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Vocabulary: Second Language

P Nation, Victoria University of Wellington, Wellington, New Zealand

Learning Burden

Knowing a word well involves knowing several aspects covering the form, meaning, and use of the word. The difficulty these aspects have for any particular word depends on how closely the aspects relate to knowledge the learners already have. This knowledge can come from the learners' first language or other languages they know, and it can come from the knowledge they already have of the second language. For example, if the learners' first language uses the same written script as the second language, then this will make the learning burden of the written form of the second language much lighter. If the written form of the second language is very regular with one letter always representing the same sound and vice versa, then the learning burden of the written form will be even lighter. Similarly, if the two languages share a lot of cognate vocabulary, some of the learning burden will be lighter. Spanish learners learning the academic vocabulary of English find that these words have a light learning burden because most have very similar forms and meanings in English, for example *acquisition* and *evaluation.* Finnish learners of English are faced with a more difficult task.

Teachers can try to lighten the learning burden of a word by explicitly relating it to known items that are similar in the first or second language, by showing the patterns or rules that the word fits into, and by preteaching items and features that will make the new word easier to learn. Before teaching a word, it is worth doing a quick analysis of the learning burden of the word to work out what aspects of the word the teaching needs to focus on.

Word Form

Words that are difficult to pronounce are usually difficult to learn (Rodgers, 1969; Ellis and Beaton, 1993). Words that are easy to pronounce can more easily be held in working memory and thus have a greater chance of entering long-term memory. Thus, the words introduced early in an English course should be easy for learners to pronounce. Substantial listening practice and a small amount of guided pronunciation practice can make it easier for words with unfamiliar sounds to be learned.

Although English spelling is notorious for its irregularities, there are numerous patterns and rules that can help learning. First language research on reading has shown that developing phonemic awareness (the idea that words are made up of separable sounds) can have very positive effects on learning to read English (Ehri *et al.*, 2001). Similarly, giving some attention to phonics (sound-spelling relationships) can also help with learning to read and write (Stahl *et al.*, 1998). A very large proportion of English words come from French, Latin, or Greek and thus make use of prefixes, suffixes, and stems that can occur in many different words. Learning can be helped if the most common affixes and their meanings are learned, and often a simple explanation of a word's etymology (e.g., the word *rank* has the same stem as the word *arrange*) can help learning. Irregular affixation can increase the learning burden. Laufer's (1997) study of

synforms has shown that, when knowledge of a form is not firmly established, there can be considerable interference with words of roughly similar form.

Word Meaning

If an L2 word is a loan word or a cognate in L1, it is then very easy to relate the form of the word to its meaning. For example, approximately 70% of the 570 words in Coxhead's (2000) Academic Word List exist in Spanish in a similar form with a similar meaning. Only a very small number, approximately 10%, are false cognates in which the form is similar but the meaning is not. The reason for such a large overlap is that over half of English words came to English from French or Latin (Roberts, 1965). As a result, other languages derived from or with a lot of borrowing from Latin and related languages share a large amount of vocabulary. One important effect of this is that the analysis of words into parts, particularly giving attention to prefixes and suffixes, can greatly help the learning of these words. Remembering the meaning of a regularly affixed word such as *unpredictable* or *miscommunication* is helped by having an understanding of the parts that make it up. There are lists of the most frequent, regular, productive, and predictable affixes in English that learners of English as a second language can usefully learn (Bauer and Nation, 1993).

Some English words require considerable concept development by learners with particular first languages. The most striking of these may be words for family relationships and pronouns if English uses a system different from that in the first language. For example, in the Thai system for showing family relationships, relative age is very important and the term used to refer to an older sister is different from that used to refer to a younger sister. Similarly an aunt on your mother's side who is younger than your mother is referred to in a different way from one who is older than your mother. Learning such a system takes a lot of time and experience for a nonnative speaker.

Some areas of technical vocabulary may also present a heavy learning burden. Recent studies of technical vocabulary (Chung and Nation, 2003) have shown that a very large proportion of the running words in specialized texts are technical words. In highly technical subjects such as anatomy almost one in every three words is a technical word. In other areas, this may drop to one in five. From a learning-burden perspective, technical vocabulary can be divided into two types: technical words that have forms that are largely unique to the specialized area and words that also occur in nonspecialized areas, usually with the same or a related meaning. The first group includes words such as *thorax, sternum,* and *vertebrae* in anatomy and *pixel, ROM,* and *cpu* in computing. The second group includes words such as *by-pass, chest,* and *rib* in anatomy and *file, open,* and *save* in computing. Usually the completely new words such as those in the first group will have a heavier learning burden because both a new form and a new concept must be learned. Words in the second group can be made easier to learn by relating their nontechnical meaning to their technical meaning.

When learning most other words, the learner may find the L1 equivalent to be sufficient as a first step in developing an L2 concept for the word. If a word has a wide range of senses that do not correspond to the L1, then this can increase learning burden.

Word Use

If the grammar and collocations of a word are not similar to those in the first language or to known second language synonyms, then the learning burden is heavy and teachers may need to spend time on these aspects. Collocations are words that typically occur with other words. Some typical collocates of *sweet* in the British National Corpus are *smile, smell, flavour, dreams, tooth, boy, juice,* and *dreams*. If these do not parallel the first language, then they need to be learned. This is probably best done through extensive experience with the language. Such learning can also be helped by drawing attention to the concept underlying the range of uses of the word (*sweet* shows that something is pleasing and well liked) and by explicit attention to the collocates. It has been suggested that it is knowledge of collocational units that makes native speakers sound nativelike and that allows them to use the language fluently (Pawley and Syder, 1983). That is, native speakers can use the language well because they have stored units of language that are much larger than a word. Storing and accessing units such as *that's all very well for you to say* and *without further ado* allow a speaker to produce accurate language quickly.

Some words such as *faucet, kid, bugger,* and *explicate* have restrictions on their use. These restrictions include geographical restrictions (Americans use *faucet*; British use *tap*), register (*expedite* is very formal; *speed up* is more colloquial), currency (some words such as *forsooth* and *breeches* are no longer in use), age restrictions (*potty* and *choo-choo* are used by and with children), gender restrictions (*fabulous* tends to be used by women), and frequency (some words such as *diligent* and *capricious* are not commonly used). When learning and using these words, these restrictions need to be noted.

Idioms

Most groups of words (multiword units) in normal language are easy to comprehend if the words that make up the multiword unit are known. So, understanding *is the food good?* and *they are going to the city* is not usually problematical. Some multiword units, however, have a meaning that is very different from the meaning of their parts. Carefully applying the criteria of noncompositionality and nonfigurativeness, Grant and Bauer (2004) made an exhaustive search of idiom dictionaries, articles about idioms, language teaching texts, and television scripts to find all the English core idioms. The term 'core idiom' was used to distinguish it from the looser uses of 'idiom.' For example, *by and large* is a core idiom because the meaning of *by and large* cannot be related to the meaning of the individual words *by* and *large* – that is, it is noncompositional – and we cannot visualize some figurative use of *by and large* relating it to its meaning – that is, it is nonfigurative. On the other hand, *the worm turns* is not a core idiom. We can imagine or visualize a mild worm turning fiercely on an attacker (which conveys the meaning of the phrase), and so it is a figurative and thus not a core idiom.

Only 104 core idioms were found. Each of these items was then searched for in the British National Corpus (BNC) to find its frequency, various forms, literal uses, and collocations. The most frequent core idiom, *by and large*, occurred 487 times in the 100 000 000 token corpus. This frequency is not sufficient to get it into the most frequent 5000 words of English. Most of the core idioms occurred fewer than 50 times per 100 000 000 running words, and 18 of them did not occur at all in the BNC.

Core idioms are usefully distinguished from other types of multiword units because they require different interpretation and learning procedures. They have to be treated as unanalyzed wholes. Figuratives and collocations can be learned by analyzing their parts.

Fifty-nine of the 104 core idioms were not frozen; that is, they had variations in the BNC, some of them quite substantial. If frozenness was added to the criteria for a core idiom, there would only be 45 English core idioms.

A few core idioms such as *a piece of cake, beat it,* and *Uncle Sam* have literal equivalents; *a piece of cake* is most often literally 'a piece of cake' not 'something easy to do.' Forty-nine of the 104 had no literal equivalents, and a further 34 were very unlikely to have literal equivalents.

Core idioms are a small group of infrequent items. They do not deserve teaching time, but learners may benefit from some help in choosing and using an idiom dictionary.

Learning Conditions

Ease or difficulty of learning can be affected by the conditions under which the learning takes place. Crothers and Suppes (1967) found that when the learning burden of the words was heavy, it was more effective to learn small groups of words (around 20) rather than larger groups. In the early stages of language learning, the learning burden tends to be high because the learner is unlikely to be familiar with the systems and patterns of the new language. When the learning burden is low, it is much more effective to learn much larger groups of words.

Deliberate and Incidental Learning

Experiments involving deliberate learning show learning rates and long-term retention rates that far exceed those from incidental learning (Nation, 2001: 298–299). Similarly, in message-focused learning through speaking activities, vocabulary whose meaning is overtly negotiated is much more likely to be learned than that which is quietly guessed from context clues. There are several issues to consider here. First, incidental learning and deliberate learning should not been seen as competitors; they can be mutually reinforcing, and thus it is better to have both types of learning rather than just one. Second, it is not clear how to apply the label 'difficulty' properly to these two kinds of learning. The deliberate learning of vocabulary and negotiation of vocabulary involve more focused effort. Incidental learning, in the short term at least, is less effective but also involves much less focused effort. If difficulty is measured by results then deliberate learning is easier. If it is measured by the amount of focused effort, then incidental learning may be easier. One of the best studies of incidental vocabulary learning was carried out by Waring and Takaki (2003). They looked at incidental learning from reading one graded reader containing 25 target words. After the learners read the text, Waring and Takaki tested each target word in three different ways. The easiest test was a recognition test in which the learners saw a list of 42 words and had to indicate which ones occurred in the story they had just read. The average score was around 16 out of 25. A multiple-choice test required them to choose the most suitable meaning for each word from four choices. The average score was 10 out of 25. The most difficult test was a translation test that required the learners to translate a given word into their first language. The average score was around 4 out of 25. The translation test is the one closest to what the learners might need to do while they read, and the score was low. However, if the total learning

as revealed by the three tests is considered, it is clear that quite a lot of learning occurred that would be built on by further encounters with the words.

Involvement Load

Involvement load (Hulstijn and Laufer, 2001) is an attempt to measure the amount of mental processing that learners do when working on a vocabulary learning task. The three factors that Hulstijn and Laufer focused on are (1) need (Is the vocabulary needed to complete the task?), (2) search (Do the learners have to look for the word form or meaning or are they already provided?), and (3) evaluation (Do the learners have to decide if the word or meaning chosen is the most suitable one?). Hulstijn and Laufer rated each task they studied using the three factors, scoring the role of each factor as 0, 1, or 2. The involvement load of the task was the sum of the ratings for each of the three factors. Hulstijn and Laufer's studies showed that the greater the involvement load, the more likely a word was to be learned. This finding parallels those on generative use, that is, using a word in creative ways, which show that the more generatively a word is used, the more strongly it is learned (Joe, 1998). These studies relate increased mental effort to more effective learning.

Negotiation

What at first glance seems like a contradiction to this finding comes from studies involving negotiation of vocabulary. Negotiation occurs when learners try to work out the meaning of an item by discussing it with one another. Here is an example from Nation and Hamilton-Jenkins (2000).

> S12: bus driver? I don't think so
> S10: bus driver because it is . . .
> S9: if you don't have a licence how can you drive a bus, the police will catch me (The others agree)
> S11: I see so we need **registoration**
> S12: . . . so bus driver also need **reg** . . . **registration** because of competence so at first I think teacher, doctor, and lawyer is a very specific occupation so um it um at first they have to go to the university and polytech so they need require **registration** so ah in my opinion er I bus driver . . . if we want to be bus driver only we have ah licence and then we can ah get as a driver so I don't forget **registration** so I mistaked ah Japanese guess
> S10: maybe it is not **registration**, maybe it is not **registration**, I think maybe it is only bus driver licence . . .
> . . . maybe **registration** is just like a list where you can find some name like doctor.

Several studies have shown that learners who quietly observe negotiation taking place learn just as well as those who actively negotiate (Stahl and Clark, 1987; Ellis and Heimbach, 1997). Stahl and Clark deliberately designed this feature into their experiment. The learners were divided into three groups. One did the activity, which involved discussing things with one another. A second group observed the activity, but were told that they would be tested on what happened in the activity. The third group just observed with no expectation of being tested. All three groups were tested, and it was found that those who did not expect to be tested did not learn as well as those who did.

One problem with the vocabulary studies of such learning is that vocabulary knowledge was measured using only one test, so it was not possible to see how well each learner knew each word. However, putting this aside, the studies show that it may not be overt effort that determines learning but mental effort. Negotiation involves mental involvement. It also provides opportunities for generative use. Generative use occurs when a word is used in a way that is different from the ways in which it has been used or met before (Joe, 1998). This difference may be quite small (the word is used in the plural rather than the previously met singular form) or large (the word is used with new collocates). The bigger the difference (the greater the generativity), the stronger the learning resulting from the use is likely to be.

Strength of learning can be measured by testing each word in, preferably, three different ways with tests of varying degrees of sensitivity as in the Waring and Takaki experiment. Strength of knowledge is determined by adding together the scores for the three tests for each word.

When learners negotiate the meanings of items, they put the word into new contexts; that is, they use the word generatively. Several of these contexts may be metalinguistic contexts: *What does 'shed' mean? How do you spell 'tiger'?* The power of negotiation may be that it causes the learners to give focused deliberate attention to an item and that it results in generative use of the item. Negotiation thus sets up conditions that encourage learning.

Interference

There are now several studies that show that learning related items together makes learning more difficult (Higa, 1965; Tinkham, 1997; Waring, 1997). If near-synonyms (*bring* and *take*), opposites (*fat* and *thin*), free associates (*knife* and *fork*), or members of a lexical set such as articles of clothing or types of fruit are learned together, then learning is 50–100% more difficult (Nation, 2000). That is, learning the days of the week in the same lesson is much more

It is red
black
blue
green
white
yellow

Figure 1 Sample substitution frame.

difficult than learning one of the days of the week and six other unrelated words. The difficulty is even greater if words have some formal similarity to each other, so *Tuesday* and *Thursday*, for example, are especially likely to interfere. The difficulty occurs because crossassociations are made between the word forms and their meanings. So, for example, the word *white* may be associated with the meaning 'black,' and *black* may be associated with the meaning 'white.'

This difficulty can manifest itself in several ways. If learners have worked out some kind of mnemonic or luck is on their side, then the wanted associations may be made. Another possibility, as already described, is that the items are crossassociated. A more common possibility is that the learner realizes that *black* and *white* are two of the colors but is uncertain which is which. Most textbook writers are clearly not aware of this source of difficulty. Tinkham (1997) found that words that were related such as the words in a story, for example, *frog, green, slimy, pond,* and *splash*, were easier to learn together than unrelated words or members of a lexical set. If we attempt to generalize about the interfering and facilitating relationships, we can see that items that would be listed one under the other in a substitution or paradigmatic relationship (**Figure 1**) are likely to interfering.

Items that are in a syntagmatic relationship *the green slimy frog jumped into the pond with a splash* are likely to be easier to learn together than unrelated items or items in a paradigmatic relationship. This has implications for lesson planning. If a course book writer chooses a topic such as colors, clothing, or at the fruit shop, interference is likely to result. If, however, the lesson is organized around a story, there is less likelihood of interfering relationships occurring. Interference occurs when most or all of the items in a set are unknown. Once most or all of the items are known, there is some value in bringing them together to see what the distinctions between them are. If, however, the learning of the items is not already reasonably well established, then interference will occur.

The way words are grouped in lessons can have a major effect on learning difficulty. Once interference has occurred, then some mnemonic trick is needed to establish the correct associations.

Massed versus Spaced Learning

The same words can be studied intensively for a period of time (massed learning), or they can be repeatedly studied for briefer periods of time at increasingly spaced intervals (spaced or distributed learning). That is, a learner could spend an hour studying a group of 30 or so words, or the learner could spend 10 minutes studying them now, in an hour's time spend another 10 minutes, and then in 4 or 5 hours time another 10 minutes and then continue in this way the next day and so on. In total, the spaced learning could total 1 hour. Experiments comparing massed and spaced learning show much better results for spaced learning (Bloom and Shuell, 1981; Dempster, 1987; Baddeley, 1990). The repetitions should be spaced further and further apart. The principle behind this is that the older a piece of learning is, the slower the forgetting. This means that soon after something is first learned, forgetting occurs quite quickly. There needs to be another repetition before too much is forgotten. After the next repetition, the learning is now older and so the forgetting does not occur as quickly as it did the first time. It will thus take a little longer for the forgetting to reach the point where another repetition is needed. Pimsleur (1967) proposed a formula, which should not be taken too seriously but which provides a very useful and easy to remember guide for spacing repetitions: The time to the next repetition should be the square of the time between the two previous repetitions. So, if a word was studied and then looked at again 5 minutes later, the next repetition should be 5×5 minutes later (25 minutes later), the next 25×25 minutes later (10.5 hours later), the next 10.5×10.5 hours later (approximately 4 days later), and so on.

First Language Definitions

Learning vocabulary is easier if the meanings of words are conveyed in short, clear ways. The more detailed and complicated a definition, the more difficult it is for both native and nonnative speakers to understand. The main reason is that there tends to be too much information for a learner to focus on and the learner chooses just one part to latch on to. This usually misrepresents the meaning of the word. One of the clearest and simplest ways of providing a meaning for a word is to give a first language translation. This has several advantages: (1) the translation is usually short and clear, (2) it is usually in the form of a synonym rather than a definition (definitions are more difficult to understand because of their complex grammatical structure), (3) the new word is related to something the learners already know well, and (4) the meaning is presented in totally familiar language.

There is some experimental evidence that translations are an effective way of conveying meaning (Lado *et al.*, 1967; Mishima, 1967; Laufer and Shmueli, 1997). If other ways of conveying meaning, such as pictures, objects, demonstrations, and second language synonyms can meet these same criteria, they are also likely to be very effective. Often, however, they do not.

Many of the factors involved in the learning burden and difficulty can be manipulated to some degree by teachers and course designers. Aspects of the learning burden can be lightened by pointing out analogies with known items, by drawing attention to patterns or rules, and by directing deliberate attention to the particular aspect. Learning conditions are even more manipulable. George (1962) pointed out that teaching can have three effects: a positive effect in which teaching results in learning that takes the learners forward in their knowledge, a neutral effect in which nothing is learned, and a negative effect (the result of 'unteaching') in which the teaching results in learning that confuses or upsets previous learning. Good teachers can also be good 'unteachers.' An awareness of factors such as involvement load, negotiation, generative use, interference, and spaced repetition can reduce 'unteaching' and make the time spent on teaching and learning more productive and enjoyable.

See also: Corpus Studies: Second Language; Interlanguage; Language Education: Vocabulary; Lexical Acquisition; Munda Languages; Second and Foreign Language Learning and Teaching; Second Language Reading; Word.

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Vocal Production in Birds

G J L Beckers, Leiden University, Leiden, The Netherlands and Max Planck Research Insitute for Ornithology, Seewiesen, Germany

Bird vocalizations are widely noted for their extreme diversity in acoustic structure and sometimes high degree of complexity. Understanding the mechanistic basis of vocal performance in birds has been a long-standing effort. This is largely because of intrinsic scientific interest, but also, more recently, due to the growing importance of birdsong as an animal model system for the development and neurobiology of human speech. In this article, I review some highlights of current knowledge on the peripheral mechanisms underlying vocal production in birds and point out notable parallels and differences with speech production in humans.

Principles

The biophysical principles of vocal production in birds are similar to those involved in voiced speech of humans. Air flow, induced by the action of respiratory muscles, is modulated by vibrating structures in a voice organ, a process that causes acoustic pressure waves. These waves propagate through the air spaces of the vocal tract and eventually radiate into the outside environment. The exact characteristics of the sound that is produced depend on the vibration properties of vocal source, the acoustic resonances of the vocal tract, and the acoustic radiance function of the structure from which the sound eventually is emitted, e.g., the beak or 'vocal sacs.' To a first approximation, vocal production in birds can be explained, like human speech, by considering the properties of the vocal source and vocal tract independently, even though they function as one system and interactions between these two components may sometimes occur.

Vocal Source

Voice Organ

Vocal source vibrations in birds are generated by a unique voice organ, the 'syrinx,' which is an evolutionary innovation not found in any other group of animal. Birds also possess a larynx, which is the voice organ in mammals, reptiles, and anurans, but the larynx has not been found to be involved as a sound source in bird vocalization. The sole function of the syrinx is sound generation, and from a vocal production point of view it may therefore be less constrained in its mechanical design than the larynx, which also has functions related to respiration and feeding. For this reason perhaps, many birds appear to be much better vocal performers – at least from a production point of view – than any laryngeal vocalizer, including humans.

The syrinx consists of a modification of the airway at the junction of the trachea and bronchi and is situated in an air sac deep inside the thoracic cavity. In general, it comprises a cartilaginous or bony framework containing vibratory structures, either membranes or labia, and muscles that control the geometric configuration of the framework. The specific morphology of the syrinx, however, may differ considerably between bird taxa, even in basic design.

The most complex syrinx is found in the most virtuous singers among birds: the songbirds (suborder Oscines or Passeres, comprising approximately 40% of all bird species). The songbird syrinx is special because it has two sound sources, a voice at the cranial end of each bronchus, which can be controlled independently by highly specialized musculature (Figure 1).

The bipartite nature songbird of the syrinx is exploited in various ways across taxa to enhance vocal performance in spectacular ways. For example, in many songbirds, each syringeal voice specializes in its own vocal register – the left voice usually covers a