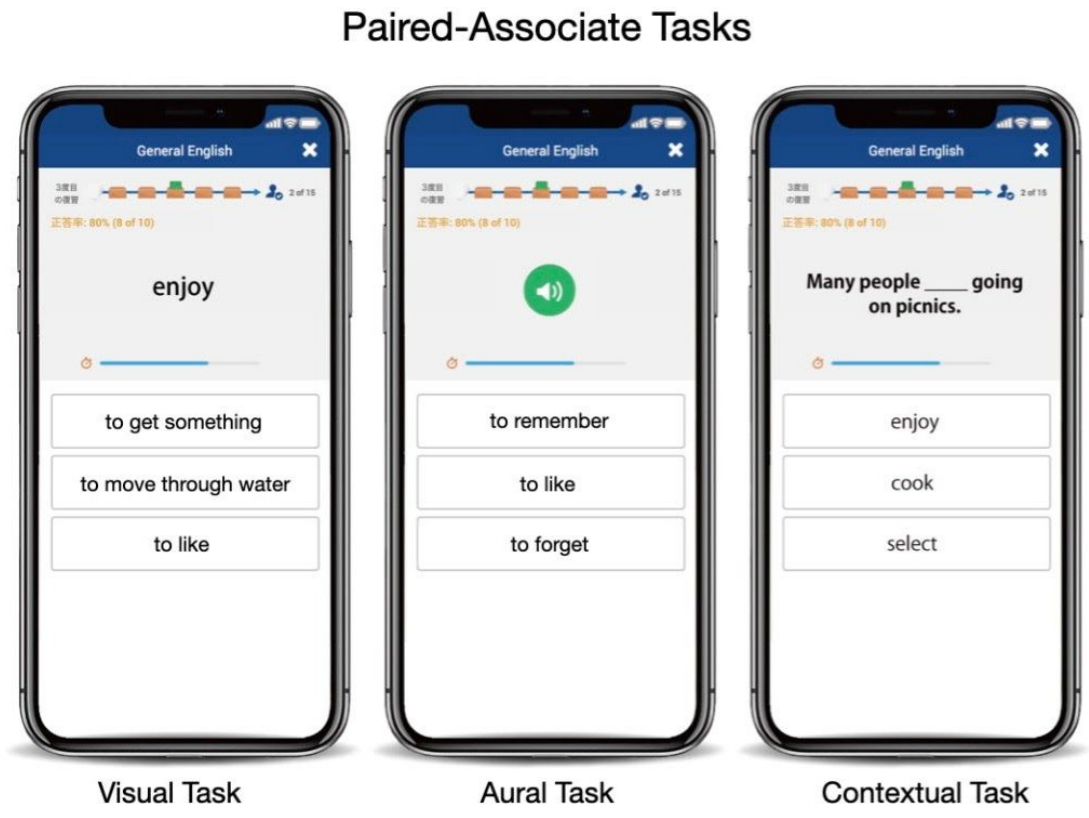
Review of WordEngine Vocabulary Study App

Lexxica, September 2020

Vocabulary Study Application

WordEngine is designed to rapidly improve comprehension of high-frequency English vocabulary. WordEngine combines a patented adaptive dictionary with digital flashcards. WordEngine teaches the most frequently occurring vocabulary words through a variety of associative flashcards. Studies have shown that WordEngine increases overall comprehension and scores on standard tests. Based on data from hundreds of thousands of students, most ESL/EFL learners can double or even triple their vocabulary size within 90 days by studying an average of 10 minutes per day.



WordEngine Starts with the VCheck Lexical Test

VCheck is a diagnostic test that identifies which specific words a person knows and which words they do not know. VCheck enables WordEngine to teach each student a personally tailored list of the most frequently occurring words that they don't know (Browne & Culligan, 2008). VCheck also provides accurate score correlations for standard tests and reports test score increases as a learner makes progress.

VCheck is composed of visual and aural vocabulary questions. Each question provides the VCheck Computer Adaptive Test with the maximum possible information about the learner's ability. VCheck takes about 12 minutes to identify a respondent's lexical ability. When VCheck is completed, WordEngine cross references the respondent's lexical ability metric to the item difficulty metrics of the 13,385 words in the database. The 13,385 words in the database cover 99 percent of all words in a two-billion word corpus representing all genres and domains.

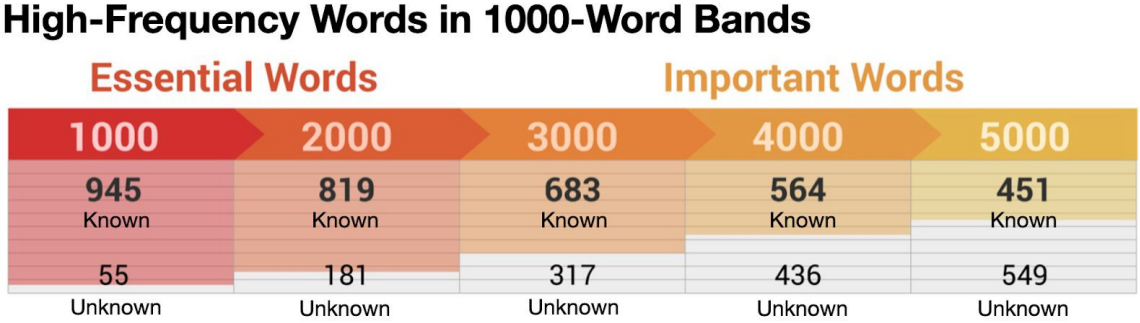
Word difficulty metrics and respondent ability metrics are plotted on the same logarithmic scale in the database. A word with a difficulty metric that is above the respondent's ability metric is likely unknown. The further above a respondent's ability, the less likely it is that a word will be known. Conversely, a word with a difficulty metric below the respondent's ability is likely to be known.

VCheck is available free online. Anyone can use it to see how many English words they know among the 13,385 words that constitute 99 percent of all word occurrences. The VCheck test is free during a 7-day free trial period. Learning new high-frequency words after the free trial requires a paid subscription.

5,000 High-Frequency Words and Vocabulary Gaps

Learning the first 5,000 most frequent words in the English language should be considered a high priority for all English language learners. Developing automatic recall ability for the first 5,000 words is especially beneficial (Nation, 2001). Due to language exposure differences throughout their formal education, learners do not acquire their English vocabulary in the order of word frequency. As a result, English language learners have significant gaps in their comprehension of the first 5,000 most frequently occurring words. These gaps cause frustration and difficulty; in particular on standard proficiency tests.

The diagram below shows the typical breakdown of known and unknown vocabulary for a learner with a 4,000-word total vocabulary size. Despite knowing a total of 4,000 words, the learner is still missing 236 of the first 2,000 high-frequency words.



Filling the Gaps and Changing Lives

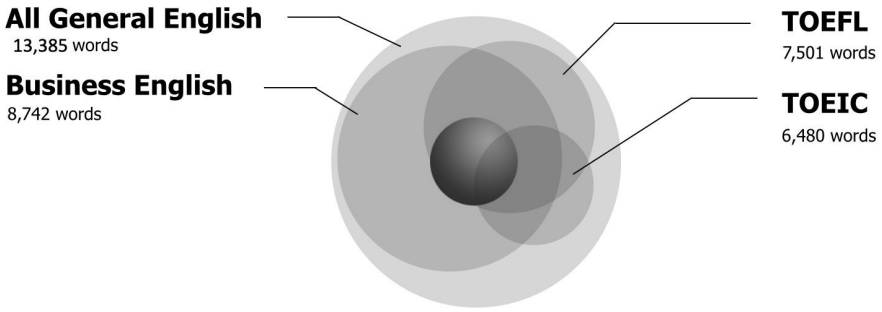
A student with a total 4,000-word vocabulary is an upper-intermediate level learner with a TOEIC score of about 500 and a TOEFL iBT score of about 52. When such a student begins to study with WordEngine, their personal flashcards will first teach their missing 236 high-frequency words. Many thousands of beginner-level students with 650-word vocabularies will end the school year having learned 2,500 or more high-frequency English vocabulary words. Some of them will have learned more than 10,000 words. It is not uncommon for EFL students who previously said they disliked English to discover that they can excel with WordEngine.

General English and Special-Purpose English

For General English, the WordEngine teaches new vocabulary based on the frequencies of word occurrences in all genres. For a particular test such as TOEFL, words are prioritized based on the frequency counts for that test domain. WordEngine includes 13 special purpose courses for proficiency tests such as: TOEFL, IELTS, TOEIC, EIKEN, GTEC and more. During the VCheck test the special purpose courses remain locked. After a learner finishes VCheck they can study with the 13 special purpose courses.

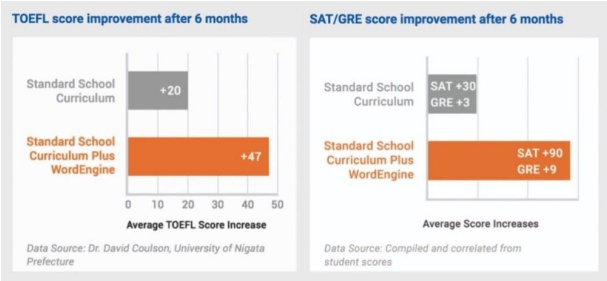
Proficiency Test Subdomains

Standard proficiency tests each have their own particular word frequency counts. If a learner is planning to take one of these tests, they can use WordEngine to focus on the high- frequency vocabulary for that test. The special purpose courses in WordEngine provide 99 percent coverage of the words and phrasal verbs that occur on a particular test. The diagram below illustrates how two popular tests have their own vocabulary orbits within the universe of all General English. The concentrated sphere at the center represents the 2,000 most frequent words. When someone finishes learning all of their missing words for a special purpose course, the WordEngine guides them to continue learning with the General English course.



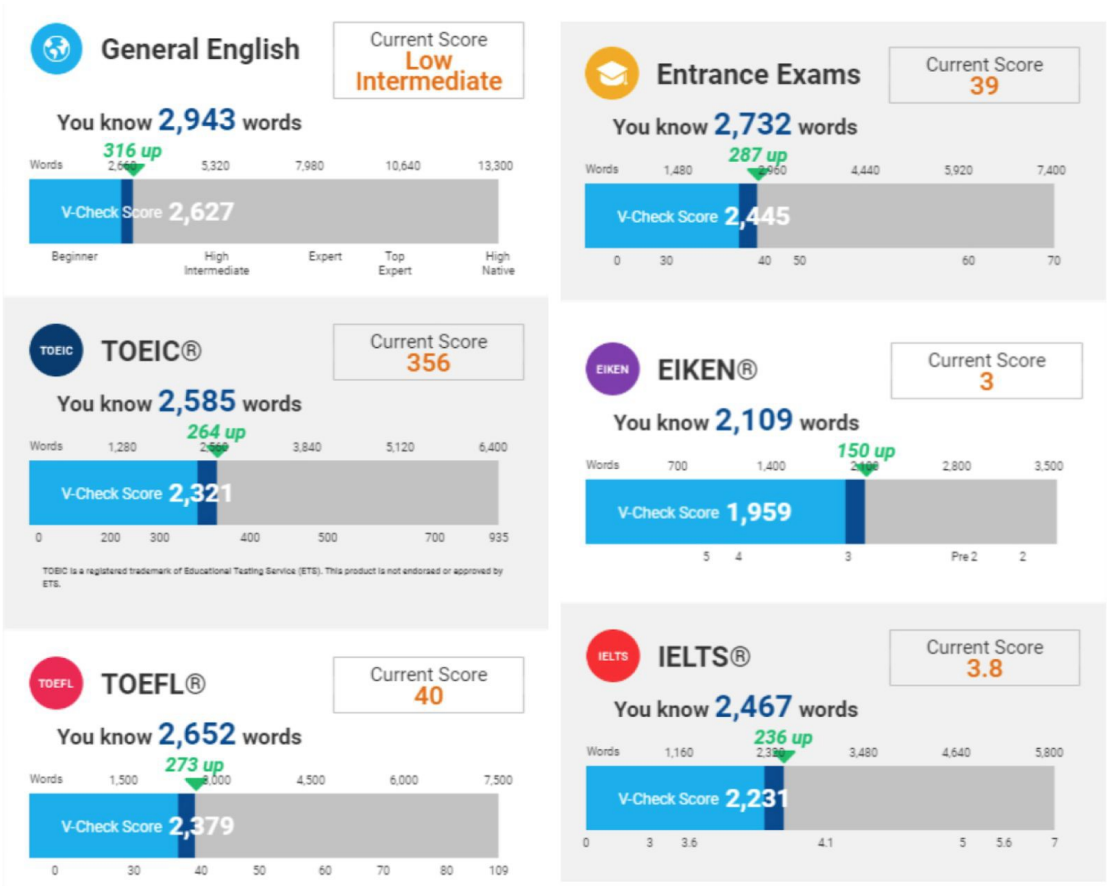
Improved Academic Achievement

Studies have compared WordEngine's flashcards to equal time on task with other self-study approaches such as intensive reading, extensive reading, word lists, and paper flashcards. The conclusions were that equal time with WordEngine's flashcards produce higher new vocabulary retention and higher test scores compared to the other approaches (Agawa, Black & Herriman, 2011) (McLean, Hogg & Rush, 2013).



Correlation to Proficiency Test Scores

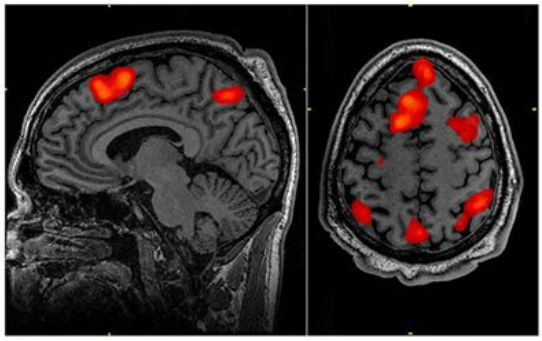
WordEngine provides correlated test scores for a variety of major tests. These score correlations are based on the actual test scores of more than 7,300 learners.



How Does Vocabulary Ability Affect Test Scores?

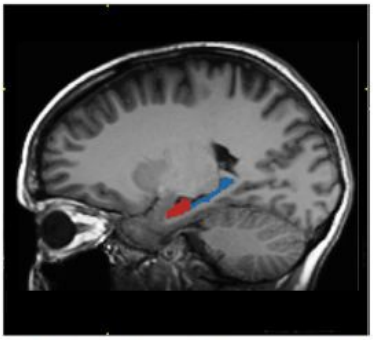
Unknown words create a burden for the brain's working memory and its capacity to grasp overall meanings. When listening and reading in a foreign language, the brain must do extra work to resolve its vocabulary comprehension gaps.

Researchers have suggested that when 20 percent or more of words are unknown it becomes impossible to comprehend meaning (Laufer, 1992); and when less than two percent of words are unknown the receiver is likely to feel confident in their ability to comprehend meaning (Nation & Hu, 2000). fMRI and fNIRS brain scans reveal differences in the amount of energy required to process unknown and known words.



Regions active during working memory tasks.

Source: Journal Frontiers in Neurology Vol. 4, 2013



Regions active during automatic memory tasks.

The Magnetic Resonance Image (fMRI) on the left highlights working memory activity whilst reading unknown words. The fMRI on the right shows the brain processing known words using automatic recall ability located in the hippocampus. These images indicate that additional energy and time are required to process unknown words as compared to well-known words for which the person has developed automatic recall ability (Berglund-Barraza et al, 2019).

Playful Engagement and Learning

Play is an essential form of learning through which people can develop a sense of achievement, mastery, and self esteem when their actions lead to measurable results (Prensky, 2001; Garris et al, 2002; Hoffman & Nadelson, 2010). In the context of learning, dopamine uptake activity generally occurs during the uncertain anticipation phase of a task for which a correct result is expected but not 100 percent certain. Such uncertainty is especially fascinating to the brain and it is associated with higher levels of dopamine, a powerful neurotransmitter associated with emotional attraction and long-term memory retention (Howard-Jones et al, 2011). Neuroscientists consider dopamine uptake a measurable indication of pleasure and it is often studied in the context of reinforcement learning (Wise, 2004). Unfortunately, the vast majority of learning applications to date have delivered less interesting certain-type rewards and been limited in content scope (Clark & Mayer, 2016).

The Motivational Value of Uncertainty

An uncertain outcome increases a learner's engagement by causing higher levels of dopamine production (Fiorillo, Tobler & Schultz, 2003; Howard-Jones, 2011). This seemingly contradicts traditional educational approaches where correct responses are rewarded and incorrect responses are not. Educational psychologists know that waiting to see if a response is correct is the exact process that produces dopamine and the kind of sustained rush that powerfully attracts people (Shizgal & Arvanitogiannis, 2003).

Natural Motivation

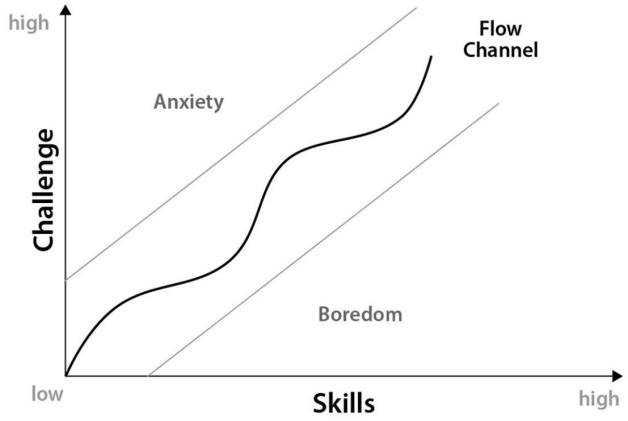
Natural motivation describes a reaction to external experiences that cause a person to take positive action (Dobbin, 2012). Educational psychologists recommend the integration of uncertain rewards to promote natural motivation to increase academic achievement (Howard-Jones & Jay 2016). WordEngine manages the degree of uncertainty that is experienced while learning new high-frequency vocabulary. It is believed that managing the degree of uncertainty enhances natural motivation.

Managed Uncertainty

What sets WordEngine apart from other learning applications is that it can control the degree of uncertainty for each study task. Once the VCheck test is completed, WordEngine can manage the percentage likelihood that a learner will correctly recognize any given word in its database. As an example, every 100 flashcards sent to a particular learner can be expected to produce immediate recall for 50, fast recall for 30, slightly delayed responses for 15, and there will be 5 new words they need to guess at. In this way, studying with WordEngine conforms to Krashen's *i + 1* input hypothesis (1987) and to Howard-Jones's suggested ideal uncertainty ratio (2011).

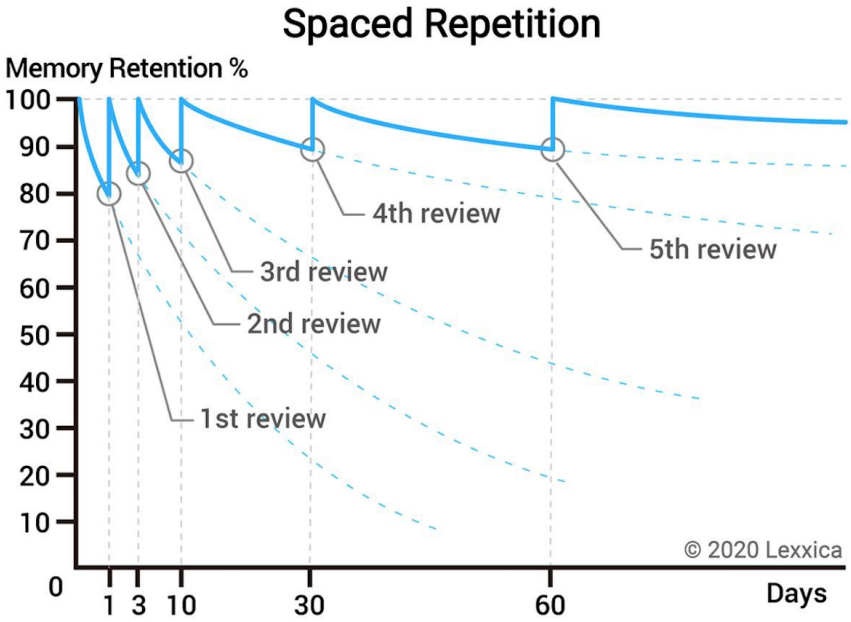
Flow State

A Flow State is achieved when one's mind is so deeply engrossed while doing something that it loses track of time (Csikszentimihalyi, 1990). WordEngine works to promote a Flow State by keeping the ratio of unknown new words below the frustration level and above the boredom level.



Spaced Repetition for Memory Retention

Spaced repetition is a brain hack invented by German psychologist Hermann Ebbinghaus to help people memorize new facts in the fastest possible way. The inclusion of spaced repetition protocol in the WordEngine accelerates the development of long-term memory retention. Each next review of a recently learned word is timed to increase the length of memory retention for that word. With spaced repetition protocol, new vocabulary words are first learned and then tested again at five increasing time intervals. The diagram below shows the time-spaced intervals that are applied in WordEngine and the effect that each repetition has on memory retention.



It may seem counterintuitive that words should be repeated before they have been forgotten but Ebbinghaus's research showed that waiting until a word gets closer to being forgotten is the most efficient way to convert short-term to long-term memory. Subsequent studies have concluded that not reviewing a word during the time intervals is what makes spaced repetition effective (Balota et al, 2007).

Personal Digital Flashcards

WordEngine provides each learner with a personalized database of flashcards and three types of paired-associate flashcard tasks; visual, aural, and contextual. Thanks to VCheck, WordEngine is able to teach new vocabulary words with easily understood definitions by using only words that the learner can be expected to know. Additionally, the distractors (incorrect answers) that appear in the flashcards are matched by part of speech; are more difficult than the words being taught, and are randomly presented in each review so as to prevent distractor recognition.

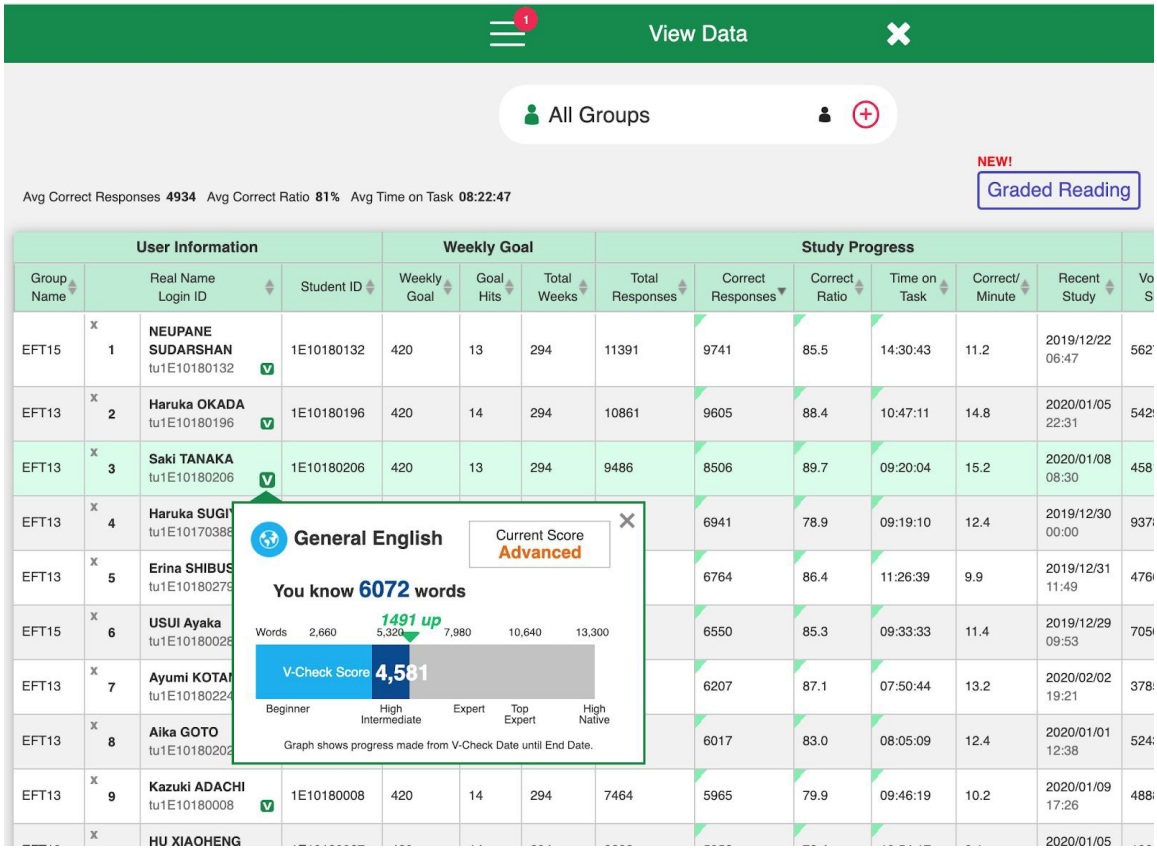
Error Correction

With spaced repetition, an error made at any review, whether it be caused by a careless mistake or a lexical misunderstanding, will cause the missed word to go back to the start of the process. Missed words come back in the next study session so that learners can quickly recognize and benefit from their errors.

Managing Study Goals and Student Progress

Teachers and program administrators use the VAdmin learner management system to track student progress. VAdmin provides key performance indicators and rich data about each student's progress. VAdmin sends weekly email summary reports and the teacher's secure LMS provides detailed data views on computers and mobile devices.

Schools that use WordEngine with large numbers of students will pre-register their students and teachers' accounts. The maker of WordEngine provides full support to all students and teachers.



Team Challenge Tournaments

WordEngine sponsors optional Team Challenge tournaments. Teams compete in weekly matches. Students study individually at their own level of ability and their study progress is combined into a collective score for their team. Students and teams do not need to be at the same level of ability. Competition among different levels of ability is productive and highly motivating (Slavin, 1980). A study with two thousand students found that during a tournament, average WordEngine study time can double compared to when a tournament is not ongoing.

"My students learned thousands of new words and the Team Challenge program transformed the experience from independent self study to a team effort where students pull together and motivate each other." Catherine da Silva, Tokyo International University

Summary

WordEngine provides an efficient and emotionally satisfying way for learners to quickly establish automatic recall ability for the most frequently occurring words in the English language. Fast recall ability for the most frequently occurring words allows working memory to focus on overall meanings rather than unknown words. The VAdmin learning management system provides teachers with tools for setting self-study goals; monitoring student performance, creating quizzes, playing team study games, and joining vocabulary study tournaments. WordEngine is a premium vocabulary learning system based on the best available research.

WordEngine Web App

https://www.wordengine.jp

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