Discourse structure and word learning

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The extant literature on discourse comprehension distinguishes between two types of texts: narrative and expository (Steen, 1999). *Narrative discourse* tells readers a story by giving them an account of events; the narration informs and/or persuades the readership by using textual elements such as theme, plot, and characters. *Expository discourse* explains or informs the readership by using concepts and techniques such as definition, sequence, categorization, and cause-effect relations.

The present study is based on two experiments. In Experiment 1, we compared the two discourse types to examine if college students would be better at extracting the meanings of novel words from one of the two types of discourse structure than from the other. The findings indicated that participants were significantly better at inferring the meaning of novel words from narrative compared to expository discourse. In Experiment 2, we examined the number of situation models that a reader is required to mentally construct, as a possible characteristic that influences the difficulty of learning new word meaning within narrative discourse. Contrary to intuition, fewer novel words were learned in a single-situation, as opposed to a multi-situation model condition, suggesting that the additional inferencing needed to construct multiple models also promotes word learning. Results are discussed with respect to how the structure of written discourse can facilitate word learning in a reader's native language. Implications for education and assessment are also discussed.

Keywords: narrative vs. expository genre, word learning, situation model, text comprehension, written discourse, theory of mind

Introduction

Pragmatics and discourse can be considered from a purely theoretical perspective by analyzing the underlying rules or forms present in everyday verbal exchanges (Mey, 2001). In contrast, the current special issue focuses on the relatively neglected practical benefits of discourse analysis. Along these lines, one can treat

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discourse not as a scientific object unto itself, but instead as a tool that can be manipulated in order to bring about real social change. For example, one could view verbal exchanges as a tool for knowledge transfer in vocational settings (Fillietaz, this issue) and reasonably ask how the form of discourse could be altered so as to improve knowledge transfer.

The current article takes the perspective of viewing discourse as an educational tool that can convey the meanings of new words. Some texts will be more efficient than others in doing this. Through rigorous experimental manipulation, social scientists can identify the factors that are likely to influence how effectively a given piece of discourse can fulfill this function. Once the appropriate factors have been isolated, one can make new and improved vocabulary teaching "tools."

Improving word learnability in discourse could have important social implications for what is known as the "achievement gap" in the United States (Hedges & Nowell, 1999). This refers to the disparity in knowledge and skills that exists between the poor and the rich at essentially every level of education, and which ultimately contributes to disparities in income and job opportunities. One way that this gap is expressed is through vocabulary knowledge: privileged groups have larger vocabularies than the less privileged (Hedges & Nowell, 1999). This difference in vocabulary size gives students a leg up in learning new concepts through reading and discourse as they progress through the educational system.

The implication is that even small deficits in vocabulary at an early age can snowball into larger intellectual deficits later in life. For example, if students fail to master basic Newtonian physics because they never learnt the meaning of the words "acceleration," "inertia," and "mass," they are unlikely to continue on to master more difficult concepts like "energy damping." So an initial gap in basic vocabulary could ultimately contribute to, for example, a difference in the number of engineers coming from rich vs. poor backgrounds. Knowing how to create efficient texts for word learning could help to repair some of these problems.

The nature of word learning

Efficient word learning requires structured hypothesis testing. A writer uses a word whose meaning a reader does not yet master, and the reader must infer the meaning of that word based on the currently available clues. It is plainly the case that the majority of texts are not written to teach new word meaning (Schatz & Baldwin, 1986) but paradoxically, the primary way in which adults learn new word meaning is through written discourse (Landauer & Dumais, 1997; Sternberg & Powell, 1983). Studies have indicated that adults can learn up to five new words per day through reading (Landauer & Dumais, 1997). However, few studies have

examined the role of discourse *genre* in influencing adults' ability to glean word meaning from text.

The underlying theme of this paper is that while discourse genres may not dramatically differ on superficial features of the text, they likely do differ in how readers respond to them. As readers become more engaged in integrating information across many parts of the text, their ability to learn new words increases because they have a larger and more elaborate hypothesis space to work with. Genre differences may systematically influence how much conceptual integration is likely to happen and therefore how efficient word learning will be.

Types of discourse

Discourse genre is a level of text categorization that is used to classify text according to its type of linguistic expression. Text genres are characterized by attributes like domain, medium, content, form, function, type of classical rhetoric, and language. Four well-known genre types include: argumentation, description, exposition, and narrative (Steen, 1999). Of these four types, narratives and expositions are the two genre types that are most frequently encountered by adults in everyday reading materials (e.g., instructional manuals and short stories), and they are the focus of this study.

Narratives are defined as texts that give an account of events through storytelling. Typically, narrative texts are used to entertain or persuade people by using elements such as theme, plot, characters, and social interaction (DuBravac & Dalle, 2002; Weaver & Kintsch, 1999). According to the Programme for International Student Assessment (PISA, 2001), the information in narrative text provides readers with answers to "when", or "in what sequence" questions. One often encounters narrative in story books or novels. In contrast, expositions are defined as texts that explain or inform readers using definition, sequence categorization, and cause-effect (Britton & Black, 1985). The purpose of exposition is to introduce new materials and explain difficult concepts to readers. Expositions or informational text provide an explanation of how the component elements interrelate in a meaningful whole and often answer "how" questions (PISA, 2001). These types of text are usually presented in textbooks and scholarly journals (DuBravac & Dalle, 2002; Tun, 1989).

Exposition, narrative and word learning

The literature on discourse has recognized that a distinction has to be made between narrative and expository types of text. However, sparse consideration has

been given to the effect of genre types and adult vocabulary learning. Intuitively, one might think that vocabulary learning would be easier in expository text simply due to the fact that in this text type it is often the case that the author explicitly intends to teach a new word or concept to the reader.

However, this view neglects the importance of reader response to the text. In particular, there is some evidence for the view that narrative text is generally more engaging than exposition. For example, when asked what they would like to buy, adults prefer text about people over text about objects (Barnes, 2011). Secondly, if forced to choose between two texts that are about objects, they prefer those about fictional objects (Barnes, 2011). This suggests that adults generally prefer fiction and text about people, which maps on pretty well (although not perfectly) to the "narrative" genre. On the other hand, adults seem to dislike non-fiction and text about objects, which maps pretty well onto the "expository" text type.

If people do become more engaged in narrative compared to expository text, then one would expect word learning to be better in the case of narrative text since engagement would induce readers to make the inferences necessary for word learning.

There also exists some preliminary evidence that narrative may be more engaging specifically when it comes to inferring the mental states of others (often referred to as 'theory of mind'). For instance, Lisa Zunshine (2006) recently argued that the main reason that people read narrative fiction is because it provides "social practice." In essence, fiction allows the readers to exercise their theory of mind in a way that expository text does not. Supporting this, Mar et al. (2010) found that children's exposure to storybook narratives predicted theory of mind abilities and development, whereas children's exposure to other types of media did not. These results suggest a link between fictional narrative and theory of mind ability, although the direction of the possible causality is unclear.

Theory of mind has been shown to play a particularly important role in word learning (Bloom 2005). On this view, learning the meaning of a new word from text involves engaging theory of mind in order to assess the mental states of the author, the mental states of a character in the story, or both in order to correctly map a word's form to an underlying concept. If it is indeed the case that narrative text more fully engages theory of mind than does expository text, that would in turn provide readers with a wider range of word learning clues to work with in figuring out what a word in text means. Thus, both in terms of general engagement and theory of mind engagement, narrative texts might be expected to provide a more solid foundation for word learning.

Presently existing studies on discourse type

Since narrative and exposition are most frequently encountered in everyday societal discourse, it is important that more attention be given to which text is best suited for learning and comprehension situations. Few studies have looked at this directly.

With regard to learning, Nagy, Herman, and Anderson (1985) investigated 13–14 year olds' incidental word learning in the context of reading everyday discourse. Participants were given either a narrative or exposition passage to read and were asked to define unfamiliar words within the passage. The adolescent subjects did indeed learn new words while reading, but the proportion of words learned was similar across genre types. Other studies have also failed to find significant differences in word learning between narratives and expositions (Carroll and Drum, 1982; De Beni, Borella, & Caretti, 2007; Harris, 1998; Hartley, 1986; Johnson, 2003; Tun, 1989; Zabrucky & Moore, 1999).

When it comes to reading comprehension, the literature shows genre effects to be more prevalent, as recall has been found to be aided by a particular genre type. Tun suggests that narrative texts are generally easier to follow, as compared to expositions, because they are more familiar to readers, more predictable, and have a well-defined structure. Several researchers (DuBavac & Dalle, 2002; Graesser, 1981) suggest that narrative texts allow for more knowledge-based inferences. Since narratives are more easily related to readers' everyday world, they argue, text recall is easier in the case of narratives because readers are better able to draw from their own personal experience and make inferences using the material provided in the text. The use of personal schemas also allows readers to make more inferences and elaborations when reading narratives.

On the other hand, several studies have demonstrated that adults comprehend expositions better than narratives. Hartley (1986) examined younger (18–28 years old) and older (61–75 year old) adults' ability to recall propositions from either narrative or expositions. Results indicated that both younger and older adults correctly recalled more propositions from expository than from narrative texts. Additionally, Harris (1998) reported that expositions led to better conceptual representation and faster reading times than narrative texts. This finding was attributed to the fewer linguistic elements necessary for recall from expositions, thus leading readers to faster understanding and better preservation of conceptual meaning.

The current study

Based on the lack of consensus regarding genre types and its relationship to word learning, there appears to be a need to further examine the question of adults'

word learning during reading within specific genre types. The present study examines adults' vocabulary acquisition during the silent reading of two genres of discourse: narrative and expository. In Experiment 1, adult readers were exposed to novel vocabulary in multiple narrative and expository passages. Their knowledge of word meanings was analyzed on the basis of the definitional accuracy of their responses (i.e., correct *vs.* incorrect). In Experiment 2, a quantitative analysis of the structure of the passages used in Experiment 1 was conducted. We aimed to determine if the characteristics of written discourse that are related to situation models (van Dijk and Kintsch, 1983) had any influence on word learning.

Experiment 1

In Experiment 1, we examined whether in adult readers, narrative or exposition is better for acquiring the meaning of new words. We did this by comparing the proportion of novel vocabulary words defined correctly in each genre type. We predicted that word learning in narrative texts would be improved relative to expository text because narrative text would be more likely to encourage conceptual integration. This hypothesis is consistent with the aforementioned work on adult preferences for fiction/narrative and on theory of mind engagement. If readers are more engaged with the text and dispose of social clues to word meaning, then they are more likely to integrate disparate pieces of information. Given the lack of consensus in the literature, this outcome was not obvious.

Method

Participants

Seventy-four participants were recruited from two major universities in the United States, one in the Northeast (n = 35) and one in the Southeast (n = 39). All participants were native American English speakers. Participants varied in their socioeconomic background, as assessed by mother's level of education. All students volunteered their time and received either class credit or extra credit for their participation.

Reading Skill Level

The reading comprehension subtest of the *Nelson-Denny* (Form H; Brown, Fishco, & Hanna, 1993) was used to determine the range of reading skill levels of the

participants; their scaled scores on the *Nelson-Denny* ranged from 187–250. This range in scaled scores translated to a range of grade equivalents of 9.5–18.9.

Background Knowledge

The vocabulary subtest of the *Nelson-Denny* (Form H; Brown, Fishco, & Hanna, 1993) was used to determine the range of participants' level of global of word knowledge. Participants' scaled scores on the *Nelson-Denny* vocabulary subtest ranged from 179–254. This range in scaled scores translated to a range of grade equivalents of 8.5–18.9.

Written Discourse

Experimental Passages. All participants were asked to read six narrative and six expository passages. Passages for both genre types were adapted from everyday popular books such as *Little House on the Prairie* and *The Greatest Muhammad Ali* (See Appendix A). Original texts were edited: 1) to control for context clues presented, 2) to check text difficulty levels, and 3) to assure that the text would not be recognizable. Edits made to attain these goals included shortening passages, removing low frequency words that were not used as target words in the study, and changing character names.

All experimental passages were matched on their readability and number of words. As to the former, Lexile ratings (Stenner, Horabin, Smith & Smith, 1988) were used as a measure of readability. Lexile ratings are computed using word frequency and average sentence length as variables. Narrative passages had an average Lexile rating of 790 ($SD = 143$), expositions had an average Lexile rating of 890 ($SD = 106$). This average Lexile value indicated that these passages were at an educational level where a 6th grader could achieve 75% comprehension accuracy; in other words, they were at a level that all participants could grasp. The 100L difference was not statistically significant, $F(1,10) = 1.63$, $p = .23$. As to number of words, narrative passages had an average of 109 words (SD= 9.1), whereas expositions had an average of 98 words ($SD = 7.4$). Table 1 shows the Lexile rating and number of words for all 12 passages used in the study. Based on the Lexile ratings, the readability of the passages was below the grade level of the participants in this study, with most of the passages being well within the range of reading levels for college students.

Filler Passages. The passages included as fillers in the study were taken from an instructional textbook (Roit & Stein, 2002). These passages were included in the experiment to minimize the occurrences of novel words. After each filler passage,

Table 1. Passage and Readability Level

Passage Title Author	Genre	Lexiles	Nr. of Words in Passage
Sounder Armstrong, William H.	N	930	106
Where the Red Fern Grows # 1 Rawls,Wilson	N	640	118
Where the Red Fern Grows # 2 Rawls,Wilson	N	720	115
The Mouse and the Motorcycle Cleary, Beverly	N	670	93
The Little House on the Prairie Ingalls, Laura	N	990	106
The Lion, the Witch and the Wardrobe Lewis, C. S.	N	830	114
The Greatest Muhammad Ali Myers, Walter Dean	E	970	106
Eyewitness Books: Bird Burnie, David	E	980	85
Seeing Earth from Space Lauber, Patricia	E	940	96
The West: An Illustrated History for Children Duncan. Dayton	E	940	97
Sharks McMillian, Beverley	E	780	99
So you want to be President St. George, Judith	E	730	105

participants provided responses to true/false comprehension questions (n=66). Inclusion of filler passages pushed the percentage of passages containing non-words up to 46 %.

Novel vocabulary words. Within each passage from the set of experimental stimuli, low frequency words were replaced with non-words; participants were asked to read the passages and then define the non-word presented in the passage. Low frequency words were defined in this study as words that occurred less than 10 times in 1st through 5th grade text (as determined by Zeno, Ivens, Millard and Duvvuri's, 1995 *The Educator's Word Frequency Guide*). Non-words in this study refer to pseudowords that look like real words but do not exist in the English language (e.g. *goffram*). These target pseudowords were generated so that they would

not overlap orthographically with other English words, but at the same time were pronounceable. To facilitate target word generation, the ARC Database (Rastle, Harrington, & Coltheart, 2002) was consulted. Boundaries were set to ensure each non-word had no orthographic neighbors and word length was limited to five to eight letters. The words were then manually checked to ensure that they did not resemble any real English words too closely; this was done to prevent participants from confusing the target pseudoword with a word they already knew in English and using their prior knowledge of that English word to define the pseudoword. Morphemes were added to pseudowords so that pseudowords would fit the correct part of speech of the target word that they replaced. For example, the verb *insurmountable* was replaced by *rirsable* and the noun *tactics* was replaced by *thagwuns*.

Definition Production and Scoring. Following each passage, a meaning generation test was administered to assess the participants' word learning. Participants defined each target word ($n = 40$) they saw in the passage they had read. A definition production test was used to promote recall of the word within context. The participants' definitions were scored, using a dichotomous scale, as either incorrect or correct. Definitional responses were assigned a score of 1 ('correct'), if either (1) the definition denoted partial knowledge of the general theme of the passage, or (2) the response was equivalent to what the original authors had intended, or (3) the response was a synonym for the actual word appearing in the original text. Responses not semantically related to the passage or using wrong definitions were assigned a 0 ('incorrect') score.

Procedure

All written discourse passages were administered using the Psychdata website (www.psychdata.com). Psychdata is a program that increases the efficiency of data collection by enabling researchers to administer studies via the Internet.

For the purposes of this study all participants were tested in a lab setting. First, participants completed a demographic questionnaire. Next, they read passages presented in one of four randomized orders. Participants were asked to read the passages as if they were reading a book or magazine and answer the comprehension questions. They were not told the true purpose of the study, nor were they to know that they were defining pseudowords until after the study was completed. The entire session took approximately 45 minutes to complete.

Results

Definition production test

The mean percentage of words that elicited a correct meaning inference was calculated across all participants for each genre type. The mean percentage of words incidentally learned in expositions was .54 (*SD* = . 23), while in the narratives was .60 (*SD* = .22). Means were subjected to separate one-way ANOVA's to assess the variability by participants (F_1) and items (F_2). Word learning was different across genre types. This finding was supported by a main effect of genre type that was significant by participants, $F_1(1, 73) = 9.565$, $p = .003$, $\eta^2 = .11$, but not by items, $F_2(1, 39) = 1.16$, $p = .26$, $\eta^2 = .06$. The results indicated that a greater percentage of words were learned from narrative texts than from expositions.

Summary

Adult readers in the current study generated a statistically significant 6% more accurate definitions for novel vocabulary words that they encountered within narratives than for those they encountered in expositions. This held even when variables such as context clues presented, text difficulty, and familiarity were all controlled for.

This pattern of word learning in adult readers is consistent with the idea that narrative text encourages general inference and the integration of information (i.e. the information necessary for word learning) more than is the case for expository text.

Our observation is supported by recent empirical evidence that the process of learning new words from discourse is related to the process of generating inferences (Hannon & Daneman, 2001; Williams, 2004). Readers delay their construction of meaning for new words until they have encountered both the unfamiliar word and contextual information, and do this in ways that are much like the manner in which predictive inferences are delayed on-line. Hannon & Daneman (2001) also demonstrated a relationship between inference generation and the learning of new words. The probability of adults learning new words from narrative passages was positively correlated with their performance on tasks that required inferencing from text ($r = .40$).

These data patterns suggest that the greater narrative comprehension observed in Experiment 1 (as manifested by the proportion of words learned) may be related to the internal structures of narrative discourse that are associated with generating inferences. Thus, in the follow-up to Experiment 1, we attempt to discern

if some properties of narrative text might better support meaning based inferences for novel words than would other properties. (See Experiments 2A and 2B)

Experiment 2A

The finding that narrative texts were better for the purposes of new word learning caused us to speculate as to what aspects of narrative texts might modulate their difficulty. Van Dijk and Kintsch (1983) have suggested that there are three levels of mental representations that people construct during language comprehension: (a) surface structure; (b) the text base; and (c) the situation model. The surface structure of a text can be classified as the phonological representation of the text's specific wording along with its underlying syntactic structure. The text base refers to the literal meaning of the text. A situation model, by contrast, is an integrated representation of the meaning of the text once contextual dependencies like anaphora resolution and inferences have been taken into account. Take the following passage from Zwaan (2003, 94) as an illustrative example:

> Harry put the wallpaper on the table. Then he put his mug of coffee on the paper.

At the very least, in order to integrate these sentences into a coherent situation model, a reader must somehow represent the fact that the wallpaper is on top of the table, that the coffee mug is on the paper, and therefore that the mug is on the table. Note that a representation of the paper being on top of the table was not explicitly coded for in the literal meaning of the text; it emerges from the integration of the text base of the first sentence with the text base of the second sentence. Readers might also make elaborative inferences specifying, for example, that the table's surface is horizontal.

In Experiment 1, we observed an advantage in word learning from narrative texts under a condition where the surface structures of the texts were similar (i.e., the average readability formulas for narratives and expositions were equivalent). In Experiment 2, by contrast, the focal characteristic is the deeper situation model. Here, we operationally define a 'situation model' as a composite mental structure which represents simple environments of temporal, spatial, and causal properties (Barsalou, 1999; Zwaan, 1994). Research suggests that in online situations, comprehenders keep track of at least five dimensions: time, space, characters, causation, and motivation (Zwaan and Radvansky, 1995).

There is empirical evidence that establishing a new situation model incurs a mental cost. For example, Radvansky and Zacks (1995) found a 'fan effect', in which many objects from one and the same location were easier to recall than the same object appearing in many locations. Their reasoning was that when many

objects were found in the same location, this only required creating a single situation model, whereas the condition having the same object in many locations required the creation of multiple models. For example, it is easier to visualize a palm tree and baseball that are both located in a hotel lobby than a palm tree that is located both in a hotel lobby and bedroom. Further evidence comes from findings that initial sentences of paragraphs usually take longer to read than subsequent ones and that people spend more time reading words or sentences that change topic, point of view, locations, or time (Gernsbacher, 1990).

On the other hand, McNamara, Kintsch, Songer, and Kintsch (1996) suggest that the cognitive costs associated with situation model building in individuals with advanced reading skills and copious background knowledge actually work in the reader's favor. The cognitive processes that are involved in making inferences and repairing gaps in the text base lead the learner to gain a deeper understanding of the text. McNamara *et al.* (*ibid.*) demonstrated that readers who were high in background knowledge were able to generate more inferences, even from texts with low cohesion. In contrast, readers who were low in background knowledge were only able to generate more inferences from high cohesion texts.

Experiment 2A explored the effects of constructing situation models on word learning. It was hypothesized that the mental cost of creating multiple situation models would either decrease or increase the probability of learning new word meanings from context. On the one hand, if creating multiple models inhibits later recall, it could be harder to learn the meaning of novel words from narrative texts requiring multiple situation models, compared to narrative texts requiring a single situation model. Alternatively, if the creation of multiple models demands more active processing and elaborate inferencing regarding the meaning of text, then the probability of word learning would be increased. Experiment 2A was designed to tease these possibilities apart.

Method

Participants

The subjects participating in Experiment 2A were the same as those who had participated in Experiment 1.

Written Discourse

The passages used in Experiment 2 were the same as those used in Experiment 1, but this time, the six narrative passages were analyzed with respect to the number

of situation models counted. The rules of thumb for counting situating models were as follows:

1. Situation models were considered as a mental representation of a bound spatial, temporal, and causal physical scene. So if a text described, for example, an event that took place in a matter of minutes in a living room, then that would count as one situation model. If, on the other hand, the text first described an event that happened in a living room, and then one happening in the kitchen, that would count as two situation models.
2. A scene was operationalized as an event or series of events that takes place in a local spatial and temporal setting.
3. Our rule of thumb for a 'local' spatial setting was shouting distance, and
4. Our rule of thumb for a 'local' temporal setting was seconds, minutes, or hours (in contrast to days or months).

For example, in *The Little House on the Prairie* (see Appendix A) a story is told about a family parking a wagon. The dog goes to a river. Then the father starts preparing the wagon to cross the river. We counted this as one situation model (which happens to be broken up into subparts) since (1) everything happened within close proximity of the wagon (i.e. within shouting distance), and (2) everything happened in a temporal sequence spanning over seconds or minutes (as opposed to days or years).

Results

It was determined that the following passages had only a single situation model: *The Little House on the Prairie*; *The Lion, the Witch, and the Wardrobe*; and *Where the Red Fern Grows 1*. The remaining narrative passages had more than one situation model: *Sounder, The Mouse and the Motorcycle*, and *Where the Red Fern Grows 2*. Participants generated fewer accurate definitions in narrative passages with only one situation model (.39) compared to narrative passages with multiple situation models (.60). This finding was substantiated by a significant main effect of number of situation models; the effect was significant by participants, $F_1(1, 73) = 92.39$, $p = .001$, $\eta^2 = .56$, but not by items, $F < 1$.

Experiment 2B

Validation of the Situation Model Index

Before we were completely confident about our hypothesis that the number of situation models influences the difficulty of narrative text, we validated the situation model count that we had created by hand, by using an objective measure. We selected indices from Cohmetrix version 2.0 (Graesser, McNamara, Louwerse & Cai, 2004) as our objective measures. CohMetrix is a computational tool that generates a variety of indices of the linguistic and discourse characteristics of a text. These values can be used to determine the coherence of a text. Our logic was that the less coherent a text, the more situation models it will have. If a text describes actions taking place in a living room and a kitchen, for example, that text should be less spatially coherent than one that simply describes actions in a living room.

Within the Cohmetrix indices, temporal cohesion and spatial cohesion are the two that correspond to the elements of the situation model index we created. The temporal cohesion index reflects the repetition score for tense and aspect. The spatial cohesion index includes the incidence of location prepositions (LSP), such as *in*, *by*, *near*, divided by LSP plus the incidence of location nouns, such as *place*, *Memphis*, *Central Park*. Each text was entered into the online database and values were computed for temporal cohesion and spatial cohesion.

Our subjective rubric was limited such that it only explicitly accounted for the elements of time and space within situation models. However, situation models also contain the elements of causal physical relations and character intentions. Either of these other two elements may have contributed to the pattern of word learning we observed in narrative passages. In order to examine whether these other aspects of cohesion of were related to word learning, we utilized additional Cohmetrix indices that were suggested to be related to situation models, namely, causal cohesion, causal content, and intentional cohesion. In Cohmetrix, causal cohesion reflects the ratio of causal particles to causal verbs. Cohesion suffers when the text has many causal verbs (signifying events and actions), but few causal particles that signal how the events and actions are connected. Intentional cohesion reflects the number of main verbs that are intentional and that are performed by animate subject nouns. It was expected that, as the ratios or values for these indices decreased, the proportion of words learned by our highly knowledgeable readers would increase. In Experiment 2B, the relations among Cohmetrix indices and word learning in narratives were explored.

Results

Validation of Situation Model Index

Table 2 displays the descriptive statistics (means and standard deviations) for all 6 of our narrative passages as well as for all of the 6 expository passages, along with their corresponding Cohmetrix indices. Non-parametric correlations between the hand count of situation models (single *vs.* multiple) and the Cohmetrix indices were computed. The pattern of correlations that emerged from the analysis closely followed the elements of time and space from the subjective rubric used to count the number of situation models. Temporal cohesion ($r = -.59$) and spatial cohesion ($r = .55$) were related to the number of situation models in narrative texts. Narrative texts with multiple situation models had less repetition of tense and aspect (temporal cohesion) than had narrative texts with single situation models. Narrative texts with multiple situation models had a higher ratio of incidence of location prepositions to that of location nouns (spatial cohesion) than was found in narrative texts with single situation models. Causal cohesion and intentional cohesion were not significantly correlated with our subjective situation model index.

Situation Models and Word Learning in Narratives

Pearson product moment correlations were also computed to examine the relations between Cohmetrix indices and the proportion of words learned. Table 3 *(N = Narrative, E = Expository)* displays the intercorrelations between our situation model index, the Cohmetrix indices, and word learning in narrative passages. As Table 3 shows, only one Cohmetrix index was correlated with the proportion of words learned from narrative passages. There was a significant positive correlation ($r = .57$) between the proportion of words learned and the causal cohesion of the narrative passage in which a particular word appeared. In other words, the more causally cohesive a narrative passage was, the more words were successfully learned.

The analogous correlation in expository passages was negative (–.35), indicating that as the causal cohesion values decreased, word learning increased. However, in expository texts there was a highly significant and very large positive correlation between intentional cohesion and word learning (.72). Since causal cohesion was isolated as the strongest correlate of word learning in narratives, we compared the values for causal cohesion across genre types. The results of a between-groups analysis of variance (ANOVA) with genre as the dependent variable revealed that the causal cohesion of narratives (.21) was not significantly lower statistically than the causal cohesion value of expositions (.57), $F(1,10) = 1.90$, $p = .19$, $\eta^2 = .16$.

Table 2. Situation Model Indices for Narratives and Expositions

Title	Causal Cohesion	Causal Content	Spatial Cohesion	Temporal Cohesion	Intentional Cohesion
Narratives					
Sounder	.40	56.60	.56	.58	37.74
Where the Red Fern Grows 1	.11	75.63	.39	.80	25.21
Where the Red Fern Grows 2	.13	69.57	.47	.72	8.70
Mouse & Motorcycle	.17	63.83	.46	.72	0
Little House on the Prairie	.17	55.57	.40	1	27.79
Lion, Witch & Wardrobe	.33	61.40	.41	.78	26.32
Mean	.21	63.93	.40	.78	21.12
Standard Deviation	.11	7.37	.06	.13	12.14
Expositions					
Greatest Muhammad Ali	.13	75.47	.40	1	28.30
Birds	.33	81.40	.73	1	11.62
Seeing Earth From Space	.57	103.09	.33	.75	41.24
West	.67	91.84	.50	.75	20.41
Sharks	0	70.71	.53	.81	30.30
So You want to be President	1.67	65.42	.31	.71	9.35
Mean	.57	79.47	.43	.84	20.65
Standard Deviation	.61	12.85	.09	.12	9.76

Summary

The number of situation models was related to the proportion of words learned in narrative passages. The probability of learning new words increased when the number of situation models *increased* in the text. Our subjective measure of the number of situation models was qualified by its reflection of temporal and spatial aspects of the situation model. Narratives with greater numbers of situation models were less spatially and temporally cohesive as confirmed by significant correlations between our situation model index and Cohmetrix indices of temporal and spatial cohesion.

This finding is highly unintuitive and will receive more attention in the general discussion below. One potential reason for this is that texts that are less coherent demand more work from the reader, and this encourages the type of integrative reasoning that is ultimately necessary for effective word learning.

One other result worth pointing out is the impressive positive correlation between intentional cohesion and the proportion of words learned in expository

Table 3. Correlation between Word Learning Accuracy and Situation Model Variables by Genre

	Causal Cohesion	Causal Content	Temporal Cohesion	Spatial Cohesion	Intentional Cohesion
Narrative	.57***	−.52*	−.16	.32	.25
Exposition	−.35	.26	−.15	−.11	.72***

Note: *=$p<.10$; **=$p<.05$; ***=$p<.01$.

text. This was an unexpected finding, but one with potentially important implications. One underlying idea as to why expository text suffers relative to narrative text in word learning is that it does not engage theory of mind reasoning as much. The Cohmetrix index for intentional cohesion reflects explicit use of words denoting intentional activity. Explicit use of intentional language is unlikely to boost word learning much for narrative since that text genre naturally activates theory of mind anyway. But our results suggest that in expository passages, explicit use of intentional language can provide a major boost in this text genre's ability to convey the meaning of new words.

General discussion

The purpose of this study was to examine how text genre affects the acquisition of new word meanings. We have shown that the proportion of new words learned was significantly higher when the new words appeared in narratives than when they appeared in expositions.

In relation to how genre influences incidental vocabulary learning, previous research has presented three hypotheses. First, based on the finding of Carroll and Drum (1981) and Nagy *et al.* (1985), one might believe that there would be no difference in word learning between expository and narrative discourse. Alternatively, previous findings from Harris (1998) and Hartley (1986) suggested that expositions would be better suited to vocabulary learning. The third hypothesis indicated that narrative texts would yield more word learning in adults than was the case for expository texts (De Beni *et. al.*, 1997; Tun, 1989; Zabrucky & Moore, 1999).

Our own take on the subject was that for adult word learning, narrative discourse is likely to provide a better context than expository text, because narrative encourages more thorough conceptual integration, and conceptual integration is the 'stuff' of word learning. It is likely the case that narrative does this for a number of reasons: general engagement, theory of mind engagement, and potentially, overall text structure. We found support for this hypothesis by demonstrating that

adults learn significantly more new words from narrative discourse than from expository discourse.

Following up on this, Experiments 2A and 2B provided insight into the mechanism by which narrative text might encourage word learning. When presented with less coherent narrative, both spatially and temporally, participants were surprisingly better at learning the meaning of new words. This suggests that getting subjects into a 'mode of thought' of conceptual integration (i.e. integrating across models) encourages word learning.

This characteristic of narratives may have contributed to their superiority in the context of word learning, as compared to expositions. The cohesion of narrative texts fell within the lower range of cohesion ratios and values (.11-.33). It has been suggested that the low level of cohesion enables readers to better utilize their ability to generate inferences and do problem-solving (McNamara *et al.*, 1996). Our participants' cognitive aptitude, as assessed by their *Nelson Denny* reading comprehension and vocabulary knowledge scores, indicated that they had the requisite knowledge to comprehend our texts. This global requisite knowledge may have been sufficiently comparable to the domain-specific knowledge tested by McNamara *et al.* (1996) for it to allow readers to generate better inferences for new words appearing in narrative texts, as compared to new words that appeared in expositions.

We also stumbled upon another finding: subjects get a major boost in learning from expository text the more intentionally coherent that text is. This supports our point that a major factor separating narrative and expository text is the degree to which theory of mind is activated. As previous literature implies, narrative text may naturally activate theory of mind, which allows the reader to successfully integrate information about the authors' or characters' communicative intentions with contextual clues leading to word meaning. In complementary fashion, one may be able to artificially boost the effectiveness of expository text by increasing the amount theory of mind related language.

Addressing discrepancies between these and previous findings

Our experiments show that word learning was facilitated when the discourse was less spatially and temporally cohesive. The mismatch between the cognitive aptitude of our participants and the readability of the text as measured by surface structure measures (e.g. Lexiles) may explain why our findings depart from previous patterns established in the word learning literature. Nagy *et al.* (1985) and Carroll and Drum (1982) suggested that word learning from context can account for the majority of vocabulary growth in adolescents. However, their results did

not demonstrate a difference in learning between discourse genres. The present study demonstrates that adults learn more new words from narrative texts than from expositions. The contradiction between the outcome of our experiments and the results of previous vocabulary studies could be attributed to the readability of the used passages. Our participants read passages that were below their grade level (5th grade). By contrast, the texts used in the Nagy *et al.* and Carroll and Drum vocabulary learning studies were matched to the participants' grade level.

The authors of this paper wish to point out that while our study adds to the literature on word learning through everyday discourse, we were limited in that we allowed the elements of the situation model to freely vary across genre types. We selected texts from popular discourse on a best-seller list. Future studies should control for the elements of the situation models when selecting texts. Such an improved design would provide better insight into any interactions that may exist between aspects of the situation model, genre type, and new word learning. Our estimates of cohesion may also have been unstable, due to the brevity of our texts. A replication of the patterns observed in this study, but with extended discourse, should therefore be warranted

Implications

The ability to comprehend written discourse finds its place in our lives alongside other ways of communicating. We are confronted with written discourse in many societal forms: in textbooks, newspapers, and magazines, on the computer screen, on TV, and on posters and signs. In these various forms, it is crucial for authors to convey information and for readers to acquire new information. New technical terms are often introduced into the language via written discourse. Similarly, novel words are encountered in academic texts, health materials, and leisurely reading materials like magazines and blogs. Often, these forms of written discourse appear as expositions. Since the purpose is informational, the information is conveyed in a manner where words and phrases are explicitly connected.

It is possible that text may be engineered to optimize the transmission of new vocabulary by having authors select narrative genre as their platform or produce expositions that are not causally cohesive. Our data suggest that authors who are writing for mature audiences (i.e. individuals with high levels of comprehension skill and global vocabulary knowledge) may have the liberty to write so that readers have gaps to fill in the story or the information sequence. These gaps may lead to active processing of the discourse, which in turn will lead to better acquisition of new word meaning. Our results suggest that ideas plainly stated in either discourse genre are not the ones which spawn the acquisition of new words in one's primary language. If there is little room for the readers to integrate their own

knowledge into the discourse, new labels for old concepts or even new concepts themselves may soon be forgotten.

Finally, we specifically studied texts which could clearly be identified as either expository or narrative. However, in the real world, readers may also encounter hybrid genres. For example, instead of simply describing Newton's laws of motion in expository form, one could elaborate on their development over the course of history, incorporating both narrative and exposition. Not enough work has been done on hybrid genres of this sort, but one data point from our study does bear on this. The single largest correlation found in this study was that between intentional cohesion and word learning in expository texts. By introducing more social-intentional language into expository texts, one would likely find an increase in adults' ability to learn from text. This ultimately suggests that giving scientific explanatory texts a 'human touch' could have a huge impact on readers' ability to learn.

References

Anderson, Richard C. and James W. Prichert. 1978. Recall of previously unrecallable information following a shift in perspective. *Journal of Verbal Learning and Verbal Behavior*, 17, 1–12.

Barnes, Jennifer. 2011. Fiction and Social Attention: Reading Preferences in Asperger Syndrome. Talk at the Biennial Meeting of the Society for Research in Child Development, Montreal, Quebec.

Barsalou, Lawrence W. 1999. Perceptual and symbol systems. *Behavioral and Brain Science*, 22, 577–660.

Bloom, Paul. 2005. Word learning, intentions, and discourse. *Journal of the Learning Sciences*, 14, 311–314.

Britton, Bruce and John Black. 1985. *Understanding Expository Text: A theoretical and practical handbook for analyzing explanatory text*. Hillsdale, N.J..: Erlbaum.

Carroll, Bonnie A. and Priscilla Drum A. 1982. The effects of context clue type and variations in context on the comprehension of unknown words. J. A. Niles & L.A. Harris (Eds.), *New inquiries in reading research and instruction: 31st yearbook of the National Reading Conference* (pp. 89–93). Rochester, N.Y.: National Reading Conference.

DuBravac, Stayc and Mathieu Dalle. 2002. Reader question formation as a tool for measuring comprehension: narrative and expository textual inference in a second language. *Journal of Research in Reading*, 25, 217–231.

Gernsbacher, Morton A. 1990. Language Comprehension as structure building. Hillsdale, N. J.: Erlbaum.

Graesser, Art. 1981. Prose comprehension beyond the word. New York: Springer-Verlag.

Graesser, Art C., Danielle S. McNamara, Max M. Louwerse and Zhiquiang Cai. 2004. *Coh-Metrix*: Analysis of text on cohesion and language. *Behavior Research Methods, Instruments, and Computers*, 36, 193–202.

Hannon, Brenda and Meredyth Daneman. 2001. A new tool for measuring and understanding individual differences in the Component Processes of Reading Comprehension. *Journal of Educational Psychology*, 93, 103–128.

Hedges, Larry and Amy Nowell. 1999. Changes in the Black-White Gap in Achievement Test Scores. *Sociology of Education*, 72, 111–115.

Harris, Joyce L. and Wendy Rogers. 1998. Written Language comprehension in younger and older adults. *Journal of Speech, Language and Hearing Research*, 41, 603–617.

Hartley, Joellen T. 1986. Reader and text variables as determinant of discourse memory in adulthood. *Psychology and Aging*, 1, 150–158.

Hynd, Cynthia R. and Nancy D. Chase 1991. The relation between text type, tone, and written response. *Journal of Reading Behavior*, 3, 281–306.

Johnson, Ronald E. 2003. Aging and remembering of text. *Developmental Review*, 23, 261–34

Landauer, Thomas and Susan Dumais 1997. A solution to Plato's problem: The latent semantic analysis theory of acquisition, induction and representation of knowledge. *Psychological Review*, 104, 211–240.

Long, Lisa and Raymond J. Shaw. 2000. Adult age differences in vocabulary acquisition. *Educational Gerontology*, 26, 651–664.

Mar, Raymond A., Jennifer L. Tackett and Chris Moore. 2010. Exposure to media and theory-of-mind development in preschoolers. *Cognitive Development*, 25, 69–78.

Mey, Jacob L. 2001 [1993]. *Pragmatics, an Introduction*. Malden, Mass. & Oxford: Blackwell.

McNamara, Danielle S. (2001). Reading both high and low coherence texts: Effects of text sequence and prior knowledge. *Canadian Journal of Experimental Psychology*, 55, 51–62.

McNamara, Danielle S., Eileen Kintsch, Nancy B. Songer and Walter Kintsch. 1996. Are good texts always better? Text coherence, background knowledge, and levels of understanding in learning from text. *Cognition and Instruction*, 14, 1–43.

Nagy, William E., Patricia A. Herman, and Richard C. Anderson. 1985. Learning words from context. *Reading Research Quarterly*, 20, 233–252.

Ozuru, Yasuhiro, Kyle Dempsey, Jasmine Sayroo and Danielle S. McNamara. 2005. Effects of text cohesion on comprehension of biology texts. Proceedings of the 27th Annual Meeting of the Cognitive Science Society (pp. 1696–1701). Hillsdale, N.J.: Erlbaum.

PISA [Programme for International Student Assessment], 2001. Organization for Economic Cooperation and Development (OECD).

Radvansky, Gabriel A. and Rose T. Zacks. 1991. Mental models and the fan effect. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 17, 940–953.

Rosch, Eleanor. 1975. Cognitive representations of semantic categories. *Journal of Experimental Psychology*, 104, 192–233.

Schatz, Elinore K. and R. Scott Baldwin. 1986. Context clues are unreliable predictors of word meanings. *Reading Research Quarterly* 21, 439–453.

Sanford, Anthony J. and Simon C. Garrod. 1981. Understanding written language: Explorations of comprehension beyond the sentence. New York: Wiley & Sons.

Spiro, Rand J. and Barbara M. Taylor. 1987. On investigating children's transition from narrative to expository discourse: The multidimensional nature of psychological text classification. In R. J. Tierney, P. L. Anders, & J. N. Mitchell (Eds.), *Understanding reader's understanding: Theory and practice* (pp 77–93). Hillsdale, N.J.: Erlbaum.

Steen, Gerard J. 1999. Genres of discourse and the definition of literature. *Discourse Processes*, 28, 109–120.

Stenner, Jackson, Ivan Horabin, Dean R. Smith and Malbert Smith. 1988. *The Lexile Framework*. Durham, N.C.: Metametrics, Inc.

Sternberg, Robert and Janet S. Powell. 1983. Comprehending verbal comprehension. *American Psychologist*, 38, 878–893.
Tun, Patricia A. 1989. Age differences in processing expository and narrative text. *Gerontology*, 44, 9–15.
van Dijk, Teun A. and Walter Kintsch. 1983. *Strategies of discourse comprehension*. New York: Academic Press.
Weaver Charles A. and Walter Kintsch. 1991. Expository Text. In R. Barr, M. Kamil, P. Mosenthal, and P. Pearson (Eds.), *The handbook of reading research*, vol. 2 (pp. 230–245). White Plains, N.Y.: Longman.
Williams, Rihana S. 2004. *Incidental Vocabulary Acquisition: The Role of the Reader in the Utilization of Sentence Context to Develop and Retain New Word Meanings*. Unpublished doctoral dissertation, University of South Carolina.
Zabrucky, Karen M. and DeWayne Moore. 1999. Influence of text genre on adults' monitoring of understanding and recall. *Educational Gerontology*, *25,* 691–710.
Zeno, Susan, Stephen H. Ivans, Robert T. Millard and Rai Duvvuri. 1995. *The Educator's Word Frequency Guide*. New York: Touchstone Applied Science Associates.
Zunshine, Liza. 2006. *Why We Read Fiction: Theory of Mind and the Novel*. Columbus: The Ohio State University Press.
Zwaan, Rolf. 1994. Effect of genre expectations on text comprehension. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 20, 920–933.
Zwaan, Rolf. 2003. Text comprehension. *Handbook of Discourse Processing*. Mahwah, N.J.: Erlbaum.

Appendix A. Sample Passage by Genre

Narrative Passage

In preparation for dinner Ken's dad took from the shelf a flat oak *slab (bruesud)*, bigger than any of the pans or dishes. Ken liked to rub his fingers on the edge of it. His father had hollowed it out during long winter evenings as he sat by the stove. Ken remembered when they used to have ham on it. One year his father had won a pig in a shooting match and raised it to a hog. That year they had spareribs and *chitlins (brinths)*. Sometimes when Ken's father helped butcher hogs at the big house he would bring home spareribs and lots of *sowbelly (tempuk)*.

Expository Passage

Cassius Clay entered the 1960 Olympics as a light heavyweight. His style: straight, crisp punches and *avoiding* (*kudying)* being hit impressed the *international* (*umdoovy*) judges. He won his first three fights easily, but his fourth fight was against a European champion whose strength and attacking style made him look bad. Clay lost the first round. He tried some quick jab-and-move *tactics* (*thagwuns*) in the second round but was receiving as much punishment as he was giving. He came out in the third and final round with the determination that was to become his trademark. He used every bit of the skill he had to take control of the fight.

Note: The words in parentheses are the pseudowords that replace the low frequency words in the actual experiment.