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“Chicken and Egg” problem: Word counts or academic ability?

Mamoru TAKAHASHI[1], Patrick DOUGHERTY[2], and Jason TACKER[3]

Abstract

When students’ English scores reach the CEFR B1 level, they are able to read and write paragraphs smoothly and they become academically successful. The present research used three research questions to investigate how learners incrementally increase their TOEIC test scores through extensive reading. The first question concerns the number of English words that must be read to reach the CEFR B1 level. Students’ word counts were recorded by MReader for one academic year to estimate the word count that is necessary for reaching the CEFR B1 level. The TOEIC online test scores at the beginning and end of the school year were also recorded and the amount of reading that is necessary to reach the CEFR B1 was calculated. As a result, it was estimated that reading about 500,000 words was required. The second question is about identifying which factors most affect the final TOEIC scores. What had a greater effect on the TOEIC scores, the learner’s initial English ability or their reading volume? This looks like the classic chicken and egg problem, but multiple regression analysis of the data showed that the amount of reading affected their test scores more than their initial ability. The third question is about the students’ motivation. What psychological factors affect the amount of reading? We used multiple regression analysis and found that the students’ cognitive awareness and positive attitude toward reading were influencing the total amount of reading being done.

Keywords: TOEIC online test, MReader, word counts, English ability, psychological factors

Introduction

Practical skills of English are increasingly required in today’s world. Among other activities, Extensive Reading has been used by more teachers and is a useful approach to improve reading skills. A number of previous studies investigated the relationship between ER and TOEIC test scores (Nishizawa, Yoshioka, & Fukada, 2010; O’Neil, 2012; Carney, 2016; Nishizawa, Yoshioka, & Ichikawa. 2017; Goto, 2021). All in all, they hint that ER promotes the TOEIC test score growth. However, it is not enough to say the merit of ER if we would like to successfully make use of ER in our classroom. In the questionnaire we gave at the end of the school year, many

[1]Akita Prefectural University
[2]Akita International University
[3]Akita Prefectural University

students answered that ER was the most difficult activity among other activities. Even if they know that ER is an effective approach, they keep struggling against their doubt that ER is a waste of time. Is ER really a waste of time because it is difficult to continue? The answer is definitely no. We need to remind ourselves that the more difficult the task is, the more learners gain. For example, the authors of *Make It Stick: The Science of Successful Learning* say, "when you let the memory recede a little, for example, by spacing or interleaving the practice, retrieval is harder, your performance is less accomplished, and you feel let down, but your learning is deeper and you will retrieve it more easily in the future." (75) As English teachers, we would really like to give more information to our students to boost their word counts. How can we convince them that gaining the habit of reading is always difficult at first but the reward pays off in the end? In this short paper, we'd like to show evidence with which we can convince our students that ER is truly worthwhile to spend time on.

The research questions are as follows:

(1) How many words should a learner read to reach the CEFR B1 level?
(2) Which factor had a greater effect on the TOEIC scores, the learner's initial academic ability or their word counts?
(3) What psychological factors affect the amount of reading?

Method

Research Design

When we gave a questionnaire to our students at the end of the academic year of 2020, many of them answered that ER was the most difficult activity among others. One of them even wrote that he felt like his time was deprived by ER. Thus, we felt that it is not enough to say, "Read quickly and enjoyably with adequate comprehension so you don't need a dictionary." (*Guide to Extensive Reading*, p.1) In this short paper, some results of the analysis using the word counts, TOEIC online test scores, TOEIC Bridge test scores, and answers to the questionnaire will be shared. First, the word counts that will be necessary for achieving the level of CEFR B1 in the TOEIC test will be shown. Second, the effectiveness of ER will be statistically shown by comparing the students' original levels of English and word counts. Third, dominant factors that influenced the TOEIC scores will be identified by analyzing psychological factors.

Participants

This was a one-academic-year study that included students who volunteered in a freshman English class in 2021. The participants in this study numbered 17 male and female first-year students at a 4-year science and technology university in Japan. The students were between the ages of eighteen and nineteen years old and their native language was Japanese.

Procedure

The university library is equipped with 8,000 regular graded readers in addition to 550 eBook graded readers. Students were instructed to start with the easiest books. Books that were 2 or 3 levels lower than their current level were recommended so that they wouldn't be discouraged by high-level words or complicated grammar structures.

Word counts were recorded by MReader. It is a website where students can answer quizzes after reading graded readers. When students answer a certain percentage

correctly, they receive credit for the number of words in their account. The total word count for each student was downloaded and recorded each semester.

Online TOEIC® Listening & Reading IP test (hereafter TOEIC online test) was used to assess English proficiency. The tests were administered at the beginning (June) and the end (February) of the academic year. The TOEIC online test scores ranged from 10 to 990. The results were given to the test takers immediately after finishing the test.

The TOEIC Bridge tests were also given twice a year: the first in April and the second in late December. The TOEIC Bridge test is a low-level version of the full-scale TOEIC Listening & Reading test.

All the data including the TOEIC online test scores, the TOEIC Bridge test scores, the number of words recorded in MReader, and other data that was gathered in the questionnaire were analyzed by using SPSS ver.28.0.

Results

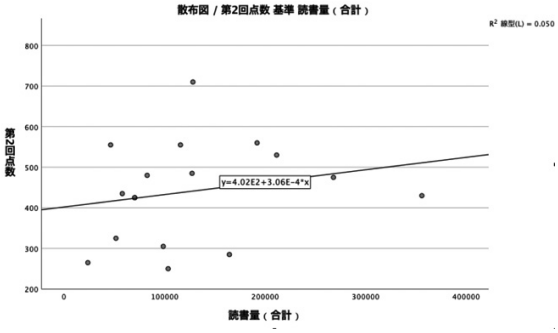
(1) How many words should a learner read to reach the CEFR B1 level?

As the results of the correlation analysis show, the correlation between the amount of reading and the score of the 2nd TOEIC online test was very weak. The *P*-value is larger than .05, so there was no significant correlation.

The correlation coeffient of the word counts and the second TOEIC test scores

	word counts	2nd TOEIC test score
correlation coeffient	1	.217
P-value		.403
frequency	17	17

However, by performing regression analysis, we were able to draw a regression line that predicts the correlation between reading volume and TOEIC scores. The regression equation is y=0.000306x + 402. If we use this equation to calculate the word count that is necessary for achieving 550 in the TOEIC test, a student must read 483,660. That is approximately 500,000 words.



(2) Which factor had a greater effect on the TOEIC scores, the learner's initial academic ability or their word counts?

Multiple regression analysis was used to create a prediction formula. In the prediction formula, the explanatory variables are the word counts, the scores of the 1st TOEIC online test, and the scores of the TOEIC Bridge test that were given in April and December. The response variable is the scores of the 2nd TOEIC online test. This prediction formula can also be called model construction. When the irrelevant explanatory variables are eliminated, the response variable can be explained by the appropriate explanatory variables. This is why the prediction formula is called model construction. An indicator of the fit of the entire model is the adjusted R-squared. This is like a correlation coefficient between the 2nd TOEIC online test scores and the predicted scores. It takes a value between -1 and 1. If you look at the standardization coefficient β, you can see

which of the two, the score of the 1st TOEIC online test or the amount of reading, had a greater effect on the scores of the 2nd TOEIC online test.

A prediction formula that predicts the response variable will be created by using multiple explanatory variables. To see if the prediction formula fits well, you need to look at the coefficient of determination R-squared (called adjusted R-squared in SPSS) and the *P*-value. To see if multiple coefficients in the prediction formula fit with a 95% probability, SPSS outputs the non-standardized coefficients, which are orders of magnitude different from the other coefficients. The standardized partial regression coefficient is arranged like a deviation value, and it is displayed as the standardized coefficient β in SPSS. The larger the value of β, the higher the rate at which the item affected the response variable.

Model summary

	R	R-Squared	Adjusted R-Squared	Standard error of estimates
	.900[a]	.810	.746	60.325

a. predicted value: (constant), word counts, April Bridge, December Bridge, June TOEIC, February TOEIC.

ANOVA

	sum of squares	variance	mean square	F-value	p-value
regression	1.86E+05	4	4.65E+04	12.771	.001[b]
residual	4.37E+04	12	3.64E+03		
total	2.30E+05	16			

a. dependent variable: TOEIC online test score in February

b. predicted value: (constant), word counts, April Bridge, December Bridge, June TOEIC.

Coefficients [a]

	non-standardized coefficients				
	B	standard error	standardized coefficient β	t-value	p-value
(constant)	-264.142	105.1248		-2.512	.027
Total word counts from April to January	.000	.000	.116	.910	.381
TOEIC Bridge test score in April	-.132	3.281	-.012	-.040	.968
TOEIC Bridge test score in December	8.897	3.602	.776	2.470	.029
TOEIC online test score in June	.182	.229	.149	.795	.442

a. dependent variable: Word Counts

Prediction formula that is based on the multiple regression analysis

Predicted score of the 2nd TOEIC online test=word counts x 0.000
- TOEIC Bridge test score (April) x 0.132
+ TOEIC Bridge test score (December) x 8.897
+ 1st TOEIC test score x 0.182

As a whole, we have a good prediction formula. The adjusted R squared is 0.746 and the *P*-value is 0.01. The most influential factor in this formula is the December TOEIC Bridge test scores with a standardized coefficient β of 0.776. When we compare the word counts (0.116) with the April TOEIC Bridge test scores (-0.012), we can see that the April TOEIC Bridge test scores had a negative influence and the amount of reading had positive influence on the final TOEIC scores. Unfortunately, the impact of the first TOEIC online test scores (0.149) is slightly higher than that of word counts (0.116). In this sense, initial English ability was more influential than the word counts. However, it is possible that the first TOEIC online test scores were affected by the amount of reading because the first TOEIC online test was held on June 12th. Our students had read Graded Readers for almost two months and a half before they

took the first TOEIC online test.

(3) What psychological factors affect the amount of reading?

Another point to note is that multiple regression analysis can be performed to determine what factors influenced the word counts the most. Factors such as 'feeling pleasant when reading English books' and 'willingness to choose a book they can read within 24 hours' were used as explanatory variables (predictor variables) when the word counts were the response variable (dependent variable).

Prediction formula that is based on the multiple regression analysis

response variable = factor1 x $\beta 1$ + factor2 x $\beta 2$ + ……

predicted word counts = (feeling pleasant when reading English books) x $\beta 1$
+ (willingness to choose a book they can read within 24 hours) x $\beta 2$ + ……

Note: $\beta 1$, $\beta 2$, $\beta 3$… are the values of standardized coefficient β in multiple regression analysis.

We have a good prediction formula again. The Adjusted R squared is 0.875 and the *P*- value is 0.043.

Model summary

	R	R-Squared	Adjusted R-Squared	Standard error of estimates
	.987[a]	.975	.875	32902.268

a. predicted value: (constant), Q1 , Q2, Q3, Q4, Q5, Q6, Q7, Q8, Q9, Q10, Q11, Q12.

ANOVA

	sum of squares	variance	mean square	F-value	p-value
regression	1.27E+11	12	1.55E+10	9.744	.043[b]
residual	3.25E+09	3	1.08E+09		
total	1.30E+11	15			

a. dependent variable: Word Counts

b. predicted value: (constant), Q1 , Q2, Q3, Q4, Q5, Q6, Q7, Q8, Q9, Q10, Q11, Q12.

The factors that influenced 'word counts' can be identified when we look at the values of 'standardized coefficient β'. Among the factors, Q2, Q3, and Q9 gave a positive influence on word counts. On the other hand, Q5, Q6, and Q10 gave a negative influence on word counts.

Coefficients [a]

	non-standardized coefficients				
	B	standard error	standardized coefficient β	t-value	p-value
(constant)	-554063.92	190666.154		-2.906	.062
Q1 Do you feel it's pleasant to read an English book that you can easily understand?	-6171.32	8464.980	-.116	-.729	.519
Q2 Would you like to choose an English book that you can finish reading within 24 hours?	99272.152	22420.235	1.774	4.428	.021
Q3 Do you think it's important to finish reading a whole English book within 24 hours?	-44257.558	15658.239	-.911	-2.826	.066
Q4 Do you think it's important to read an English book every day?	141407.921	40171.381	2.286	3.520	.039
Q5 Are you always ready to read an English book?	-137440.130	26170.072	-3.746	-5.252	.013
Q6 Do you go to a library to borrow or read English books?	-33865.282	6721.461	-.972	-5.038	.015
Q7 Do you like reading English books in your spare time?	54031.813	21548.429	1.513	2.507	.087
Q8 Do you sometimes visit English websites and read them on the Internet?	13318.415	6350.55	.480	2.097	.127
Q9 Do you try to find time for reading in English?	83752.271	17676.518	2.301	4.738	.018
Q10 Do you want to read at least one English book during your vacation?	-64683.509	14917.249	-1.580	-4.336	.023
Q11 If someone tells you that he or she likes an English book very	-30048.171	15527.814	-.662	-1.935	.148
Q12 Do you want to read many English books in the future?	7848.153	19369.492	.235	.405	.713

a. dependent variable: Word Counts

Discussion

(1) How many words should a learner read to reach the CEFR B1 level?

As we have seen in the previous chapter, there was no statistically significant correlation between the word counts and the TOEIC test scores. *P*-value was much bigger than 0.05. However, this situation often happens when the sample size is small. The correlation coefficient shows a very weak correlation between the two factors. In our calculation, the word counts that is necessary for achieving 550 points in the TOEIC test was 483,660 words, and the number is very close to 500,000 words. Around 550 points in the TOEIC test is the minimum score of the CEFR B1 level. In our previous study (Takahashi, 2021) that used the data of TOEIC Bridge test scores, we had a similar result. Therefore, 500,000 words can be recommended as a specific goal for our future extensive readers.

(2) Which factor had a greater effect on the TOEIC scores, the learner's initial academic ability or their word counts?

Look at the standardization coefficient β in the following prediction formula:

Prediction formula that is based on the multiple regression analysis

Predicted scores of the 2nd TOEIC online test = word counts x 0.000
-first Bridge test scores (April) x 0.132
+ second Bridge test scores (December) x 8.897
+ 1st TOEIC online test scores x 0.182

Both the second Bridge test scores in December (8.897) and the 1st TOEIC online test scores in June (0.182) had greater influence on the scores of the 2nd TOEIC online test. However, the word counts (0.000) had greater influence on the 2nd TOEIC online test scores than the first Bridge test scores in April (-0.132) did.

Consequently, the word counts had larger influence on the final scores of the TOEIC online test scores than the first Bridge test scores did. This supports the argument that the word counts had larger influence on the final TOEIC online test scores more than the students' initial English ability that was assessed by the first Bridge test scores in April.

(3) What psychological factors affect the amount of reading?

Among the items that influenced the word counts, the loadings of Q2, Q3 and Q9 had greater effects on the word counts. These are all related to psychological conation (willingness to read) and cognition. On the other hand, Q5, Q6, and Q11 gave negative impact on the word counts. Interestingly, those who didn't go to the library to borrow books and didn't read the books recommended by someone else, read more books. These items (Q5 and Q6) are also conative factors. The results lead us to think that avid readers are those who are cognitively aware of the importance of reading and reading books on their own will.

Q1 Do you feel it's pleasant to read an English book that you can easily understand? (Affective)
Q2 Would you like to choose an English book that you can finish reading within 24 hours? (Conative)
Q3 Do you think it's important to finish reading a whole English book within 24 hours? (Cognitive)
Q4 Do you think it's important to read an English book every day? (Cognitive)
Q5 Are you always ready to read an English book? (Conative)
Q6 Do you go to a library to borrow or read English books? (Conative)
Q7 Do you like reading English books in your spare time? (Affective)
Q8 Do you sometimes visit English websites and read them on the Internet? (Affective)
Q9 Do you try to find time for reading in English? (Conative)
Q10 Do you want to read at least one English book during your vacation? (Affective)
Q11 If someone tells you that he or she likes an English book very much, are you going to read it too? (Conative)
Q12 Do you want to read many English books in the future? (Affective)

We hope the results of this small research study provide useful information for other teachers to promote extensive reading. In the future, we would like to give our students the information from this research (i.e., 500,000 words of word counts to reach CEFR B1 level, the importance of cognitive awareness and setting goals to become avid readers) and conduct a further questionnaire survey to investigate whether these factors promote extensive reading further.

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