Exploring the Internal Structure and Rules of Irregular Patterns of Past Tense Verbs Applied in Vocabulary Acquisition by Chinese EFL Learners in UIC

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Abstract

Morphology as a branch of linguistics, has been proven to positively promote literacy skills, especially in the area of vocabulary acquisition in the aspect of spelling and reading, for example, infection of past tenses of verbs. However, there has been a dearth of research investigating the construct and proceeding process of transformation of irregular past tenses through EFL learners. This article conducted an experimental study in an English immersion teaching university — Beijing Normal University – Hong Kong Baptist University United International College in Zhuhai, Guangdong Province, China, which examined whether the Chinese EFL learners in UIC relied on lexicon memory or minor rules based on similarity to process the past tense of irregular verbs. This study focused on revealing whether there is internal structure and rules in irregular patterns of past tense verbs being applied in vocabulary acquisition, by EFL learners in UIC through a language test consisting of 45 fill-in-blank completion sentences. We set and verified the hypothesis that minor rules based on the similarity in the irregular's clusters, exist in the inflection of irregular verb past tense during the process of transforming by EFL learners in UIC. This study involved 20 college students, adopted the quantitative research method and analyzes data through SPSS. The findings illustrate that the participants relied on grammatical rules in the conversion of the past tense of verbs, but at the same time, some could also find the similarity or associative patterns in the past tense of irregular verbs. The results of the data analysis show that among EFL learners of UIC, this hypothesis is not tenable, but we cannot deny that minor rules based on the similarity of the irregular's clusters exist among inflection of the irregular verb. The experimental results will be of reference significance to the systematic design of teaching of past tense verbs based on the way language learners recognize and process words.

Keywords: regular verbs, irregular verbs, past tense, grammatical rules, memory

1. Introduction

1.1 Research Questions

Some researchers such as Kieffer and Lesaux (2007) have also proven that morphology can be a powerful tool in comprehensive vocabulary

acquisition. The morphological skills are spontaneously used by language learners when they visually decompose complex words, and there is some difference in the decoding process (Dawson, N., Rastle, K. & Ricketts, J., 2018). This suggests that human language system has different mechanisms and processes in dealing with different kinds of words. Besides, it has been proven that the human brain is divided into two systems for language learning, one is the declarative system, used to learn stored memorized words. Irregular form of the past tense of the verb is proved to belong to this classification. While another system of learning a language is procedural system, which is about processing rules rather than memory and the past tense of rules is considered a rule product (Ullman, M. T., Corkin, S., Coppola, M., Hickok, G., Growdon, J. H., Koroshetz, W. J., & Pinker, S., 1997). Based on this, the morphological consciousness and decoding of words, namely the processing of grammatical rules such as the transformation of past tense of verb, belong to the procedural system in human brain. However, most studies on the specific morphological rules existing in the past tense of verbs focused on ESL learners, while there were few studies on EFL learners in Asian countries such as China as subjects. The current study is trying to fill the gap by studying when EFL learners learn the past tense of verbs, especially the irregular past tense, whether they rely on complete memory or access to certain rules. And we are going to set and verify the hypothesis that there are rules could be found in the transformation of irregular verb past tense.

1.2 Significance of the Study

There is evidence and study feedback from English language learners that there do have certain regular patterns in acquiring the irregular past tense verb. And our study is to verify this assumption. The research questions are that do EFL learners process the verb past tense via grammatical rules or memory. And whether the memory is referred as ordinary stored memorization, or by association in the transformation of irregular verb past tenses. This paper will make a practical investigation to find and analyze the phenomena, and put forward some suggestions and measures on this basis, which will promote the reform and development of vocabulary teaching. The results of the experiment will point out the direction of the teaching design for the acquisition of

irregular past tense of verbs, in EFL learners' regions such as China and Even East Asia. Getting to know ways of dealing with the irregulars (by memory or by rules) will be a good way for both students and educators. For students, they will get a systematic approach to better acquired the irregulars while the teacher can develop better way to teach irregular verb transformation. If it is proved that EFL learners subconsciously apply rules when acquiring the past tense of irregular verbs, educational institutions and schools can improve the curriculum design and learning methods of English language learning based on this. A systematic theoretical framework and acquisition model can be developed for irregular word learning, providing guidance for non-native English study on regular and irregular word acquisition methods.

2. Literature Review

Ullman, Corkin, Coppola, Hickok, Growdon, Koroshetz, and Pinker's study (1997) explored the language processing in human brain regions, which studied the different manifestations of aphasia with lesions in temporal or parietal cortex and frontal cortex/basal ganglia respectively, the brain's memory system for language acquisition is divided into two parts: declarative system for learning and storage of evens and facts, namely memory, as well as the procedural system for learning and possessing of motor perceptual, cognitive skills namely, rules. Besides, the research noted that the regular and irregular past tense are well-matched the complexity (one word), syntax (tensed), meaning (past) in proving that the two aspects of word acquisition — grammar and memory, are performed in two different systems in the human brain.

Based on the evidence, three theories were put forward. One was that the regular verbs are generated by rules (stem + suffix -ed), which didn't access to memory and it was default whenever the memory access failed, while the irregulars are memorized (Pinker, 1998). The second was regular and irregular are composed by rules with a bit of memory to process the minimum information, which means that there were also rules in the past tense irregulars. The last theory is that regulars/irregulars are both computed by a connectionist associative memory. The mentioned all suggested that there are certain acquired similar patterns as rules applied for irregular forms of verbs.

What's more, the study by Steve Pinker (1998) shows that there was contrast between regular and irregular past tense inflections. The regular verb past tense was predictable and open-ended by adding suffix "-ed". There was an example of this productive rule: overgeneration occurs when learners deal with irregular past forms of verbs, such as come-comed, and they produced ones that was not allowed in the standard English and dictionary. This also suggested that regular past tense was generative. However, it is worth noting that similar situation happens when some learners deal with irregular past forms of verbs with similar inflections. For example, there irregular transformation like sing-sang-sung or sink-sank-sunk; when his research participants (college students) are given novel verbs such as spling and asked to process their past tense forms, most wrote splang or splung among their answers (Bybee & Moder, 1983). These are not just random similarities, but also ones that are produced from time to time by current English speakers. It is proved that the irregular forms cannot simply be regard as stored items. Therefore, two very different theories have arisen to support the fact that there are actually internal word structure of the irregular verb past tense and also minor rules derived from the similar patterns among the cluster of the verbs with their past tense form.

The first one is theory of generative phonology applied to irregular morphology by Chomsky and Halle (1968) and Halle and Mohanan (1985). In this theory, there are minor rules for the irregular patterns: "change "i" to "a", similar to the suffixing rule for regular verbs such as ring-rang, sing-sang and sit-sat". But the first theory has been proved unable to cover all irregular verb types. The second theory is Parallel Distributed Processing or Connectionism, which extends a rule to irregulars — memory: linking the features of an item to the features of another item like cling-clung, string-strung, stick-stuck. This is a kind of psychological memory enhancement and can be regarded as another type of rules.

However, most of the subjects in the above studies are ESL learners with some native English learning experience. Comparatively, there are few researches on EFL learners without immersive language environment. To fill in the gap, I am gonging to conduct a study on the university EFL learners by designing experimental tests. The present study is trying to study when EFL learners learn the past tense of verbs, especially the irregular past tense, do they rely on complete memory or apply certain rules. I am going to prove the evidence that there are rules applied in the irregulars past tense transformation. The main purpose of this study is to test the hypothesis that minor rules based on the similarity in the irregular's clusters, exist in the inflection of irregular verb past tense.

3. Methodology

3.1 Research Design

The current study is quantitative and experimental research. I designed a lexical test questionnaire containing 45 fill-in-blank completions and comprising real words and non-words will be designed, which is adapted from Tighe and Schatschneider's seven experimental morphological awareness measures (2015), to conduct my study. Besides, according to research of Ullman, Corkin, Coppola, Hickok, Growdon, Koroshetz, and Pinker's study (1997), regular and irregular past tense are well-matched the complexity (one word), syntax (tensed), meaning (past) in proving that the two aspects of word acquisition. That is regular past tense is processed in the procedural system responsible for rules proceeding and irregular past tense is memorized through the declarative system responsible for fact storage in human brain, which means it has been proven that regular past tense applies memory and irregular past tense applies grammatical rules. Based on this, 45 irregular verbs were selected and adapted in the stems of the 45 fill-in-blank questions. This test paper consists of four categories of verbs past tense transformations and 45 fill-in-blank sentences, with 10 sentences of regular verb transformation, 15 sentences of high-frequency irregular verb transformation, 10 sentences of low-frequency verb transformation and 10 sentences of novel verb transformation.

3.1.1 Regular Verbs

The first category includes the common regular inflection of the past tense of verbs (e.g., open-opened) and low-frequency regular inflection of the past tense of verbs (e.g., ablate-ablated) that may be new to the majority, which is the most common past tense transformation in English vocabulary study.

3.1.2 High-Frequency Irregular Verbs

The second category uses common irregular

past tense verbs. Almost all were learned during the participants' English acquisition over the past decade.

3.1.3 Low-Frequency Irregular Verbs

The fourth were rare past tense of irregular verbs and have a similar pattern of inflection to high-frequency irregular verbs, with similar lexical and phonological features. According to the search results in the corpus, some are from Old English and may no longer be used after undergoing language changes.

3.1.4 Novel Irregular Verbs

The fourth category is the novel past tense of irregular verbs. They are forged, based on the morphological and phonetic features of the past tense of irregular verbs of types II and III, which exist in the dictionary.

If the participants do regular past tenses and common irregular past tenses well, but do low-frequency and novel irregular past tenses badly, it means they do not refer to memory but the grammatical rules because the they can just apply the regular past tense rules and they just simply apply memory in the irregulars. If they do all four categories of past tense (regular, common irregular, high-frequency irregular and novel regular) transformation well, they do actually apply associative memories in possessing the irregular verbs and here are evidences that EFL learners do imply rules in acquiring the irregular past verbs.

3.2 Participants and Sampling

Snowball sampling was used to collect the participants in the way of recruitment on WeChat. This ensured that the number of participants was sufficient for the analysis. The participants were 20 EFL students of a range age (19-22 years, mean= 20.6±0.99). There were 5 males aged 19-22 years (mean= 19.6±1.34), and 15 females aged 20-22 years (mean= 20.93±0.59). All the students were undergraduates, including two ACE Language preparatory students and eighteen undergraduate students from different divisions of UIC (Beijing Normal University – Hong Kong Baptist University United International College), an international college with English immersion teaching in Zhuhai, Guangdong Province, China. English native speakers were excluded in this research. This study was approved by the Ethnic Committee on Human Research Protection of Beijing Normal University – Hong Kong Baptist University United International College University.

3.3 Procedure

The test took place in quiet environments. Under the guidance of the researcher, participants were informed of the details of this experiment and asked to do the lexical questionnaire, in a specific campus site with controlled time of 30 minutes.

Besides, a piloting was done firstly to see the feasibility of the test volume. Then the questionnaires were addressed to collect data. The participants had different daily schedules, so it was difficult to get everyone to take the test at the same time and in the same place. As a result, the test was divided into three waves based on time, conducted in three similar places and times, in order to maximize the exclusion of external accidental factors. Before deciding whether to continue to participate as well as in order to make the participants clear about their involvement, they were informed of the purpose of the experiment, the procedure of the test, the treatment of the results, confidentiality of the study, potential risk and withdraw during this experiment as well as a reminder that electronic devices and dictionaries were not allowed to use during the process and they had to finish the test by themselves. Their individual permissions were obtained and they must sign an informed consent form before participating the test. The test lasted 30 minutes, and almost all completed the questionnaire within 20 minutes, with more than half completing 45 past tense blanks in less than 15 minutes. After all the participants finished and handed in the test papers, each of them received rewards as compensations.

3.4 Data Analysis

The data were divided into four groups based on four types of past tense verbs. Correct and expected answers will be recorded as 1, while incorrect and expected answers will be recorded as 0. I took advantage of the software SSPS to process the data by applying the statistical methods of Chi square test t and Pearson correlation analysis. By means of chi-square test, the mean and variance of the accuracy of four groups of data are calculated respectively to analyze the statistical differences of data and judge whether the data has scientific significance. And Pearson Correlation Analysis was applied to see whether the data distribution of common irregular verb past tense is reflected

in categories of high-frequency irregulars and novel irregulars. In addition, the chi-square test was used to evaluate the performance of twenty subjects in four sets of data (Eighty percent to define the correct rate, the subjects' performance depends on whether they get more than eighty percent of the four pairs of words correctly) to verify the hypothesis. If the participants do regular past tenses and common irregular past tenses well, but do low-frequency and novel irregular past tenses badly, it means they do not refer to memory but the grammatical rules because the they can just apply the regular past tense rules and they just simply apply memory in the irregulars. If they do all four categories of past tense (regular, common irregular, high-frequency irregular and novel regular) transformation well, they do actually apply associative memories in possessing the irregular verbs and here are evidences that EFL learners

do imply rules in acquiring the irregular past verbs.

4. Discussion of Results

4.1 Statistical Significance of Four Groups of Data

I calculate the mean and variance of the correctness of four kinds of verbs, which showed that the accuracy rate (%) of regular, common irregular, low-frequency irregular and Novel irregular groups were 99.43±3.38, 62.71±16.51, 37.71±20.01 and 23.71±15.36 respectively. The difference of accuracy among the four groups was statistically significant, which indicated the current data could be used to test my hypothesis.

The results revealed that students had the best command of regular, good command of common irregular group, poor command of low-frequency irregular, and worst command of Novel irregular. (See Table 1)

Table 1. Mean and Standard Deviation of Accuracy (%) of Four Categories Verbs (Regular, Common Irregular, Low-Frequency Irregular, Novel Irregular)

	M	SD	F	P
Regular	99.43	3.38	18.916	0.000
Common irregular	62.71	16.51		
Low-frequency irregular	37.71	20.01		
Novel irregular	23.71	15.36		

4.2 Correlation Analysis

Statistical method of Pearson correlation analysis was used to analyzed correlations of the four groups of data. I arranged and combined these four groups of data in pairs respectively and analyzed the correlation of six pairs. The comparison of results was presented in the form of a line graph (See Figure 2). The results of analysis indicates that the correlation coefficient between transformation of regular verb past tense and common irregulars was 0.092 > 0.05, which showed no statistical significance. Hence there was no correlation between regular group and common irregular group accuracy. The correlation coefficient between regular and low-frequency irregular was 0.059 > 0.05, which has no statistical significance, that is, there is no correlation between the accuracy of regular group and low-frequency irregular group. The correlation coefficient between regular and novel irregular was 0.144 > 0.05, which showed no statistical significance, that is, there was no

correlation between Regular and Novel irregular accuracy as well.

However, the correlation coefficient between common irregular and low-frequency irregular was 0.000 < 0.05, which was statistically significant, that is, there was a significant correlation between the accuracy of common irregular group and low-frequency irregular group. The correlation coefficient between common irregular and Novel irregular was 0.020 < 0.05, which was statistically significant, that is, there is a significant correlation between the accuracy rates of regular group and novel irregular group. The correlation coefficient between low-frequency irregular and Novel irregular was 0.040 < 0.05, which was statistically significant, that is, there was a significant correlation between the accuracy of low-frequency irregular and Novel irregular.

The above suggests that there is no correlation between the accuracy of the Regular group dependent on rules and the accuracy of the

other three groups, that is, the accuracy of common irregular group, low-frequency irregular group and novel irregular group do not depend on rules. Whereas, the accuracy of common irregular group, which relied on memory, was significantly correlated with accuracy of low-frequency irregular group and Novel irregular, that is, students who did well in the specific types of common irregular words can do well in low-frequency irregular group and novel irregular group.
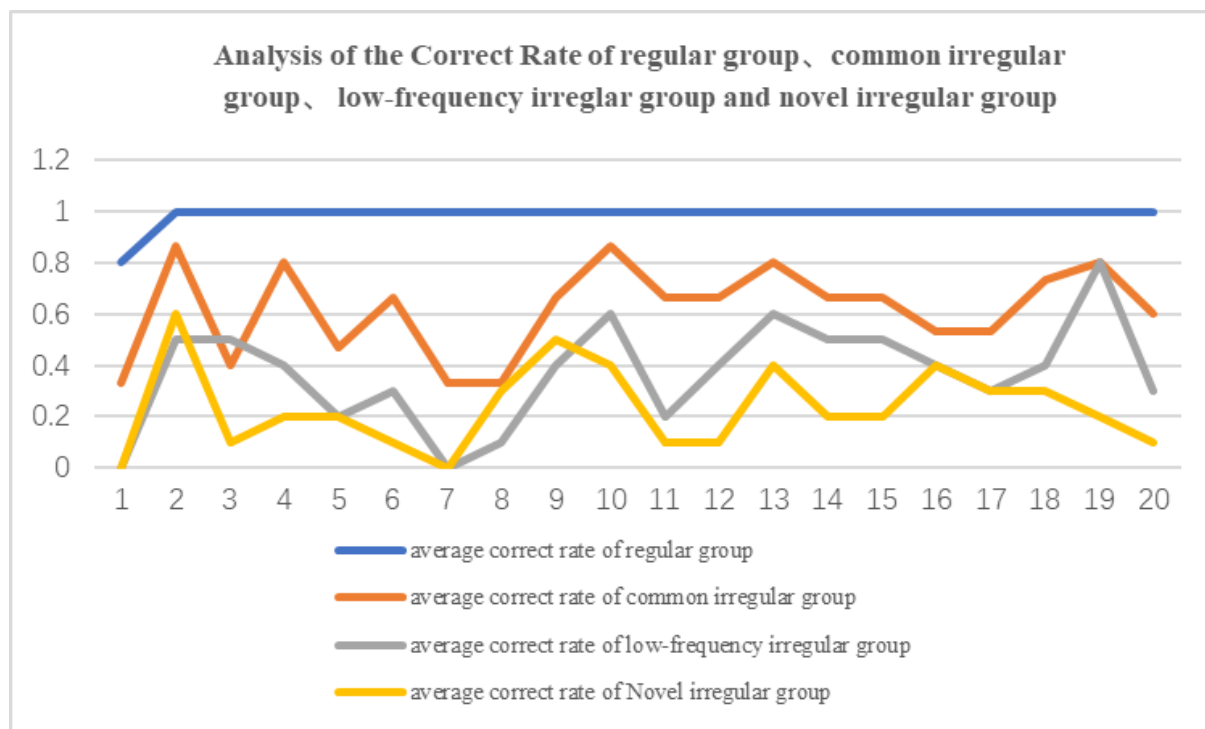

Figure 1. Correlation Analysis of Accuracy Rate (%) of Four Categories of Verbs

Table 2. Analysis of Number of Participants in Grammatical Rules Group and Memory Group with Different Performance

Number of Participants	Did well in Low-frequency irregulars & Novel irregulars	Did badly in Low-frequency irregulars & Novel irregulars	F	P
Did well in Regular & common irregular	8	4	5.690	0.028
Did badly in Regular & common irregulars	1	7		

4.3 Hypothesis Testing

In this part, I applied the statistical method of Chi-square test to verify the hypothesis that minor rules of irregular past tense transitions exist, which namely is the associative memory based on the similar patterns.

The average scores of regular group and common irregular groups, low-frequency irregular group and Novel irregular group were in line with normal distribution. respectively. The average accuracy rate of all students in the regular and common irregular groups which was 0.805 and the average accuracy rate of all students in the low-frequency irregular and Novel irregular groups which was 0.302, were taken as the two critical values. All the participants were divided into two groups: grammatical rules group and memory group. There were 8 subjects in the grammatical rules group (regular and common irregular groups had an average score of more than 0.81, and low-frequency irregular and novel irregular groups had an average score of less than 0.31).

There were 4 persons in the associated memory group (the average score of regular and common

irregular group was greater than 0.81, and the average score of low-frequency irregular and Novel irregular group was greater than 0.31). There was 1 person in the non-grammatical rule group (regular and common irregular group had an average score less than 0.81, and low-frequency irregular and novel irregular groups had an average score greater than 0.31). There were 7 students in other groups (the average score of regular and common irregular groups was less than 0.81, and the average score of low-frequency irregular and Novel irregular groups was less than 0.31), and there was a statistical difference in the number of students among the four groups (F=5.69, P=0.028 < 0.05). The results revealed that there were 8 students in the grammatical rule group (40%) and 4 students in the associative memory group (20%), which means that a small number of students may have associative memory, and more students rely on grammar rules. However, there are still some students who need to further explore the mode of memorizing words, and there may be differences in language environment and vocabulary habits.

5. Conclusion

The hypothesis that rules of irregular past tense transformation does exist is not true, but it cannot be denied. The results show that students have the best command of the rule group, indicating that their past tense processing of verbs relies on the declarative sentence system of the brain, that is, the grammatical rules of adding "ed" as past tense indicator. For common irregular word good mastery, but poor output of the low frequency irregular verb past tense and novel irregular verb past tense, it means that students in the treatment of the irregular verbs past relied on the memory, but not associated memory, this suggests that the majority of people are learning the irregular verbs past by rote learning rather than finding similarities or rules between words with similar morphological and phonetic patterns, there are still minority of subjects who are able to detect the inherent rules of irregular past tense verbs and use associative memory. There are too few subjects that meet the expected assumptions. As a result, whether irregular verbs have regular past forms are still vague. In addition, the specific patterns of associative memory and factors that affect the mastery of associative memory, which may be vocabulary size, study experience of morphology and phonetics, and

language environment need to be further studied.

5.1 Implications

This research has important implications for vocabulary teaching. According to the conclusion, although most EFL learners rely on grammar rules by default when they fail to access memory, a few of them can still observe some association patterns in the past tense conversion of irregular verbs. This may depend on the learner's vocabulary sensitivity, English level and so on. In learning, students can effectively acquire new words based on their mastery of this association pattern. In the teaching process, teachers or educators can design different teaching plans based on their understanding of students, especially for small classes. If students are highly sensitive to the past tense of irregular verbs, teachers or educators can encourage students to use secondary rules to deal with the past tense of irregular verbs on the basis of memory in class, and make a systematic teaching for this.

5.2 Limitations and Recommendation for Further Study

There are a few limitations that should be addressed. The first is the selection of verbs. Although we used a corpus to sift through many outdated or words that had not existed anymore after going through the language changes, there was still some exceptions like there was one selected word were found to have two expected answers, such as the real irregular past tense of sink–sank or sunk. The form depends on the use and nature of the verb. When "sank" as past tense, it basically means "going down", which refers to a gradual downward movement, especially a vertical drop of an object through air or water, usually down to the ground or below the water level, or completely submerged. While the basic meaning of the past tense of sunk is "to sink something" or "make something going down", which is a transitive word, but it can either be used as intransitive verb. A transitive verb takes a noun or pronoun as an object that can be used for passive structures. Part of the participants' understanding of this difference was deficient, affecting the distribution of the data. It is still not clear what caused the result of "sunk" as the past tense of "sink". Whether the students lack understanding of the usage of this word or simply misremember it, or whether some students attached themselves to the past

tense of "sunk" under the influence of language changes (this influence may be temporal and spatial or geographical).

Besides, since the words of the subjects are placed in sentences with content, the different understandings of the meanings of the sentences of the subjects will result in data comfort inconsistent with the actual situation. For example, subjects with high context sensitivity originally wrote the corresponding past tense of the verb in accordance with the expectation, but were influenced by the content prompt, and wrote the opposite result, the experimental result may be affected by such chance.

What's more, the experimental data showed that the common irregular group can affect the low-frequency irregular group and the novel irregular group. While sorting out the data, it was found that the changes of the high-frequency irregular group include "i-a" conversion (e.g., sink-sank) and "i-u" conversion (e.g., stick-stuck). Some subjects who have the tendency to use association memory will be affected here. It turned out, for example, that "swing" of the low-frequency irregular group, whose past tense is swung, is mostly written as "swang". But "swing" is a real word and "swang" as past tense is wrong in the dictionary. So it was regarded as the unexpected data for verify the hypothesis. But "i-a" and "i-u" were both expected answers in the novel irregularity group (e.g., dring–drung or drang, ting–tang or tung). On the other hand, it is not known whether this conversion is affected by phonological factors.

Finally, the subjects come from EMI University, most of them are female or most of them are English majors, and a few of them are male or from other majors. On the other hand, the subject sample is too small and has strong gender bias, language bias and limitations, which may have a strong impact on the data.

Therefore, experiments need to be ameliorated, such as the diversity and breadth of samples, the design of questionnaire content should be improved. And more systematic studies, such as the relationship between irregular verb past forms and phonetics, need to be further implemented to support the research design and solve the problems above.

References

Dawson, N., Rastle, K., & Ricketts, J. (2018). Morphological effects in visual word recognition: Children, adolescents, and adults. *Journal of Experimental Psychology. Learning, Memory, and Cognition*, *44*(4), 645-654. https://doi.org/10.1037/xlm0000485

Kieffer, M. J., & Lesaux, N. K. (2012). Knowledge of words, knowledge about words: Dimensions of vocabulary in first and second language learners in sixth grade. *Reading & Writing*, *25*(2), 347-373. https://doi.org/10.1007/s11145-010-9272-9

Pinker, S. (2000). Words and rules: The ingredients of language. Phoenix.

Pinker, Steven. (1998). "Words and Rules." *Lingua*, 106(1-4), pp. 219-242., https://doi.org/10.1016/s0024-3841(98)00035-7.

Tighe, E. L., & Schatschneider, C. (2015). Exploring the dimensionality of morphological awareness and its relations to vocabulary knowledge in adult basic education students. *Reading Research Quarterly*, *50*(3), 293-311. https://doi.org/10.1002/rrq.102

Ullman, M. T., Corkin, S., Coppola, M., Hickok, G., Growdon, J. H., Koroshetz, W. J., & Pinker, S. (1997). A neural dissociation within language: Evidence that the mental dictionary is part of declarative memory, and that grammatical rules are processed by the procedural system. *Journal of Cognitive Neuroscience*, *9*(2), 266-276. https://doi.org/10.1162/jocn.1997.9.2.266