

## **Free Productive Ability and Lexical Text Analysis to Improve Student Writing**

Mark Deadman

### **Keywords:**

Writing, Free Productive Ability, Lexical Analysis, Correlation, Peer and Self Grading

### **Abstract**

The classroom is often an arena of *Controlled Productive Ability*. Within this system, the teacher issues communiques and makes deposits which the students patiently receive, memorize, and repeat. Further, this ‘banking’ concept of education, extends the scope of action afforded to students only as far as receiving, filing, and storing the deposits. Education is thus seen as a process of depositing knowledge into passive students. Freire (1970) exhorts that ‘...the more completely they (the students) accept the passive role imposed on them, the more they tend simply to adapt to the world as it is and to the fragmented view of reality deposited on them’.

This research paper will look at how a class of low-intermediate Japanese learners of English, can become more attuned to *Free Productive Ability*, the active use of productive vocabulary, in their written English endeavors. Writing itself is a production skill, in that it requires learners to produce language, as with speaking activities. Written English can be used to produce a message that you want others to understand. However, at most stages of the writing process from selecting themes and topics, brainstorming ideas, organizing ideas, drafting a text, reviewing and editing before submission, and finally grading and reflecting, the student is part of a passive process managed by the authority of the teacher. This inhibits student critical thinking and the ownership of their own productive abilities. An alternative is to develop and practice a free productive system, limiting the traditional teacher-centric learning system. At all times, students should be encouraged to think, and tackle problems presented to them on their own. This

research builds on previous research of student self-affirmation (Deadman, 2015a, 2015b, 2016a and 2016b).

## 1. Introduction

As both a teacher and researcher, interested in helping students to perform better and become more independent, I felt it was pertinent to increase the ‘active’ participation of students not only in their own writing endeavors, but also in the grading and evaluation aspects of writing. This would require a more appropriate grading system, one that was simplified for students to understand and complete successfully. In addition, I wanted to utilize technology more to simplify my own grading work, and also incorporate a grading system that was fairer to the students in terms of appropriate grading of each text. Technology can offer a quantitative grading system that allows for a faster, more equitable and fairer system and at the same time can offer each student insights into their own individual writing that an English teacher may not be able to realize. This research represents an amalgamation of traditional learning techniques (textbooks, wordlists, student writing, a classroom setting), with non-traditional grading (peer and self), and the use of statistical analysis and technology (statistical analysis and correlation testing).

## 2. Literature Review

The principal source of literature for this research paper comes from Laufer and Nation, in their 1995 research paper, *Vocabulary Size and Use: Lexical Richness in L2 Written Production*. They proposed a new measure of lexical richness in a text composition, the *Lexical Frequency Profile*, which looks at the proportion of high frequency general service and academic words in learners writing. The study shows that it is possible to obtain a reliable measure of lexical richness which is stable across two pieces of writing by the same learner. The authors state that this reliable and valid measure of lexical richness in writing is useful for determining the factors that affect judgements of quality in writing and is useful for examining how vocabulary growth is related to vocabulary use. In the process of their research, Laufer and Nation (1995) developed the software program *VocabProfile* for statistical lexical analysis, and validated it as a research instrument. *VocabProfile* is freely available on the Internet, with the expressive purpose by the authors Laufer and Nation to allow other researchers to undertake similar research. *VocabProfile* takes any text and divides its words into four categories by frequency: (1) the most frequent 1000 words of English (*K1*), (2) the second most frequent thousand words of English, i.e. 1001 to 2000 (*K2*), (3) the academic words

of English (the *AWL*, 550 words that are frequent in academic texts across subjects), and (4) the remainder which are not found on the other lists called the *OFFlist*. In other words, *VocabProfile* measures the proportions of low and high frequency vocabulary used by an English language native speaker in a written text. A typical breakdown of a text has a split of 70-10-10-10, or 70% from first 1000, 10% from second thousand, 10% academic, and 10% less frequent words.

Laufer and Nation (1995) state that this relatively simple tool has been useful in understanding the lexical acquisition and performance of second language learners. In addition to the breakdown of the word frequencies, the software also provides amongst other tests, variables such as *different words*, *type-token ratio*, and *lexical density*. All three of these variables were calculated in this research. The *different words* variable is simply a measure of how many different word family types are in a text. From this, the *type-token ratio* indicates the number of different words in the text (*types*) divided by the number of words on which they are based (*tokens*). If learners are being encouraged to increase the variety of words used in their writing, they will be encouraged by a higher type-token ratio number.

Meara, Lightbown, and Halter (1997) considered classrooms as lexical environments. Analyzing typescripts of classroom interaction with *VocabProfile*, these researchers found that virtually all the vocabulary offering across several classrooms consisted of basic items from the 0-1000 frequency level. In addition, Meara and Fitzpatrick (2000) proposed that an alternative to multiple choice vocabulary tests, typical of many classrooms, is for an active vocabulary test using the *VocabProfile* framework. Cobb and Horst (2001) grew academic vocabulary with a collaborative online database. In their study, Asian and Francophone learners contributed word look-ups to a collective database of academic vocabulary. Morris (2001) also looked at the use of vocabulary profiles in predicting the academic and pedagogic performance of TESL trainees. The purpose of the study was to explore the potential for using vocabulary profiles as predictors of academic and pedagogic success in the case of TESL trainees.

### 3. Hypotheses

The hypotheses of this research paper take their lead from the research of Laufer and Nation, in their 1995 paper, *Vocabulary Size and Use: Lexical Richness in L2 Written Production*. As detailed above, this paper proposed a new measure of lexical richness in a text composition, the *Lexical Frequency Profile*, which looks at the proportion of high frequency general service and academic words in learners writing. As Laufer and Nation proved the validity of Lexical Frequency Profiles, I decided to

measure student's lexical richness over a semester, through six assignments from the start of the course to the end. The hypotheses for this paper are limited to two, that encompass a whole set of data in the form of 139 collected assignments from 29 students.

### Hypotheses

- A) *Over the course of one semester, students' writing will display an increase in greater lexical complexity, denoted by a decrease in the percentage of K1 (the first thousand words in English) words used, with a simultaneous increase in the percentage of K2 (the first two thousand words in English) words and AWL (Academic word list) words.*
- B) *Over the course of one semester, the lexical profile of the students will show an increase in the number of different words (types) used, type-token ratio, and the lexical density (content words/total).*

## 4. Methodology

### 4.1 Participants

The data for this study was collected from student writing assignments in the Writing 'C' class. Writing Class 'C' denotes that the class is at a lower intermediate level of English.

The students in this class represent a homogenous group of students aged 18-19, all ethnically Japanese, and of similar English language linguistic and educational levels, based on their TOEIC test scores. The sample group represents 29 students, with a 21/8, male/female split, attending Kyoai University.

### 4.2 Study type

This research details an extensive quantitative study utilizing statistical analysis and correlation testing. This quantitative study will present a large collation of data to test and validate the hypotheses.

### 4.3 Sampling Method

Conducting a large-scale data collection exercise for testing and developing student written skills requires the researcher to assume that any results would yield

valuable evidence for any hypotheses proposed. Before embarking on such a large-scale data collection, processing and analysis, as a researcher I needed to be certain that I could gather some valuable data and results, and that ultimately this could be passed on to my students, enabling them to benefit in better writing skills.

In the first instance, statistical analysis and correlation testing of the textbook example texts and the student's first written assignments were conducted to provide a smaller scale indication that comparing different texts, textbook and student texts, would yield some insights into how to improve student writing skills. Once validated, as detailed below, the two hypotheses were applied to the remaining written assignments in the first semester of the 2017 Spring/Summer schedule.

#### 4.5 Data Collection

Student assignments and a final composition were collected from the students over the first semester of the 2017/18 academic year. In total, 26 assignments were analyzed in the first stage of the hypothesis formation, and a further 113 assignments were analyzed over five more units in the first semester. This figure of 139 analyzed assignments represents a large-scale data collection sample, adding a high degree of validity to the statistical analysis of the assignments.

#### 4.6 Data Processing

Once the assignments were downloaded from Moodle, they were prepared and input into the software program *VocabProfile* on the lextutor.com website, as per Laufer and Nation (1995). Laufer and Nation developed this program for their own research paper and made it available freely over the Internet to 'interested researchers'. The 'preparation' of each assignment before entering the data into the software entailed editing of the original text. Every assignment was edited to enable a fairer and more accurate measure of a student's written lexical richness, or density. Firstly, number forms and proper nouns were removed as they do not reflect a student's lexical knowledge, and refer only to a unique number or entity, such as *Kyoei University*, *Saki*, *Gunma*, or *Google*. Words that were clearly used incorrectly, such as inserted Japanese lexis were deleted. Incorrect spellings were re-spelt before analysis as they indicate lexical depth and range of the writer, albeit incorrectly spelt. Comprehensible grammar mistakes were left unedited, as they still represent the student's lexical richness, as shown in the following examples;

(*了*) This program was record (was recorded)

(イ) *Many things were happened* ('happened' or 'have happened')

(ウ) *I dreamt that I was on voyage* (on a voyage)

After pasting the edited text into the software program *VocabProfile*, a lexical text analysis was performed, generating word frequency lists, the number of *different words*, the *type-token ratio*, and the *lexical density* of texts. Once the raw data, in the form of written assignments, was collected and prepared for a text analysis, a statistical analysis was also employed to search for valid patterns in student writing, and to formulate a better grading system. The statistical analysis produced a large amount of data, for each assignment, student, and the class. Lexical analysis was performed to give a breakdown of student texts into the word count, the number of different words, the type-token ratio and the lexical density of each text.

Following the statistical lexical analysis of the student texts, correlation and regression analysis was performed on the overall tabulated data of the class. Lowry (1999) explains that correlation and regression refer to the relationship that exists between two variables, X and Y, in the case where each value of X is paired with one value of Y. For example: the measures of height for individual human subjects, paired with their corresponding measures of weight; or more pertinent to this study, the number of words or tokens in a student assignment, paired with a corresponding variable such as the K1, K2, AWL or off-list word ratios.

## 5 Results

### 5.1 First stage hypotheses testing

The next step was to apply the statistical lexical analysis and correlation and regression analysis, using the *VocabProfile* software. This analysis would add statistical parameters to the grade, ensuring a fairer quantitative grading, than a teacher controlled qualitative and subjective grading system. The initial results from the first assignment were collated to test the validity of this research. With any course, it is important to match class materials to student level, or rather to a level that appropriately challenges the student to perform better. Invoking the Russian educator and psychologist Vygotsky, the classroom textbook 'Academic Writing', is appropriate to the notion of scaffolding, Vygotsky said instruction is only useful when it moves ahead of development, drawing learners just beyond their existing capabilities to 'stretch' their intellect and so help them to develop (Mercer, 2000). Teaching should be appropriate to the student's potential, rather than actual achievements. To achieve this, we need to provide a 'scaffold' for learning. Table 1 below outlines the student's typical English level, from

their first assignment at the outset of the course, compared to the first twelve textbook examples from the designated course textbook. The first twelve text examples from book, texts which students will cover in the first semester of their study and with this research, are useful indicators of the overall level of the textbook from the outset of the course. Students need to understand and utilize these texts for their own writing, adhering to the level of the book and working towards attaining a similar lexical complexity.

	Words	K1	K2	AWL	Off	Different words	Type-token ratio	Lex Density
Text 1	136	86.03	2.94	3.68	7.35	86	0.63	0.48
Text 2	123	78.86	3.25	0.81	17.07	73	0.59	0.54
Text 3	154	82.47	6.49	0.00	11.04	91	0.59	0.55
Text 4	193	80.31	11.40	0.52	7.77	102	0.53	0.46
Text 5	186	93.01	2.15	4.84	0.00	77	0.41	0.34
Text 6	135	80.74	11.85	1.48	5.93	71	0.53	0.52
Text 7	153	83.66	8.50	0.65	7.19	84	0.55	0.60
Text 8	171	83.04	4.68	5.26	7.02	95	0.56	0.55
Text 9	137	86.06	6.57	0.00	6.57	83	0.61	0.45
Text 10	146	87.67	7.53	0.00	4.79	100	0.68	0.52
Text 11	159	88.68	2.52	3.14	5.66	91	0.57	0.50
Text 12	188	80.85	4.26	5.85	9.04	107	0.57	0.53
Average	157	84.28	6.01	2.19	7.45	88	0.57	0.50
Student Assignment 1	141	88.9	4.3	1.04	5.75	80	0.57	0.54
Difference	-16.0	+4.62	-2.29	-1.15	-2.30	-8	0	+0.04

Table 1 - Statistical Analysis of student texts in Semester 1

The book examples show an average text level of K1 words, the first thousand words used in English of 84.28%, compared to the student level of 88.9%. Therefore, the course textbook exhibits a denser lexical richness than the average student text for Assignment 1. This assignment was used in isolation from the other student texts to show the initial student level of lexical richness, before they had studied from the course textbook and had learnt techniques for improving their writing skills. This is the base

level of their writing at the outset of the course. The range of the K1 ratio from 78.86% to 93.01% in the example texts, from the course textbook, reflects a wide difference in complexity of texts.

The second most common words used in the English language (those in the 1001-2000 range), denoted by K2, account for 6.01% of the tokens found in the text, compared to 4.3% for the average student text. In addition, the book examples display 2.2% level of academic words (AWL), compared to the student level of 1.04%. These figures show a higher complexity level of the textbook examples, compared to the average student text. The course textbook is an appropriate challenge to the students, in that the K2 and AWL word count is higher than that of the student texts, 8.2% compared to 5.34%.

However, there is little distinction in the lexical density of words, the ratio of content words out of the total words in the text, between the book examples and the student texts, at 0.50 to 0.54 respectively. However, the twelve textbook examples show a range in lexical density ratio from 0.34 to 0.60. More than half of these texts have a ratio of 0.50 to 0.60, which would fall within a good rate for challenging a student within an increase of complexity, adhering to Vygotsky's notion of *Zones of Proximal Development* (Mercer, 2000). As detailed above in the statistical lexical analysis section, using the demo examples from the *VocabProfile* page itself, a typical science text will have a higher lexical density, with the demo example attaining 0.62, a 'news' text recorded 0.55, and even the abstract for this research paper recorded a ratio of 0.59. However, the limiting factor in these texts is their rather limited word count, due to space restrictions in the text layout, and for better clarity for the students. The average word count of the textbook examples is 157, compared to the student's first writing average as a class of 141. It is hypothesized that through adherence to the words and phrases provided by the textbook, self-monitoring and peer feedback, students can improve on their lexical density ratios, providing a better reflection of their potential writing skills. As such, it is expected that the word count of student texts will necessarily and naturally increase over the course of the semester, to accommodate better and more detailed writing skills.

At the same time, as the book examples are on average 157 tokens, or words, in length, students will often use this as a guide for writing. However, the book is maximizing space for its examples, so the students were informed of this fact. As mentioned above, although I am the teacher of the class, I wanted the students themselves to set the word count for the assignments. As such, it was observed from the data, shown in Table 4, that the students surpassed this book word count from Units 4 to



8, with some students regularly attaining 300 words per assignment and the class average reaching 268 items by the last assignment. In addition, a motivating factor for increasing the word count is the extra points that could be gotten for writing longer texts. Not within the scope of this research, the word count points were actually determined by the students on performance and effort. For each assignment, students were awarded points based on the class average. Students were then awarded, or deducted points based on their word count in relation to the class average.

The course textbook provides useful words and phrases for various themes to help students become better writers in terms of improving their lexis. These words are challenging for the student as seen in the lexical make-up of the vocabulary. The ‘useful words and phrases’ taken from the course textbook, are presented in statistical lexical analysis form in Table 2 below.

	Families	Types	Tokens	Percent
K1 Words (1-1000):	55	57	59	53.15%
Function:	...	...	(13)	(11.71%)
Content:	...	...	(46)	(41.44%)
K2 Words (1001-2000):	26	26	26	23.42%
K1 + K2 Words (0-2000)		...	...	(76.57%)
AWL Words (academic):	5	5	6	5.41%
Off-List Words:	...	20	20	18.02%
	86	108	111	100%

Table 2 - Statistical lexical analysis of texts from the course textbook (Units 3-8)

The actual number of listed words, tokens, is small (111 words), and is made up of 86-word families and 108 types. An interesting and useful element within this data is the breakdown of function and content words in the K1 word list. Function words carry only grammatical meaning such as: prepositions (in, on, at etc.), auxiliaries (are, was, do etc.), quantifiers (some, any, all etc.) and pronouns (he, we, this etc.). Content words are those that carry real meaning such as nouns (Sophie, chair, computer etc.), verbs (hit, swim, eat etc.), adverbs (wrongly, frequently, generally etc.) and adjectives (beautiful, green, fantastic etc.). Normally, content words carry stress and function words are unstressed or weak. In this sense, it is important for students to develop their depth and range of content words that will help them to improve their written skills through adverbs and adjectives, and more complex vocabulary. They should have a

sound structure of function words from their lower intermediate level of English, probably repeatedly drilled in secondary education English classes.

This sample of words shows that it is heavily populated with less common words, those from the K2 list, AWL and Off-list tokens, at 46%. This is not representative of a sample text, as it only lists words that students can use to better express their written expression. However, it provides a useful indication of the level of words that students need to use, those found in the 1001-2000 word list.

The second stage of the hypotheses testing was statistical analysis and correlation testing.

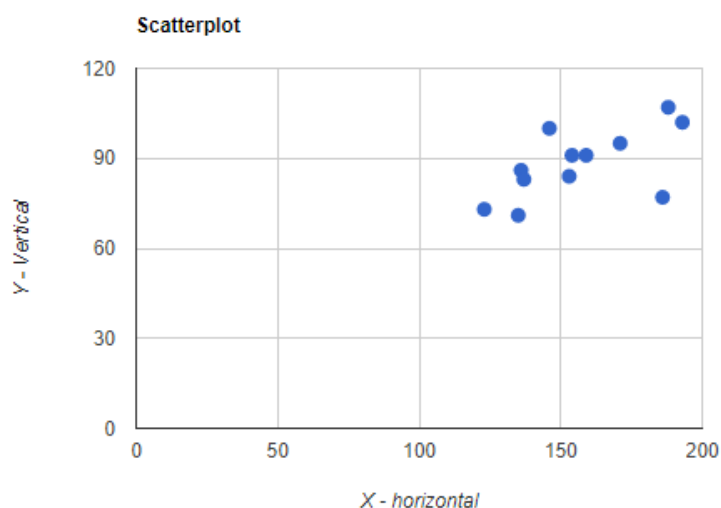


Figure 2 - Scatterplot graph: *Word count* matched against *different words* (Student textbook averages)

In analyzing correlation and regression coefficients, it is important to discover any patterns from the course textbook. All twelve textbook examples were tested for statistical correlations. The first correlation test performed, as shown in Fig 2 above, shows a strong positive correlation between the X horizontal axis recording text example *word counts*, and the Y vertical axis of *different word* types. This visually and statistically significant correlation appears self-explanatory, in that the independent variable of word count and dependent variable of different word types, reflects the tendency for high values of X (word count) to be associated with high values of Y (different word types), and vice versa; hence, the data points will tend to line up along an upward slanting diagonal. This test has a positive correlation of efficient of  $r=0.61$ , with a resultant correlation determination of  $r^2=0.37$ , and both P levels (one and

two-tailed) are significant at 0.02 and 0.04 respectively. A one-tailed test and a two-tailed test are alternative ways of computing the statistical significance of a parameter inferred from a data set. We can therefore say that the correlation coefficient, as expressed by  $r=0.61$ , is 61% as strong as it could be, given the values from the student data of  $X_i$  and  $Y_i$ . In addition, the coefficient of determination, as expressed by  $r^2=0.37$ , is 37% as strong as it could be, given the values from the student data of  $X_i$  and  $Y_i$ . Therefore, taking  $r^2$ , the coefficient of determination, as a truer determination of the strength of a correlation, we can say that 37% of the variability in Y (score) is coupled with variability in X (word count), and vice-versa.

As stated above, it would seem explanatory that a higher word count would result in a higher number of different word types. However, this correlation was used as an initial test to show the usefulness of correlation to detect patterns that are not always obvious to the teacher, when presented with a series of data. Such correlation analyses quickly show the researcher patterns in their data that can be analyzed further for other patterns. Only two other significant correlations were found in the textbook examples. Of 12 correlation tests, with 24 P1 and P2 variables calculated, only four correlations were found to be statistically significant. In addition to the two correlations described above, two other correlations were found to be statistically significant. As stated above taking the  $r^2$  coefficient of determination as a truer determination of the strength of the correlation, the first correlation attained which explains that a score of 0.30 or 30% of the variability in X (word count) is coupled with variability in Y (type-token ratio), and vice-versa. In addition, an  $r^2$  score of 0.27 explains that a 27% variability in X (type-token ratio) is coupled with variability in Y (lexical density). Both scores are significant at only the P1 level. It must be remembered that the *type-token ratio* is derived from the ratio of different words to the word count.

The correlation tests of the textbook show that a limited range and depth to text examples does not show a significant correlation between variables. The average text word count was only 157, with the range between 123-193 words. In addition, the average figures for K1 (84%), K2 (6%) and AWL (2.1%) indicate a consistently pitch level of a writing design to challenge low intermediate students, such as those in this study.

The first stage hypotheses testing provided valid evidence that a large-scale data collection exercise, with appropriate statistical analysis and correlation testing would be a valid research plan, to help students, become better writers. The original hypotheses were as follows;

1. *Over the course of one semester, students' writing will display an increase in greater lexical complexity, denoted by a decrease in the percentage of K1 (the first thousand words in English) words used, with a simultaneous increase in the percentage of K2 (the first two thousand words in English) words and AWL (Academic word list) words.*
2. *Over the course of one semester, the lexical profile of the students will show an increase in the number of different words (types) used, type-token ratio, and the lexical density (content words/total).*

The first stage hypotheses testing show that the student textbook is pitched at a higher lexical density than the first student texts. The book adequately scaffolds student learning and development over their Writing class course. Both Table 1 and Table 2 illustrate that the textbook has a lower level of word frequency in the K1 range, and a higher level of word frequent within the K2 and AWL ranges. In addition, the textbook texts have higher *word counts*, a greater number of *different words*, but a similar level of *type-token ratio* and *lexical density*. This means that students have the potential at this stage to write longer texts, with a similar lexical density, but need to develop a greater number of *different words*. Table 2 shows that the textbook and the associated 'useful words and phrases' that it provides throughout the lessons are content-heavy lexis, compared to function-heavy words that students use in their writing. The textbook therefore offers an opportunity for students to develop as writers, validating a large-scale data collection of student texts for greater analysis.

## 5.2 Second stage hypotheses testing

The first stage hypotheses testing validated further lexical analysis, statistical analysis and correlation testing of student assignments to ultimately improve the students writing skills through better lesson preparation, student written production, student's free productive ability and grading.

Five further student assignments were included in this process, as presented in Table 4 below. The table details the complete breakdown of the lexical analysis of all student texts set as assignments in Semester 1. It is seen in the table that the *word count* figure increased by 127 from Text 1 to Text 6. At the same time, the number of *different words*, increased by 59. As explained above, as the K1 score fell, the K2 and AWL scores increased. The OFFlist score also fell, at students learned to edit and replace lexis terms for Japanese words and replaced repetitive use of names with other personal pronouns.

	Words	K1	K2	AWL	Off	Different words	Type-token ratio	Lex Density
Student texts								
Text 1	141	88.9	4.3	1.1	5.9	86	0.59	0.49
Text 2	187	88.0	6.0	0.8	5.1	98	0.60	0.46
Text 3	193	89.5	5.2	2.2	3.1	92	0.50	0.50
Text 4	208	85.3	7.7	1.3	5.7	108	0.50	0.50
Text 5	219	88.7	5.7	1.4	4.3	117	0.54	0.46
Text 6	268	88.2	4.6	2.5	4.7	145	0.55	0.54
Average	203	88.1	5.6	1.6	4.8	108	0.54	0.49
Textbook (12 texts)								
Average	157	84.3	6.01	2.2	7.4	88	0.57	0.50
Difference	46	3.8	-0.4	-0.6	-2.6	20	-0.03	-0.01

Table 4 – Lexical Analysis of all student texts (Class averages)

The next correlated tests were carried out for the students' written assignments. As stated above, it is hypothesized that over the course of the first semester, with students working through textbook examples and applying these to their own writing, their writing skills will improve over the various categories. A total of 72 correlated tests were made, matching 12 pairs of variables ( $X + Y$ ) over six written assignments in the first semester. From these 72 correlations, 144 P1 and P2 scores were recorded, with 50 (34.7%) found to be significant, compared to only four (16.6%) significant scores from the textbook examples.

The greatest number of significant correlations was found between two tests, that of the matching between *word count* and *different words*, and between *word count* and the *type-token ratio*. As detailed above, the *type-token ratio* is a calculation of the ratio of different words and total word count. These two tests, recording 12 significant correlations each, accounted for 24 out of 50 correlations (48%), of all tests. Of these 24 significant correlations, 22 with strongly significant at a  $<0.0001$  level at both the P1 and P2 levels. The strongly significant correlation, at both the P1 and P2 levels, between *word count* (X) and *different words* (Y) in the averages figures for the class in each unit

or writing assignment indicates not only an expected increase in word count results in an increase in different words, but that the low-level intermediate students in this writing class are able to increase the length of their texts without resorting to simply repeating words to get a higher word count. As the word count increases, the correlation analysis shows that these student writers have incorporated more words into their texts. These words would have been garnered from textbook examples, but also from developing their ideas and thoughts and putting these on to the page. The course textbook averaged 157 words per text with 88 different words, for a ratio of 0.56. The student text examples averaged 203 words with 105 different words, or a ratio of 0.51.

Therefore, there is also a strong correlation between word count and the type-token ratio. Test 7 measures the correlation between the word count (X) and type-token ratio (Y). As detailed above, the *type-token ratio* is the ratio obtained by dividing the types (the total number of different words) occurring in a text or utterance by its tokens (the total number of words). A high *type-token ratio* indicates a high degree of lexical variation while a low *type-token ratio* indicates the opposite. Criticism leveled against test involving type-token ratio is that the ratio varies widely in accordance with the length of the text being studied. Longer texts might have lower *type-token ratio* than shorter texts. The student writing a long text would need to use many more different words to get a higher *type-token ratio* than a student writing a short essay. This is especially true for the typical student in the class in this study, of a lower intermediate level of English, who would probably use a higher number of adjectives, and repeat them, rather than use many different words about a noun. For example, a student writing about their best friend in the first assignment about descriptions, would probably use many high frequency adjectives such as pretty, cute, friendly, kind, tall and short. However they will probably repeat some of these words a lot throughout the essay, such as friendly or kind. At this level of English, they would probably refer to their friend using vocabulary such as friend, he or she only. The overuse of these nouns and personal pronouns, compensates for the lack of knowledge about other terms that could be used, such as mate, soulmate, pal, companion or buddy to name but a few.

It was hypothesized also that student lexical density would increase over the semester. The *lexical density* figure used in this software refers to the ratio of content words out of the total words in the text, or tokens. *Lexical density* constitutes the estimated measure of content per functional (grammatical) and lexical units (lexemes) in total. Spoken texts tend to have a lower lexical density than written ones. Balanced lexical density is approximately 50 percent. This means that half of each sentence is made up of lexical words and half of functional words. Lexical words give a text its

meaning and provide information regarding what the text is about, simply nouns, adjectives, verbs, and adverbs. Generally, texts with lots of lexical words tend to be specialized academic texts. Low lexical density texts are easier to read, but if the density is too low, writing becomes meaningless and vague. Surprisingly no significant correlations we found between word count and lexical density. The students apparently displayed no increase in lexical density over the course of the six written assignments. The Lexical Density score attained by all students in the six assignments averaged 0.49, compared to 0.50 for the twelve textbook examples. This average student score indicates that there was an even balance between content and functional words. In this case, the students haven't developed greater lexical density over the six assignments at face value according to this score. Student writing relies on a balance of content and function words, regardless of the length of the texts. However, this also indicates that the lexical density didn't fall relative to an increased word count, meaning that students are writing longer texts, but maintaining a constant level of complexity. This means that students can write longer texts, but at this point in their writing knowledge they need help making their ideas more creative and descriptive, using more of their passive bank of vocabulary in meaningful and contextual ways, through higher level vocabulary and more content words.

This fact is backed up by the correlation tests that reveal that of 36 possible correlations incorporating lexical density scores, matched with word count, K2 and AWL, and Type-token ratio, only the latter two recorded moderately significant correlations. No significant correlations were recorded when matched with word count. However, this issue must be addressed so that students can begin to add word depth and range to their writing as their ideas develop, using a greater number of K2 and AWL words in longer texts, than relying on the familiar, expressed in their K1 level writing.

	Families	Types	Tokens	Percent
K1 Words (1-1000):	329	447	3411	90.24%
Function:	...	...	(2075)	(54.89%)
Content:	...	...	(1336)	(35.34%)
K2 Words (1001-2000):	64	76	160	4.23%
K1 + K2 Words (0-2000)		...	...	(94.47%)
AWL Words (academic):	24	27	40	1.06%
Off-List Words:	...	75	169	4.47%
	417	625	3780	100%

Table 5 - Assignment 1 (full student texts statistical lexical analysis)

Table 5 compiles and breaks down all 26 student texts from the first assignment. The K1 listed words account for 90% of all tokens, or words in the texts. Of these, 55% are function words, and 35% are content words. Therefore, students are relying on grammatical terms in their writing, indicating that they have a low level of vocabulary in the form of content words such as nouns, verbs, adverbs and adjectives. The ‘Useful words and phrases’ listed in the student textbook revealed a greater concentration of content words (41%) compared to function words (12%). This indicates that the scaffolding of student learning and progression provided by the book, focuses on the need to develop content vocabulary power, whereas the students at the outset of the course were reliant on function words, perhaps an indication of their English learning from secondary education, one which relies on rote learning, memorization, word lists in a controlled practice ability setting, the notion that the teacher controls most elements of learning, leaving little free practice to the students and lacking creativity and original thought. This ‘Banking of Education’ removes decision making by the student, the writer, as students fill in pre-determined texts, gap-fill exercise, translate texts from Japanese to English and vice-versa. Such students are ill-prepared to create their own imaginative and descriptive texts.

For the type of academic writing students need to achieve, it is necessary to address their current writing skills, incorporating written English skills such as nominalization, the process of turning verbs into nouns; actions into concepts and ideas. In addition, writing should be concise and succinct, with no unnecessary words, sentences and parts. The textbook itself is a scaffold that contains stock phrases in each unit as a guide for student writing. These phrases are useful in constructing sentences and paragraphs, but teachers need to ensure that examples aren’t overused and that the selection is taught more succinctly, and more appropriate examples are used in each instance. Another tactic to improve lexical density is for students to draft their texts and redraft them more carefully and actively. One popular approach to redrafting written work is to get students to use a marker to black out redundant parts, often allowing students to shorten an original text, clearing the deadwood away and allowing students to expand those parts that offer the writer and reader a better piece of writing. In addition, the presentation of complex ideas as a series of single sentences is typical of lower intermediate students. By combining sentences, using nominalized terms, redrafting, students can increase their increase the lexical density of their texts while reducing the word count and presenting a clearer text. In addition, these teaching ideas provide the student with instantaneous self-correcting feedback and guidance.



## 7. Conclusion

In the first case, this research has allowed a detailed tabulation of the course textbook in terms of example texts that students use as a basis of their own writing. The data and subsequent statistical and correlation analysis has confirmed that the textbook is pitched at a slightly higher level than the students' current level, in terms of lexical density. This fact allows me as the teacher to continue using the textbook, knowing that it is an appropriate and challenging source material for this level of student. Ideally, every teacher would engage in a similar check of the materials they use, to confirm that they have pitched materials at an appropriate but challenging level. From this, a detailed breakdown of student texts, over six assignments was conducted to test the hypotheses.

This research has demonstrated that the hypotheses have been realized, albeit to a smaller than expected degree.

Hypothesis A stated that:

*Over the course of one semester, students' writing will display an increase in greater lexical complexity, denoted by a decrease in the percentage of K1 (the first thousand words in English) words used, with a simultaneous increase in the percentage of K2 (the first two thousand words in English) words and AWL (Academic word list) words.*

From statistical analysis of the students' written assignments, an inverse relationship was found between the student text word count and the K1 score. The first written assignment scored an average of 88.9% for K1 words, against an average for all texts of 88.1%, a 0.8%-point decrease over one semester. This is matched by the fact that the K2 and AWL scores conversely increased as the K1 score fell. The K2 score increased from 4.3% in the first written assignment to a six-assignment average of 5.6%, and the AWL score increased from 1.1% to 1.6% over the same period. In addition, the OFFLIST score decreased from 5.9% to 4.8%.

Hypothesis B stated that:

*Over the course of one semester, the lexical profile of the students will show an increase in the number of different words (types) used, type-token ratio, and the lexical density (content words/total).*

The average student *word count* increased by 127 words from the first assignment (141) to the sixth and final assignment (268), with an average of 203 words for the six assignments. At the same time, the number of *different words* recorded in

student texts increased from 86 lexis items in the first assignment to 145 by the last one. This represents a 168% increase in the word count. Although both variables (*word count* and *different words*) increased in number, the latter variable increased at a slower rate. Different words accounted for 61% of the total words in the first assignment, falling to 54% by the sixth and final assignment. As the students increased their word count over the six assignments, the number of different words increased at a slower rate than the word count recorded. Students are therefore writing longer texts but with a greater reliance on the same words or types of words, such as repetitive use of a small number of adjectives, nouns and pronouns. This is an indication of their limited vocabulary range and depth, supported by the high K1 score seen throughout the writing. In addition, the type-token ratio saw a drop from 0.59 to an average of 0.54 over the six assignments. The *Lexical Density* figure recorded the same rate for both the first assignment and the average of the six assignments, indicating that no noteworthy increase was recorded.

Therefore, hypothesis 2 is supported to a lesser than expected degree in that the number of different words increased in student's assignments, from the first to the last, albeit at a slower rate than that recorded for the word count increases for the assignments. The type-token ratio recorded a small 5% drop, which is related to the number of different words used in the text, confirming the fact that the word count increased at a greater rate than the number of different words. In addition, the lexical density figure remained constant when averaged over the course, from the first assignment.

## 8. Discussion

This research paper detailed the application of statistical lexical analysis, correlation testing and self and peer-grading to improve the writing skills of lower-intermediate English language learners. The students in this study are used to more controlled practice environments of learning, installing a sense of controlled practice ability, or deference to the teacher, and acceptance of teaching materials, themes and instructions, indicative of secondary education English language classes and the 'banking of education' put forward by Freire (1970). There has been a lack of creativity and self-expression, which is reflected in their active vocabulary limited to the first thousand words of English, as dictated by the common corpus lists of the most frequently used words.

This research has attempted to instigate free productive ability into student thinking and action. This has been addressed by utilizing statistical lexical analysis,

correlation testing and self and peer grading. The resultant analysis of the data has shown that students' productive work in the form of written assignments has shown tentative improvement in improving their written skills and understanding of self-and-peer-grading. In addition, the statistical analysis has allowed myself as the teacher and researcher to pinpoint weaknesses for students in the class and typical of students at this level of English. The course textbook has been shown as an appropriate scaffold for student learning, and the students have improved on the textbook in terms of word count. The book scaffolds students with their next target of improving the number of different words, type-token ratio and lexical density; as it scaffolds students to actively use words from the K2 range, the top 2000 words of English, specifically the 1001-2000 most frequent words. This represents the student's current passive range of vocabulary.

Students at this level have a sound working active knowledge of K1 words, as they average 88% of their lexis within this range of vocabulary. However, this means that they over rely on content words and less on function words. The function words, as detailed above, are the grammatical tags in writing that help to construct accurate sentences. These words and grammar the students will probably have activated in their English knowledge from endless repetition and memorization from secondary education. However, their content structure is low and needs to be taught, used and activated as active language rather than its present passivity. This can be achieved by students using content words in a meaningful way through their writing. This cannot be achieved by gap-fill exercise in writing classes, or translating from Japanese to English, and vice-versa. The same is true of reading, listening, writing and speaking skills in standardized tests that have been allowed to run rampant through education. The key to developing better writing skills is for the students to develop active vocabulary garnered from motivating and interesting writing tasks. Such writing will allow students to better utilize vocabulary that is appropriate to their own ideas, hobbies, opinions and interests, supporting the notion of both *Free Productive Ability* and the need for better comparison with existing vocabulary in the form of corpus. This study has been limited by the reliance on statistical analysis and correlation testing using the British National Corpus which was utilized through the *VocabProfile* software program. This corpus is based on a 100-million-word collection of samples of written and spoken language from a wide range of sources, designed to represent a wide cross-section of British English from the later part of the 20th century, both spoken and written. The latest edition was released in 2007. However, as stated above, this does not reflect the lexis that may describe the life

of a young adult in Central Japan, typical of the setting of this research paper, Kyoai University.

Students therefore need more meaningful use of both function and content words. As detailed above, the ‘useful words and phrases’ taken from the book are overwhelmingly of content focus. The course textbook is a scaffold to student learning and as it is matched and appropriate to the student’s level, as seen in its higher lexical word structure than the student’s texts, the ‘useful words and phrases’ push students to a higher level of English skill by pitching such words above their active comfort zone range of vocabulary. Unlike the student texts, 23% of these words are K2 lexis and another 23% are AWL or OFFlist. Alternative function words need to be taught to allow students to develop more meaningful grammatically correct sentences. In addition, content words need to be utilized that apply to each student’s text, based on their own interests and ideas. Generalized words that best fit large groups will hinder the individual students’ writing skills, motivation, learning and activating passive vocabulary. The notion of *Free Productive Ability* will allow students to progress as learners and develop a wider and deeper range of vocabulary, this will in turn allow students to increase their repertoire of K2 and AWL words, decreasing the overreliance on K1 words and their misuse of OFFlist words. A greater range of vocabulary will increase their number of different words, raise their type-token ratio and their lexical density. Laufer (1998) states that in most models of language learning, it is acknowledged that the learning of a new word usually progresses from receptive to productive knowledge. Therefore, a word that can be correctly used should also be understood by the user, when heard, seen or both. The mere memorization of a word form without understanding the word’s meaning in context, cannot be called productive knowledge. This is mechanical reproduction, not language production. Consequently, a student’s passive vocabulary size is larger than their active size even if it is difficult to substantiate the difference. The research has shown an indication of this difference in a small group of students of lower-intermediate ability.

## 9. Further study

This research paper has shown that student’s written lexical richness and free productive ability can be improved over a short 15-week semester. This research was limited to a one-class, one-semester study. Further study would include a greater range of English levels amongst groups of students, based on English skill, vocabulary range, English language written and spoken experience, reading and writing comprehension, and motivation levels. A major concern for this study was the lack of knowledge and

creativity with new and alternative forms of vocabulary, grammar and phrases. This factor may reflect the secondary education held by the students, which has largely been based on rote memorization, scripted writing and speeches, directed and controlled tasks, tests, translation exercise and a severe lack of free communication, whether spoken or written. As a result of the data analysis performed on the *VocabProfile* with regards to the corpus utilized in its database to ascertain the variables of a text, it was obvious from the data collection and analyzing stages that such a lexical richness is very subjective when using online corpuses such as The British National Corpus. Further study should address this British English centric focus, which does not consider many other varieties of English, specifically the English used by Japanese speakers of English. Such research would allow other researchers to ascertain the students' typical most frequently used English words, which words they would need to learn to develop better and more appropriate vocabulary and how texts and classroom materials could be better selected to address the real needs of students as they begin to enter the workforce or further study.

## References

- Cobb, T. & Horst, M. (2001). Growing Academic Vocabulary with a Collaborative Online Database. In B. Morrison, D. Gardner, K. Koebke, & M. Spratt (Eds.), *LT Perspectives on IT & Multimedia* (pp. 189-226). Hong Kong: Polytechnic University Press.
- Deadman, M. (2014). Exploratory study in the evaluation of a group of native Japanese English language learner's perception of World English. *Niijima Gakuen Journal*. Volume 34, pp. 161-181.
- Deadman, M. (2015a). "What I Say": Lessons from Jazz Improvisation for English Language Teaching, *Niijima Gakuen Journal*. Volume 35, pp. 127-149.
- Deadman, M. (2015b). There are no Mistakes on the Bandstand (or in the Classroom), *Kyoai Gakuen Journal Vol. 15*, pp. 85-114.
- Deadman, M. (2016a). The Banking of English Education in Japan, *Niijima Gakuen Journal*. Volume 36, pp. 115-135.
- Deadman, M. (2016b). Practical Student Self-affirmation, *Maebashi Kyoai Gakuen University Journal Vol. 16*, pp. 45-68.
- Freire, P., (1970). *Pedagogy of the Oppressed*, Continuum, New York.
- Laufer, B. (1998). The Development of Passive and Active Vocabulary in a Second

- Language: Same or Different? *Applied Linguistics*, 19(2), 255-271.  
doi:10.1093/applin/19.2.255 (APA ok)
- Laufer, B., & Nation, P. (1995). Vocabulary size & use: Lexical Richness in L2 Written Productions. *Applied Linguistics* 16 (3), 307-322.
- Laufer, B., & Nation, P. (1999). A vocabulary-size test of controlled productive ability. *Language testing*, 16(1), 33-51.
- Lowry, R (1999). <http://vassarstats.net/textbook/ch3pt1.html>
- Meara, P. & Fitzpatrick, T. (2000). Lex30: An Improved Method of Assessing Productive Vocabulary in an L2. *System* 28, 1, 19-30.
- Meara, P., Lightbown, P. M., & Halter, R. (1997). Classrooms as lexical environments. *Language Teaching Research*, 1(1) 28-46.
- Mercer, N. (2000). *Words and Minds*. Oxford: Routledge
- Morris, L. (2001). The Use of Vocabulary Profiles in Predicting the Academic And Pedagogic Performance of TESL Trainees. *International Language in Education Conference* (Hong Kong, November 2001).

## 要旨

### 自主的発表能力と語彙に関する英語学習者の

### ライティング技能向上を目的とした分析

デッドマン マーク

教室は頻繁に統制的発表能力(Controlled Productive Ability)の活動の場となる。このシステムでは、教師は声明を発表し、学習者が根気よく受け、記憶し、繰り返さなければならない預金という行為も行う。さらに、学校教育におけるこの「銀行業務」という概念は、学習者が預金を受け取り、自分なりに整理し、蓄積する限りにおいて、その効果範囲を拡大する。このように学校教育は、受動的な学習者に知識を預けるプロセスと見なすことができる。Freire(1970)は、「学習者が強要された受動的役割をより完全に受け入れるほど、世間と供託された現実社会の視界の断片により簡単に順応する傾向がある」と説いている。

本稿では、日本人の中級下位の英語学習者が英語ライティングの努力の下、どのようにして自主的発表能力(Free Productive Ability)や発表語彙の積極的な活用に適応していくのかを調査している。ライティングは一つの運用能力であり、スピーキングアクティビティーのように学習者が言語を生み出すことは不可欠である。ライティングは自分が他者に理解して欲しいメッセージを作り出すことである。

しかし、テーマとトピックの選択、アイデアを出し、整理し、下書き、見直し、提出前の編集、最終的な採点と内省と、ほとんどのライティングプロセスの段階で学習者は、統御者である教師の管理下における受動的プロセスの一部にすぎない。これは学習者のクリティカルシンキングや発表能力を持つ当事者意識を抑制するものである。自主的発表能力を発達させ、実践する一つの案として考えられるのは、伝統的な教師主導型の学習システムを制限することである。常に学習者は思考し、呈示される問題に取り組むことを奨励されるべきである。

本稿は、学習者の自己肯定に関する前研究を基に書いたものである(Deadman, 2015a, 2015b, 2016a and 2016b)。