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Vocabulary and Computer Technology: A Commentary on Four Studies for JALT Vocabulary SIG

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Abstract

Four papers by Clint Denison and Imogen Custance, Louis Lafleur, James Rogers, and Andrew Obermeier will be presented at the Eighth Annual JALT Vocabulary SIG Symposium in Tokyo, Japan, on September 20, 2020. The topics covered in the four papers are vocabulary learning using online student-created vocabulary lists, development of a flashcard program that manipulates the review schedule and question format, creation of a list of multi-word units based on corpora, and examination of the acquisition of declarative and tacit vocabulary knowledge from deliberate computer-assisted learning. This commentary briefly summarizes each study and offers suggestions for future research. All of the four studies exhibit how computer technology can be used to facilitate vocabulary research, teaching, and learning.

1 Vocabulary and Computer Technology

According to Nation (2013), Tom Cobb once observed that "the relationship between computer technology and vocabulary is a marriage made in heaven" (p. 32). As Tom Cobb nicely puts it, computer technology can help vocabulary research, teaching, and learning in many ways. For instance, thanks to computer technology, researchers today can analyze large quantities of text with a single click of the mouse. Suits of computer programs, such as those developed by Tom Cobb and Laurence Anthony, enable researchers to create word lists, identify keywords, analyze vocabulary load of texts, or extract common collocations (Nakata, 2013). Computers have also advanced how researchers measure vocabulary knowledge through computer-adaptive testing (Laufer & Goldstein, 2004) or priming experiments (Elgort, 2011). Computer-based resources such as online dictionaries, vocabulary learning software, lexical profilers, and concordancers have also helped us teach and learn vocabulary effectively and efficiently. Given the benefits offered by computer technology, it is apt that the 2020 Japan Association for Language Teaching (JALT) Vocabulary SIG (Special Interest Group) Symposium organizes a session that exclusively focuses on computer technology and vocabulary. In what follows, I will briefly summarize and discuss four papers presented at the symposium.

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2 The Four Studies

2.1 Vocabulary Learning Using Student-created Class Vocabulary Lists by Clint Denison and Imogen Custance

Clint Denison and Imogen Custance reported a study that examined the effects of collaborative vocabulary notebooks (class vocabulary lists) implemented with Google Spreadsheets. The entries in the class vocabulary lists were compared against frequency-based lists (British National Corpus/Corpus of Contemporary American English [BNC/COCA], New General Service List, Test of English for International Communication [TOEIC] Service List), as well as an information technology keyword list (for informatics students only). The analysis suggested that most items entered in the class vocabulary lists were words that were useful and relevant for the learners.

Many researchers and teachers would agree that ready-made vocabulary lists are useful for vocabulary teaching, learning, and materials development. At the same time, teachers sometimes may need or want to prioritize vocabulary items that are relevant for their students and immediate context, rather than those taken from ready-made lists. Class vocabulary lists may be especially beneficial for this purpose. One significant aspect of this study is that the authors not only had the students create the class vocabulary lists but also incorporated them into their classes. The authors created quizzes and activities based on the class lists, and some of the items were also tested in the mid-term and final exams. Denison and Custance did not describe that in their paper, but I believe that designing classes around student-created lists required an extensive amount of effort and time, and I would like to congratulate them on being dedicated teachers as well as good researchers.

The authors have used Google Spreadsheets for class vocabulary lists, but they could have also used Group Lex on Compleat Lexical Tutor developed by Tom Cobb (https://www.lextutor.ca/group_lex/demo_lab_mod/). Group Lex allows learners to keep a log of unfamiliar words, together with their definitions and example sentences, in a database. The online nature of the software also enables learners to share the entries with their peers (Horst, Cobb, & Nicolae, 2005). If the authors could clarify why they chose to use Google Spreadsheets over Group Lex, it would strengthen their paper. In addition to being a part of class activities and tests, if items in the class vocabulary lists were studied with flashcard software or practiced in online exercises, it might facilitate independent learning outside of the classroom and increase learning even further (Group Lex has a function to automatically generate fill-in-the-blank exercises based on words entered by users). Class vocabulary lists in this paper included pronunciation codes (number of syllables in the word and position of the stressed syllable). In addition to the pronunciation codes, the International Phonetic Alphabet may also be included in the class lists. If learners could hear audio recordings of the pronunciation of the words, it would also be helpful. This can be done by creating links from class vocabulary lists to entries in online dictionaries, most of which provide audio recordings of the pronunciation (e.g., https://www.dictionary.com/). Websites such as youglish.com (http://youglish.com/) also allow learners to hear how a given English word or expression is used in authentic speech. Creating links to online

databases such as Just the Word (http://www.just-the-word.com/) from class vocabulary lists would also help learners acquire common collocations and understand how the word is actually used in authentic texts. The authors wrote that they analyzed the entries with Compleat Web Vocabulary Profiler and manually highlighted words in New General Service List and TOEIC Service List. This can be done automatically by preparing the word lists as separate sheets and using a vlookup function in Google Spreadsheet.

2.2 The Indirect Spaced Repetition Concept by Louis Lafleur

Louis Lafleur developed a prototype flashcard program for vocabulary learning called Indirect Spaced Repetition Software and described its features in his paper. One significant aspect of his software is that it keeps a record of the learner's performance on individual items and controls not only the review schedule but also the practice format (e.g., receptive recognition, productive recognition, and productive recall). Although research suggests that learning vocabulary form flashcards is a useful strategy (e.g., Elgort, 2011), one potential weakness of paper-based flashcards is that it is not very effective for learning multiple aspects of word knowledge such as pronunciation, collocations, or grammatical functions. Lafleur's software is significant because it has the potential to offer the benefits of flashcard learning, while at the same time, providing opportunities for learning multiple aspects of word knowledge that are usually hard to learn with paper flashcards.

One suggestion I have for the paper is that perhaps the author could have discussed the strength of his software in comparison to existing vocabulary learning programs such as *Quizlet*, *Memrise*, or *Anki*. It would have also been useful to evaluate the effectiveness of his software using frameworks such as Technique Feature Analysis (Nation & Webb, 2011) or criteria for evaluating flashcard software (Nakata, 2011). Also, I am not quite sure whether the name of his software (Indirect Spaced Repetition) accurately captures its significant features. The most innovative aspect of the software seems to be its ability to promote elaborate processing and systematic review of vocabulary simultaneously, both of which are considered important in vocabulary learning (Hulstijn, 2001). I wonder if the software could be given a name that highlights these two important design features.

Regarding the review schedule, Lafleur wrote that there are two ways to manipulate spacing: expanding and equal (uniform). In expanding spacing, the intervals between encounters of a given item are gradually increased (e.g., 1 week, 2 weeks, and 3 weeks). In equal spacing, the intervals between encounters of a given item are held constant (e.g., 2 weeks, 2 weeks, and 2 weeks). Perhaps it is useful here to point out that some studies examined the effects of contracting spacing, where the intervals between encounters are gradually decreased (e.g., 3 weeks, 2 weeks, and 1 week). Lafleur stated that many studies have failed to find any significant difference between the effects of equal and expanding spacing. Most of the studies cited in his paper, however, examined the learning of materials other than second language (L2) vocabulary such as name pairs (Landauer & Bjork, 1978, Experiment 1) or face-name pairs (Carpenter & DeLosh, 2005; Landauer &

Bjork, 1978, Experiment 2). The author could have also pointed out a number of L2 vocabulary studies have compared equal and expanding spacing, failing to find the significant advantage of expanding spacing over equal spacing (Kang, Lindsey, Mozer, & Pashler, 2014; Karpicke & Bauernschmidt, 2011; Nakata, 2015; Pyc & Rawson, 2007). At the same time, although results of empirical studies are not necessarily in favor of expanding spacing, I understand why Lafleur decided to employ expanding spacing for his software as expanding spacing is perhaps easier to implement than equal spacing. Expanding spacing may also have a positive effect on learners' motivation because it may lead to higher retrieval success than equal spacing during the learning phase.

Regarding the question format, the author argued that the questions were designed to cover three tiers of word knowledge proposed by Nation (2001): form, meaning, and use. However, according to Nation, each of the three tiers consists of three aspects, resulting in a total of nine aspects. Form consists of the written form, spoken form, and word parts. Meaning consists of form and meaning, concept and referents, and associations. Use consists of grammatical functions, collocations, and constrains on use. It is not clear how some of these aspects (e.g., word parts, associations, or constraints on use) are addressed in the software. I also wondered about the sequencing of the different question formats. According to the retrieval effort hypothesis (Pyc & Rawson, 2009), difficult but successful retrievals facilitate retention more than successful but easy retrievals. This hypothesis suggests that when sequencing different types of questions, they should be given in the order of increasing difficulty. In other words, easy formats should be given before difficult formats because this may help us to gradually increase difficulty while ensuring that retrieval will be successful. In Indirect Spaced Repetition Software, L1 sentence to L2 sentence translation (Level 5) is given before L2 sentence to L1 sentence translation (Level 6; Table 4). However, considering that translating from L2 to L1 is usually easier than translating from L1 to L2, I wonder if the order of these two question formats should be reversed. The author also discussed the concept of interleaving. Effects of interleaving have been studied extensively in the field of cognitive psychology (e.g., Kang & Pashler, 2012; Rohrer & Taylor, 2007; Taylor & Rohrer, 2010), as well as L2 learning (Carpenter & Mueller, 2013; Nakata & Suzuki, 2019a). In these studies, interleaving refers to a schedule where multiple concepts or skills are practiced simultaneously, as opposed to blocking (where only one concept or skill is practiced at a time). Lafleur, however, used the term to refer to multiple exercises for a given target word, so it is not clear whether what he calls interleaving in his software has similar effects on learning as suggested by earlier research.

The paper also presents results of a 2-week trial with seven university students. Questionnaire results suggested that participants generally expressed positive attitudes toward the software. One possible limitation of the study is that the questionnaire was designed to explore four constructs (usefulness, usability, enjoyment, and consideration), but there was only one question for each category. Including multiple questions for each construct would have increased the validity and reliability of the questionnaire. Nonetheless, the software described in the paper has a number of features that may facilitate learning, and I would like to congratulate the author on developing it.

2.3 On Creating a Large-scale Corpus-based Academic Multi-word Unit Resource by James Rogers

James Rogers presented his attempts to create a list of academic multi-word units in English based on corpora. When Michael West created General Service List (West, 1953), frequency counts had to be done manually. Even with help from an army of research assistants, such endeavor must have required a tremendous amount of effort and time. Nowadays, thanks to corpus linguistics software such as AntConc (Anthony, 2019), researchers can analyze large quantities of text, create frequency-based vocabulary lists, or extract common collocations with just a single click of the mouse. This paper is a great example of computer technology helping advances in vocabulary research. The paper by Rogers is also significant because his vocabulary list concerns multi-word units rather than single words. Despite the increasing recognition that the knowledge of multi-word units is important for language learning and processing, most vocabulary lists to date have been on single words, although several lists of multi-word units have been published in recent years, such as the Academic Formulas List (Simpson-Vlach & Ellis, 2010), PHRASEList (Martinez & Schmitt, 2012), Academic Collocation List (Ackermann & Chen, 2013), and PHaVE List (Phrasal Verb Pedagogical List; Garnier & Schmitt, 2015). The word list described in this paper will be a very useful addition for researchers, teachers, learners, and materials developers.

The multi-word unit list in this paper has been carefully created with a number of considerations in mind, and the justification for adopting certain approaches is clearly explained in the paper. The information provided in this paper will be useful for researchers who attempt to create a list of multi-word units in the future. In addition to objective data such as frequency, the author also turned to survey data involving English as a Foreign Language (EFL) practitioners when creating the list. Providing more details about the survey would have been useful. For instance, how many EFL practitioners were surveyed? How were they selected? Were they native speakers or non-native speakers? Were there large variations among respondents, or were they mostly consistent (issue of inter-rater reliability)? Is there any data suggesting that EFL practitioners' intuition is accurate and useful? The author wrote that about half of the collocations surveyed "were judged to be useful for learners" by the EFL practitioners. But what was the threshold for collocations to be considered useful? Although it is not the main purpose of the paper, I was also interested in how the author thinks the multi-word units identified in the paper should be taught and studied. Although we can expect multi-word units to be learned mostly in the same way as single words, it is possible that effective principles for learning single words may not necessarily apply to the learning of multi-word units. For instance, although most studies suggest that increasing temporal spacing facilitates the learning of single words (e.g., Karpicke & Bauernschmidt, 2011; Nakata, 2015; Nakata & Suzuki, 2019b; Nakata & Webb, 2016), one recent study suggests that spacing may not necessarily increase the learning of multi-word units (collocations), especially when they are learned incidentally (Macis, Sonbul, & Alharbi, 2019). The findings suggest that more research examining how to teach and learn multi-word units is warranted.

2.4 Exploring the Effectiveness of Deliberate Computer-assisted Language Learning by Andrew Obermeier

Traditionally, in most empirical studies, vocabulary learning has been measured by an offline, paper-based test such as a translation or multiple-choice test. In other words, vocabulary acquisition has essentially been synonymous with the acquisition of declarative knowledge. In recent years, thanks to advances in technologies such as eye tracking, priming, or event-related potential (ERP), an increasing number of studies have attempted to measure tacit (or non-declarative) knowledge. This line of research was pioneered by Irina Elgort (2011), who will be a discussant at the JALT Pan SIG conference in 2020. Obermeier, who worked closely with Elgort, described a research design that examined the effects of deliberate, computer-assisted learning of vocabulary. The proposed study included measures of tacit knowledge, as well as online and offline measures of declarative knowledge.

In order to communicate effectively in L2, declarative knowledge alone is not sufficient. Learners should have fluent and automatic access to the formal and semantic representations of L2 words. However, since most existing studies have measured only declarative knowledge, our understanding of how tacit knowledge can be effectively taught and learned is still limited. A small number of studies examining the acquisition of declarative and tacit knowledge have suggested that effective principles for developing declarative knowledge may not necessarily apply to the acquisition of tacit knowledge. For instance, Nakata and Elgort (2019) suggested that although spacing facilitates the acquisition of declarative knowledge, it may not necessarily be effective for the development of tacit knowledge. Due to the importance of tacit knowledge for vocabulary development and paucity of research examining its acquisition, findings from the proposed research by Obermeier will be valuable. The paper lists a number of research question options. It would be useful if the rationale for investigating these questions, along with hypotheses, were also given. The paper also mentions the possible use of pseudowords in the experiment. As the author argued, pseudowords are very useful when controlling for prior knowledge. Lexical variables that might affect learning and processing can also be controlled more easily with pseudowords, which is especially important when measuring response times on an online lexical decision task as described in the paper. Ethical issues, however, need to be addressed, especially when data are collected during regular class hours.

3 Conclusion

Although the four papers differ in their focus, all of them are great examples of how computer technology can be used to facilitate vocabulary research, teaching, and learning. The paper by Denison and Custance demonstrates how online student-created vocabulary databases may facilitate vocabulary teaching and learning. The paper by Lafleur shows how computer technology can be used to maximize vocabulary learning from flashcards. Data gained from the flashcard program may also provide valuable data for researchers. For instance, data might allow researchers to identify what factors (e.g., parts of speech, word length, abstractness, and polysemy) make some words harder to learn than others.

Researchers may also be able to track learners' vocabulary retention or attrition over time based on data collected from the software. The paper by Rogers demonstrates how computer technology facilitates the creation of a list of multi-word units and is a great example of computers helping vocabulary researchers. The resulting list, at the same time, will be useful not only for researchers but also for teachers and students. The paper by Obermeier is primarily concerned with how computers enable researchers to measure the development of both declarative and tacit vocabulary knowledge. His proposed research may also demonstrate the potential for computers to increase deliberate vocabulary learning, just like the paper by Lafleur clearly shows.

One suggestion for future research is to examine actual vocabulary learning gains from computer-assisted language learning. The main purpose of the paper by Denison and Custance was to analyze the usefulness of the words entered in the class vocabulary lists, and the authors did not examine how much vocabulary was actually learned. Because the class vocabulary lists were created by learners throughout the semester, I understand that it was not feasible to measure vocabulary gains using a standard pretest-treatment-posttest design. At the same time, considering that some items from the class vocabulary lists were tested in the mid-term and final exams, it may be useful to analyze learners' performance on these items. The paper by Lafleur involved trialing the flashcard program with students for 2 weeks. Although a questionnaire was administered at the end of the trial, no vocabulary gains were measured using a posttest. A study comparing the effects of Indirect Spaced Repetition Software and other learning methods may also be useful because it may allow researchers to tease apart which factors of the software are especially beneficial for learning. Investigating vocabulary learning gains may also increase the chance of research being published. For instance, submission guidelines of *Language Learning & Technology*, one of the top journals in the field of computer-assisted language learning, state that "Articles containing only descriptions of software, pedagogical procedures, or those presenting results of surveys without providing systematic empirical data and analysis on language learning outcomes or processes will not be considered" (https://www.lltjournal.org/submission-guidelines/).

The four papers reviewed here demonstrate many ways in which computer technology helps us research, teach, and learn vocabulary in L2. I hope that this marriage made in heaven will last a lifetime and look forward to seeing more research being published, further demonstrating a strong bond between computer technology and vocabulary.

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