Effects of web-based vocabulary training for TOEIC

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The paper reports on a study of the *Word Engine* TOEIC course, a web-based vocabulary-learning tool. *Word Engine* integrates the practicality of computer-based flash cards, spaced-learning, Leitner's approach to vocabulary recycling, and target words calibrated to each student's ability. Students in a second-year level course "English for Testing" were required to subscribe to the course online and access it frequently. Seventy-six participants spent approximately thirty minutes per week for eight weeks using the site. In this pilot study, the dependent variable is TOEIC score improvement compared with previous years' cohorts. The main independent variable is time on task. TOEIC-score results for the study group are compared with data sets of students' score increases over the same interval in the past eleven years. The average score increased in this study, but a number of mitigating factors exist.

　本論文では、ウェブ・ベースの語彙学習ツールであるWord Engineを用いた Word Engine TOEICコースの成果について論じる。Word Engine は、PCベースの単語カードの実用性、分散学習方式、およびLeitnerの提唱する語彙リサイクルおよび学習者のレベルとニーズに合わせた目標語彙の設定へのアプローチを取り入れたものである。二年次生向け「English for Testingコース」の受講生が研究対象グループで、Word Engine ウェブサイトにサインアップし、高頻度でアクセスすることを課した。8週間にわたり、76人の受講生が1週間に約30分間ウェブサイトを使用した。今回の試験的研究では、学力が同程度と想定される前年度以前のグループと比較した場合の、受講生のTOEIC得点の改善度を従属変数とした。主要な独立変数はタスクに要する時間である。受講生のTOEIC得点結果の推移を、過去11年間の学生が同じタイムスパン内で見せた得点の上昇のデータと比較する。この研究では、平均スコアは上がったが、いくつかの要因が"影響してい。

MANY JAPANESE universities use the TOEIC as an independent means of assessing students' progress in English. For ambitious students, a high score on TOEIC serves their employment prospects well, since corporate Japan has, perhaps uncritically, a high regard for the test. A basic requirement for a higher TOEIC score is a large vocabulary. Those teaching courses in TOEIC preparation in the Japanese university involved in this study recognized a vocabulary deficit in those students who seemed unable to raise their TOEIC scores. After some research on possible ways to boost vocabulary it was decided to implement a vocabulary-learning program based on *Word Engine*, the main feature of which is the notion of spaced learning. The version selected required students to access the on-line site in their own time and test themselves on a corpus of frequently occurring words drawn from TOEIC contexts.

Vocabulary for TOEIC

A focus on developing vocabulary seems understandable for many Japanese university teachers who aim to raise their students' TOEIC scores. Although incidental vocabulary learning has been promoted over the years, researchers generally agree that development of vocabulary in this way takes time. Further, a study by Nasaji (2003) showed that inferencing strategies used by English language learners (ELLs) are often inaccurate. Thus a focus on explicitly teaching vocabulary becomes appealing to teachers. This begs the question: how many words should ELLs know for the TOEIC? Kiyomi & Oghigian (2009) suggest that for understanding 95% of the test, roughly 4,000 words are needed. Although this percentage may seem high, Liu & Nation (1985) explain that a 95 to 98% coverage range is the lower limit at which ESL learners are able to effectively guess word meanings from contexts. Therefore, vocabulary development for test preparation is highly relevant, especially with the observation that there tends to be a vast discrepancy between Kiyomi & Ohigian's proposed 4,000 words and the actual vocabulary of an average Japanese high school graduate. To help raise TOEIC scores by improving student vocabulary learning, the *Word Engine* online vocabulary learning site was selected for use in our university's English program since it seemed to fit in with four notions that support effective vocabulary learning, particularly: making a vocabulary list, deliberate learning, spaced study periods, and self-motivated study.

Vocabulary lists

The TOEIC has a quantifiable range of vocabulary for which, ideally, a word-list could be assembled. Such a list might comprise 90% or so of words encountered on any sitting of the test. There is obviously a group of very low frequency words outside of any proposed list. With the specified list in place, a rational first goal for students seeking to improve their vocabulary in preparation for the test would be mastering at least 80% of that vocabulary list with a special emphasis on the most frequently occurring words. This target would be in accord with ideas proposed by Nation (2001). Next, as stated earlier, somewhere between 95 to 98% coverage is the minimum target for comprehending a text comfortably. Therefore, for students wishing to significantly increase their TOEIC score, mastering upwards of 98% of that vocabulary would be the optimum target (Nation 1993a, 2001, 2005, 2010). With this target in mind, it is important to point out that at the commencement of the study the *Word Engine* corpus was comprised of over 5000 words that have appeared on past TOEIC examinations and in test preparation materials.

Deliberate learning

While rote styles of learning may not currently be emphasized in some Western countries, Folse (2004) points out that students in Japan and China are by and large accustomed to rote learning and memorization. Deliberate learning by rote techniques fits Japanese students' learning styles and expectations. Additionally, it has been well established that both implicit and explicit knowledge of vocabulary can be gained from deliberate vocabulary learning, for example, through flashcards. Furthermore, deliberate learning for which the student has individual responsibility maximizes the return on effort (Nation 1995, 2003, 2006). Promoting such explicit learning is a quite well-established notion in SLA that, unlike grammatical forms which are acquired in sequences, "…other aspects of language—for example, vocabulary—can be taught at anytime," (Lightbown & Spada, 1999, p. 135). Regardless of competing theories of SLA, study after study shows that vocabulary gains can be achieved through rote learning.

Spaced study periods

It is well established that spaced learning is more effective than mass learning in general. There may be few subjects more amenable to spaced learning than vocabulary (Nation 1974, 1993a, 1993b, 2003). Spaced Learning can become a metacognitive strategy, providing structure for students through set practice sessions (Schmitt, 1997). To support this concept, Bloom & Shuell's (1981) study demonstrated greater vocabulary gains in spaced sessions of study (1 unit completed 10 minutes every three days) compared with "mass rehearsal" (3 units in 30 minutes in one day) on a test four days later. An example of a spaced practice schedule is Pimsleur's (1967) "graduated-interval recall," which refers to a steadily expanding "rehearsal" of introduced vocabulary, for example in sessions 1 day later, 5 days later, and 25 days later. Students need more than one exposure to a word, as was demonstrated by the results of Hulstijn's (1992) study. Webb's (2007) research, for example, showed significant gains with 10 exposures to new words in context in a 40-minute time period. Spaced learning and recycling can be seen therefore as vital components in the development process of students' lexicon.

Self-motivated study

It goes without saying that the teacher can merely guide a student towards, but not force, language acquisition. Though gains are made by the student's own effort, a teacher's role can nonetheless be instrumental in leading and supporting students' progress. Thus, self-motivated learning is fundamental in L2 development. Accordingly, Nation explains that a key problem limiting progress in the acquisition of vocabulary is learners' not taking responsibility for their own progress (Nation 1974, 1975, 2003, 2005, 2006). Self-motivated learning can, nevertheless, be cultivated. Nunan (1999) suggests that teachers develop "ways in which learners can record their own progress" (p. 233). In this way, if students feel a program is effective, they will be more inclined to use it. An example of where this is possible is in the use of flashcards. In the study reported here, a card is flashed on the screen, followed by a target choice from three distractors.

Another proposal by Nunan (1999) that supports self-motivated learning is to make "instructional goals explicit to learners" (p. 233). With the *Word Engine* program, ELLs are able to see how many words they have been exposed to, how many they can remember, and how many more words they need in order to reach their goals. Students otherwise would have no knowledge of the extent of their L2 lexicon. As a final point, to help facilitate self-motivated learning in using the *Word Engine* program, Gardner and Lambert's (1972) idea of promoting "instrumental motivation" can be applied. Teachers may choose to set motivational goals, such as a TOEIC score of 650, as a challenge to students and as an object valued for its perceived intrinsic worth.

Research questions

Based on the four concepts of making a vocabulary list, deliberate learning, spaced study periods, and self-motivated study, two general research questions were posed. The first concerned the extent to which student TOEIC scores can be raised in one year with the use of the *Word Engine* program. It is hypothesized that modest gains in TOEIC scores will be observed. The second question explored student perceptions of the effectiveness of the *Word Engine* program for the study of vocabulary, preparation for TOEIC, and English abilities overall. It was proposed that if students feel *Word Engine* is helping them and is effective, they will be more disposed towards self-motivated study.

Method

Participants

The participants were 76 second-year English majors (aged 19 to 21) at a Japanese private university, who had enrolled in one of four sections of a two-semester core course "English for Testing." Each student met the criteria for participation in the study by completing eight weeks of Word Engine and taking the same two Institutional TOEIC tests. Thirty (39.5%) of the respondents were male and 46 (60.5%) were female.

Materials

The primary material was student data from the *Word Engine* TOEIC vocabulary course. Additional materials were the results from two Institutional TOEIC examinations and a student survey. TOEIC score results from the study group were compared with data sets of student score changes over the same interval in the past eleven years.

Procedures

The students were given in-class printed instructions for enrolling in *Word Engine* by using individual access codes, and were told to sign up for their instructor's group with a *Word Engine*-generated code assigned individually for each of the four sections of the course. They were then asked to access the site in their spare time for short periods several times each week, in conformity with the notion of spaced learning. The *Word Engine* "V-Admin" feature was used to export and store weekly reports of student progress as Excel files. The reports contained the following data categories: name, ID-number, course, coverage, location of words in process (i.e., 1 day, 3 day, 10 day etc.), total learned words, total time on-line and average time on task per access.

Using student identification numbers to match the data, *Word Engine* reports were merged with December 2009 and June 2010 TOEIC examination results. All students took the TOEIC examination in December 2009 (at the end of the second semester of their first year and prior to the study period) and in June 2010 (at the end of the first semester of their second year and following the 8-week study period). Correlations between TOEIC scores and *Word Engine* progress were examined via the learners' *Word Engine* data for word coverage, depth of word recycling and time-on-task.

To address the second research question, an opinion survey regarding their on-going TOEIC vocabulary study with *Word Engine* was administered in the second semester of the "English for Testing" class. The survey sought the students' perceptions, motivation and attitudes regarding *Word Engine*.

Analysis/Results

Table 1 shows the December to June TOEIC score improvements over the past eleven years for tests taken at the end of the 1st year and the middle of the 2nd year by student cohorts in the English language program. The participants in the study showed a total mean-score improvement of 55 points (mean scores: December - 373, June - 428). This is the second highest improvement in test score mean for students of the equivalent cohort over the eleven years.

Table 1. Dec. to June TOEIC partial scores, and total mean score improvement, 1998-2009.

Entrance year	Exam dates	Listening mean	Reading Mean	Total mean	Difference for total
1998	Dec 98	253	176	428	
	June 99	254	187	441	13
1999	Dec 99	218	146	363	
	June 00	220	155	375	12
2000	Dec 00	198	127	325	
	June 01	238	144	382	57
2001	Dec 01	211	158	369	
	June 02	261	160	422	53
2002	Dec 02	269	150	404	
	June 03	277	161	438	34
2003	Dec 03	245	154	399	
	June 04	264	154	417	18
2004	Dec 04	273	177	451	
	June 05	279	156	435	-16
2005	Dec 05	248	140	388	
	June 06	276	149	425	37
2006	Dec 06	228	133	360	
	June 07	261	148	408	48
2007	Dec 07	223	129	353	
	June 08	248	153	401	48
2008	Dec 08	276	143	421	
	June 09	260	153	413	-8
2009	Dec 09	233	140	373	
	June 10	270	158	428	55

The eleven-year total score improvement mean is 26.9 points. The achieved average score improvement of 55 this past year is double the norm. While a number of factors can affect TOEIC scores from one test to the next, it is important to point out that a large percentage of students did complete weekly *Word Engine* assignments resulting in a trackable number of words learned (mean: 262; median: 153 in *Word Engine's* "total learned words" column for the group at end of term). Even if it is recognition knowledge of vocabulary that was introduced through *Word Engine*, this may have been enough to raise student motivation for concentrated effort during the June 2010 TOEIC. The correlation between vocabulary knowledge and effective reading and listening is well established. Additionally, more word coverage can lead to the test being less overwhelming. Nevertheless, despite the relative success in average gain for the study group's TOEIC scores, analysis of the dependent variable "TOEIC score" and independent variable "time-on-task" showed no significant correlation in the results. The variables of "words learned," "location of words in process" and "coverage" likewise were all found to have no significant correlation with the data on individual student *Word Engine* performance or corresponding TOEIC score results.

The student survey produced several noteworthy results in regard to the students' attitude to *Word Engine* and their motivation. First, to the statement "I like *Word Engine*," 59.5% of respondents agreed while 39.2% disagreed, indicating a generally favorable response to using the system. Further support for a positive reaction towards *Word Engine* is evidenced with almost 84% agreeing or strongly agreeing that *Word Engine* helped them with their English, dropping to around 75% for helped with TOEIC, and down slightly further to 73% for being a good way to learn vocabulary. These numbers indicate broadly positive student perceptions of *Word Engine* as helping their language acquisition if compared with the nearly 40% who indicated that they did not like the program. The most striking

result from the survey was that 58% strongly agreed that the TOEIC test was important to them yet only 16% strongly agreed they studied hard for the test. As noted in previously cited research, gains can only be made if the student evinces a positive resolve to improve; and furthermore, that self-motivated study is essential to language acquisition, and in this case specifically, to the acquisition of a lexicon specific to TOEIC score improvement. The authors conclude that expectations for the success of any vocabulary development program must be tempered by the realities of student motivation and commitment to achievement.

Discussion/Conclusion

When dealing with a general population of students whose abilities are typically below 98% coverage of a vocabulary set necessary for the TOEIC, perhaps it becomes logical to make use of *Word Engine's* focused and deliberate vocabulary building system. What remains to be demonstrated is under which conditions and to what extent *Word Engine* can be said to objectively lead to increases in TOEIC scores.

One feature in the data of this study, though too small to assert as a trend at present, is the combination of "coverage" plus "total words learned." *Word Engine* recommends achieving at least 97% coverage of words in the *Word Engine* TOEIC course as a threshold for expecting improvements in TOEIC examination scores (comparable to the 95 to 98% range mentioned earlier). In our study, only 12 of the 76 students achieved ≥97% coverage during the test period: 7 already at the start of the study, 5 after the eight weeks of using *Word Engine*.

Table 2. TOEIC improvement for 12 students with ≥97% coverage.

TOEIC improvement	Initial coverage	Final coverage	Total learned words	Total time on task
80	97.65	98.90	432	795
95	98.31	98.49	230	214
-10	96.32	98.25	92	337
-30	97.96	98.03	27	11
180	97.80	98.03	226	190
150	97.56	97.75	166	354
5	96.72	97.54	242	170
150	96.64	97.47	244	42
-45	97.32	97.39	59	275
0	97.08	97.20	92	244
125	96.73	97.18	315	254
135	96.68	97.03	241	363

Of these 12 students, the fact that 4 of them (highlighted in the table above) showed a drop in score or no improvement initially seemed to indicate the same lack of any correlation in the results. However, further analysis shows that those students also had fewer than 100 words learned in the eight weeks of using *Word Engine*. Follow-up research is needed to establish whether a trend towards TOEIC score improvement can be observed for students who have both ≥97% coverage and >100 total words learned in an 8-week course. It may be that students who pass these two thresholds demonstrate the motivation and commitment to learning that is necessary to achieve TOEIC score improvement.

The initial findings suggest that for achieving TOEIC success *Word Engine* will not, on its own, be a panacea and that any

correlation with score improvement will likely involve clearly defined steps and study patterns characteristic of a determined, self-motivated learner.

Limitations

The significant limitation of this study is the short period of time in which it was conducted. Eight weeks is a brief period in which to conduct a treatment study of this kind. Many students also took several weeks to settle down to regularly accessing the *Word Eng*ine site. It is likely that more robust findings will result from students continuing to access *Word Engine.* To test this proposition, the study reported here has continued by following the current cohorts' progress into the second semester during which they will have been required to continue accessing *Word Engine* and take TOEIC at the year's end.

Bio data

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