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Author(s): JOE BARCROFT

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Effects of Synonym Generation on Incidental and Intentional L2 Vocabulary Learning During Reading

JOE BARCROFT

*Washington University in St. Louis
St. Louis, Missouri, United States*

This study examined effects of synonym generation on second language (L2) vocabulary learning during reading in both incidental and intentional vocabulary learning contexts. Spanish-speaking adult learners of L2 English ($N = 114$) at low- and high-intermediate proficiency levels read an English passage containing 10 target words translated in the text. Participants were assigned to one of four conditions: (a) Read for meaning only (*incidental*). (b) Read for meaning and try to learn the translated words (*intentional*). (c) Read for meaning and generate Spanish synonyms for the translated words (*incidental + semantic*). (d) Read for meaning, try to learn the 10 translated words, and generate Spanish synonyms for the translated words (*intentional + semantic*). Posttest measures were English-to-Spanish and Spanish-to-English recall of target words. Target word recall was higher when explicit instructions to learn new words were provided and when synonym generation was not required. Negative effects of synonym generation emerged in both the incidental and intentional learning conditions.

Research on second language (L2) vocabulary acquisition has addressed the relationship between semantic elaboration and L2 word learning. *Semantic elaboration* refers to a focus on the semantic properties or the meaning of a word, such as if one reflects on the extent to which the word *snail* represents an example of an animal, insect, food, or another category, or if one tries to think of other words related to *snail*. Studies on intentional L2 vocabulary learning have demonstrated that L2 word form learning can decrease when learners are required to perform semantically oriented tasks, such as making pleasantness ratings about the meaning of words, answering questions about word meaning, and writing words in sentences (Barcroft, 2002, 2003, 2004). These studies weigh against the idea of a generalized benefit for semantic processing on L2 vocabulary learning but are limited to the realm of intentional vocabulary learning only. In order to understand the relationship between

semantic elaboration and L2 vocabulary learning in both intentional and incidental learning contexts, new research is needed.

The current study, conducted for this purpose, examined the effects of requiring learners to generate synonyms for target words in a first language (L1) on incidental and intentional vocabulary learning during L2 reading. Synonym generation, a semantically oriented task used in previous research on memory and vocabulary learning (e.g., Pressley, Levin, Kuiper, Bryant, & Michener, 1982), was included given that this task invokes semantic elaboration and can be verified in written form. To generate a synonym, one must activate semantic properties of a word in order to activate, retrieve, and produce another word that contains a sufficient amount of overlap in meaning. The type of cognitive processing involved in synonym generation is largely semantic in nature, particularly if it is done while focusing on meanings of words that one already has acquired without difficulties associated with attempting to retrieve words that one does not know yet in L2. For example, a Spanish speaker attempting to learn the L2 English word *sham* (*engaño* in Spanish) may generate the word *mentira* (*lie* in English) without having to generate the English word *lie*.

With regard to incidental versus intentional learning, all of the learners in this study were instructed to read a text for meaning, but only some were instructed to attempt to learn the target words translated in the text and were given information about a pending test on these words. As such, the incidental conditions corresponded to what Hulstijn (1992) referred to as *meaning given*, as opposed to *meaning to be inferred*, incidental learning (see Hulstijn, 1992, Experiments IV and V for examples of other meaning-given incidental learning conditions). Therefore, the methodological definition of incidental learning in the current study was that participants in incidental conditions were not instructed to attempt to learn target words and were not informed about a pending vocabulary test. These provisions made it possible to compare four conditions: (1) incidental vocabulary learning, (2) intentional vocabulary learning, (3) incidental vocabulary learning with synonym generation, and (4) intentional vocabulary learning with synonym generation.

REVIEW OF LITERATURE

This section reviews research leading up to the current study. The first part of the review examines theoretical perspectives and research with regard to semantic elaboration and memory for different types of target items, including both previously acquired (known) words and new words during vocabulary learning. The second part focuses on the distinction between incidental and intentional vocabulary learning and considers

why the effects of semantic elaboration may or may not differ for these two types of vocabulary learning. The discussion then leads into the specific motivations for the current study.

Semantic Elaboration, Memory, and Vocabulary Learning

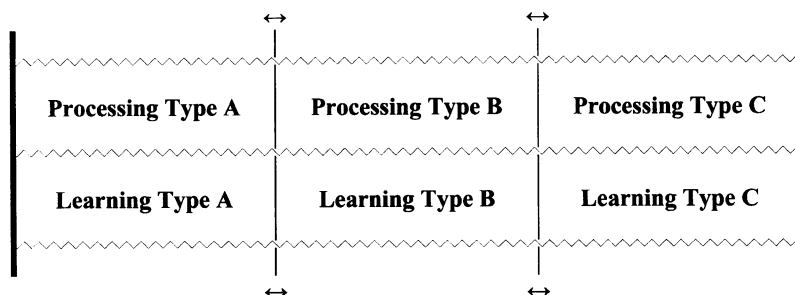
Many studies have demonstrated that semantic elaboration can improve recall performance in tasks that involve previously acquired L1 words (e.g., Craik & Tulving, 1975; Hyde & Jenkins, 1969; Johnson-Laird, Gibbs, & de Mowbray, 1978; Tresselt & Mayzner, 1960). Craik and Lockhart (1972) explained this phenomenon using the notion of *depth of processing* within the levels of processing framework. According to the *levels of processing* (LOP) framework, semantically oriented tasks increase memory performance more than structurally oriented tasks (tasks in which one focuses on the structural or formal properties of a word, such as if one counts how many letters or syllables there are in the word *snail* or thinks of other words that rhyme with it) because semantically oriented processing is inherently deeper than structurally oriented processing.

Morris, Bransford, and Franks (1977) proposed *transfer appropriate processing* (TAP) as an alternative to LOP. According to TAP, the effect of a variable on memory depends on the nature of the task performed at study and testing such that semantic orientation should facilitate performance on subsequent semantically oriented tasks and structural orientation should facilitate performance on subsequent structurally oriented tasks. Morris, Bransford, and Franks provided evidence to support this position by demonstrating improved recall of L1 words for a structurally oriented rhyming task at study when the task performed at testing involved rhyming as well (for other empirical support of TAP, see McDaniel & Kearney, 1984).

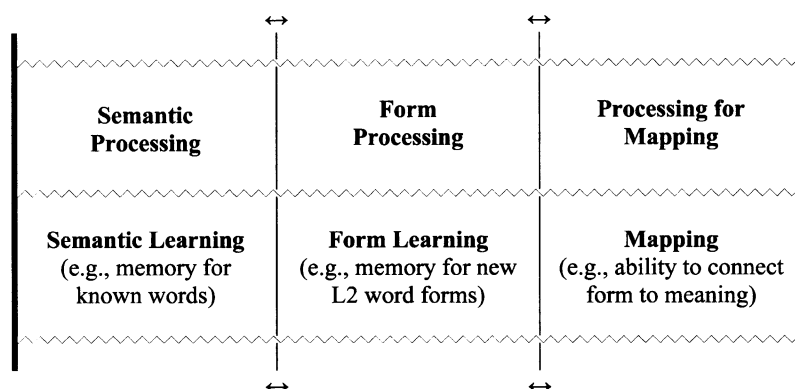
Consistent with the general tenets of TAP, the *type of processing–resource allocation* (TOPRA) model (Barcroft, 2000, 2002) visually represents how different types of processing can yield different types of learning outcomes. Three manifestations of the model appear in Figure 1, the most general appearing in Figure 1a. The thicker outer lines in the model remain stable because they represent the restricted amount of processing resources available to a learner. The inside lines can move, however, as different types of processing (Processing Type a, b, c, d ...) and corresponding types of learning (Learning Type a, b, c, d ...) increase or decrease. The basic idea is that each type of processing must exhaust processing resources. As one type of processing increases due to a specific type of task demand, others must decrease to accommodate. The amount and type of learning that ultimately takes place will reflect this kind of tradeoff.

FIGURE 1
Type of Processing–Resource Allocation (TOPRA) Model

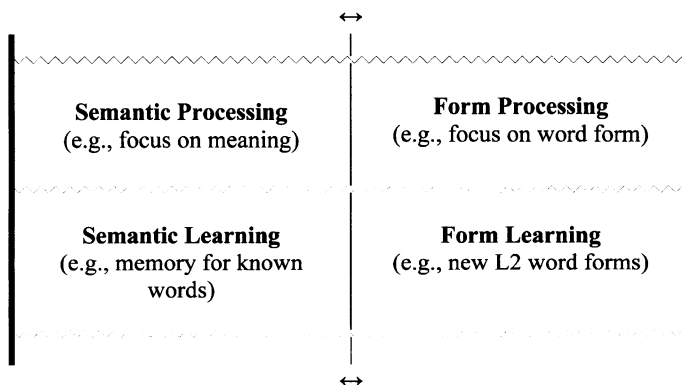
a. General Version: Types of Processing and Learning



b. Components of Lexical Learning: Semantic, Formal, and Mapping



c. Semantic and Formal Components of Lexical Learning



Originally published in Barcroft, J. (2003). Effects of questions about word meaning during L2 lexical learning. *The Modern Language Journal*, 87, 546–561. Reprinted with permission.

The TOPRA model that focuses on key elements of vocabulary learning illustrates why the LOP view of the relationship between semantic processing and memory may not work when it comes to learning new word forms, a critical component of vocabulary learning. The TOPRA model also can be used to focus on how different types of processing affect learning rates for word forms, word meanings, and form–meaning mapping (Figure 1b) or to focus specifically on the relationship between semantic and structural processing (Figure 1c). In contrast to the LOP approach, the model dissociates semantic processing from form processing and visually depicts why increased semantic processing may not improve or may decrease the formal component of L2 vocabulary learning. Specifically, the TOPRA model predicts that when processing demands are sufficiently high, increased semantic processing can increase learning for the semantic (and conceptual) properties of words while decreasing learning for the formal properties of words. Word-form learning decreases under these conditions because fewer processing resources remain available for structural processing. An unqualified LOP approach to L2 vocabulary would not make these same predictions.

Several studies on L2 intentional vocabulary learning have supported the predictions of the TOPRA model by demonstrating negative effects for semantically oriented tasks on L2 word-form learning. Barcroft (2000, 2004) found that requiring English-speaking learners of L2 Spanish to write new Spanish words in sentences produced large and extended negative effects on productive L2 vocabulary learning, based on scores on a picture-to-L2 recall test. Folse (1999) also found sentence writing to be less effective than completing three fill-in-the-blank exercises in a study on L2 learners of English that included more receptively oriented measures of L2 knowledge. In a study on L1 vocabulary learning, Pressley et al. (1982) also found negative effects for a semantically oriented synonym-generation task as compared with no-strategy condition, based on performance on a word-definition matching test.

In another study, Barcroft (2002) asked English-speaking L2 Spanish learners to attempt to learn new Spanish words while making pleasantness ratings about each word (+semantic), counting the number of letters in each word (+structural), and doing their best to learn the words only (control). The dependent measures in the study were free recall of target words in Spanish, free recall of target words in English, and cued recall (with pictures as cues). The results provided evidence of an inverse relationship between the semantic and formal components of processing and learning: Spanish free recall was higher for +structural over +semantic, but English free recall was higher for +semantic over +structural. Additionally, overall recall was higher for no elaboration over +semantic and +structural, and cued recall was higher for control over +semantic and +structural. Barcroft (2003) also found that requiring

English-speaking L2 learners of Spanish to address questions about word meaning (e.g., *In what ways can this object be used?*) decreased productive L2 vocabulary learning, based on lower Spanish-cued recall scores in the questions condition as compared with a control condition.

The overall pattern of findings on semantic elaboration and vocabulary learning is consistent with the general predictions of TAP and with the specific predictions of the TOPRA model for the relationship between the semantic and formal components of processing and learning (Figure 1b). As predicted by TAP, the findings suggest that the effect of semantic elaboration depends on the nature of task to be performed at study and at testing. As predicted by the TOPRA model, the findings suggest that an inverse relationship can arise between learning the semantic and formal components of new words when overall processing demands are sufficiently high. When this inverse relationship is operative, tasks that involve semantic elaboration can decrease word form learning by exhausting processing resources that could otherwise be used for encoding new word forms.

Although TAP and TOPRA also predict that semantic elaboration can facilitate learning semantic components of new words (e.g., new uses and new meanings), with L2 vocabulary learning, one would expect this benefit only in cases in which a learner is acquiring new L2-specific meanings of words and L2-appropriate semantic space. This type of L2-specific semantic elaboration is, arguably, not the norm when L2 learners first encounter a new L2 word and have an opportunity to learn the word. When an English-speaking learner of Spanish learns the word *hueso* (*bone*) for the first time, the learner most likely will be focusing on the overlapping semantic space between English and Spanish for the referent *bone* (e.g., *part of the skeletal system, can be broken*) and not on how *hueso* can be used in Spanish in the idiomatic phrase *¡A otro perro con ese hueso!* (*to another dog with that bone!*) to express the idea of *Don't give me that! Come off of it!* (Cassagne, 1995, p. 14). Although semantic elaboration related to the idiomatic phrase could benefit the learner, semantic elaboration on the overlapping referential meaning of *hueso* would be largely redundant with regard to learning the L2-specific semantic space for *hueso*.

Although current studies in this area have helped to clarify how learners process the semantic and formal components of L2 words in intentional vocabulary learning contexts, important questions remain regarding the potential effects of semantic elaboration and increased semantic processing during incidental L2 vocabulary learning. Does semantic elaboration affect processing-resource allocation and L2 word form learning differently in incidental vocabulary learning contexts? Are the predictions of the TOPRA model applicable to incidental vocabulary learning? Whereas existing studies have provided evidence of negative effects for semantically oriented tasks on discrete-item intentional L2 vocabulary learning, the current study was designed to examine the

effects of a semantically oriented task during both incidental and explicit L2 vocabulary learning.

Incidental and Intentional Vocabulary Learning

In *incidental vocabulary learning*, learners acquire new words from context without having the intention of doing so, such as when picking up new words with no intention of doing so during free reading. *Intentional vocabulary learning* refers to learning new words while intending to do so, such as when a learner studies a list of target words or completes activities in a workbook while working to learn a set of new target words. A great deal of vocabulary learning may be neither purely incidental nor purely intentional, however. Different types of vocabulary learning can be viewed as points on a continuum between incidental and intentional (Coady, 1997) because attention is not a dichotomous entity (Gass, 1999; Wesche & Paribakht, 1999). Vocabulary instruction methods also range from being highly indirect to highly direct (Haynes, cited in Wesche & Paribakht). Reading for meaning while paying some attention to new words in the text can be viewed as neither completely indirect (incidental learning) nor completely direct (intentional learning). Reading a list of new words within a communicative context also may fall somewhere between the two ends of the continuum.

These clarifications being made, learning new words in a more intentional manner can give rise to a series of immediate consequences that do not arise when learning new words in a more incidental manner. During intentional vocabulary learning, the learner may invoke different types of learning techniques as compared with incidental vocabulary learning. As Hulstijn (1992) noted, when individuals know in advance that they will be tested on words, they may invoke “all kinds of rehearsal and memorisation techniques” (p. 116). These techniques may help improve vocabulary learning performance relative to more incidentally oriented learning conditions, such as when individuals do not know in advance that they will be tested on words and retention is low (Eysenck, 1982; Hulstijn, 1992).

Studies on incidental and intentional vocabulary learning have demonstrated benefits for intentional orientation (Hulstijn, 1992) and direct vocabulary learning activities (Paribakht & Wesche, 1997). Hulstijn (1992, Experiment V), for example, compared incidental and intentional orientations. Nonnative learners of Dutch took two tests on how well they learned word meanings during reading. The first test was administered after the participants read a text but had not been told that they would be tested on target word meanings. The second test was administered after the participants had been informed that they would be tested on target

word meanings after reading and were allowed to read the text again. Retention scores on word meanings were much higher on the second test associated with the intentional-learning orientation. Paribakht and Wesche compared the effects on L2 vocabulary learning of reading for meaning only versus reading for meaning plus the use of direct vocabulary learning activities. Although both conditions led to new L2 vocabulary learning, the reading plus direct vocabulary learning condition resulted in greater vocabulary-learning performance. The findings of these studies demonstrate that vocabulary learning is typically greater in more intentionally oriented vocabulary-learning contexts.

Important benefits of learning new words from context have been widely acknowledged, however. The context of spoken discourse or reading can provide learners with access to the variety of properties of what it means to know a word, including morphological, syntactic, collocational, sociolinguistic, and pragmatic properties. Word properties such as these may be more difficult to acquire during intentional vocabulary learning if words are presented in more restricted contexts. In light of these considerations, one could argue that effective vocabulary instruction should involve a combination of both incidental and intentional forms of vocabulary learning. Nation (2001) described learning vocabulary from context and intentional vocabulary learning as “complementary activities, each one enhancing the learning that comes from the other” (p. 232). From an instructional standpoint as well, it should be useful to know how tasks that evoke semantic elaboration affect both incidentally and intentionally oriented vocabulary learning. Specifically, do the negative effects of semantically oriented tasks on intentional L2 vocabulary learning (e.g., Barcroft, 2002, 2003) also emerge in incidental-learning contexts? From the general perspective of TAP and the TOPRA model, I have proposed two possible hypotheses with regard to this question: the attention-drawing hypothesis and the resource-depletion hypothesis.

According to the *attention-drawing hypothesis*, negative effects of semantically oriented tasks will not emerge in contexts of incidental vocabulary learning. Inherent differences between intentional and incidental learning can be used to support this position, particularly those related to task specificity and learner attention. During intentional vocabulary learning, the defined task is to attempt to learn specific words, and learners must pay attention to target words in order to be able to do so. Learners, therefore, may be more likely to pay attention to target words, regardless of whether they are also required to perform a semantically oriented task. As suggested by the TOPRA model, performing a semantically oriented task, even during incidental learning, has the potential of decreasing learners’ ability to encode the formal properties of the target words by exhausting processing resources for semantic processing at the expense of form processing. During incidental vocabulary learning, however, the

defined task is not to learn specific words, which means learners may be less likely to attend to new words to the same extent, at least as their primary task. Requiring learners to perform a semantically oriented task on a target word in this context may help to draw learners' attention to the target word and increase the likelihood that they will learn the target word. This type of semantic elaboration might facilitate various components of target word learning—including both word form and word meaning—by drawing learners' attention to target words.

Alternatively, according to the *resource-depletion hypothesis*, the negative effects of semantically oriented tasks on intentional L2 vocabulary learning can emerge in incidental vocabulary learning contexts. The rationale for this position is that although semantic elaboration may draw learners' attention to the meaning of a target word, elaboration of this nature will not facilitate encoding and retention of the target word form. When performing a semantically oriented task in an incidental vocabulary learning context, the learner may pay more attention to a target word meaning than would otherwise be the case, but this increased semantic processing still may exhaust processing resources that could otherwise be used to encode the formal properties of the target words. Therefore, semantically oriented tasks should decrease L2 vocabulary learning in incidental learning contexts as well.

PURPOSE OF THE CURRENT STUDY

The current study expands on existing research on semantically elaborative tasks during intentional vocabulary learning by examining how requiring learners to perform a semantically oriented task, synonym generation, would affect both intentional and incidental L2 vocabulary learning. In this way, the current study tested the predictions of the attention-drawing hypothesis versus those of the resource-depletion hypothesis with regard to semantic elaboration during incidental vocabulary learning. Would required performance of a semantically oriented task such as synonym generation positively affect incidental vocabulary learning, as predicted by the attention-drawing hypothesis, or would it negatively affect incidental vocabulary learning, as predicted by the resource-depletion hypothesis?

Incidental learning is inherently problematic to operationalize in research because (a) incidental versus intentional learning is a continuum; (b) learners may choose on their own to attempt to learn words in varying degrees at any time; and (c) it is difficult to determine the extent to which a given task may or may not invoke intentional learning even when learners have not been instructed to learn target words. Nevertheless, incidental learning was operationalized in this study based solely on the presence or absence of explicit instructions to attempt to learn target words. Learners

in the intentional-learning groups received instructions to attempt to learn the target words, whereas learners in the incidental-learning groups did not. Therefore, following Hulstijn (1992), a specific operational definition of incidental learning was adopted for the study without negating that some learners in the incidental groups may have attempted some intentional learning on their own. In addition, because overall performance in the incidental versus intentional conditions was assessed directly, it was possible to determine whether the incidental-versus-intentional manipulation produced an effect before assessing the impact of the semantically oriented task in both the incidental and intentional conditions.

The study also included two L2 proficiency levels—high and low intermediate—in order to examine whether the effects of semantic elaboration on incidental vocabulary learning might be moderated by proficiency level. If high-intermediate learners are able to comprehend more readily than low-intermediate learners, then the synonym-generation task might affect learners at these two proficiency levels differently. High-intermediate learners might be able to allocate more processing resources to attend to the target words in the semantic condition because they may need to use fewer processing resources for text comprehension. The availability of these additional resources might render the target-word-oriented synonym task more beneficial to high-intermediate learners as compared with low-intermediate learners.

RESEARCH QUESTIONS

The study was guided by the following research questions:

1. Does instructing learners to learn target words and informing them that a test will follow (intentional learning) affect L2 vocabulary learning during reading as compared to instructing learners to read for meaning only (incidental learning)? If so, in what way?
2. Does requiring learners to perform a semantically oriented task (L1 synonym generation for target L2 words) affect L2 vocabulary learning during reading? If so, in what way?
 - a. If the answer to Question 2 is *yes*, does the effect of performing the semantically oriented task depend on type of vocabulary learning (incidental versus intentional)?
 - b. If the answer to Question 2 is *yes*, does the effect of performing the semantically oriented task depend on proficiency level (low versus high intermediate)?

If the negative effects of semantic elaboration on L2 word-form learning in intentional-learning contexts do not emerge in incidental-learning contexts, as predicted by the attention-drawing hypothesis, then

cued recall scores—and in particular L1-to-L2 cued recall, which depends greatly on the formal component of L2 word knowledge—should be higher in the intentional condition than in the intentional-semantic condition but not higher in the incidental condition than in the incidental-semantic condition. However, if the negative effects of semantic elaboration do emerge in incidental-learning contexts, as predicted by the resource-depletion hypothesis, then cued recall should be higher in the intentional condition than in the intentional-semantic condition and higher in the incidental condition than in the incidental-semantic condition. Additionally, the negative effects of semantic elaboration might be more pronounced with L1-to-L2 recall because it requires production of each word form, making this measure particularly sensitive to knowledge of word form, whereas L2-to-L1 recall requires only partial or recognition-oriented knowledge of each word form for successful performance.

The study also included analyses of text comprehension scores in order to assess the degree to which learners read the passage for meaning (based on minimum, maximum, and mean comprehension scores) and a method of exploring the relationship between attention to lexical form and attention to the meaning conveyed in the text. Research on text-level input processing suggests that attending to grammatical surface forms can reduce learners' ability to attend to passage meaning in both the spoken mode (VanPatten, 1990) and the written mode (Greenslade, Bouden, & Sanz, 1999). Would this finding hold true for new lexical forms? Would conditions associated with greater attention to target words and higher vocabulary learning be associated with lower comprehension scores? The current study addressed these questions by means of separate analyses on the effects on text comprehension of orientation (incidental, intentional), synonym generation, and proficiency level.

METHOD

Spanish-speaking learners of L2 English at low- and high-intermediate proficiency levels were instructed to read a text for comprehension. The text contained 10 target English words with their Spanish translations in parentheses after each target word. Each participant was randomly assigned to one of four conditions: (a) In the *incidental condition*, participants were instructed to read for meaning only. (b) In the *intentional condition*, they also were instructed to attempt to learn the translated words and that a test on the words would follow. (c) In the *incidental-semantic condition*, they were instructed to read for meaning and to generate a synonym in Spanish, their L1, for each translated word. (d) In the *intentional-semantic condition*, they were instructed to read for meaning, to attempt to learn the target words and that a test on the words would follow, and to generate a synonym.

After the reading task, Spanish-to-English and English-to-Spanish cued recall tasks were administered to measure productive and receptively oriented vocabulary. As a measure of text comprehension, a 15-question short-answer comprehension test was administered.

Participants

The participants in the study were 114 Spanish-speaking university students learning L2 English at a large university in Mexico City. There were 59 in low-intermediate classes and 55 in high-intermediate classes. At the university in question, English Levels 3–6 corresponded to four different levels of proficiency in English, Level 3 being the lowest and Level 6 being the highest among these four. None of the participants had been informed that the study focused on vocabulary learning. The original participant pool meeting these criteria included 120 participants. For participants in the synonym-generation conditions, a minimum of 5 (out of 10 possible) filled-in blanks was the minimum established to be included in the data for the study. Five participants were excluded because they did not fill in at least 5 out of 10 blank spaces on the synonym-generation task. If any participant correctly translated one or more target words on the embedded pretest, the data that they provided would be excluded from the study. One participant was excluded because the participant correctly translated three of the target words on the embedded pretest. After these reductions, the remaining participant pool included 114 participants. None of these participants correctly translated any of the words on the embedded pretest.

Design

The study included three between-subjects independent variables and one within-subjects independent variable. The three between-subjects independent variables were orientation (incidental, intentional), task (–semantic, +semantic), and level (low intermediate, high intermediate). The within-subjects independent variable was recall type (L1 to L2 and L2 to L1), which corresponded to each participant's score on the first recall test (L1 to L2) and the second recall test (L2 to L1). Cued recall of vocabulary and comprehension recall were the dependent variables.

Note that any findings related to recall type (L1 to L2, L2 to L1) need to be interpreted in light of the fact that the L2-to-L1 task was administered after the L1-to-L2 task, but the two recall types were included to assess two levels of sensitivity to target word form and not to provide a

direct assessment of L1-to-L2 versus L2-to-L1 recall without the possibility of cross-test influence.

Materials

All of the participants received one learning packet, which corresponded to one of the four learning conditions: (a) incidental, (b) intentional, (c) incidental-semantic, and (d) explicit-semantic. All packets included the following pages in the following order: a language background questionnaire; an “Activity 1” sheet with four activities in which the 10 target words for the experiment had been embedded; an “Activity 2” instruction sheet with instructions to read a passage for meaning and specific instructions for one of the four possible treatments (see Appendix A); the passage “The Date that Was Not Meant to Be!” with or without spaces for writing synonyms next to Spanish translations of target words (see Appendix B for version including spaces for synonyms); the L1-to-L2 cued recall test titled “Vocabulary Quiz”; the L2-to-L1 cued recall test entitled “Vocabulary Quiz 2”; a 15-question comprehension quiz; and a postexperiment questionnaire on the participants’ opinions about how well they learned the translated words and how well they had comprehended the text. The passage, which contained 491 words, had been written with the intention that it would be largely comprehensible but not overly simple for the study participants. The comprehension test was designed to test both details and general ideas conveyed in the passage. The researcher also used a presentation program on a laptop computer to mark time for different stages of the experiment.

Experimental Words

The 10 experimental words were *brash*, *conceit*, *swindle*, *gloat*, *sham*, *posy*, *smidgen*, *plight*, *mushy*, and *steadfast*. These words were selected on the basis that the participants most likely would not know them but could benefit from learning them in consultation with advanced native speakers of Spanish. Spanish translations for each word can be found in Appendix B. In order to reflect a range of word classes, the target words consisted of five nouns, three adjectives, and two verbs.

Procedure

The participants were not instructed beforehand that the experiment was about vocabulary learning. Instructions were provided in

Spanish. Data were collected in the participants' regular classrooms during regular class hours with the exception of four participants from one class who participated while attending a different class on the day of the experiment and whose data were included with their normal class and level. All data were collected according to the following procedures:

1. The researcher invited the students to participate in a study on reading in a second language.
2. The participants gave informed consent to participate in the experiment.
3. The researcher instructed the participants to turn pages of the study packet one by one only when instructed to do so.
4. The packets were distributed one by one. The packets had previously been stacked so that each group of four packets distributed corresponded to each of the four learning conditions. In this way, participants within the same class received all of the learning conditions.
5. The participants were given as much time as they needed to complete the language background questionnaire and to complete Activity 1, the set of four activities in which the 10 target words for the experiment had been embedded. Therefore, by completing Activity 1, the participants completed the embedded pretest.
6. The participants were given as much time as they needed to read the instruction sheet for Activity 2, the instructions to read a passage for meaning and specific instructions for one of the four possible conditions (see Appendix A).
7. The participants were given 10 minutes to read the passage "The Date that Was Not Meant to Be!" in each of their respective learning conditions (see Appendix B).
8. The participants were given 2 minutes to complete the L1-to-L2 cued recall test titled "Vocabulary Quiz."
9. The participants were given 2 minutes to complete the L2-to-L1 cued recall test titled "Vocabulary Quiz 2."
10. The participants were given 5 minutes to complete the 15-question comprehension quiz.
11. The participants were given as much time as they needed to complete the postexperiment questionnaire on their beliefs about how well they learned the translated words and how well they had comprehended the passage.
12. The researcher concluded the experiment and thanked the participants after monitoring and ensuring that the participants worked individually on each task in question.

Scoring

For L1-to-L2 recall, scores of 1 were assigned for each completely produced target L2 (English) word, and scores of 0.5 were assigned for responses in which at least half of the target word was correctly produced (at least half of the number of the letters in the word). L2-to-L1 recall was scored based on the same scale: Scores of 1 were assigned for each correctly recalled L1 (Spanish) word. No score of 0.5 was needed to be assigned because the words to be produced for L2-to-L1 recall word were words that the participants had acquired already in their L1, which means that they would not be likely to know them as partial words at the time of this study. The 15-question text comprehension test was scored assigning 1 point for each correct short answer provided.

Analyses

Participants in the synonym-generation condition had to complete at least 5 of the 10 blank spaces provided for the synonym-generation task in the text. Data provided by five participants were excluded because their synonym-generation performance was below this level. Mean performance (for filling in the blanks) of the remaining participants in +semantic conditions was 8.92, $SD = 1.47$, or slightly above 89%.

All vocabulary recall data were submitted to a $2 \times 2 \times 2 \times 2$ analysis of variance (ANOVA). Orientation (incidental, intentional), task (–semantic, +semantic), and level (low intermediate, high intermediate) were between-subjects independent variables. Recall type (L1 to L2, L2 to L1) was a within-subjects independent variable. Cued recall score was the dependent variable. Text comprehension data were submitted to a second $2 \times 2 \times 2$ ANOVA with orientation (incidental, intentional), task (–semantic, +semantic), and level (low intermediate, high intermediate) as between-subjects independent variables and comprehension score as the dependent variable. Means reported are estimated marginal means in light of different cell sizes in the dataset for the variables to be examined. Alpha was set at 0.05 for all analyses.

RESULTS

Vocabulary Learning

Means for the L1-to-L2 and L2-to-L1 cued recall based on orientation (incidental, intentional) and task (–semantic, +semantic) appear in Table 1. Means were much higher in the –semantic condition (5.20) than in the +semantic condition (2.80) and higher in the intentional condition

TABLE 1
Means for Number of Words Recalled Based on Orientation and Task (Max = 10)

Orientation	Task	N	Mean	Std Dev
Incidental	-Semantic	31	4.69	2.16
	+Semantic	29	2.30	2.15
	Total	60	3.50	2.16
Intentional	-Semantic	31	5.71	2.15
	+Semantic	23	3.31	2.15
	Total	54	4.51	2.18
Total	-Semantic	62	5.20	2.16
	+Semantic	52	2.80	2.17
	Total	114	4.00	2.17

(4.51) than in the incidental condition (3.50). Means were much higher for the -semantic condition than for the +semantic condition in both the incidental and intentional learning conditions. In the incidental condition, means were 4.69 for -semantic and 2.30 for +semantic. In the intentional condition, means were 5.71 for -semantic and 3.31 for +semantic. These results are displayed graphically in Figure 2. Means for L2-to-L1 cued recall (4.67) were higher than for L1-to-L2 cued recall (3.34), while the results indicate a continuous pattern of higher means for -semantic over +semantic and higher means for intentional over incidental based on either L1-to-L2 or L2-to-L1 cued recall as the measure. This pattern is apparent in Table 2, which displays means based on recall type, orientation, and task; and in Figure 3, which depicts the effect of task by recall type.

FIGURE 2
The Effect of Orientation and Task on L2 Word Learning During Reading

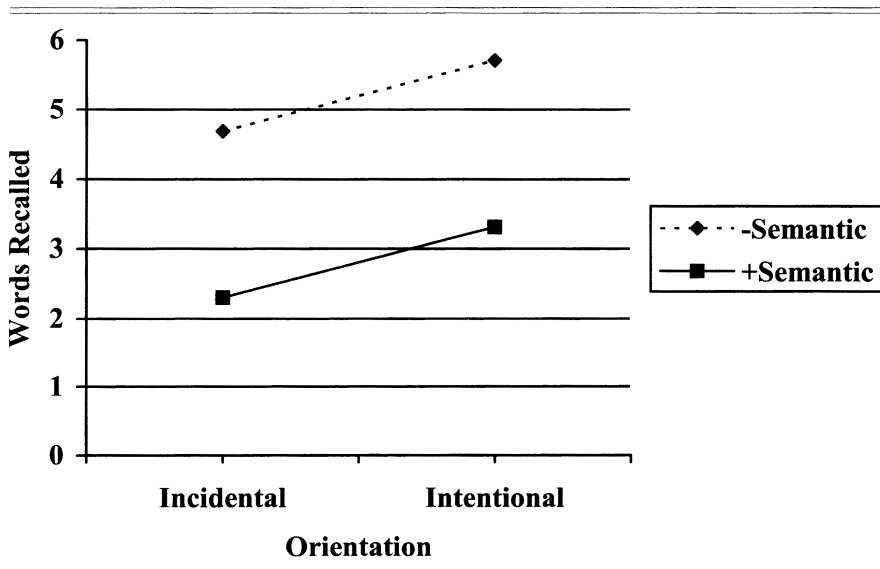


TABLE 2
Means for Number of Words Recalled Based on Recall Type, Orientation, and Task (Max = 10)

Recall Type	Orientation	Task	N	Mean	Standard deviation
L1 to L2	Incidental	-Semantic	31	3.91	2.30
		+Semantic	29	1.90	2.29
		Total	60	2.91	2.30
	Intentional	-Semantic	31	4.98	2.29
		+Semantic	23	2.55	2.29
		Total	54	3.76	2.30
	Total	-Semantic	62	4.44	2.30
		+Semantic	52	2.23	2.31
		Total	114	3.34	2.32
L2 to L1	Incidental	-Semantic	31	5.48	2.30
		+Semantic	29	2.70	2.29
		Total	60	4.09	2.29
	Intentional	-Semantic	31	6.44	2.29
		+Semantic	23	4.06	2.29
		Total	54	5.25	2.31
	Total	-Semantic	62	5.96	2.29
		+Semantic	52	3.38	2.31
		Total	114	4.67	2.31

Note. The L2-to-L1 recall task was administered after the L1-to-L2 recall task.

Means were marginally higher for high-intermediate learners ($M = 4.36$, $SD = 2.17$) than for low-intermediate learners ($M = 3.65$, $SD = 2.17$).

Results of the ANOVA on vocabulary learning appear in Table 3. The ANOVA revealed significant main effects for orientation and recall type.

FIGURE 3
The Effect of Task by Recall Type on L2 Word Learning During Reading

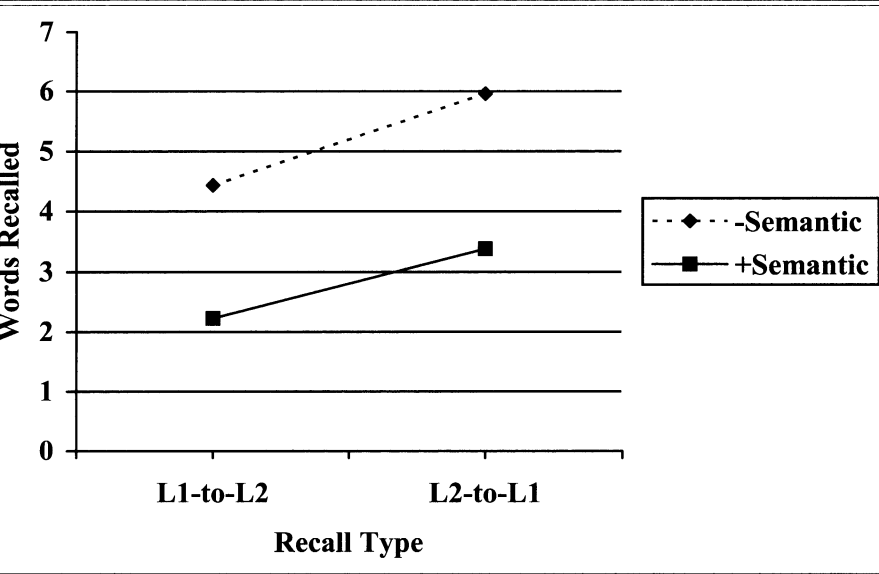


TABLE 3
Repeated Measures ANOVA for Effects of Orientation, Task, and Proficiency
Level on Vocabulary Learning

Source	<i>df</i>	<i>F</i>	η^2	<i>p</i>
Between subjects				
Orientation (O)	1	6.16*	0.055	0.015
Task (T)	1	34.71***	0.247	0.000
Proficiency level (L)	1	3.04	0.028	0.084
O x T	1	0.000	0.000	0.991
O x L	1	0.167	0.002	0.683
T x L	1	0.26	0.002	0.613
O x T x L	1	0.06	0.001	0.809
Error	106			
Within subjects				
Recall type (R)	1	81.24***	0.434	0.000
R x O	1	1.06	0.010	0.307
R x T	1	1.46	0.014	0.230
R x L	1	0.48	0.004	0.491
R x O x T	1	1.95	0.018	0.166
R x O x L	1	0.065	0.001	0.799
R x T x L	1	0.442	0.004	0.507
R x O x T x L	1	0.922	0.009	0.339
Error	130			

Note. * $p < 0.05$. *** $p < 0.001$

The effect of proficiency level ($p = 0.084$) did not reach the level of statistical significance. No other significant main effects or interactions were observed.

Text Comprehension

Means for text comprehension based on orientation (incidental, intentional) and task (–semantic, +semantic) appear in Table 4. Out of a maximum score of 15, the grand mean was 13.24 and the lowest score

TABLE 4
Means for Text Comprehension Based on Orientation and Task (Max = 15)

Orientation	Task	<i>N</i>	Mean	Standard deviation
Incidental	–Semantic	31	13.59	1.61
	+Semantic	29	13.58	1.62
	Total	60	13.59	1.60
Intentional	–Semantic	31	13.64	1.60
	+Semantic	23	12.13	1.60
	Total	54	12.89	1.62
Total	–Semantic	62	13.62	1.61
	+Semantic	52	12.86	1.62
	Total	114	13.24	1.61

was 7, indicating that the participants did read the text for meaning. Overall, means for text comprehension were higher in the –semantic condition (13.62) than in the +semantic condition (12.86) and higher in the incidental condition (13.59) than in the intentional condition (12.89). Means were 13.34, *SD* = 1.62, for high-intermediate learners and 13.12, *SD* = 1.61, for low-intermediate learners. Results of the ANOVA on vocabulary learning appear in Table 5. Results of this ANOVA revealed significant main effects for orientation, task, and orientation × task. The significant orientation × task interaction, which is displayed graphically in Figure 4), was due to higher comprehension scores for the +semantic condition in the intentional condition only. No other significant main effects or interactions were observed.

DISCUSSION

With references to the research questions that guided this study, the main findings can be summarized as follows:

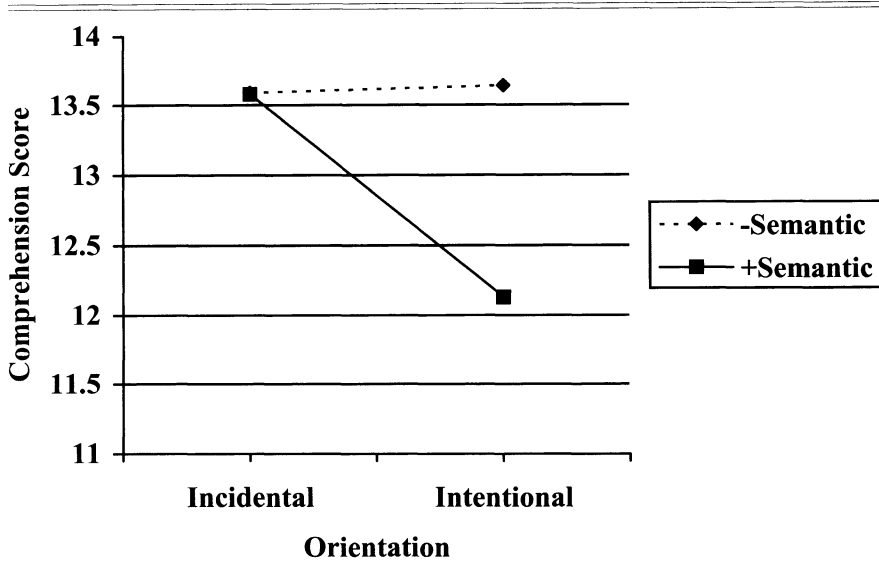
1. Instructing learners to learn target words and informing them that a test will follow (intentional learning) positively affected L2 word-form learning during reading as compared with instructing learners to read for meaning only (incidental learning).
2. Requiring learners to perform a semantically oriented task (synonym generation) negatively affected L2 word-form learning during reading.
 - a. This negative effect did not depend on whether vocabulary learning was intentional or incidental.
 - b. This negative effect did not depend on the proficiency level of the learners (low intermediate versus high intermediate).

TABLE 5
Repeated Measures ANOVA for Effects of Orientation, Task, and Proficiency
Level on Text Comprehension

Source	<i>df</i>	<i>F</i>	η^2	<i>p</i>
Between subjects				
Orientation (O)	1	5.30	0.048	0.023*
Task (T)	1	6.27	0.056	0.014*
Proficiency Level (L)	1	0.474	0.004	0.493
O × T	1	6.15	0.055	0.015*
O × L	1	0.028	0.000	0.867
T × L	1	1.059	0.010	0.306
O × T × L	1	0.695	0.007	0.406
Error	106			

Note. **p* < 0.05.

FIGURE 4
The Effect of Orientation and Task on Text Comprehension



3. Additionally, text comprehension was lower when learners were in the intentional vocabulary learning condition and were required to perform the semantically oriented task.

From a theoretical standpoint, these findings are consistent with the resource-depletion hypothesis, which posits that increased semantic processing can exhaust processing resources that otherwise could be used to encode the formal component of the target words during incidental vocabulary learning. As predicted by this hypothesis, synonym generation decreased L2 word-form learning in the incidental condition. Although this finding may seem counterintuitive at first glance, it may be viewed as intuitive if one reflects on how semantic tasks can draw learners' attention to semantic components of words without encouraging them to pay as much attention to target word forms and form-meaning mappings, even within incidental-learning contexts. This finding extends previous findings observed for other semantically oriented tasks such as sentence writing (Barcroft, 2004), making pleasantness ratings (Barcroft, 2002), and attending to questions about word meaning (Barcroft, 2003), and suggests that negative effects of semantic elaboration and increased semantic processing can be obtained in contexts of both intentionally and incidentally oriented L2 vocabulary learning.

Additionally, the negative effects of the semantically oriented task emerged based on both L1-to-L2 and L2-to-L1 measures. The larger

decrease in means for the semantic condition based on the L1-to-L2 measure (99%) as compared with the decrease in means based on the L2-to-L1 measure (76%) may have resulted from the L2-to-L1 measure's lesser sensitivity to the level of word-form knowledge because it does not depend on production of each word form. Nevertheless, the substantial negative effect of the semantically oriented task on L2-to-L1 recall suggests that increased semantic elaboration can decrease one's ability to make early form-meaning mappings as well. For the L2-to-L1 recall task, participants were provided with the target L1 word forms and were asked only to generate L1 counterparts, rendering performance on this task less dependent on L2 word form than the L1-to-L2 recall task for which no L2 word forms were provided. Therefore, the negative effect observed for L2-to-L1 recall suggests that the semantically oriented task decreased the participants' ability to map L2 word forms onto their appropriate meanings, in addition to decreasing the participants' ability to encode L2 word forms themselves. This interpretation is fully consistent with the TOPRA model, which predicts that increased semantic processing can decrease not only word-form learning but also the mapping component of vocabulary learning (Figure 1b).

Whereas the previous findings support predictions of the TOPRA model within discrete-item, intentional contexts only, the current study instantiates predictions of the TOPRA model at the level of written discourse with regard to both intentional and incidental orientations toward vocabulary learning. According to TOPRA, increased semantic processing associated with the synonym-generation task should have decreased the learners' ability to process for the word-form and mapping components of learning a new word (see Figure 1b). Because performance on the two cued recall tasks in the study depended on developing these components, the synonym-generation condition resulted in decreased performance for these tasks. Considering transfer appropriateness (Morris, Bransford, & Franks, 1977), if the dependent measure in this study had been recall of target words in L1 (Spanish) instead of L2 (English), the effect of the synonym-generation task could have been very different because the task at testing in this case would not have involved knowledge of recently learned new word forms. The deeper semantically oriented processing associated with synonym generation in this case might have been of greater benefit. Using measures oriented toward new-word-form learning, however, the deeper semantically oriented processing was detrimental.

With regard to proficiency level, vocabulary learning was marginally higher among high-intermediate learners as compared with low-intermediate learners, but this effect was not statistically significant. No differences in text comprehension performance were observed between these two levels of proficiency. The marginally higher vocabulary learning

scores among learners in the higher proficiency level are in the direction that one might expect because these learners should have been able to comprehend the text more easily and allot more available processing resources to learning the target words in the text.

Means obtained for text comprehension demonstrated that participants clearly attempted to read the passage for meaning ($M = 13.24$ out of 15, with 7 as the lowest score). The additional statistical analysis on comprehension scores also revealed a negative effect for the synonym-generation task in the intentional condition. Previous research suggests that attending to grammatical surface forms can reduce learners' ability to attend to passage content in both the spoken mode (VanPatten, 1990) and the written mode (Greenslade, Bouden, & Sanz, 1999). The present finding that text comprehension scores were lower in the intentional and +semantic condition suggests the combination of intentionally trying to learn the new words and performing the synonym-generation task was sufficient to decrease learners' ability to attend to the text for meaning. Participants in the intentional/+synonym condition apparently could no longer attend to the meaning of the text as well while performing these two other tasks.

PEDAGOGICAL IMPLICATIONS

Two main pedagogical implications can be derived from the results of the current study. First, the study provides evidence favoring the inclusion of direct instructions to learn target words and other techniques to foster intentional vocabulary learning during reading, corroborating previous findings on this area (e.g., Hulstijn, 1992). Second, the findings disfavor the use of semantically oriented tasks during the initial stages of learning new L2 words, given that overall cued recall of the new L2 vocabulary was approximately 86% higher when learners were not required to perform the semantically oriented synonym-generation task. Target-word-oriented semantic elaboration may help learners to acquire L2-specific meanings of target words and to develop their ability to use target words appropriately in L2. Nevertheless, the present findings suggest that (at least) some types of semantic elaboration can yield strong negative effects during the early stages of learning new L2 words during reading. Limiting forced semantic elaboration during these initial stages may help learners to reserve processing resources needed to encode and retain new L2 word forms when processing new words as input.

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THE AUTHOR

Joe Barcroft is an associate professor of Spanish and second language acquisition in the Department of Romance Languages and Literatures at Washington University in St. Louis, St. Louis, Missouri, United States. His research interests include second language vocabulary acquisition, processing resource allocation, the bilingual mental lexicon, and psycholinguistic approaches to issues in second language acquisition and bilingualism.

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APPENDIX A

This is an English translation of general and specific instructions (originally in Spanish).

General Instructions

On the following page you will find a passage in English.

When instructed to do so, turn the page and read the passage. Read the passage carefully and do your best to understand and remember all of the information that appears in the text. You will have ten minutes to read the text. After the reading there will be a comprehension quiz during which you will not be able to refer to the text.

Specific Instructions for Each Condition

Incidental/-Semantic: (No additional instructions provided)

Incidental/+Semantic:

In addition, you will find ten English words with their Spanish translations in parentheses () in the text. Next to the translation, you will find a blank space. For each word, think of another Spanish word related to the one that appears in parentheses and write it in the space. An example appears below: what you could write appears in italics.

building (edificio *rascacielos*)

smart (inteligente *leído*)

Intentional/ - Semantic:

In addition, you will find ten English words with their Spanish translations in parentheses () in the text. Do your best to learn these ten words. After the reading, you will be tested on how well you have learned these words.

Intentional/+Semantic:

In addition, you will find ten English words with their Spanish translations in parentheses () in the text. Do your best to learn these ten words. After the reading, you will be tested on how well you have learned these words.

In addition, you will find ten English words with their Spanish translations in parentheses () in the text. Next to the translation, you will find a blank space. For each word, think of another Spanish word related to the one that appears in parentheses and write it in the space. An example appears below: what you could write appears in italics.

building (edificio *rascacielos*)

smart (inteligente *leído*)

APPENDIX B

Reading Passage

The Date that Was Not Meant to Be!

Have you ever gone on a date during which basically everything went wrong? Hopefully not, but here is a story of one such date, a date that one Mr. Mike Alan Smith likely never will forget!

Mike Smith is a used car salesman. His sales record is a bit poor when compared to his co-workers, but he is always very honest when it comes to working with his customers who are interested in purchasing a car. His co-worker Bob, on the other hand, is just the opposite. Bob is brash (descarado _____) and filled with conceit (vanidad _____). Bob's typical day at work consists of the following: arrive about an hour late, swindle (estafar _____) as many customers as possible, gloat (deleitarse _____) about his so-called "successes" in front of Mike, and leave about an hour early.

Mike always finds Bob's sham (engaño _____) very annoying. Nevertheless, one day while at work, Mike met a very nice young woman named Lisa. Mike decided to ask her to go on a date. Lisa, whose friend Mary had just purchased a car from Bob, found Mike to be a very pleasant person, so Lisa said "yes."

On the evening of the date, Mike arrived at Lisa's doorstep dressed elegantly. When Lisa opened the door, she saw that Mike had brought her a posy (ramillete _____) of flowers. What a nice gesture! She smiled and thanked him, but it turns out that Lisa was allergic to the flowers. Even a smidgen (pizca _____) of the pollen in that type of flower would make her sneeze violently! She did, and upon doing so, she also tripped and fell into Mike, knocking both of them down the steps of the house. Although still to be confirmed, Lisa had broken her leg, and Mike had broken his arm. Realizing that they were both hurt seriously, Lisa called her friend Mary. Mary came over, helped them into her car, and began to drive them to the hospital.

But the plight (aprieto _____) continued! Unfortunately, Mary was driving the "like new" car that Bob had sold her earlier in the week even before the car had been fully inspected. As Mary was arriving at the hospital, the brakes on the car stopped working. Consequently, instead of driving "to" the hospital, Mary drove "into" the hospital—literally, halfway into the middle of the emergency room! Fortunately, no one was hurt seriously, but Mike and Lisa ended their date face up, staring at the ceiling of the emergency room as they were being treated for injuries.

The story does have a happy—and a bit mushy (meloso _____)—ending though. Believe it or not, Mike and Lisa went on a number of dates after the "hospital" date. With steadfast (perserverante _____) conviction, they dated for six months, fell in love, got married, and have been happily married for 27 years. Not surprisingly, Bob the coworker was not invited to their wedding!