Memory in the Information Age: New Tools for Second Language Acquisition

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HOW many of us remember our bank account numbers? telephone numbers of colleagues? driving directions? Thanks to technology, we no longer need to recall such trivial information; we can look it up on our laptops or press the automatic-dial button on our cellphones. As global positioning system (GPS) technology is added to our mobile computing devices, we won't have to remember where we are or where our loved ones are (Specter). Not certain what you are looking at? Soon your perception of the world around you will be "augmented" through a head-mounted device that annotates what you see, by combining GPS information with databases to superimpose labels on the objects in your perceptual field (Feiner). New technologies may even make it unnecessary to learn foreign languages! Already there are handheld devices that use speech recognition to translate words and common phrases (Breeden).

Does ready access to information diminish our ability to remember? David Shenk argues that more and more of us are overloaded with information; the veritable "data smog" that surrounds us may produce such symptoms as attention deficit disorder, high blood pressure, declining visual acuity, impaired judgment, and overconfidence (36–38). He argues, as well, that information overload can indeed lead to memory loss. According to Shenk, memory may atrophy because we depend so much on one source—our computer monitor—for most of the information we receive (48). Although I have stressed ways in which technology reduces our ability or our need to remember certain types of information, technology can also be an aid to memory. One promising approach is the use of tracking technology, which keeps a record of how users interact with information presented to them on the screen. When we store this tracking information in Web-accessible databases, we can examine how groups of users interact with information interfaces. For example, online assessment tools employ tracking technology to record students' answers to online test questions, the date of the test, and the amount of time students took to complete the test.

StudyDB

What I describe here is a database project, currently under development at Middlebury College, that is called StudyDB. StudyDB is a set of relational databases with an interface that allows students to create custom study lists from items they find in the database. It is essentially like flashcards, only much more flexible. As with flashcards, students can drill themselves, separating and sorting the individual items into different lists. The database keeps track of the number of times students see a given item; the last time they saw the item; and, of all the times they drilled themselves on the item, the percentage of occasions they could recall or recognize it. Students can use this information to sort their custom study lists in much the same way they would sort flashcards.

Such a methodology, that of direct instruction, attracts considerable criticism in second language acquisition circles, from two sources: those who favor the communicative approach, with its emphasis on communicating messages and creating meaningful contexts in which to acquire language, and those who argue that vocabulary, the most common material studied by means of flashcards, is best acquired through reading. Yet recent studies show that some direct instruction is indeed helpful (Ellis; Hulstijn; Zimmerman), especially for beginners. Batia Laufer has proposed that for English, at least three thousand word families (words and their most usual derivations and inflections) need to be known for the basic reading comprehension out of which vocabulary may be acquired. Peter J. M. Groot has noted, too, that for intermediate and advanced

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stages of language acquisition, students must often quickly learn a large number of words—words that cannot easily be acquired incidentally, because they do not occur frequently enough in language-learning material (61).

What I am suggesting here is that we can use the technology available for retrieving information as an aid in the retention of that information. The search interface of StudyDB is designed for the presentation of lists of vocabulary words and phrases organized by units for direct study and for the display of glosses for words a student looks up while reading second-language (L2) texts. The interface can be configured to present words, phrases, or glosses in one's first language (L1), in L2, or in stages beginning with L2 context sentences, followed by L2 glosses, and finally L1 glosses. The tracking technology remembers every item a student either identifies as known or unknown in direct study or looks up while reading. With such additional tracking information as retrieval date, frequency, and context, students can sort their study lists by number of times seen, date last seen, or knowledge (ratio of times seen to times recognized, recalled, or identified).

The StudyDB interface has three different modes of presentation. The first is the simple drill mode. Here a student can specify what to display, either L1 or L2 text. In addition, a student can choose to display contextual information, such as an image, a sentence containing the vocabulary item, or any other information that can be linked to the item. If the student chooses to hide certain contextual information, it can be retrieved by a mouse click when necessary. Audio playback is always available by a mouse click. The student also has the option of adding any item to the known or unknown list. This type of presentation, the one most similar to flashcards, might constitute the first mode of study for new vocabulary words and phrases or could be the principal means of glossing words while reading.

The second mode of study is recognition. StudyDB can create various types of multiple choice quizzes based on search-and-display options in the database, making it possible for students to practice recognizing the meaning of an item as one of a set of choices. The multiple choices are randomly selected from the database according to the search criteria enabling a form of contextual hinting in vocabulary acquisition. Thus a student can select this way to study items for a given lesson. If the lesson is organized around words and phrases from a particular semantic field, such as food or family or commands like "stay!", for example, the recognition drill would require students to identify the correct match from among a group of words and phrases from that subject area. If, following Michel Foucault, we regard natural entities as defined not by some essence but by a recognition of what they are not—the traits that distinguish them from all other things like them (138)—then StudyDB's multiple choice capability may be a powerful, efficient way to gain L2 mastery of a semantic field. Students can also review their personal study lists (lists of words they have identified as known or unknown) in this recognition mode. Doing so means they would need to recognize items from among other items they have already seen. Such a drill can sharpen students' existing vocabulary, clarifying what they have already learned. As I mentioned earlier, students' vocabulary lists can be sorted according to when learners last saw an item, the number of times they have seen it, and how well they know the item. Students can decide whether to focus on new or old vocabulary from the perspective of time, frequency, or familiarity.

The third, and last, mode of study is recall. Instead of selecting the correct response from among multiple choices, a student types in the correct L2 translation of an L1 item, or vice versa (much improvement in the interface is needed here since the matches must be exact according to the database; no variation in possible translations is allowed). This mode can function as a cloze exercise, particularly if a student shows an item in L1 with a context sentence in L2 (the L2 item targeted in this display would be replaced by a blank).

Discussion

Is all of this work merely "drill and kill"? There are mind-numbing elements to this systematic display of vocabulary items. If we decide to relegate certain uses of StudyDB to such a categorization, we ought to consider, at least, that the technique is highly efficient, customizable, extensible "drill and kill," far more flexible than learning vocabulary through bilingual lists or flashcards. For less commonly taught languages, there seems to be a great need for such tools. The Web abounds in flashcard programs, particularly for Chinese and Japanese. What makes StudyDB unique at this point is that it is connected to a Web-accessible database, so that an instructor can view the word lists of all students and monitor their progress. Since StudyDB is also a bilingual dictionary that can be used to look up unknown words encountered in L2 reading material, it combines and complements direct study with incidental learning.

We have no idea how effective StudyDB will be for students, nor are we aware of any other software with exactly the same features, although we have modeled some of its features on existing software on the market. In particular, we have incorporated features from the CAVOCA (Computer-Assisted VOCabulary Acquisition) program that is described by Groot. We developed another flashcardlike program, called FlashTrack, that has been used by the Chinese, Japanese, and Arabic schools at Middlebury College for the last few years. Testimonials from students suggest that the program has been relatively useful. What distinguishes StudyDB from this earlier program is that it is database-driven and can maintain records of students' performance across sessions, so that students can develop extensive lists over time and call up specific information about how they have interacted with the database. The various display, sorting, and study modes make it a surprisingly sophisticated tool whose effectiveness will depend on how skillfully its options are employed. It is conceivable that the interface itself could analyze students' work habits and suggest study methods. Commercial packages that offer similar functionality do not give as much control over the display and sorting of items—perhaps because they have worked out an optimal methodology or, more likely, because they wish to keep the interface simple and easy to use. While there is much to be said for simplicity, developing an interface that allows for the most control possible over the available content may, ultimately, be more important.

The StudyDB interface is a primitive example of the real power of technology to process information in general. We are all familiar with knowledge bases; they are, essentially, databases containing either storehouses of information from many individuals who have expertise in a given topic or the facts and ideas that students are expected to learn in a given course. What we have here is the beginnings of what might be described as a student knowledge base—the database of what a student has learned. Tracking technology of this sort could replace traditional testing. Instead of requiring all students to take a particular test within a particular time period, we could simply ask them to log so many hours of time on one of these interfaces. This is the notion of continuous testing. Since everything is stored in Web-accessible databases, instructors could monitor the study lists and quiz results of the class as a whole or of each student, with the computer generating relevant statistical information.

Having a database of each student's knowledge opens up new possibilities. Consider combining this approach with a technology known as collaborative filtering (Gladwell), which has gained popularity in recent years, particularly among book retailers. It is a technique for predicting preferences by comparing individual choices with those of a population. For example, all your purchases at Amazon.com are entered into the appropriate database and your purchasing profile is compared with others'. From that comparison, the database suggests additional products that might interest you, since they were purchased by individuals whose profiles are similar to yours. With enough data, this process may seem uncanny. In fact, it is simply pattern matching across a population. The same technique could be applied to learning. As a student uses tools like StudyDB, the software would compare his or her individual learning methods with those of other students. From this comparison, it would generate what Stephen Krashen refers to as "comprehensible input"—that is, it would locate the words, phrases, and concepts that are a little beyond the student's current level of competence and thus most likely to help the student learn the language (127). The program would therefore add to the student's knowledge base by identifying material that has enabled students with similar learning patterns to increase their familiarity with the language. For example, students who tend to absorb information by going from the particular to the general might first learn the words for "apple" and "lettuce," proceed to "fruit" and "vegetable," and then to "food," "nutrition," "hunger," and so on.

Anyone who has failed to be impressed by the book recommendations made by Amazon.com ought to buy more books and encourage others to do the same. The collaborative filtering technology is only as good as the scope of the data on which it operates. In the same way, the larger and more diverse the collection of student knowledge bases, the more intelligent and useful the recommended study material can become. Selecting, for a student, learning activities completed by "comprehensible peers"—students who have gone somewhat beyond the student's level of competence—is a helpful approach, because the student works with instructional materials successfully integrated into knowledge bases similar to his or her own. Thus the technology has the potential to create a customized curriculum for each student, a curriculum based on particular interests, study patterns, and strengths and weaknesses.

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