

The Digital Keyword Method in an Analog Classroom

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従来型の教室でデジタルキーワード法を

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Abstract: This paper reports on a pilot study that used a one-group pretest-posttest design with 69 Japanese second-year university students who were taught a version of the Keyword Method for remembering vocabulary. A receptive vocabulary test was used as a pre- and posttest measure. Results showed a significant ($p < .05$) increase in vocabulary scores at the end of the semester, suggesting that an adapted version of the Digital Keyword Method may be an effective way of teaching vocabulary in an analog classroom environment.

Key words: vocabulary acquisition, mnemonics, Keyword Method

1. Introduction

In order to become receptively and productively fluent, the second-language (L2) learner must memorise vocabulary (Tight, 2010). Despite the importance of lexical development, there seems to be confusion about the best way to teach vocabulary to L2 learners. Cohen (1987) suggests that there are four main techniques for vocabulary acquisition; rote repetition, the method primarily used in the Japanese education system (Fewell, 2010), structure analysis, semantic strategies, and mnemonic devices.

Mnemonic devices are memory aiding strategies that aim to create links between two pieces of information where none exist naturally (McLaughlin Cook, 1989). Although mnemonics have been used for at least 2,000 years (Caplan, 1954), it wasn't until the mid-1960s that they began to be seriously studied scientifically (Cohen, 1987). This paper is interested in assessing one mnemonic technique in particular; the Keyword Method.

1.1. The Keyword Method

The Keyword Method is a two-stage mnemonic process that uses a keyword (or keywords when necessary) to create a chain of three links in order to build a connection between the target L2 word and the first-language (L1) translation (Atkinson, 1975). Figure 1 provides a visual representation of how the keyword creates a bridge between the two words.

In the first stage, the acoustic link, an L1 word that has a similar sound to the L2 word is chosen. This L1 word is known as the keyword. An example might be to use a “Hummer” car as a keyword for the Japanese word 浜 (*hama*), which means “beach”. The amount of overlap between the L2 word and the keyword is an indicator of the keyword's

quality (Beaton, Gruneberg, Hyde, Shufflebottom & Sykes, 2005). The best keywords contain all of the sounds of the L2 word with no gaps in between.

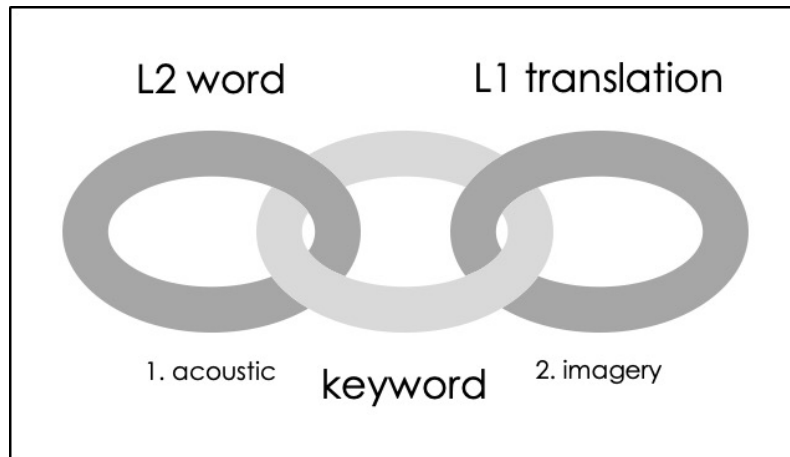


Figure 1. The Keyword Method is a chain of three links.

The imagery link, stage two, involves the creation of a mental image that includes the keyword and the L1 translation of the L2 word. Research has shown that it is easier to remember picture-pairs when they are interacting with each other (Paivio, 1991), so the mental image should include some kind of interaction between the keyword and the translation. An example for remembering *hama* might be to think of driving on a beach in a big Hummer. The more vividly the mental image can be seen with the mind’s eye, the more effective it will be (Levin, 1981). Adding details such as imagining yourself doing Tokyo-drift type moves in the Hummer in between people sunbathing should make it more vivid (see Figure 2).

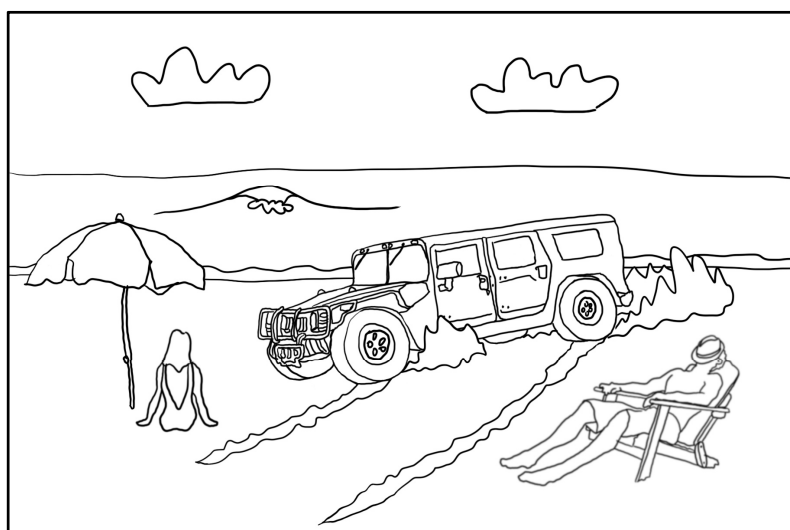


Figure 2. A Hummer on a beach.

In my example (see Figure 3), the concrete-noun keyword “Hummer” acts as the acoustic link for the L2 word *hama*, and the vivid image of driving around the beach in a Hummer is the imagery link that connects the keyword to the L1 translation.

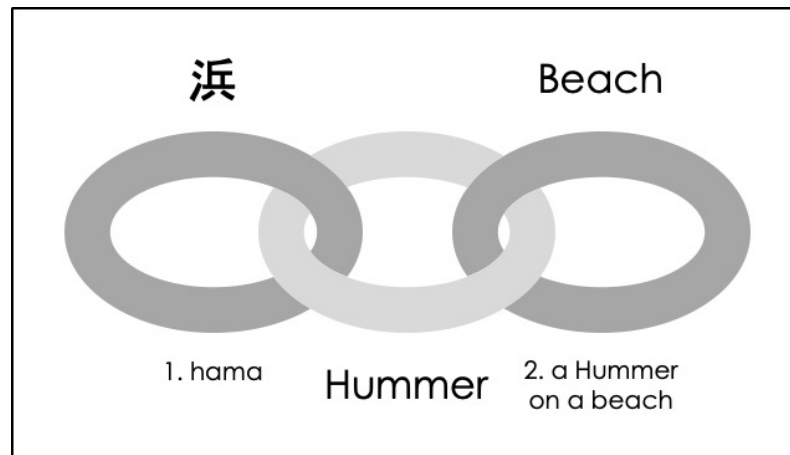


Figure 3. Using the Keyword Method to remember *hama*.

More than 50 articles report the Keyword Method as being statistically significantly better than other vocabulary learning strategies such as rote learning, and it has been shown to work with languages such as Chinese, English, German, Hebrew, Navajo, Russian, Italian, Spanish, and Tagalog (Sagarrá & Alba, 2006). The Keyword Method’s use of associative learning, whereby the new information is paired with pre-existing knowledge, encourages deep cognitive processing on both the sensory level (acoustic link) and the deeper semantic level (imagery link), and is believed to be the main reason for its success (Brown & Perry, 1991).

1.2. The Digital Keyword Method

The Digital Keyword Method (Sustenance, 2019) extends the original Keyword Method by using modern technology to create a multi-modal image that combines written text and still images. This image is then shared among class members using social media. I developed the Digital Keyword Method while teaching a first-year Reading and Writing course at a university where all of the students were required to purchase an iPad, and all of the classrooms were Wi-Fi equipped. The classes met four times a week, and over the course of a year, more than 250 words were turned into what Bezemer & Kress (2008) refer to as modal ensembles.

After moving to another university, where I was in put in charge of four cohorts of a one-semester 2nd-year English Communication class that only met once a week, I was interested to see whether this Digital Keyword Method could be an effective tool for memorizing English vocabulary in a university-level foreign language analog classroom. I was expecting an environment where all I would have at my disposal would be a projector and a blackboard, but due to the pandemic, about one third of the semester was conducted remotely using Zoom.

2. Method

2.1. Participants

Four English Communication classes from the Department of Creative Engineering at a national university in the north of Japan participated in this pilot study. Of the 78 Japanese students enrolled in the required second-year course, 69 students (male = 60, female = 9) completed both the pretest and the posttest. As all students were exposed to the Keyword Method instruction, this can be considered a one-group pretest-posttest design.

2.2. Instructional Process

Experiments about the Keyword Method have often been based on very short periods of time (from one day to a week) with a test at the end and then possibly another surprise test sometime in the future, with no review of material in the interim (eg. Atkinson & Raugh, 1975). However, this does not resemble the way an actual classroom operates. In order to be representative of the type of learning that occurs in a classroom, the current study was conducted over the course of a 15-week semester. Spaced repetition, also known as spaced retrieval, is a process where material is reviewed at intervals to help consolidate it in long-term memory, and has been shown to have a positive effect on enhancing recall (Dempster, 1989). My project included some spaced repetition built into the weekly class structure.

During the first face-to-face (F2F) class of the semester, which was in week 3 due to the first two weeks of the semester being conducted online, all students completed a receptive English vocabulary pretest to assess prior knowledge (see Appendix A). The test was comprised of ten English words from a total of 40 that would be studied during the semester, and had no bearing on their grade. The 40 words (see Appendix B) were taken from the TOEIC Service List (Browne & Culligan, 2016), a 1.5-million-word corpus of TOEIC-specific words, which was chosen because the students in the study need to score at least 300 on the TOEIC test to be eligible to graduate from the university. Participants were asked to write a Japanese translation for each of the 10 English words on the test. This type of grammar-translation test is very common in the Japanese education system, so students were very familiar with the style.

After the pretest, the students were introduced to the Keyword Method. They were first shown some examples of how the Keyword Method could be used to study Japanese (see Appendix C), and were then shown how to use the Keyword Method to study English using Japanese sentences (see Appendix D). To complete the class, the students were shown one keyword image for each English word using PowerPoint and a projector. These images, which were made by past students, were used to reinforce the idea that the sentences can also be thought of as images.

In the third class, the students were given a chance to actually create their own Keyword sentences. They were given a list of 17 English words that included a Japanese translation and an approximation of the English pronunciation written in Japanese *katakana* text (see Appendix E), and worked in pairs to think of possible keyword sentences. After a period of about 5 – 10 minutes, students were invited to write their ideas on the blackboard. There was a lot of laughter and commenting as students read the ideas that their classmates had created. After the sharing was completed, just like at the end of class 2, the students were shown at least one example image for each word on the list.

At the end of the lesson, students were given a piece of A5 paper that had the first 8 words to be studied for the semester (see Appendix F). Much like the handout that was completed in pairs in class, this Vocabulary List 1 sheet had the eight English words on the left, the Japanese translations down the middle, and the *katakana* pronunciations on the right. Between each word, there was a space for students to write their ideas for how to remember each word. Students were told to think of ways to remember the words for next week’s class. This was considered their first encounter with the words.

At the start of class 4, students were given several minutes to share their ideas with the person next to them, and then, just as in the previous lesson, they were given a chance to share their ideas with the class before being shown some example images. The students were then told about a website that had been made especially for them, and encouraged to look at in their own time (a link was posted on the class Moodle LMS site). This was considered their second encounter with the words. The website that contains all the images used during the semester, including the introductory classes, can be found at;

<https://key2021.weebly.com>

Class 5 began with a vocabulary quiz. The test consisted of eight English words on one side, with a space for the Japanese translation on the right (see Appendix G). This was their third encounter with the words. At the end of this lesson, students were given the next vocabulary list and the cycle began again. Each word was “encountered” at least three times, but words in the first two vocabulary lists were encountered five times, due to reviews in classes 8 and 11, and the third list was also reviewed in class 11. Table 1 shows when and how often each vocabulary list was encountered.

Table 1.

The timing and frequency of encounters with each vocabulary list.

Vocab List Number	Class													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1			1	2	3			4			5			
2					1	2	3	4			5			
3							1	2		3	4			
4										1	2	3		
5												1	2	3

In class 8, which was conducted online, students were given a quiz using Google Forms. All of the 15 words that were used in the first introductory lesson as well as the 16 words from the first two lists were put into alphabetical order

and spaced over 6 questions in a Google Form that utilized a multiple-choice grid format. An example of how the questions in the quiz were set out is given in Figure 4. The review of vocabulary lists 1, 2 and 3 in week 11 took place in the classroom. Students were shown each word with three possible choices using PowerPoint, and were instructed to raise one, two or three fingers to show their choice.

1.	5 points				
	Apology	Atom	Auditor	Authority	Boast
権限・権威	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
謝罪	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
原子	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
自慢する	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
会計検査官	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Figure 4. Vocabulary Review using a Multiple-Choice Grid in Google Forms

This was the process of introducing the Keyword Method and studying the 40 words chosen from the TOEIC Service List. Except for classes 1 and 9, which were used for the course introduction and mid-term presentation respectively, every class incorporated some time spent on the 40 vocabulary words. Some of the time these activities were conducted in an F2F classroom, and sometimes the classes were online via Zoom. The online environment meant that the way some activities would normally have been conducted had to be adjusted. A table summarizing the instructional process can be found in Appendix H.

At the end of the semester (in class 14), the pretest vocabulary test was administered once more as a posttest. The score on this test shows how many English words the students learnt over the semester.

3. Results

Seventy-eight Japanese students were enrolled in the course over four separate classes. A total of 69 (88.4%) participants completed both the pretest and posttest. Table 2 shows the mean and standard deviation results for each test.

Table 2.

Results from the pre- and posttests.

	Mean	Standard Deviation
Pretest	0.77	1.02
Posttest	5.06	2.29

Data from the four cohorts was quantitatively analysed using a paired samples t-test on the basis of the difference between the scores. The test results from the pretest ($M = 0.77$, $SD = 1.02$) and posttest ($M = 5.06$, $SD = 2.29$) vocabulary tests indicate that instruction in the Keyword Method resulted in a statistically significant improvement in vocabulary that was not likely to have occurred by chance, $t(68) = 17.88$, $p < .00001$.

4. Discussion

Table 3 shows the number of students for each score on the pretest and the posttest. There are several points, shaded in on the table, that seem worthy of discussion. More than half of the students (53.6%) scored zero out of ten on the pretest. Only one student scored more than three, and no students scored higher than five. In contrast, no students scored zero on the posttest, and 28 out of the 69 students (40.6%) scored higher than five out of ten. Also, two students scored a perfect ten out of ten.

Table 3.

The number of students for each score on the pretest and the posttest.

Score	Pretest		Posttest	
	Ss Number	%	Ss Number	%
0	37	53.6	0	0
1	16	23.2	4	5.8
2	13	18.9	3	4.3
3	2	2.9	14	20.3
4	0	0	9	13
5	1	1.4	11	15.9
6	0	0	10	40.6
7	0		5	
8	0		8	
9	0		3	
10	0		2	

The bar chart in Figure 5 describes the results of the pretest and posttest, and provides insight into how each individual’s scores changed. Each column on the X-axis represents an individual student, and the Y-axis has the score out of 10. The scores were first put in order from lowest to highest on the pretest, and then each relevant score level on the pretest (0, 1, 2, 3 & 5) was ordered from lowest to highest based on the posttest score. The black columns are the results of the pretest, and the grey columns represent the posttest results. The main thing that becomes clear when looking at the bar chart is that every student in the study improved their score.

Another important detail that the visual representation of the scores shows is that there is a big discrepancy between the lowest posttest scores (1) and the highest posttest scores (10). The mean of the pretest was 0.77 and the mean of the posttest was 5.06, but within this, five students were only able to improve their score by one point, whereas five students were able to improve their scores by either eight or nine points. From a pedagogical perspective, this seems to indicate that the technique works better for some students than it does for others.

Even though the increase of 42.9 percentage points from pretest to posttest in the percentage answered correctly was statistically significant, the fact remains that on average, students were only able to recall a little more than 50% of the words at the end of the course. Therefore, although significant learning did occur, nearly half of the vocabulary items were not remembered correctly. Further research, in the form of qualitative questionnaires or semi-structured interviews, may shed some light onto the subject of how to ensure that all students experience large vocabulary gains.

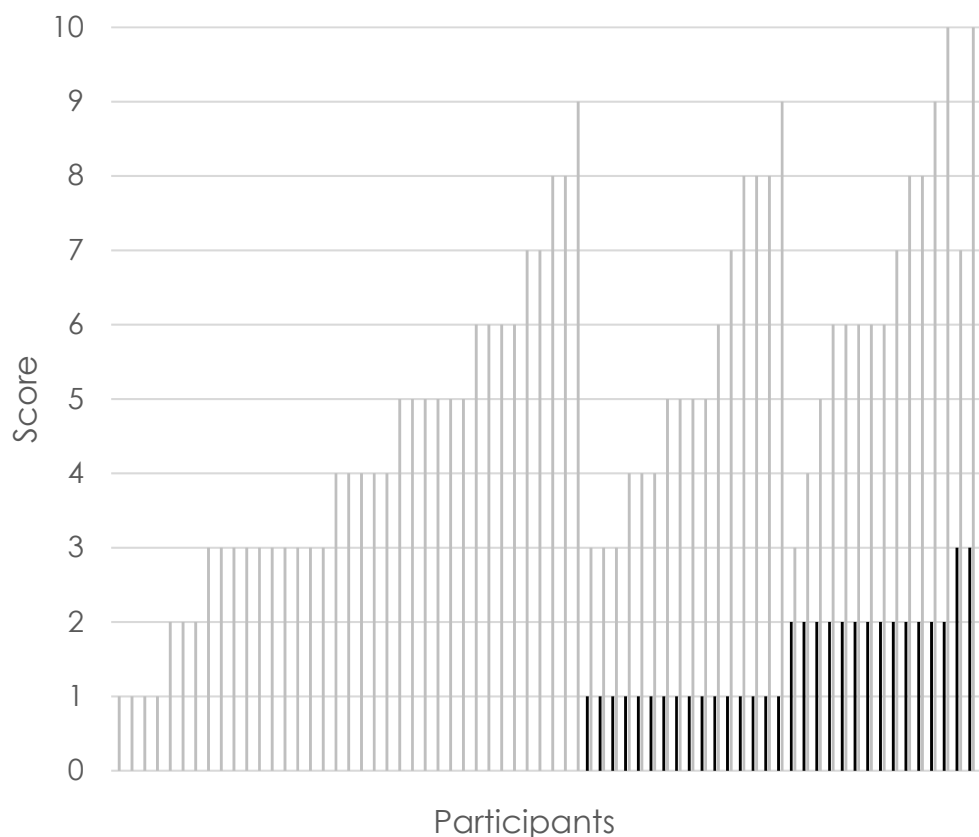


Figure 5. Pre- and posttest scores in order from lowest to highest.

5. Limitations

This pilot study used a one-group pretest–posttest design. The absence of a control group means that there is a possibility that the differences observed between the pretest scores and the posttest scores “could be due to one or more factors besides the treatment or intervention” (Reichardt, 2009 p. 48), which would bring into question the internal validity of the study. There are seven common threats to internal validity in this type of design; maturation, history, seasonality, testing, instrumentation, attrition and statistical regression. Of these seven, the only one that seems to be relevant in this study is the idea that the actual taking of the pretest could help the participants become more “test wise” (Reichardt, 2009, p. 49), therefore influencing the posttest scores. However, this is usually only considered an issue if the test is assessing opinions, rather than facts (Eckert, 2000). Also, as was mentioned earlier, the grammar-translation type of test was chosen specifically because of its ubiquitous nature in the Japanese education system, which further strengthens the argument that no testing effects occurred.

Due to complications caused by the pandemic, the final vocabulary test and the posttest fell on the same day instead of being at least one week apart. One word on the pre- and posttests, “partial”, was part of Vocabulary List 5, and this may have slightly increased the posttest scores. However, a statistical analysis of the data without including “partial” in either the pretest ($M = 0.75$, $SD = 0.96$) or the posttest ($M = 4.13$, $SD = 2.19$), still shows a significant improvement in scores, $t(68) = 14.74$, $p < .00001$. In future studies, care should be taken to avoid this situation. For example, all words on the pre- and posttests could be introduced in the first 2 or 3 vocabulary lists.

As mentioned above, the classes during the semester that this pilot study was undertaken were neither completely F2F nor completely online. The first class of the semester was conducted online, and then there was also a period in the middle of the semester (classes 4 – 10) when either some or all of the classes were taught remotely using Zoom (see Appendix H). It is difficult to know if this hybrid style of classroom environment affected the results.

One final consideration concerns the gender of the participants. The group that participated in the survey was comprised of 60 males and 9 females. While this is not an uncommon ratio of males to females in classes at the university where the study was undertaken, it is unlikely that it represents the larger Japanese university-level English-language-learning population.

6. Conclusion

The purpose of this pilot study was to investigate whether the Digital Keyword Method could be an effective teaching strategy in an analog classroom in a Japanese university context. Despite the aforementioned limitations, based on an analysis of the results of the pre- and posttests of 69 Japanese students, it can be concluded that a version of the Keyword Method has shown the potential to be a powerful tool for improving receptive vocabulary with students who are not majoring in English. I believe that it warrants further research, and, in the future, I hope to use a mixed methods approach that combines both quantitative and qualitative approaches to investigate how the Digital Keyword Method can be adapted for use in an analog classroom.

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Appendix A. Pretest / posttest

Name: _____

Student number: _____

Write the **Japanese meaning** of each word.

English word	Japanese
Auditor	
Criteria	
Merge	
Obtain	
Durable	
Convey	
Flaw	
Demolish	
Mandatory	
Partial	

Appendix B. The 40 words that were studied during the semester.

1	Apology	謝罪	4	Demolish	破壊する
1	Economy	経済	4	Urgent	緊急の・急を要する
1	Similar	同様の	4	Embed	埋める・埋め込む
1	Auditor	会計検査官	4	Recipient	受取人
1	Forbid	禁じる・禁止する	4	Aisle	通路
1	Transform	変形する	4	Cargo	貨物・積荷
1	Criteria	判断の基準	4	Mandatory	強制的な
1	Humid	むしむしする	4	Detach	取り外す
2	Authority	権限・権威	5	Partial	部分的な・一部の
2	Merge	合流する・合併する	5	Recruit	募集する・新入社員・雇う
2	Tactic	戦術	5	Deduct	差し引く・控除する
2	Tremendous	ものすごい・巨大な	5	Strategic	戦略の
2	Enroll	名前を登録する・入会する	5	Verify	検証する・確かめる
2	Obtain	手に入れる・得る	5	Attain	達成する・獲得する
2	Facilitate	容易にする・促進する	5	Hygiene	衛生
2	Durable	長持ちする・丈夫な・耐久力のある	5	Temporarily	一時的に
3	Eager	熱心な			
3	Obvious	明らかな			
3	Repetition	繰り返し			
3	Convey	運ぶ・伝える			
3	Permanent	永久的な・永久の			
3	Resemble	似ている			
3	Activate	活性化する・活動的にする			
3	Flaw	欠点			

Appendix C. English Keyword Sentences for Japanese Verbs

Keyword Sentences

Read the sentences, then write the correct Japanese verb in the box

Write your name on your <u>car key</u>	
I understand <u>white curry</u> is the best	
Oh! <u>Yogi bear</u> can't swim	
<u>He's soggy</u> because he hurried here in the rain	
<u>You show</u> me the game, and I will win the championship	
If you get a full time job you will get a <u>shoe shock</u>	
I washed all the bloodied clothes used in the <u>centre coup</u>	
Stimpy practiced with <u>Ren's shoe</u>	
What? A " <u>shin pie</u> "? Oh, that's a worry ...	
You didn't consult her? That's <u>so dumb</u>	
Can you <u>shear a bear</u> ? I will look into it...	

Appendix D. Japanese Keyword Sentences for English Words

The Keyword Method

Read the keyword sentence and choose an English word from the table below

1		ブルーベリーを埋める
2		海老ダンスの証拠写真
3		クレーンで鶴をつる
4		結果的にユーンしか食べんす！
5		結婚してチューしよんっていう憲法作ろう！
6		散歩ルートを汚す
7		リス、ポン酢に反応する
8		ハンガー食べたくなるほどの飢え
9		ラーメン食べることができず、嘆かわしい
10		歯に蜂蜜を
11		「上いる」と泣き叫ぶ
12		垂直のバーって光るの？
13		鉄腕アトムの子
14		坊主とデートしたことを自慢する
15		リスに救われる

lamentable	evidence	honey	consequence	response
bury	squirrel	constitution	atom	vertical
wail	hunger	boast	pollute	crane

Appendix E. Making Keyword Sentences

<u>English Word</u>	<u>Japanese Meaning</u>	<u>Katakana Sound</u>
Ceiling	天井	シーリング
Reimburse	返金する	リインバース
Evacuate	避難する	イヴァキュエイト・エヴァキュエイト
Inference	推測	インファレンス
Sigh	ため息	サイ
Mechanic	整備士	メカニック・メカニク
Residence	住居	レジデンス
Cabinet	内閣	キャビネット・カビネット
Faulty	不完全な・欠陥のある	フォルティアー
Prohibit	禁止する	プロヒビト・プロヒビット
Rumor	噂	ルーマ
Spouse	配偶者	スパウス
Punishment	罰	パニッシュメント
Beverage	飲み物	ベヴァリジ
Vendor	売り子	ヴェンダ
Lily	百合	リリー
Scholarship	奨学金	スカラシップ・スコラシブ

Appendix F. Vocabulary List 1

Vocabulary list I

English	Japanese	Katakana Sound
Apology	謝罪	アポロジ
Economy	経済	イコノミ
Similar	同様の	シミラ
Auditor	会計検査官	オーデター
Forbid	禁じる・禁止する	ファビド・フォビド
Transform	変形する	トランスフォーム
Criteria	判断の基準	クライテリア・クライテリヤ
Humid	むしむしする	ヒューミッド・ヒューミド

Appendix G. Example Vocabulary Quiz

Name: _____

/ 8

Student Number: _____

Write a **Japanese translation** for each word.

English Word	Translation
Apology	
Auditor	
Criteria	
Economy	
Forbid	
Humid	
Similar	
Transform	

Marked by: _____

Appendix H. How the Hybrid Keyword Method was taught.

Class	Activities	Time (mins)	F2F or Online
2	Pretest (paper) Keyword Intro part 1	20	All F2F
3	Keyword Intro part 2 Vocabulary List 1 – handout (paper)	15	All F2F
4	Vocabulary List 1 – ideas (blackboard / Google Docs) Vocabulary List 1 example images	10	2 F2F / 2 Online
5	Vocabulary Quiz 1 – (paper / Google Forms) Vocabulary List 2 – handout (paper / PDF)	10	2 F2F / 2 Online
6	Vocabulary List 2 – ideas (Google Docs) Vocabulary List 2 example images	10	All Online
7	Vocabulary Quiz 2 – (Google Forms) Vocabulary List 3 – handout (PDF)	10	Online
8	Vocabulary 1 & 2 Review – (Google Forms) Vocabulary List 3 – ideas (Google Docs) Vocabulary List 3 example images	15	Online
10	Vocabulary Quiz 3 – (paper / Google Forms) Vocabulary List 4 – handout (paper / PDF)	10	1 F2F / 3 Online
11	Vocabulary 1, 2 & 3 Review – (PowerPoint) Vocabulary List 4 – ideas (blackboard) Vocabulary List 4 example images	10	F2F
12	Vocabulary Quiz 4 – (paper) Vocabulary List 5 – handout	10	F2F
13	Vocabulary List 5 – ideas (blackboard) Vocabulary List 5 example images	10	F2F
14	Vocabulary Quiz 5 – (paper) Posttest – (paper)	15	F2F