

Imagery, Verbal Processes, and Second Language Learning

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It has long been theorized that imagery underlies many verbal processes. Although this hypothesis is not without controversy, it is supported by connectionist theories which hold that the processing of linguistic units is done in parallel and may be based on different kinds of underlying forms. Further support is offered by the results of research on the role of imagery in expediting various aspects of the language learning process. Thus, hearers may not rely solely on parsing when comprehending ambiguous sentences, but may also employ imagery as a disambiguation strategy. This paper attempts to describe the nature of imagery, to show its place in theories of language learning and to provide guidelines for its use in the second language classroom.

多くの言語処理の根底にイメージがあるという理論は昔からある。この仮説には異論がないわけではないが、言語処理においては異なるユニットの処理が並行して行われ、異なる種類の形式がもとになっているかもしれないと主張するコネクショニスト理論は、この仮説を支持している。さらに、言語学習の過程をさまざまな面で促進するイメージの役割に関する研究からもこの仮説を支持する結果が得られている。つまり、聞き手は、曖昧な文を理解するときにパーシングのみに依存するのではなく、意味を特定するためのストラテジーとして、イメージを使っているかもしれないということである。この論文は、イメージの特性を記述し、それが言語学習理論の中にどのように位置づけられるかを示し、第二言語の授業での利用法のガイドラインを提供する。

The deep structure of much language might be composed of images. Twenty years ago, such a statement would have been made with few to listen. Now, however, the theories underlying language learning known as connectionism, parallel distributed processing (PDP), or associationism give new weight to this possibility. In a PDP model of language (see Ney and Pearson, 1990; Rumelhart and McClelland, 1987; Shirai and Yap, 1993) the processing of linguistic units is suggested to be done in parallel. PDP approaches have been used to program computers to imitate human language learning (Rumelhart, 1987; Seidenberg, 1994)

and, based on the results of such research, it appears that information for the production and recognition of language may come from a number of different places in the brain. It is therefore quite possible that certain linguistic elements are based on different kinds of underlying forms. For a number of people, one such underlying form might be imagery.

Ambiguous elements, for instance, may be of this nature and may possibly be disambiguated by the use of imagery as well as parsing. Consider the disambiguation of *The shooting of the hunters* (Chomsky, 1957, p. 88). Traditional grammarians parse the sentence in a serial fashion so that, in one reading, the noun, "hunters," is subject and in another reading the noun, "hunters," is object. However, it is possible that some English speakers may also call up images of the hunters being shot for one interpretation and the hunters doing some shooting for the other interpretation, thereby retrieving information as images which provide for the disambiguation of the two readings of sentence.

The sentence, *Time flies*, is also ambiguous, although the ambiguity might not be readily apparent. For most people, the Latin words *Tempus fugit* come to mind. However, for a less frequent reading, there is an image of a man with a stop watch timing flies in a miniature fly race. At this point, there are two possible "readings" of *Time flies*. There is the picture of the man, the flies, and the stop watch and there is the abstract concept of the rapid passage of time. The underlying forms for *Time flies* on the one hand, might be verbal and, on the other hand, might also be imagery.

Similarly, in speech ["the" sɔnz reiz miit] is ambiguous, whereas the written form is not ambiguous; it is either "the sons raise meat" (that is, they work on a cattle ranch) or "the sun's rays meet" (as, for instance, in an evening sunset). Each of these meanings can be visualized in terms of imagery.

A bi-modal disambiguation of these two examples, the sentence *Time flies* and the phrase, [sɔnz reiz miit], can be explained by the presence of two systems in the mind, one verbal and the other non-verbal. Paivio's dual coding hypothesis (1986) holds that all human thought is either in the form of words or images. As suggested by Marschark and Hunt (1989, p. 710), "Human cognition is assumed to include separate but interconnected verbal and imaginal processing systems." The verbal system might well conform to Chomsky's deep structure as logical form; whereas the non-verbal may be cast in the form of imagery. To quote Paivio, "the nonverbal and verbal symbolic systems are assumed to be functionally independent in the sense that one system can be active without the other or both can be active in parallel ..." (1986, p. 62), as they are in the two "readings" of the

examples given above or in a computer simulation of the phrases using PDP analysis (Ney and Pearson, 1990).

This line of reasoning presents the possibility that speakers of a language do not only use an elaborate system of parsing to arrive at an understanding of an ambiguous reference, but may also have access to imagery as well. And it is at this point that imagery and its effect on mental processes fits into the teaching/learning paradigm. From such a perspective, it may be that Asher's position (1969, 1972, 1977) that children learn languages better than adults because they learn in the context of bodily action may not be completely accurate. Language learning by children is facilitated not only by the context of bodily action but also by the contexts of images, emotions and whatever else is in the perceptual field of the youngsters. In contrast, language learning by adults in many classroom settings is often more limited in terms of input rich in and evocative of the images, bodily actions and emotions found in a natural setting. Such a context-free learning environment may tend to mitigate against free access of the imagery pathway as a learning strategy.

A Connectionist Perspective on Language-Specific Forms

In the early days of transformational grammar, Lakoff (1969) published a paper suggesting that pattern practice is ineffective since language is innate. However, if this is so, then how do humans learn vocabulary and those facets of a language that are language specific and, thus, cannot be a part of an innate universal grammar? This question remains relevant since linguists and language teaching methodologists have said very little about the mastery of vocabulary or linguistic features which are language specific, often irregular and seldom rule-based. The answer is not found in a transformational system of language analysis which, all along, has pushed irregularities off into the lexicon and has never provided any hint as to how the irregular facets of language are learned. An alternative interpretation of the process of language learning is found in connectionist or PDP systems where "Rule-based, analogy-based, and rote-based ..." facets of language are learned by the same mechanisms and in the same way (Rumelhart and McClelland, 1987, p. 226; see also Shirai and Yap, 1993; Seidenberg, 1994).

Cohen's *The Use of Verbal and Imagery Mnemonics in Second Language Vocabulary Learning* presents a quick survey of methods that minimize "The use of the native language in the classroom . . ." (1987, p. 52) but skip the practice-based exercises of many language learning methods. However, practice as classroom pedagogy seems to be on the

verge of a resurgence under the impetus of associationism, connectionism, and PDP. (See Gasser, 1990; Ney and Pearson, 1990; Sokolik, 1990.) Since the transformational revolution in 1957, it is impossible to ignore the creative aspect of language use. Now, however, with the advent of connectionism, it is no longer possible to down play the habitual aspect of language use. The first requires that the language teacher use creative exercises, as in communicative language teaching methods or the Natural Approach; the second requires that exercises be used to help with the drudgery of learning the habitual aspects of language use. As Gallagher states, "I don't know anybody who has learned a second language who has not had to do a lot of memorization" (1976, p. 93).

These two aspects of language use, the habitual and the creative, are found in a PDP or connectionist model. Rumelhart and McClelland (1987, p. 226) provide support for such a duality when they write about "rote" learning and "A blend of rule-based, analogy-based, and rote-based learning." The present report deals largely with what Rumelhart and McClelland call "rote" learning (see also Chandler, 1993).

Research Findings on the Role of Imagery in Learning

At this point, it is useful to look at the place of imagery in the teaching/learning paradigm. Here we find that imagery is used to improve reading (Long, Winograd and Bridge, 1989; Oakhill and Patel, 1991; Jawitz, 1990, Cothorn, Konopack and Willis, 1990), geometry instruction and reasoning (Battista and Clements, 1991; Mitsuda, 1994). It is also used to aid students in mastering writing (Good, 1986; Jampole, 1990; Miller, 1990; Worley, 1991) and in the comprehension of complex verbal material (Drose, 1989). Jampole, Konopak, Readence and Moser (1991) found positive effects for the use of imagery in the creative writing of academically gifted elementary students and Yoder (1991) determined that use of imagery helped college students in reading. McDermott and Roediger (1994) found that it also helped in test-taking. Nelson (1992) determined that imagery assisted fourth graders in verbal narrations and Jawitz (1990) found that it also helped elementary students in reading comprehension. Imagery has been shown to facilitate the recall of science textbook material (Knuttgen, 1992) and historical facts (Ruggieri and Alfieri, 1992; Dretzke and Levin, 1990), and has also been used extensively in teaching the learning disabled (Rawley, 1991; Ferro, 1991; Whitmire and Stone 1991).

Imagery has been especially valuable in helping students to learn second language vocabulary (Cohen, 1987; Wang, Thomas and Ouelette, 1992; Johnson, Adams and Bruning, 1985; Hager, 1990) and has been

shown to have improved the retention of Chinese characters in a language class (Wang et al., 1992). Imagery has been used to enhance the whole language classroom in teaching language arts (Shaw, 1990) and also to encourage creativity with Native American children (Nelson and Lalemi, 1991). There is even a *Journal of Mental Imagery* which discusses, among other things, the use of mental imagery in medical procedures (Korol and von Baeyer, 1992; see also Daake and Gueldner, 1989).

These diverse studies point to the necessity of describing the nature of imagery, especially as it is used pedagogically.

Types of Imagery in the Language Classroom

In second language classrooms, many teachers use imagery in the form of pictures to help with the mastery of vocabulary. These pictures call up high-imagery words that “are easier to remember than abstract, low-imagery words” (Coltheart and Winograd, 1986, p. 174; see also Stokes, 1929). Imagery can be classified according to the various types of imagining devices that serve as mnemonics. For instance, in *peg type mnemonics*, vocabulary items are associated with pegs by being referenced to pictureable words. This type of mnemonic has been used for years.

Paivio recounts how he first encountered the peg mnemonic in an undergraduate psychology course. He and other students were introduced to a so-called “expert mnemonist” who exhibited amazing powers of memory. In the demonstration, the students named twenty objects around them. The students then took turns choosing the numbers in any order. The “expert mnemonist” (in reality, a graduate assistant posing as an expert) then named the object corresponding to each number. The professor then explained how the graduate assistant had managed such a feat, and how it was possible for most people to do the same.

The assistant had used a mnemonic scheme consisting of twenty memory pegs that rhymed with numbers—one-run, two-zoo, three-tree, four-door, and so on. She had imagined the first item in a bizarre interactive relation with someone running, the second similarly associated with a zoo animal. When a number was subsequently called out, she retrieved the corresponding peg word and its associated compound image, from which the target item could be recalled. (Paivio, 1991, p. 2)

Wang et al. (1992, p. 359) refer to this as the “one-is-a-bun” pegword system in which a set of pre-memorized concrete pegwords are used that rhyme with numbers (one-bun, two-shoe, three-tree, etc.). The pegwords serve as mental pegs on which a person “hangs” the items to

be remembered by using visual imagery to associate the pegwords with the item (Higbee, Markham and Crandall, 1991, p. 65). Paivio states that many of the popular memory systems since the 1920's have been based on the pegword system (1991).

The keyword mnemonic system uses imagery in much the same fashion as the pegword system. For Wang et al. (1992, p. 359), the keyword mnemonic would be invoked, for instance, by an English speaker learning the Spanish word *caballero* who decides that "eye" is a good keyword since it is found in the pronunciation of the second syllable. The learner would then form an interactive image that incorporates both the keyword, "eye," and English translation of *caballero*. A suitable image might be the eye of a horse. The keyword, then would evoke *caballero* and, at the same time, would evoke the image in the English translation, "horseman."

Cohen (1987, p. 45) discusses this use of a *keyword mnemonic*, suggesting that the keyword—a native language word or phrase which is similar in sound to part or all of the foreign language word—is an "acoustic link" between the native language item and the foreign language word to be learned. He then goes on to state that:

An interacting image is created between the recoded or functional stimulus, the keyword, and the native language word or phrase ... the imagery link. The intended result is that an encounter with the foreign word will evoke the key word which in turn re-evokes the imagery link, and finally the native language equivalent can then be retrieved from the interaction or imagery link. (Cohen, 1987, p. 45)

In the teaching of Spanish as a foreign language, Cohen gives the example of an English speaking learner who masters the Spanish word *pato*, duck, by creating a mental image or being furnished with

a picture of a duck wearing a pot (the key word) on its head. When they are asked the meaning of *pato*, this evokes the key word "pot," which in turn re-evokes the image of the duck wearing the pot on its head. (Cohen, 1987, p. 45)

At this point, it might be pointed out that the mnemonic used appears rather bizarre because ducks do not normally go around with tin pots on their heads, but, in some studies, the more bizarre the imagery, the more effective it is (Iaccino and Sowa, 1989; Kline and Lowell, 1991; McDaniel and Einstein, 1989).

Johnson et al. (1985, p. 125) discuss the use of a keyword in German class where the keyword, "car," might be used to evoke the German word, kartoffel, which means "potato." To do this the students might

visualize a car with large potatoes for wheels. Wang et al. (1992, p. 520) use the example of the keyword, "egg," being offered to evoke the French word *eglise* (church). The visual image linking the two words would be a church built of eggs. In all of these exercises, a keyword is a familiar word that bears an acoustic resemblance to a novel word.

Paivio (1991, p. 203) discusses an example in which the French word *couteau*, "knife," would be presented to English speaking students who would then learn by selecting, "toe," as the key word since the last part of the word *couteau* sounds like the word "toe." While hearing the word *couteau* being uttered, these students imagine a knife cutting a toe. After the exercise, they would remember the image of a knife cutting a toe when presented with the English word "knife" and from the image of the knife they would reconstruct the word *couteau*.

Another example of the peg mnemonic involves teaching the French keyword *tornado*, or "tornado" for the German *torlauf*, or 'slalom', which is also translated as 'slalom' in French. Since a skier in the slalom moves down the mountain side like a tornado (*tornade*) the association would be easy (Desrochers and Wieland, 1989, p. 27).

Thus, keyword and peg word mnemonics are very similar. The difference lies in the fact that the peg word mnemonic requires a rhyming couplet between the mnemonic word, a number, and the key word, whereas the keyword requires only a rhyming syllable with the mnemonic word.

At this point, it might be wise to inject a word of caution. Over time, students sometimes have difficulty recalling the keyword or the word to which it is linked. Thus, Johnson et al. suggest:

Keywords which are both semantically and acoustically related to target words might be more resistant to decoding failure. The previously learned meaning of the keyword, already well integrated in semantic memory and similar to the meaning of the new word, could provide an additional, durable cue for recall. (1985, p. 137)

In another type of mnemonic, the chain type, "Words are remembered by their use in a story, by their being linked together through a series of visual images or by their use in rhymes" (Cohen, 1987, p. 44). Thus, attempts to link language learning exercises to some sort of discourse are chain mnemonics.

In slightly different words, chain mnemonics are "encoding mnemonics whereby verbal material (e.g. a word, phrase, or a sentence) and visual imagery serve as cognitive mediators" (Cohen, 1987, p. 45). As a result, a verbal mnemonic for a Spanish speaker learning the En-

glish word “chalk” might be constructed in the following fashion. The student might be presented with a sentence: *La tisa se choca con la pizarra* (The chalk strikes the blackboard). In this, “The Spanish mnemonic [*choca* - “strike”] has a sound similar to that of the target-language word [chalk] and is linked in meaning through the sentence that is created” (Cohen 1987, p. 45). Here, *choca* would be the link in the chain mnemonic.

By way of summary, then, mnemonics can be either peg type, chain type or keyword type, and can be either student-generated or instructor-provided. Conventionally, these mnemonics can employ various combinations of verbal and pictorial devices. When mnemonics are provided, the teacher may supply both the keywords on tape and interactive pictures on slides or as handouts (Trout-Ervin, 1990).

Using Imagery to Support Language Learning

The advantages of using mnemonics in the language class are many. First, let us consider the use of imagery as an ongoing process during speaking, reading and writing. “Images may be continually constructed and held in working memory as new information is assimilated” (Long et al., 1989, p. 368). This continual use of imagery enables memory. “There is substantial evidence that speed of acquisition and immediate recall [of second language vocabulary] are enhanced by the keyword method” (Wang et al., 1992, p. 520). Simply put, Wang and his colleagues determined that imagery mnemonics aided second language learners in acquiring vocabulary. Besides this, the use of mnemonics helped in the retention of the vocabulary learned. Coltheart and Winograd (1986, p. 179) assert that, “Word imagery remains a robust determinant of memory.”

As a second important consideration, Kasper (1985) notes,

imagery and rehearsal influence recall in different ways. While imagery subjects were able to generalize what they had learned to novel contexts, rehearsal subjects were not. This suggests that imagery enhances recall by inducing subjects to process item specific information for individual words, while rehearsal leads to the processing of complete units and dependence upon the context of original learning. (Kaspar, 1985, p. 1080A)

Learning vocabulary through the use of imagery allows learners more flexibility in recall and promotes the ability to recall vocabulary in novel environments (Long et al., 1989). Furthermore “Imagery is involved in the organization and storage of information (Lesgold, McCormick, and

Golnick, 1975, p. 369)." As reinforcement for this point, results of experiments,

indicate that the peg mnemonic and high-imagery both helped learning more than they helped retention, that high-imagery helped recall more than did low-imagery only for high-familiarity sayings, and that the recall measures affected high-imagery sayings more than low-imagery sayings. (Higbee et al., 1991)

Regarding this consideration, Paivio has stated, "The concreteness or image-arousing value of the peg word is assumed to be important in the rhyme mnemonic technique" (1991, p. 3).

This point is of significance because learning vocabulary has been slighted by generations of linguists and language teachers. And strangely enough, it has now been displaced by the teaching of grammar. It should not have been. When students learn words properly, they also learn grammar. For example, if students have not learned that the verb, 'enjoy' is followed by the gerund and not the infinitive, they have not learned the word. So, in a very real sense, the learning of vocabulary entails the learning of grammar. However, it should be noted that, although many communicative teaching methods tend to minimize vocabulary learning, this is not true of Suggestopedia (Bancroft, 1977, 1978; Racle, 1979), which has offered teachers a means to aid students in the mastery of vocabulary. Further, as Stevick (1986) maintains, if most non-verbal systems, including emotion, can be classified as imagery, then it follows that the success of Suggestopedic teaching rests at least partly in the imaging systems that are utilized so effectively in this method.

Conclusions

If verbal processes have as their deep structure images as well as words and phrases (Paivio, 1991), then it stands to reason that images help in the mastery of language related material. Further, it would seem that models derived from current theoretical positions such as connectionism (PDP) give a theoretical basis for the use of imagery. As a result, it would seem prudent for second language teachers to fill classroom material with images to aid students in their quest for mastery of the target language. Such images include keyword mnemonic devices, peg word mnemonic devices and chain mnemonics, all of which have been shown to aid students in the mastery of second language vocabulary.

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