fits the parameters of the type of study that is needed in the field (Schmidt & Frota, 1986; Long, 1994;1996), it examined only six learners over the course of a year. Even though this number is sufficient for the analyses conducted in terms of statistical power, it is arguable whether the sample is large enough to be representative. In reference to the number of speakers, it should also be noted that three of the six learners shared the same language (Arabic). Whether the learner's first language influenced their use of the global cohesive devices examined here is unknown, but could limit the extendibility of the findings. Additionally, the number of transcripts available limited the number of cohesion devices that could be analyzed. Knowing, though, that the local cohesive devices were ejected from the multiple regression analysis, this limitation is likely more equated to the need to develop additional indices to measure global markers of cohesion. However,

even additional cohesion indices may not significantly increase the predictive power of the model. Lastly, this study did not control for phonological, grammatical, paralinguistic, and other coherence cues. These are limitations that future studies should address. As well, since this study only examined naturalistic discourse and ignored instructional discourse, future studies should concentrate on how cohesion devices trigger negotiations for meaning in controlled instructional settings such as information gap activities.

Despite these limitations, none of which we feel strongly impoverish the findings, we contend that this study and its implications are of importance for second language studies. The findings reported here link global cohesive devices to negotiations for meaning in second language oral production. The results show that global cohesive devices are predictive of the comprehensibility of a learner's utterance. The cohesive devices are an indication of overall spoken text interpretability and cannot be easily localized to a single word choice, pronunciation, grammatical structure or other linguistic element. Because such phenomena are not easily intuited in large corpora, the use of sophisticated computational tools is essential. The use of such tools, which are common in disciplines within psychology, cognitive science and corpus linguistics, is relatively new in SLA studies. Thus, our study is an example of interdisciplinary work that has great potential to understanding language acquisition processes, particularly in longitudinal designs like the one in the current paper.

Overall, we demonstrate that NNSs develop communication strategies that impact the nature of negotiations for meaning over the course of time. Our findings support prior research that posits the value of negotiations for meaning as a delayed effect to second language development. Specific to the current paper, we see an important role for negotiations for meaning in providing learners opportunities in contextualized, comprehensible discourse to produce more cohesive language. We argue that the impact over time may lead to more comprehensible output through more coherent speech.

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Scott Crossley is an Assistant Professor in the Department of Applied Linguistics and ESL at Georgia State University. His interests include computational linguistics, corpus linguistics, and second language acquisition. He has published articles in second language lexical acquisition, multi-dimensional analysis, discourse processing, speech act classification, cognitive science, and text linguistics.

Thomas Salsbury is an Assistant Professor in the Department of Teaching and Learning, College of Education, at Washington State University. He has published in the areas of pragmatics and language learning, discourse analysis and content-based instruction. His current work is in second language lexical development.

Danielle McNamara is a Professor at the University of Memphis. Her work involves the theoretical study of cognitive processes as well as the application of cognitive principles to educational practice. Her current research ranges a variety of topics including text comprehension, writing strategies, building tutoring technologies, and developing natural language algorithms.