Learning Vocabulary in Lexical Sets: Dangers and Guidelines

Paul Nation

This article examines research on learning related vocabulary, such as *lexical sets*,[1] opposites, and synonyms, together. This research shows that learning related words at the same time makes learning them more difficult. This learning difficulty can be avoided if related words are learned separately, as they are when learning from normal language use. Teachers can decrease the possibility of *interference*[2] by making the contexts, *collocates*,[3] and visual representations of related words as different as possible.

Intuitively, it seems a good idea to present words of related meaning together so that learners can see the distinctions between them and gain a reasonably complete coverage of a defined area of meaning. We do not have to look very far in textbooks to see that opposites (e.g., *hot-cold, long-short, old-young*), free associates (e.g., *table-chair*), and lexical sets (e.g., *banana-orange-apple-pear-plum*) are often presented together.

Numerous writers (see, e.g., Channell, 1981; Neuner, 1992) suggest teaching words in lexical sets. The justifications for doing so are that it

- requires less learning to learn words in a set (Neuner, 1992);
- is easier to retrieve related words from memory;
- helps learners see how knowledge can be organized (Dunbar, 1992);
- reflects the way such information is stored in the brain; and
- makes the meaning of words clearer by seeing how they relate to and are different from other words in the set.

But a growing body of research indicates that this way of presenting new vocabulary is making learning much more difficult than it should be. The research shows that it takes longer to learn words that relate to each other in certain ways than it takes to learn words that are unrelated to each other or that are related to each other in a kind of story line. This means that teachers and course designers need to rethink the way they present and arrange vocabulary in lessons, and they need to inform learners that they should avoid certain kinds of groupings of words when they are learning them for the first time.

Learning new words is a cumulative process, with words being enriched and established as they are met again. Learning related words in sets is not a good idea for initial learning. As learners' knowledge becomes more established, seeing related words in sets can have a more positive effect.

The purpose of this article is to review the research on interference between related words in a second language (L2) in order to show the scope and nature of the problem. The article addresses how teachers and learners can deal with the problem, particularly when using textbooks that present related words together.

Research on Interference Between Related Words

The earliest published research on interference relating directly to the learning of L2 or foreign language vocabulary was done by Higa (1963). Psychologists were very interested in interference in the 1940s, 1950s, and 1960s because interference between items was seen as one of the major causes of forgetting. The mechanisms used to explain forgetting included items learned at the same time interfering with each other, items learned now interfering with what had been learned previously, and items learned now interfering with what is learned later. There have been few recent studies in this area because of a change from a behaviorist to a more cognitive view of psychology.

In addition to the criteria of frequency and avoidance of interference, course designers need to apply a criterion of normal use, meaning that words should occur in normal communication situations, not in contrived, language-focused activities.

It is important when looking at the memory research to carefully distinguish those studies that are like learning foreign vocabulary from those that are not. To be like foreign vocabulary learning, the learning needs to involve associating an unfamiliar form (a foreign word or a nonsense word) with a known meaning, usually a first language (L1) word or a picture. This is like learning a foreign word and its L1 translation, a common occurrence in language learning. This is, of course, a very limited view of what is involved in knowing a word, but it is a very important and central aspect of word knowledge. There are numerous pieces of research that involve people being presented with lists of L1 words and then having to recall them. The accuracy of the recall is usually related to the perceived connections between the words, with groups of related words being easier to recall than unrelated words (Birnbaum, 1968; Bousfield, 1953). But this

research is not like learning foreign vocabulary because all the word forms are familiar and the learning does not involve relating a form to a meaning.

Higa (1963), Tinkham (1993, 1997), and Waring (1997) all used nonsense words to represent the foreign word form and L1 words to represent the meaning. The use of nonsense words should be seen as a positive feature that increased the internal validity of the experiments by allowing the experimenter to control the meaningfulness (previous experience) of the forms. Tinkham and Waring switched the forms for some of the learners to doubly ensure that it was not the form of the words that was making the learning easier or more difficult.

The Range of Related Meanings

Higa's (1963) research involved seven kinds of meaning relationships between pairs of words that were compared with pairs of words that were not related to each other. The list in the sidebar on the right ranks the pairs from those that were most difficult to learn to the pairs whose meaning relationships helped learning.

More recently, Tinkham (1993, 1997) and Waring (1997) compared words organized into lexical sets of six fruit items (*apple, pear, nectarine, peach, apricot, plum*) and three clothing items (*shirt, jacket, sweater*) with sets of unrelated words (*mountain, shoe, flower, mouse, sky, television*). They found there was a clear advantage to learning words that were unrelated, as compared to learning the words presented in lexical sets, which took longer. Learners also felt that the lexical sets were more difficult to learn.

Tinkham (1997) also compared thematically related words (*frog, pond, green, slimy, hop, croak*) with unrelated words and found that, generally, the thematically related set was easier to learn, though this result was not as strong as the negative effect of the lexical sets.

It is difficult for course designers, as well as teachers and learners, to appreciate that items in sets such as months, days of the week, and numbers are best learned, initially, when not learned together.

Higa's (1963) results do not fully support Tinkham's (1993, 1997) and Waring's (1997) in that Higa found coordinate items to be helpful. A possible reason for this is that Higa used six pairs of coordinates from six different sets (e.g., *hour, minute; hammer, saw*), whereas Tinkham and Waring used six items from the same set.

Meaning Relationships Between Word Pairs

Effect of the set	Relationship	Explanation	Example
Most interfering	Near synonyms	The words in the set have rather similar meanings.	*fast rapid*
	Free associates	One word is a free associate of the other.	*bed sleep*
	Opposites	The words have opposite meanings.	*dark light*
Neutral	Unrelated	The two words have no meaning connection.	*bread foot*
	Connotation	The two words were not synonyms but close in meaning to each other.	*see vision*
	Partial response identity	The words have similar free associates (e.g., *light*).	*dark lamp*
Most helpful	Coordinates	The words occur under a headword, such as *fruit.*	*apple pear*

Note that *connotation* and *coordinates* are used here with different meanings from their use in standard linguistics.

Schneider, Healy and Bourne (1998) found that, initially, learning related words together (e.g., parts of the body) was easier than learning a set of unrelated words. Yet, on a long-term retention test and in subsequent relearning, the unrelated words were easier to learn. This research, however, used a different way of choosing unrelated words than Tinkham's (1993) study, and this may have obscured some of the differences between the related and unrelated groups.

The similarity between Higa's (1963) experiment and the experiments of Tinkham (1993, 1997) and Waring (1997) may lie in the general nature of the relationships. Interfering relationships (i.e., those that make learning more difficult) can occur when one word can substitute for another in a kind of list, as in the following example. Higa also sees these words as being more directly associated with each other.

	a shirt.		
I am wearing	*a jacket.*	It is	*hot.*
	a sweater.		*cold.*

Relationships that make learning easier may involve words that could be grammatically linked to each other. That is, the words can go together to make sentences, as in the next example.

The *green slimy frog croaked* and *hopped* into the *pond.*

Higa (1963) sees these words in helpful relationships, as being more indirectly associated with each other. If this generalization is true, then it suggests that using texts and normal language use as a way of sequencing vocabulary is likely to be more favorable to learning. Using mental associations without reference to use to sequence vocabulary (e.g., parts of the body, days of the week, things in the kitchen, occupations) is likely to have a negative effect on learning.

The Strength of the Interference Effect

Although several well-conducted experiments show that the meaning relationships between words can affect learning, it is important to see whether this effect is strong enough to concern course designers, teachers, and learners. If learning related words together causes only a small interference effect on learning, then it is not worth making any changes to the way words are grouped for learning. If the interference effect is large, however, then teachers and learners need to try to reduce the possibility of interference in a variety of ways.

Not surprisingly, Tinkham (1993, 1997) and Waring (1997) found that the strongest interference effect occurs when all the words in a group to be learned are related to each other (an unmixed group), as compared to when half are related and half unrelated (a mixed group). One must look at these unmixed groups to determine the strength of the effect. Tinkham and Waring found that it took from 47% to 97% more repetitions to learn the group of related items, as compared to the number of repetitions it took to learn the group of unrelated items. These are large differences.

Tinkham (1997) found that, of 96 possible individual comparisons involving semantically related lexical sets and unrelated words, learning was faster for unrelated words for 80 comparisons, there was no difference for 13, and learning was faster with related words for 3. Once again, the effect is strong.

For thematically related words and unrelated words, the difference is not so marked. The thematically related words took 15% fewer repetitions to learn than the unrelated words. Of 96 possible individual comparisons, learning was faster for the thematically related words for 47, there was no difference for 29, and learning was faster for the unrelated words for 20. This weaker effect is partly a result of the thematically related words being made up of different parts of speech. Nouns are generally easier to learn than verbs, adjectives, or adverbs (Rodgers, 1969; but see Laufer, 1997). The semantically related lexical sets and the semantically unrelated sets were all nouns, whereas the thematically related set contained nouns, verbs, and adjectives.

Overall, as these studies indicate, the interference effect of related items is strong and seems to affect most learners. Therefore, it is well worth doing something to minimize or avoid it.

What Can Be Done to Minimize Interference?

The question of how to minimize interference will be examined from three viewpoints: those of course designers, teachers, and learners.

Course Designers and Interference

West (1955) saw the linking together of related words, such as days of the week and parts of the body, as an undesirable process for two reasons. First, it meant that words of widely differing usefulness (as determined by word frequency counts) were taught together when the focus should have been on higher frequency words. Second, in order to teach related words together, very unrealistic situations were used.

Even if frequency is used only as a very rough guide to the sequencing of vocabulary in a course, it would lead to the separation of many members of lexical sets. The table on the right is based loosely on West (1955, p. 62), but uses more recent frequency figures from Francis and Kučera (1982). The number following each word is its frequency in approximately 1,000,000 running words from a range of varieties of written English. Thus, the higher the number, the more frequent the word.

The wide frequency difference between *old* and *young*, and *long* and *short*, is largely the result of the higher frequency member sometimes being able to be used on some occasions as a general word (How *old* are you?) and on other occasions with a particular meaning (I feel *old* today.). This divergence in frequency of members of the same lexical set is often taken as evidence for the difficulty in using frequency as a vocabulary selection and frequency criterion. From an interference perspective, frequency works very nicely as a way of keeping potentially interfering items apart. Unless lexical sets, such as months of the year, have some clear underlying system that makes them easy to remember, it is easier to learn them, initially, at different times as separate items, so that they do not get mixed up. If, like *Tuesday* and *Thursday*, there is formal similarity as well as a meaning relationship between items, then the need to learn them apart from each other is even greater.

If, in the interests of easier learning, interference is to be avoided, then the differences between related items need to be made greater.

The frequency difference should not be overstated, however. Even though the days of the week, for example, range from the first 1,000 most frequent words to the third 1,000 most frequent words, they can all be reasonably considered as high-frequency items.

It is difficult for course designers, as well as teachers and learners, to appreciate that items in sets such as months, days of the week, and numbers are best learned, initially, when not learned together. For instance, there may be times when the circumstances call for discussing *Thursday* before it has been learned, even though *Monday*, *Friday*, and *Sunday* have. However, because all the useful items cannot be learned at the same time, we need to sequence their introduction. The criteria of usefulness (frequency or need) and avoidance of interference (ease of learning) are more important than aiming for early completeness of lexical sets.

In addition to the criteria of frequency and avoidance of interference, course designers need to apply a criterion of normal use, meaning that words should occur in normal communication situations, not in contrived, language-focused activities. Using texts, topics, themes, or tasks as the unit of analysis in a course should largely help meet this criterion. On the other hand, using functions, situations, or grammatical features as the unit of analysis is likely to increase the chances of interfering items occurring together. This need not be the case, but without special attention, such occurrences are likely to happen.

Word Frequency Counts of Various Lexical Sets

Member	Frequency
white	334
red	169
black	165
blue	126
green	85
yellow	52
pink	47
orange	8
Sunday	116
Monday	72
Saturday	72
Friday	64
Tuesday	59
Wednesday	37
Thursday	34
thin	90
fat	47
old	780
young	436
long	833
short	195
mother	280
father	240
wife	265
husband	163
son	202
daughter	91
brother	135
sister	55
uncle	58
aunt	27

Teachers and Interference

Most language courses are full of potentially interfering related items occurring together. This applies not just to vocabulary, but also to grammatical features. The classic way of representing this interference is with an input/output diagram (see the top sidebar on p. 9). The box represents the learner's brain, and because the processes in the brain are not directly observable, the brain is typically represented by the "black box," where the input and output can be observed, but the internal processes cannot.

This intralingual interference was pointed out by George (1962) in his article "On Teaching and Unteaching," where *unteaching* was basically the effect of presenting related items together.

The principle behind interference is something like this. If two or more items share some strongly related common features and they are learned together at the same

time, the similar features make them become strongly associated with each other, and the differences interfere with each other.

Teachers need to inform learners of the dangers of learning related words together.

For example, *hot* and *cold* share the common features of representing degrees of heat. Their differences are their different spellings (their forms) and the different ends of the scale that they refer to, or, for the L2 learner, their different L1 translations. If the words are taught together, learners will know that they refer to heat, but many will get confused about which word goes with which of the two meanings. The bottom diagram on the right shows this interference between pairs of opposites for Japanese learners of English.

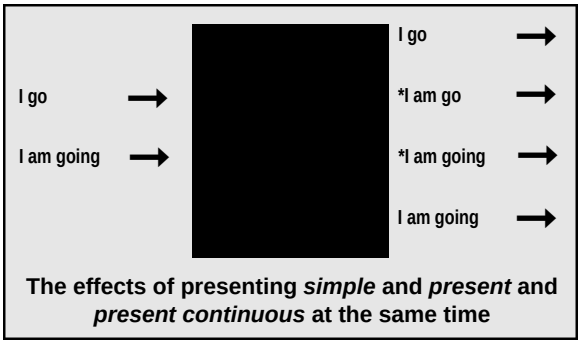
The diagram suggests that some correct connections will be made (probably with difficulty, as Higa's [1963], Tinkham's [1993, 1997] and Waring's [1997] experiments indicate), some wrong connections will be made, and some connections will not be made. Waring found five times as many examples of incorrect associations occurring between members of the lexical set than between the unrelated words.

If, in the interests of easier learning, interference is to be avoided, then the differences between related items need to be made greater. The following two points suggest ways in which teachers can do this.

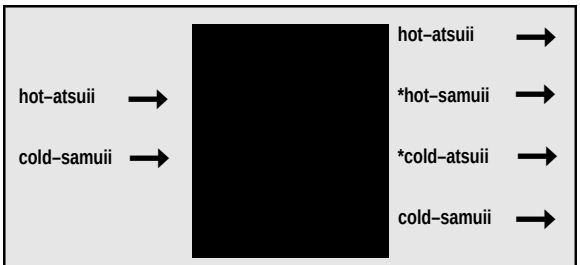
1. **Present the items at different times.** That is, present the most useful of the items (according to frequency or need) first; then, after that item has been reasonably well established, introduce the next item. These two items should be introduced at least several days apart. If the teacher is using a textbook that presents related items together, then the most useful member of a set should be presented and worked on before that part of the textbook is reached. Alternatively, the teacher can introduce only one member of the set for learners to work on and just briefly mention the others. These items would be given more time later.
2. **Use widely differing contexts.** If *hot* and *cold* occur together in a course and it is difficult to present them at different times, then they should be presented in quite different contexts. For example, *hot* can be used with collocates, such as *weather, water*, and *summer*; whereas *cold* can be used with collocates, such as *morning, meal,* and *drink*. The two words should not be used interchangeably in the same construction, such as *It's hot, It's cold,* or *hot water, cold water*. If visual aids are used, then different visual aids should be used for the different words. Increasing the differences between the items will decrease the strength of the association between them, thus reducing the chances of interference.

Teachers need to inform learners of the dangers of learning related words together. If learners understand this, then they can use this knowledge to guide their own learning as well as to understand why the teacher is not presenting all the members of a set at the same time. An objection often raised about separating members of a lexical set is that learners will want to know the other members. Helping learners to understand the nature of interference is one way to overcome this desire. Another way is to embed the items in normal use so that the learners' focus is on the message, not on the decontextualized items.

Input/Output Diagrams



The effects of presenting *simple* and *present* and *present continuous* at the same time



Interference between pairs of opposites for Japanese learners of English

*Asterisks indicate that what follows is not grammatically or semantically correct.

Learners and Interference

To be effective, vocabulary learning also has to occur outside of class time. Learners need to study vocabulary deliberately, using word cards, word building, and dictionary use strategies, as in the following two suggestions.

1. Learners need to know about interference, how to avoid it, and what to do when it occurs. So far, this article has looked at interference as interference between words of closely related meaning. Interference can also be form based. Words that look or sound somewhat alike can cause interference. Laufer-Dvorkin (1991) calls such items *synforms*. Examples include pairs, such as *attach* and *attack*, *Tuesday* and *Thursday*, and *fad* and *fade*. When using word cards to learn vocabulary, learners should know to keep formally similar items well separated, and to keep meaning-related items well separated.
2. When interference does occur, (e.g., when a learner confuses *north* and *south*), the most effective way to deal with it is to find some mnemonic trick to distinguish the items. The keyword technique is one way of doing this through making associations with a L1 word of similar form (Ott, Butler, Blake, & Ball, 1973; Hulstijn, 1997). A common mnemonic trick used to help learners remember the difference between the formally similar words *principal* and *principle* is the sentence "The princi*pal* is your *pal*."

These mnemonic tricks mean that access to the wanted form or meaning will be more indirect than it should be, but that is the price of distinguishing items that have become confused through interference.

The Limits of Interference

Interference largely occurs when items presented together are both unfamiliar, or when one is unfamiliar and the other poorly established. Once items have been reasonably well established, there is good value in deliberately bringing the items together to see how they differ from each other and where the boundaries between them lie. Seeing items in contrast to each other can clarify their differences in meaning and use, but this contrast should not occur until one or both of them are firmly established. Bringing the items together when one or both have been well established also helps strengthen associations, which may be useful in subsequent use of the items.

There is no research to tell us how well established an item needs to be before it can be safely contrasted with its opposite, near

synonym, or other members of its lexical set. Personal experience as a learner and a teacher suggests that items need to be fairly strongly established. There is also no evidence to show that if one item is well established, it can then be contrasted with its previously unfamiliar related items and still not be confused.

Research that tells us whether meeting items in context will reduce the chances of interference is also lacking. If the contexts for the related items are quite different from each other, it is likely to reduce the chances of interference. However, learners tend to decontextualize items and to look at them as language items. This may overcome the effect of context and result in interference.

Once items have been reasonably well established, there is good value in deliberately bringing the items together to see how they differ from each other and where the boundaries between them lie.

This survey of interference between words in L2 and foreign language learning is dealing with a small factor affecting learning. However, a quick glance at current published language courses shows that interference is a factor that is not appreciated by most course designers. The associational links that encourage designers to bring related items together in a lesson are the same links that increase the possibility of interference. Research also shows that where interference does occur, it considerably increases learning difficulty. Teachers and course designers need to draw on the findings of research to make the learners' task easier. This article has presented some of this research in an effort to show how this can be done.

Notes

[1] "A unit of vocabulary is generally referred to as a lexical item, or lexeme .... Specific groups of items, sharing certain formal or semantic features, are known as lexical sets" (Crystal, 1997, p. 221).

[2] The notion of *interference* generally refers to "the errors a speaker introduces into one language as a result of contact with another language; also called negative transfer .... The most common source of error is in the process of learning a foreign language, where the native tongue interferes; but interference may occur in other contact situations (as in multilingualism)" (Crystal, 1997, pp. 199-200). In this article, I address the issue of *lexical interference*, that is, the errors that occur between related words when ESL or EFL learners are acquiring related vocabulary.

[3] *Collocates* refers to lexical items that tend to occur together, such as *hot* with *weather*, *water*, or *summer*.

References

Birnbaum, I. M. (1968). Free-recall learning as a function of prior-list organization. *Journal of Verbal Learning and Verbal Behavior, 7*, 1037-1042.

Bousfield, W. A. (1953). The occurrence of clustering in the recall of randomly arranged associates. *Journal of General Psychology, 49*, 229-240.

Channell, J. (1981). Applying semantic theory to vocabulary teaching. *ELT Journal, 35*, 115-122.

Crystal, D. (1997). *A dictionary of linguistics and phonetics* (4th ed.). Oxford, England: Blackwell Publishers.

Dunbar, S. (1992). Developing vocabulary by integrating language and content. *TESL Canada Journal, 9*(2), 73-79.

Francis, W. N., & Kučera, H. (1982). *Frequency analysis of English usage.* Boston: Houghton Mifflin.

George, H. V. (1962). On teaching and unteaching. *ELT Journal, 17*(1), 16-20.

Healy, A. F., & Bourne, L. E. (Eds.). (1998). *Foreign language learning: Psycholinguistic studies on training and retention.* Mahwah, NJ: Lawrence Erlbaum.

Higa, M. (1963). Interference effects of intralist word relationships in verbal learning. *Journal of Verbal Learning and Verbal Behavior, 2*, 170-175.

Hulstijn, J. H. (1997). Mnemonic methods in foreign language vocabulary learning: Theoretical considerations and pedagogical implications. In J. Coady & T. Huckin (Eds.), *Second language vocabulary acquisition* (pp. 203-224). Cambridge: Cambridge University Press.

Laufer, B. (1997). What's in a word that makes it hard or easy? Intralexical factors affecting the difficulty of vocabulary acquisition. In N. Schmitt & M. McCarthy (Eds.), *Vocabulary: Description, acquisition and pedagogy* (pp. 140-155). Cambridge: Cambridge University Press.

Laufer-Dvorkin, B. (1991). *Similar lexical forms in interlanguage.* Tübingen, Germany: Gunter Narr Verlag.

Neuner, G. (1992). The role of experience in a content- and comprehension-oriented approach to learning a foreign language. In P. J. L. Arnaud & H. Béjoint, *Vocabulary and applied linguistics* (pp. 156-166). London: Macmillan.

Ott, C. E., Butler, D. C., Blake, R. S., & Ball, J. P. (1973). The effect of interactive-image elaboration on the acquisition of foreign language vocabulary. *Language Learning, 23*(2), 197-206.

Rodgers, T. S. (1969). On measuring vocabulary difficulty: An analysis of item variables in learning Russian-English vocabulary pairs. *IRAL, 7*, 327-343.

Schneider, V. I., Healy, A. F., & Bourne, L. E. (1998). Contextual interference effects in foreign language vocabulary acquisition and retention. In A. F. Healy & L. E. Bourne (Eds.), *Foreign language learning: Psycholinguistic studies on training and retention* (pp. 78-90). Mahwah, NJ: Lawrence Erlbaum.

Tinkham, T. (1993). The effect of semantic clustering on the learning of second language vocabulary. *System, 21*(3), 371-380.

Tinkham, T. (1997). The effects of semantic and thematic clustering on the learning of second language vocabulary. *Second Language Research, 13*(2), 138-163.

Waring, R. (1997). The negative effects of learning words in semantic sets: A replication. *System, 25*, 261-274.

West, M. (1955). *Learning to read a foreign language, and other essays on language teaching* (2nd ed.). London: Longman.

Author

Paul Nation teaches in the School of Linguistics and Applied Language Studies at Victoria University of Wellington, New Zealand. He has taught in Indonesia, Thailand, the United States, Finland, and Japan. His specialist interests are language teaching methodology and vocabulary learning. He recently completed a study of graded readers and a draft of a new book entitled Learning Vocabulary in Another Language *(Cambridge University Press).*