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SIMPLIFIED PICTORIAL REPRESENTATIONS IN EXPLICIT FOREIGN LANGUAGE VOCABULARY LEARNING

A Thesis submitted by

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Abstract

The main purpose of the two studies reported in this thesis is to examine the potential for simple images to be used in the learning of foreign language vocabulary. The classroom-based research project, consisting of Study 1 and Study 2, was conducted over an academic year of thirty weeks in a Japanese university with two classes of all female participants, set within an existing English language course. A total of 100 English target words were paired with simple pictures, and another 100 English target words were paired with first language (Japanese) translations, using paper-based and electronic materials. The participants experienced the target words in translational form and the target words in simple pictorial form in explicit learning programs consisting of similar instruction, classroom activities and self-learning exercises, involving the recall of target words using the Japanese and pictorial forms as cues. The effect of presenting target vocabulary in simple pictorial form upon vocabulary recall was investigated with pre-test, post-test, and weekly testing data. Participant recall scores were compared between vocabulary experienced in simple pictorial form and vocabulary experienced in translational form, and the rates of recall for individual words were also examined. An understanding of participant responses to learning with target words in pictorial and translational form was gained from attitudinal surveys and focus group discussions. The implications of the images, materials and activities, and the vocabulary program as a whole for teaching and learning were evaluated from vocabulary testing, surveys, focus group discussion data, and from teacher's journals. The results of the studies indicate that presenting target vocabulary in simple pictorial form was not detrimental to recall, and showed

a tendency to be more beneficial in comparison to L1 translational form. The concrete/abstract and emotional qualities of the target words, as well as the learner's comprehension of the images including personal agreement with word meaning, were shown to be major influences upon recall. Participant responses to the simple pictures and their usage were generally positive, with the main negative response being the lack of understanding of the images. The studies concluded that using simple pictorial forms does have potential as a supplemental method of teaching and learning English vocabulary explicitly. The images can encourage student interest and motivation, be used in a variety of learning activities including interactive tasks, and provide opportunities for alternative methods of instruction and learning. Additionally, paper-based and electronic instructional materials were found to be comparatively beneficial to vocabulary learning, with factors such as tactility and accessibility being highly influential upon usage. Based on the findings, the studies recommend the use of target vocabulary in simple pictorial form for lower intermediary learners as a supplementary addition to a foreign vocabulary learning program.

Certification of Thesis

This thesis is entirely the work of James William Bates except where otherwise acknowledged. The work is original and has not previously been submitted for any other award, except where acknowledged.

Student and supervisors signatures of endorsement are held at USQ.

Jeong-Bae Son

Principal Supervisor

Ann Dashwood

Associate Supervisor

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Chapter 1. Introduction

1. 1 Background to the Research

When presented with a picture, foreign language (FL) learners often appear to display an increase in attention and interest, and a decrease in the stress that can be associated with learning a language. This general observation came about from the researcher's experience as an English language teacher, as a wide variety of students in various learning settings continue to respond amiably to the use of pictorial forms. The observation has given rise to a personal belief that pictures have the very real capacity to be a positive influence upon FL learners. Additionally, the researcher has come to value and appreciate images as being effective tools of instruction. The influence of pictorial information seems conducive to the teaching and learning of a foreign language, so investigating how images might be employed in FL education appears to be a worthwhile undertaking.

One way in which pictures can be used in foreign language education is for the specific purpose of vocabulary learning. Pictures can carry meaning, and so appear to be suited to the task of teaching and learning vocabulary as the words of a language are also the conveyers of meaning. Information in a pictorial form continues to be a major feature of second language (L2) and FL teaching in general, as materials such as textbooks and learning software are full of illustrations and other graphic material. However, the use of pictures in vocabulary learning is often associated with learning at lower levels of proficiency, as with beginner level textbooks featuring pictures of everyday items, or a teacher pointing to a picture of an object and asking what it is.

Some words including concrete nouns are fairly easy to picture, yet representing words with abstract and complex meanings pictorially becomes far more difficult. The assertion that "not all words are picturable" (Nation, 2013, p. 449) appears to place a general restriction upon how pictures can be used to teach vocabulary. However, this research project intends to contest the view that pictures are of limited use when representing word meanings. The project will investigate the teaching and learning of FL vocabulary represented pictorially without being restricted to target words with concrete or easily picturized meanings.

Learning the words of a language is fundamental to learning a language; however vocabulary learning has often been associated with difficulties. Japanese FL learners had identified the learning of English words as one of their main concerns with regards to their studies (Gu & Johnson, 1996; Lawson & Hogden, 1996). More recently, the memorization of English vocabulary has been categorized as a demotivating influence upon Japanese high school students (Kikuchi, 2009). In Japan, the explicit learning of English vocabulary is pervasive, partly due to the importance of language testing as with university entrance exams and proficiency tests such as TOEIC (Test of English for International Communication). This emphasis upon vocabulary learning is evident from the fairly common sight of people self-studying from specialized textbooks, sets of word cards and wordlists on the nation's public transportation system. The value of learning vocabulary deliberately and intentionally, and its importance towards learning a language, continues to be acknowledged as a valuable part of L2/FL learning (Folse, 2004a; Hulstijn, 2001; Nation, 2013). The researcher, as a long term resident of the country, has come to realize first-hand the necessity of making a deliberate and concerted effort to study

the words of a foreign language, having come to the country with virtually no Japanese language skills.

The research project, consisting of two studies (Study 1 and Study 2) intends to investigate the explicit teaching and learning of FL vocabulary using pictorial information. The existing techniques often mentioned are visual mnemonics, such as the peg-word and loci techniques, and perhaps the most well-known and researched method: the keyword method. A lesser known method is a process of learning vocabulary through visualization, where students are encouraged to produce mental images of target words. The studies involve learning through multiple recalls, where the spoken and written forms of an FL target word are paired and associated with a given image, and subsequently that image is used as a cue for the recall of the target word. Although not a mnemonic or visualization technique per se, the research project's learning technique still involves the visualization of words and the possibility of mnemonic effects, which will also be investigated.

An important component of the research project is the type of images used. The pictures are simple, monochrome line drawings, following a symbolic and pictographic design. The main reason for choosing these types of images is due to the increasing prevalence and popularity of symbols, such as emoji (e.g., 😫 meaning *angry*) and emoticons (e.g., (^_^) meaning *smiling*) as used in social media, as well as the use of icons in computer interfaces, such as computer operating systems and on touchscreens in mobile devices. Using pictograms to represent words might be congenial to students and therefore favourable to learning, as younger people especially appear to be familiar with the engagement of information represented in symbolic form. The studies aim to contribute towards research in the area of

vocabulary acquisition by investigating the effects of simple images used in an explicit way to teach abstract as well as concrete words, which appears to be one area of research which has not been actively pursued.

1.2 Research Aims and Questions

The overall aim of the studies is to investigate the potential for simple imagery, referred to as Simplified Pictorial Representations (SPRs), to be used in the explicit teaching and learning of FL vocabulary. The central line of inquiry concerns the question of how images of a symbolic and pictographic nature might serve to assist in the learning of FL words. The studies evaluate a learning technique involving multiple recalls from cues (pictographic images) among Japanese students of lower-intermediate English language proficiency.

In order to achieve this aim, a specialized vocabulary learning program is incorporated into an existing English as a foreign language (EFL) course. An evaluation is then made of the intervention, based upon the resulting language performance and attitudinal outcomes of the participants, as well as observational data from the instructor, who is also the researcher. The studies focus upon the following three research questions:

1. What effect do simple images in paper form and in electronic form have upon EFL vocabulary recall rates when used in classroom and self-learning situations?

2. What are student attitudinal responses to using simple imagery in paper form and in electronic form when used in classroom and self-learning situations?

3. What are the potential effects of materials and activities using simple imagery on English language teaching and learning?

The first question attempts to determine the influence that simple images have upon FL vocabulary learning through the examination of a specific learning outcome. Language performance will be evaluated by testing the students' ability to successfully recall words previously introduced and studied in especially designed vocabulary learning programs. Data will be presented and analyzed using testing results from L1 translational forms as a basis of comparison, from vocabulary learning programs run in parallel to the programs using SPRs.

The second question investigates participant attitudinal responses to SPRs, including thoughts, attitudes and opinions of materials and activities utilizing the SPRs, and towards the images themselves. Given that motivation is viewed as a key factor in L2 acquisition (Ellis, 1994), finding out whether and to what degree students respond positively or negatively to SPRs is essential in assessing the images' potential as an aid to learning.

The third question focuses upon teaching and learning aspects as an important objective of the research project is to contribute towards the development of L2/FL education. The question will be addressed with data from all of the two studies' data collection instruments: vocabulary recall tests, attitudinal surveys, focus discussion groups, and teaching journals. Results and outcomes will be generalized, venturing to speculate as to how the technique and materials could (and indeed if they should) be applied to other L2/FL learning situations.

1.3 Terms and Definitions

The terms used throughout the studies are defined as follows:

SPR (Simplified Pictorial Representations)

SPRs are the pictorial forms used in the research project. The SPRs are pictorial expressions of half (100 words) of the research project's target vocabulary. The representations are simplistic, monochrome line drawings, which are pictographic and symbol-like in appearance. For example, the word *reside* is expressed as a face inside the basic outline of a house. All SPRs used in Study 1 are shown in Appendix A, and all SPRs used in Study 2 are shown in Appendix B.

The studies' learning technique

The learning technique used in the two studies is the method by which target words are studied. It involves a process of multiple recalls that uses either SPR or L1 translational forms as cues. The technique involves a process consisting of three stages: (1) The presentation of a written L1 or SPR form, and accompanying FL written and verbal form; (2) The recall of target vocabulary from the written L1 or SPR cue; (3) The testing of target vocabulary from a written or verbal FL cue. See Section 3.5.2 for further details of the technique.

Mental image

The term mental image refers to an image created in the mind. The term is defined in accordance with Finke's (1989) definition of mental imagery: "the mental invention or recreation of an experience that in at least some respects resembles the experience

of actually perceiving an object or an event, either in conjunction with, or in the absence of, direct sensory stimulation" (p. 2).

Visualization

Visualization refers to the act of forming a mental image as defined above.

External representations

An external representation, as defined by Eysenck and Keane (1990) is something which is "re-presented" in the world; something which "stands for something in the absence of that thing" (p. 202). For example, pictures or written text are external representations.

Internal representations

Internal representations (as opposed to external representations) are representations existing internally, that is, in the mind. Mental images are internal representations (Eysenck & Keane, 1990).

Descriptive representations

Descriptive representations are external representations which describe their referent, consisting "of symbols that have an arbitrary structure and that are associated with the content they represent simply by means of a convention" (Schnotz, 2002, p. 103). For example, written text is a descriptive representation as the letters describe (but does not resemble) what they represent.

Depictive representations

Depictive representations are external representations which depict their referent, being made up of iconic signs "associated with the content they represent through common structural features on either concrete or more abstract level" (Schnotz, 2002, p. 103). For example, a road sign illustrating a person walking or a sign with a bent arrow are depictive representations.

1.4 Structure of the Thesis

This chapter (Chapter 1) has presented background information to the studies, including factors leading up to the studies as well as specifying the areas of enquiry that are investigated. The overall aim of the studies was then stated, followed by the objectives and research questions that will attempt to achieve the general aim. The terms and definitions used in the studies were then listed and explained.

Chapter 2 begins with an examination of memory and cognitive models relevant to the studies. Next, an overview of L2/FL vocabulary learning in general is given, including L2/FL instruction, the linking of form and meaning, depth of processing, the determining factors in the ease or difficulty of word learning, and the use of word cards and wordlists. This is followed by information concerning the use of pictures to teach L2/FL vocabulary, including the picture superiority effect, the use of pictures in instructional materials, and mnemonic techniques. A section then focuses upon simple imagery as relevant to the studies: pictograms, emoji and emoticons. Next, a section on computer-assisted vocabulary learning (CAVL) examines electronic flashcards and electronic glossing. Lastly, a description and an explanation are given as to the theoretical bases of the studies.

Chapter 3 begins with a general overview of the research project, and then specifies the research design and structure, including a description of the studies' participants. Next, the studies' means of data collection are outlined, including details of the instrumentation employed. The next section describes the materials used in the research project, including activities and materials, the learning technique, target vocabulary items, and the design of the SPRs. Finally, procedures for both studies are explained, firstly with Study 1 and then with Study 2.

Chapter 4 conveys and analyses quantitative data from the studies' pre-testing /post-testing and weekly vocabulary testing of target word recall. Qualitative data from participant surveys, focus group discussions, and the teacher's journals are also presented and summarized. The chapter is organized in two parts: Study 1 results and Study 2 results.

Chapter 5 is organized in accordance with the studies' three research questions. The results of both studies are discussed in three sections relating to Question 1 (vocabulary testing), Question 2 (student responses), and Question 3 (implications for teaching and learning). At the end of each of the sections, the studies' limitations are discussed.

Chapter 6 lists the studies' three main concluding points, and then provides further details to the conclusions. The implications and significance of the conclusions are then given. Lastly, directions for further research are suggested.

Chapter 2. Literature Review

2.1 Overview

Chapter 2 begins with a description of theoretical models which are the bases of the research project. L2/FL vocabulary teaching and learning in general is then examined and reviewed, with a focus upon topics of relevance to the two studies. Next, the chapter concentrates upon the use of pictures as used in L2/FL vocabulary learning; including the relevance of pictures to learning, how pictures are used in instructional materials, and how they can be used to remember L2/FL vocabulary. The topic of pictures is further examined by looking at simplistic forms of pictorial information, including emoji and pictograms. The chapter then proceeds with a review of how pictures can be used in CAVL (Computer-Assisted Vocabulary Learning). The theoretical framework of the research project is then outlined. Lastly, the main points of the chapter are summarized.

2.2 Models of Memory and Cognition

When considering how words are learned, it is necessary to take into account the generally accepted theories that attempt to explain how people remember. Bartlett (1932) believed memory to be reconstructive as opposed to being reproductive: "An imaginative reconstruction or construction, built out of the relation of our attitude towards a whole active mass of organized past reactions or experience" (p. 213). Bartlett viewed memorization as an active process in which memories are constructed by an individual to their particular specifications, not simply a

reproduction as with a video recording. A constructivist approach to memory regards the process as "the combined influence of the world, and the person's own ideas and expectations" (Foster 2009, p. 13). Learning words in a foreign language can be described as a process involving the assimilation of form and meaning into an individual's experience of the world. Apart from the frequency of encounters learners have of a word, the quality of the experience also influences their personal reconstruction of it.

The most accepted theories of vocabulary learning propose that words are not stored separately in the brain from other information, as information is so interconnected that it is impossible to identify lexical items as different entities (Hulstijn, 1997). The connectionist view of vocabulary knowledge does not see the mind as a kind of dictionary. Rather, it appears to rely upon the activation of connections, and connections within connections to store information (Hulstijn, 2001). Words are arranged systematically, in a large and highly complicated semantic network (Aitchison, 1987), and do not appear to be stored in isolation awaiting retrieval as with a dictionary entry. This complex arrangement is reflected in the idea that concepts (and thereby words) are categorized with flexibility in human memory, with Barsalou (1993) proposing that "Rather than being coherent, consistent, and complete, linguistic descriptions of conceptual content are unprincipled, haphazard, and incomplete" (p. 30). The connectionist view is apparent in the importance placed upon knowing the associations (e.g., collocations, synonyms, words with opposite meanings, members of the same word family) of words to be learned. Nation (2013) believes that by knowing a word's associations, the word's "full meaning" can be better understood, and this knowledge "helps recall the word's form or meaning in the appropriate contexts" (p. 136).

Research into learning with pictures often refers to theories and models based upon a division between visual and linguistic information systems. Paivio's (1986) dual coding theory postulates two separate systems: verbal and nonverbal. Baddeley and Hitch's (1974) model of working memory features both audio processing involved with language and visual processing systems involved with imagery. Based upon these models, Mayer and Moreno's (1998) cognitive theory of multimedia learning describes how pictures and spoken words (as with a multimedia presentation) might be processed in the sensory and working memories in two separate channels.

2.2.1 Dual code theory

The dual code theory (Paivio, 1986) proposes that information is received simultaneously through two separate channels, one dealing with verbal and the other with non-verbal or visual information. The two types of input from verbal and non-verbal stimuli are received through the sensory systems, and are encoded and processed in their own separate way, as they have differing properties. Verbal information is language based and has a prepositional quality, so becomes a symbolic code with units referred to as logogens. Visual information being image based is more of a representation of actual physical objects in the real world, so becomes an analog code with units referred to as imagens. The two subsystems encode, organize, store and retrieve information differently and separately, yet this processing does include interconnections between the logogens and imagens, referred to as referential connections.

The dual code theory can be used to explain why images are more easily remembered than words, or the picture superiority effect. For example, when

presented with a picture of a tree, the information (being an image) is channeled through the non-verbal subsystem as well as through the verbal subsystem as the linguistic form of *tree*. If receiving the word *tree* only, then the verbal (language related) channel will be active, but processing through the non-verbal channel will be minimal. As (according to the theory) semantic memory has a verbal and a visual encoding system, learning will be more effective if information is received in both verbal and visual modalities using a dual code, rather than if just one channel is used. If a word has an associated image stored along with a verbal entry, then there is a greater chance of retrieval. The theory can also be used to explain why concrete words are better remembered than abstract words (see Section 2.3.5).

2.2.2 The working memory model

It would not seem possible (or even necessary) for humans to remember everything that they experience. Given the vast amount of visual and acoustic information alone which is received on a daily basis, the need for the brain to select what is to be committed to memory is apparent. Based on empirical evidence, it has been established that a kind of temporary store does exist, where seven (plus or minus two) items can be processed (Miller, 1956) for a duration of 15 to 30 seconds (Atkinson & Shiffrin, 1971). A model of such a compartmentalized memory system is the multistore model (Atkinson & Shiffrin, 1968), which proposes three separate memory storage systems. According to the model, input from the environment is received by the sensory memory, and then information which has been subject to attention is received by the short-term memory. Information is held in the short-term memory, where some of it is "rehearsed", resulting in transference to the long-term memory.

The working memory model (Baddeley & Hitch, 1974) offered a more complex

model of memory than did the multistore model, with the concept of a short-term

memory being replaced by the more complicated working memory. According to the

model, as with the dual code theory, information is received in an auditory and a

visual channel. The processing of auditory information occurs in the working

memory's phonological loop, and visual information is processed (represented and

manipulated) in the working memory's visuo-spatial sketchpad. These two

sub-systems are managed by a separate control system, the central executive.

Processing occurs within and between each sub-system, before information is stored

in the long-term memory. Baddeley (2000) later added the episodic buffer to the

model, which works as a kind of back-up or reserve storage system, and participates

in the communication of information between the central executive and the long-term

memory.

Baddeley (2003) described the working memory's visuo-spatial sketchpad subsystem

as serving "the function of integrating special, visual, and possibly kinesthetic

information into a unified representation which may be temporarily stored and

manipulated" (p. 200). An important quality of the visuo-spatial sketchpad is its

flexibility; its ability to manipulate mental images such as, for example, when an

engineer might "turn around" a building plan in their mind to answer a specific

question. Images are not stored as static entities, as with photographs and videotape.

Rather, they are more like image and video files which can be altered at will with a

kind of editing software. Baddeley (2004) stated his belief that images cannot be

directly stored in the brain, as the sheer amount of information an image has would

be far too demanding on its storage system, so images in the long-term memory are

likely to be stored in a kind of abstract code. However, the working memory may use

a system that is more of a direct representation of the image, which Baddeley (2004) describes as a "spatial slave system" which uses "the same equipment as used in perception, and depends for its functioning on the central executive component of the working memory" (p. 59).

As evidence in support of this view, Baddeley (2004) referred to an experiment by Brooks (1968) in which participants "rotated" a capital letter F in their minds, while answering simple questions about how the letter appeared in their minds. Participants in his study found that responding to questions related to the image was more difficult when answering spatially (when pointing to answers on a paper) than verbally (when giving an oral response). It appears that in order to give a response that requires visual and spatial processing; the limited visual and spatial resources in the working memory are diverted, leaving it with less capacity to carry out the visual/spatial task. Yet this was not the case with verbal resources, as interference to the task from verbal responses was significantly less. Brooks (1968) achieved similar results when his participants performed a task requiring verbal processing, where verbal responses were inhibited more than visual/spatial responses. These experiments suggest (in addition to the existence of verbal and visual subsystems of limited capacity) that visual information encoded in the working memory might be processed visually and spatially. Although they are not like photographs inside the brain, mental images may still have a kind of representational quality, which allows for manipulation in order to facilitate understanding and memorization.

Baddeley (2004) believed that imagery may also play a significant role in the storage of information in the long-term memory, as evidence exists that the capacity of a word to be imagined can determine how well it will be remembered, and the fact that

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imagery plays a prominent role in the use of mnemonic strategies. Based on earlier

experimentation (Baddeley, Grant, Wright, & Thompson, 1973), he concluded that

mnemonic techniques involving imagery rely upon the visuo-spatial sketchpad, as a

visual/spatial task interfered with the use of a mnemonic, with no difference between

the remembering of concrete or abstract words. In another experiment, no significant

difference in the interference from a visual/spatial task was found between the

remembering of concrete and abstract noun-adjective word pairs, indicating that the

concreteness of a word is not mediated by the visuo-spatial sketchpad. Baddeley

(2004) said, "The concrete/abstract difference provably has something to do with the

way the word characteristics are stored in semantic memory, with concrete words

being more richly encoded than abstract ones" (p. 62).

More recently, Baddeley (2015) has elaborated upon his earlier models with the

inclusion of colour, shape, spatial location, and kinaesthetic elements into the

concept of the visuo-spatial sketchpad, and the inclusion of non-audio

communication (such as sign language and lip reading) into the phonological loop.

With regards to L2 language learning, Baddeley (2015) maintains that a proven link

exists between the phonological loop and the long-term memory's capacity to learn

language, stating: "Not only does the capacity of the phonological loop influence the

rate of vocabulary acquisition, but also, conversely, a richer vocabulary is associated

with increased verbal memory capacity" (p. 24). However, with regards to the

visuo-spatial sketchpad, he says that research has been scant in this area, and

speculates that the visual subsystem may play a role in the acquisition of

orthographic systems which are visually complex as with Chinese characters.

Baddeley's various models have been challenged by other models of working memory, which are often process orientated rather than structurally orientated (Bunting & Engle, 2015). For example, Cowan's (2005) embedded process model theorizes that a capacity limited focus of attention plays a significant role in memory processing. However, Cowan (2015) acknowledges the important role of phonological and visual processes working within the working memory, having stating that retention of L2 vocabulary in the long term memory requires phonological forms and "A few recent visual events that may be candidates for the meaning of the new word" (p. 32). According to Wen (2016) the general consensus amongst cognitive psychologists is that there are domain specific (i.e., visual and verbal) mechanisms within the working memory, as "a completely unitary, domain-general view of working memory does not hold" (p. 21).

How the working memory functions and how it can actually be defined remains speculative. However, Baddeley's original view of working memory remains highly influential. According to Wen (2016), the model's apparently simplistic three part framework "has proven to be an extremely powerful framework for addressing a range of questions on high-level human activities" (p. 13). With regards to L2/FL acquisition, research into the working memory remains extensive, especially with studies concerning the phonological subsystem (Baddeley, 2015). Working memory is also currently believed to be a fundamental and highly influential factor upon language aptitude (Ellis & Shintani, 2014).

2.2.3 Cognitive theory of multimedia learning

Mayer and Moreno's (1998) cognitive theory of multimedia learning offers another theoretical model of how words and images are received, processed and stored. The

theory is primarily concerned with how different modes of information should be presented to the learner in order to maximize the learning experience. Having a practical quality, it is often referred to in literature concerning the design and use of educational and presentation material in computer-assisted language learning (CALL) environments, as well as studies concerning the use of pictorial information in instructional settings. The theory is based upon other theories and models as seen in the theory's features, such as the two information channels of the dual code theory (Paivio, 1986), the multi-store memory systems of the working memory model (Baddeley & Hitch, 1974), and the restricted processing capacity of Sweller's (1988) cognitive load theory.

The theory is based upon three main assumptions concerning human cognitive processing; "The human mind is a dual-channel, limited-capacity, active-processing system" (Mayer, 2005, p. 37). Firstly, the system is dual-channel, as information follows two specific pathways, originating in the multimedia presentation and ending up in the long-term memory. These channels transform the information from five different sources: (1) the words and pictures of the presentation itself; (2) the acoustic representations (sounds) and iconic representations (images) in the sensory memory; (3) sound and images in the working memory; (4) verbal and pictorial models also in the working memory; and (5) schemas which are stored in the long-term memory, becoming part of existing knowledge (Mayer, 2005). Secondly, the process has a limited-capacity as the two subsystems working simultaneously can only process a finite amount of information at one time, similar to that of the limited processing power of a computer. Thirdly, the process is an active-processing system. The words and pictures of a multimedia presentation are received in the sensory memory through the ears and eyes. Then, according to Mayer (2005), information is

actively processed in the working memory in three different ways: (1) selecting

sounds (the words) and images from the sensory memory; (2) organizing the sounds

and words into verbal and pictorial models; and (3) integrating these models into the

prior knowledge of the long-term memory. The learner is not a passive agent when

receiving multimedia material.

As an active participant, the learner is charged with understanding the material

presented and then constructing mental models that will eventually become part of

their existing knowledge. Multimedia presentations need to support and encourage

the learner in this process, as "One of the principle aims of multimedia instruction is

to encourage the learner to build a coherent mental representation from the presented

material" (Sorden, 2012, p. 2). The use of visual information is central to this process

as it is theorized that successful learning of a multimedia presentation requires the

formation of meaningful links between words and images. Meyer (2001) regards the

construction of connections between word-based and image-based representations as

the most critical stage in multimedia learning. As with dual code theory, the addition

of both visual and verbal input will result in a more effective learning experience

than with only one form. With Mayer and Moreno's theory, however, more emphasis

is placed upon verbal and visual processes working together to build internal

representations of what has been presented to the learner.

According to Mayer (2009), the three processes of selection, organization, and

integration result in meaningful learning, as opposed to no learning or shallow rote

learning. This assertion has similarities to the levels of processing theory (Craik &

Lockhart, 1972), which postulated that the greater the degree of thought put into

what is being attended to, then the better the chances of learning. In the case of

Mayer and Moreno's theory, meaningful learning is regarded as selecting relevant words and images for the working memory, organizing the selected words and images into verbal and pictorial models, and then integrating these models with each other and with prior knowledge.

In order to promote meaningful learning in multimedia presentations, cognitive processes need to be supported. Meyer, Fennell, Farmer, and Campbell (2004) identified two important considerations. Firstly, that cognitive load should be reduced so that the working memory (which has a limited capacity) is freed up or made available to carry out the three processes. Secondly, learners should be encouraged to use this available cognitive "space" by providing material which catches their interest, thereby encouraging a deeper level of processing.

As with other models of cognition, such as the dual code theory, cognitive processes are viewed as having a limited capacity. Sweller's (1988) cognitive load theory argued that instruction should be designed so as to reduce the learner's cognitive load. In line with Sweller's theory, Mayer (2009) specified twelve multimedia instructional principles, designed to support the learner in their multimedia experience by controlling and economizing their cognitive task. Mayer grouped the principles in accordance with Sweller's (1988) classification of cognitive load, as supporting extraneous, essential or generative processing.

Extraneous processing refers to the processing of information that is unnecessary to what is being learned. Mayer (2009) believes that extraneous processing results in "cognitive processing that does not serve the instructional goal" (p. 57), so information superfluous to what is being taught needs to be reduced, as it hinders

learning by taking up limited cognitive processing resources. Meyer recommended

five principles of multimedia instruction which he believes would reduce extraneous

processing: (1) Coherence Principle – Excluding rather than including extraneous

material; (2) Signaling Principle – Providing cues that highlight the organization of

the essential material being added; (3) Redundancy Principle – Presenting graphics

and narration rather than graphics, narration, and printed text; (4) Spatial Contiguity

Principle – Placing corresponding words and pictures near each other; (5) Temporal

Contiguity Principle – Presenting corresponding words and pictures at the same time

rather than in succession.

Essential processing refers to the processing of information necessary for the

material presented to be understood. Mayer (2009) describes essential processing as

"cognitive processing that is required to represent the material in working memory

and is determined by the complexity of the material" (p. 57). Information needs to be

presented in a way that does not exceed the learner's ability to receive and process it.

If the working memory cannot process information properly then learning will not

occur, so essential information needs to be managed. Mayer (2011) identifies three

principles which encourage the control of essential information: (1) Segmenting

principle – Information presented in user-paced segments rather than as a continuous

unit; (2) Pre-training principle – Giving the names and characteristics of key

components in advance; (3) Modality principle – Presenting graphics and narration

rather than graphics and printed text.

Generative processing is processing activity aimed at developing a deeper

understanding of the material through "organizing the incoming material into

coherent structures and integrating these structures with each other in prior

knowledge" (Mayer, 2009, p. 221). Principles supporting generative processing focus on the audio and visual modes in which information is received: (1) Multimedia principle – Words and pictures are better than words alone; (2) Personalization principle – Words in a conversational rather than in formal style; (3) Voice principle – A friendly, human voice rather than a machine voice; (4) Image principle – The speaker's image is not necessary when the voice is being heard.

Mayer has developed and modified his list of principles based on experimental research (see Mayer, 2011), yet the principles continue to follow the basic concepts of extraneous, essential, and generative cognitive processing. In simple terms, Mayer suggests that, in accordance with his model, multimedia presentations should be concise, well-organized, and thought provoking. Mayer and Moreno's (1998) cognitive theory of multimedia learning appears to provide a useful guide for the development of instructional materials, based on a theory of how learners learn. Sorden (2013) believes that the theory is relevant to current educational needs, as it is "learner-centred and has a cognitive constructivist orientation" (p. 168). He further states that the cognitive theory of multimedia learning will continue to evolve and to be relevant as it "focuses on finding effective instructional methods" (p. 168), so therefore is not bound to any instructional methods which can become redundant.

2.3 Second/Foreign Vocabulary Learning and Teaching

Vocabulary acquisition has been described as "the most critical component of successful language learning" (McCarten, 2007, p. 26), as learning a foreign language necessitates the inescapable task of learning the words of the language.

Meara (1980) described the field of vocabulary study as being somewhat neglected, yet would later note how "interest in this area has unexpectedly grown at an enormous rate" (Meara, 1996, p. 1). Now, the twenty-first century continues to see a substantial amount of professional interest and research into L2/FL vocabulary learning. However, despite the importance of the field and the attention it continues to receive, Schmitt (2008) claims that the bulk of this research is yet to exhort a strong influence upon actual classroom practice.

Vocabulary instruction continues to reflect trends in L2/FL teaching, including the L1 dependent grammar translation method where emphasis is placed upon translation, the more naturalistic style of the direct method in which the target language is taught in the target language, and the audio-lingual method based on the principles of behaviourism involving a stimulus-response type approach. Today, there is a general emphasis upon communicative language teaching, in which priority is given to students developing their communicative competence and functionality in the L2/FL. Yet this emphasis upon communication appears to have come at a cost to vocabulary learning. Folse (2004a) pointed out that vocabulary learning must be given a high priority, as "accurate communication depends largely on an extensive knowledge of vocabulary" (p. 10). Therefore, in order for learners to be good communicators in their L2/FL, it is necessary for educators to ensure that students gain sufficient vocabulary knowledge. Overall, the perceived neglect in vocabulary learning (so often referred to in the literature) seems to be the product of being overly concerned with how to use the L2/FL rather than learning about the L2/FL. The apparent resurgence in vocabulary learning may have occurred due to the realization and recognition that communication and functionality in an L2/FL will not be successful unless a sufficient number of words of the language are actually known.

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2.3.1 L2/FL instruction

Regardless of the approach to L2/FL vocabulary teaching, the task of successfully

learning a required amount of words persists. The number of words an L2/FL learner

needs to know is large, as reading novels and newspapers in English requires the

knowledge of approximately 4,000 word families in order to understand 95% of the

text (Nation, 2006). Such a task appears to be daunting, yet word frequency lists such

as the General Service List (West, 1953) have identified words that should be given

learning priority due to their high frequency of usage. Having concluded that 77% of

even an academic text contains the 1000 most common words in English, Nation

(2001) asserted that such words are so important that "anything that teachers and

learners can do to make sure they are learned is worth doing" (p. 16). The crucial and

formidable task of acquiring a sufficient portion of the lexicon of the target language

has been made somewhat easier through the identification and prioritization of target

words.

Literature concerning vocabulary learning and teaching often draws a general

distinction between being either explicit or implicit. The division is also applied to

L2/FL instruction in general, where explicit learning can involve the working out of

language rules from examples given, and implicit learning where "learners are given

a rule which they then practice using" (Ellis, 1994, p. 642). In vocabulary learning,

explicit learning can mean the intentional, deliberate study of target words, as with

the use of such materials as word cards and wordlists. Implicit learning can be

defined as the unintentional study of vocabulary items, such as the "picking up" of

target vocabulary through using the L2/FL in everyday conversation.

No solid evidence of the superiority of one approach alone has been forthcoming. Evidence from research, such as that of Paribakht and Wesche (1997), supports the notion that a combination of both approaches will serve the average learner best. Hulstijn (2001) and Nation (2013) hold the belief that the learning of L2 words requires deliberate as well as incidental approaches to learning, with both writers using the term "complementary" to describe the relationship between the two approaches. This complimentary relationship is also applied to similar diametric views of vocabulary learning, such as contextualized vocabulary learning (experiencing words as they appear in language usage) and decontextualized vocabulary learning (isolating words for directed study). Coady (1997) concludes that, despite the merits of contextualized learning in terms of authenticity and comprehensibility, decontextualized vocabulary learning is an indispensable process. Schmitt (2008) goes further in describing incidental and intentional approaches to vocabulary learning, stating that they are not only complimentary, but "positively require each other" (p. 353).

The argument exists that learning situations should simulate natural language contexts, where students can acquire vocabulary in their own fashion from a large amount of naturalistic-type exposure, comparable to that of L1 development. However, evidence of the outright effectiveness and superiority of this approach is not forthcoming. Pedagogical realities of time and resources, as well as the learning task at hand (in terms of sheer numbers of words, and the priority that some words must be given) make a good case for teaching words in a direct, deliberate, explicit and intentional manner. Acknowledgement of the necessity of both approaches in an L2/FL program is pervasive throughout the current literature.

In order to successfully use an L2/FL vocabulary, lexical knowledge alone is insufficient, as fluency demands that words are spoken or listened to at 2-3 words per second, and read at 3-6 words per second (Hulstijn, 2001). It has been recommended that the most frequent words (the first 1000 or 2000) should be learned to the point of automaticity, and later words learned in more contextualized situations (Coady, 1997). Despite the negative connotations of learning words for fluency using what could be regarded as behaviorist style techniques (Hulstijn, 2001), it has been argued that directed vocabulary studies aimed at automatic recall should be featured in a language program, appearing as complimentary to (and not in place of) incidental and contextualized learning (Hulstijn, 2001; Nation, 2013).

2.3.2 Current trends in L2/FL vocabulary instruction

The current approach to L2/FL vocabulary teaching emphasizes and values a variety of both explicit and implicit teaching approaches. Sokmen (1997) stated that the "pendulum has swung" (p. 239) from direct teaching to indirect (i.e., from the grammar translation method to the communicative approach), and now rests in the middle with an explicit/implicit focus. Current approaches continue to emphasize a range of teaching and learning strategies, with no one claiming to have found a panacea: a method (or a certain combination of methods) that will work for most leaners most of the time.

Sokmen (1997) identified pedagogical themes which are apparent when examining L2 vocabulary literature, reflecting this multifaceted approach to vocabulary learning. These themes include the building of sight vocabulary, the integration of new words with old, providing the chance for multiple encounters of words, the promotion of a deep level of processing, the facilitation of imaging and concreteness, as well as the

encouragement of independent learning strategies. Sokmen (1997) further identified a variety of specific learning techniques as recurring in the literature, including the use of dictionaries, mnemonic devices, and the use of semantic elaboration using the techniques of elaboration, feature analysis, mapping, and pictorial schemata.

A variety of vocabulary instructional approaches were recommended by some leading L2/FL vocabulary researchers, which appear to exemplify the recent trends in how L2/FL vocabulary is believed to be taught most effectively. Beglar and Hunt (2005) reviewed the best ten vocabulary learning ideas offered by Paul Nation, Batia Laufer, and Paul Meara, and noted the inclusion of explicit methods such as word cards, wordlists and the memorization of text in their lists of suggestions. They list six underlying principles from the suggestions, four of which match Nation's (2007) four strands of L2 vocabulary learning: comprehensible input, form-focused instruction, meaning-focused output, and fluency development. The six principles (as identified by Beglar & Hunt, 2005) are:

1. The provision of access to decontextualized and contextualized input. Decontextualized vocabulary needs to be carefully selected (i.e., high frequency words and specialist words such as academic vocabulary); contextualized words need to be presented in a meaning-focused and communicative context, provided in large quantities through intensive and extensive listening and reading.

2. The encouragement of communicative output. Learners need to "develop a personal voice in the L2" (Beglar & Hunt, 2005, p. 8) using the vocabulary in a communicative context, in which they can try out new words, and gain feedback on their usage.

3. The provision of form-focused instruction. With mere exposure to an L2 being inadequate for effective learning, assistance is required in order that words are

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actually used by the students, and thereby learned accurately.

4. The promotion of fluency development. Fluency is advanced by learners "developing faster access to already known lexis and larger lexical chunks" (Beglar & Hunt, 2005, p. 9). This can be achieved by repeatedly experiencing words through review, communicative tasks, course materials, integrated tasks (involving listening, speaking, reading and writing), and extensive listening and speaking.

5. The enhancement of student motivation. While not mentioned explicitly in the list, motivation is still an underlying factor. Motivation can be promoted through learner autonomy, the setting of vocabulary goals, and an increase in self-confidence as a result of an expanded vocabulary.

6. The development of the usage of effective vocabulary learning strategies. Learners are helped with a metacognitive awareness of the strategies that can be employed in their vocabulary learning task. The teacher has a supporting role, helping students with learning how to use such strategies, such as the use of word cards, the keyword method, regular review, guessing in context, and dictionaries.

The use of L1 translations in L2/FL instruction continues to be a point of contention. Nation (2013) points out that "Translation is often criticized as being indirect, taking time away from second language, and encouraging the idea that there is an exact equivalence between words in the first and second languages" (pp. 121-122). Folse (2004a) refutes the belief that the use of L1 translations in the classroom should be actively discouraged due to the L2 taking up too much class time or students coming to rely too heavily upon L2 forms. He points out that students doing translations (mentally and in their notebooks) are not interfering with the lesson, and the practice

actually helps with memorization, as "a brief translation of a key concept at the right time can be invaluable" (p. 60). Whether the use of translations in the classroom is a more positive or negative influence appears to be contingent upon how the lesson is taught.

2.3.3 Linking form and meaning

Regardless of whether a word is learned intentionally or incidentally, its meaning must still be understood. Establishing a link between the L2/FL word form and what it means is widely regarded as an essential practice in L2/FL teaching, especially at the beginning stages of a learner's development (Schmitt, 2008). When presenting a word, giving priority to the actual meaning of the word is considered to be good classroom practice (Allen, 1983). Learning how to use the word will become necessary at later stages, but the general underlying concept of a word must be known by the learner (Nation, 2013).

It is apparent that some words (such as high frequency words) need to be known before others, but a question arises as to what is exactly meant by knowing a word. Being able to recite a standard dictionary definition or being able to identify a correct L1 translation of a target L2/FL word is not the same as having the ability to use the L2/FL word effortlessly and accurately in a conversation. Laufer (1997) identified six main aspects of what research into L2 vocabulary learning generally regards as the requirements for knowing a word: (1) word form – how the word is written and spoken, including the pronunciation and the orthography of the word; (2) word structure – the makeup of the word, bound and free morphemes; the affixes and stems that make up words; (3) syntactic patterns – the grammatical rules which determine how the word can be used in a sentence or phrase; (4) word meaning –

referential, affective and pragmatic; (5) lexical relations to other words; and (6) common collocations.

Vocabulary knowledge is often regarded in terms of being either receptive or productive, or sometimes referred to as passive and active. In general terms, knowing a word receptively means having the knowledge required to be able to successfully receive the word (through reading and listening), and knowing a word productively means having the knowledge to produce the word (as with speaking and writing). According to Nation (2013), using vocabulary receptively "involves perceiving the form of a word while listening and speaking and retrieving its meaning" and productive vocabulary use "involves wanting to express a meaning through speaking and writing and retrieving and producing the appropriate spoken or written word form" (p. 47).

In order to use a word receptively or productively, two different types of knowledge are required. For example, the writing and speaking of a word require knowledge of the word's orthography and pronunciation, whereas reading and listening require knowing the written form and the phonetic form of the word. The distinction between receptive and passive (along with the terms themselves) is not clearly defined or universally agreed upon, so remain a point of contention. Melka (1997) noted that the dichotomy appears to be of convenience, especially for pedagogical purposes, yet believes that the term should not be used as it is too "fuzzy" (p. 99). She preferred to view the distinction as more of a continuum, which varies "according to diverse linguistic or pragmatic factors" (p. 101). However, applying a general receptive (reading and listening) and productive (writing and speaking)

classification to vocabulary knowledge and skills remains common practice in vocabulary testing and teaching.

The literature often emphasizes the importance of repetition in the acquisition of L2 vocabulary, in terms of the number of times a word is encountered, and the number of times it is recalled. O'Dell (1997) recommended that textbooks and syllabuses assure the repetition of target words, noting the work of Kachroo (1962) who found that seven or more encounters to be effective for learning. According to O'Dell (1997), "The learner should revise new material soon after the initial meeting of it and should then recall it at gradually increasing intervals" (p. 276). Nation (2001) described vocabulary acquisition as highly cumulative, where one experience builds upon the next, and emphasized the benefits of recycling and spaced repetition of vocabulary items in a learning program. He expressed the belief that repeated encounters are not only necessary to support memorization, but also give opportunities to learn the different aspects of knowing a word. According to Nation (2001), "Repetition thus adds to the quality of knowledge and also to the quantity and strength of this knowledge" (p. 76). Repetition can thereby be viewed as an enriching experience for the learner, where knowledge, understanding, and language skills related to the words can be acquired and developed, and not just repeating for the sake of memorization.

2.3.4 Depth of processing

Along with the frequency of experiences with L2/FL words, the quality of the encounters also requires consideration. Craik and Lockhart's (1972) levels of processing theory is often cited to explain how L2/FL vocabulary can be processed at different levels of semantic intensity. Rather than focusing upon the multi-store

model, where successful retention is reliant upon information shifting from short term to long term storage systems, the theory postulates that the degree of semantic involvement with the word (the extent to which it is considered, understood, and related to what is already known) is the main determining factor as to how the word is retained in the long-term memory. Craik and Lockhart (1972) gave examples of three processing levels: (1) structural – a shallow encounter as with simply looking at the word in written form; (2) phonetic – a deeper encounter in which the sound form of the word is experienced; (3) semantic – regarded as "deep" processing, where the actual meaning of the word is considered. Subsequent work by Craik and Tulving (1975) found that retention of vocabulary items was more successful (and took more time) when words were encountered in sentences with complex meanings, or more "elaborate" as opposed to simplistic sentences. They concluded that "subjects remember not what was 'out there', but what they did during the encoding" (p. 292). In reference to L2/FL vocabulary learning, this could mean that the focus of instruction should be on the experience that the learner is having of the words, and not upon the words themselves.

Depth of processing and elaboration of meaning have had a major influence upon L2/FL vocabulary research, as the benefits of experiencing words to more than just a superficial degree (i.e., simply showing the words and expecting them to be remembered) are often emphasised. According to Hulstijn (2001), "Learners should elaborate on a new word's form and meaning in order to facilitate retention" (p. 215), as successful retention is dependent upon the nature of the information processing taking place within the learner. Schmitt (2008) believes that learners should engage with the words they are learning, by having a range of experiences through an assortment of activities, in order to maximize the opportunity for successful

memorization. Similarly, Read (2004), in referring to the work of Hulstijn and Laufer (2001), explains how retention has been demonstrated to be stronger when students have had to "work" (i.e., make a concerted effort) to remember and to use words, as opposed to word meanings simply being presented to the learner.

The basic concept of the depth of processing theory continues to exert an influence upon L2/FL acquisition research. Leow (2015) notes how the majority of studies into depth of processing have provided evidence that "deeper" semantic processing does in fact result in better retention and learning of lexical forms. His contemporary view of depth of processing is more comprehensive, descriptive, and relevant to L2/FL acquisition, as his definition of the theory includes "the relative amount of cognitive effort, level of analysis, and elaboration of intake, together with the use of prior knowledge, hypothesis testing, and rule formation" (p. 204). Leow (2015) appears to regard the amount of mental or cognitive effort (from the learner) as being at the forefront of successful learning, believing that effort is congruent with "a deeper level of processing that should lead to more robust learning and retention" (p. 217). For L2/FL vocabulary learning, depth of processing research indicates that vocabulary acquisition requires attention, concentration and conscious effort, which is consistent with an explicit approach to teaching and learning.

2.3.5 Word learning ease and difficulty

It is apparent that not all L2/FL words are equal in terms of how easy or difficult they are to learn. Considerable research has identified and explored the factors effecting the learnability of individual words, indicating that vocabulary does not follow a rule-governed system as is the case with grammar, but is "subject to certain regularities" (Laufer, 1997, p. 141). These regularities are often a direct result of how

similar the L2/FL words are to what the learner is already familiar with. For example, the Japanese word *terebi* meaning *television* in English can be described as one of the less difficult words to learn, as it resembles the English word phonetically, represents the same concept as its English equivalent, and is used as a concrete noun. Nation (2013) describes the amount of effort required to learn a word as being the word's learning burden, which follows the general principle that the closer the L2/FL word resembles what the learner is already familiar with (i.e., the similarity to the L1 and existing knowledge of the L2/FL) then the lighter the learning effort will be.

In FL learning, concrete words have been demonstrated to be easier to acquire than abstract ones. In a study by de Groot and Keizjer (2000), 60 L1 words were each paired with a pseudo-word. They found that concrete words and cognates were learned more easily and were less prone to being forgotten than abstract words and non-cognates. However, the assumption that concrete words are more difficult to acquire than concrete ones has been challenged. Laufer (1997) asserted that L2 learners – unlike L1 learners – already have abstract concepts developed in their L1, so for them it is more a matter of simply attaching another label to the target word. She further states how even concrete nouns can be difficult for learners, using the example of Hebrew speakers of English commonly confusing Tuesday with Thursday. Although there is evidence for the concrete/easy, abstract/difficult assumption, Laufer (1997) put this view into a wider perspective: "Many abstract words require simply learning a new form for a familiar concept. On the other hand, concrete words may be problematic if they contain other factors of difficulty; intra- or inter- lexical" (p. 150).

The length of the L2 words being learned has not been conclusively shown to be a major determining factor in their learnability, despite studies (e.g., Coles, 1982; Phillips, 1981) which have demonstrated that word length is of significance to learning. The influence of word length could be more the result of basic cognitive functioning rather than being specific to L2 learning, as Baddeley, Thomson and Buchanan (1975) concluded (from experiments with L1 words) that "memory span is inversely related to word length across a wide range of materials" (p. 1). The cognateness of a word, followed by its frequency, has been shown to have a higher influence upon its learnability than its phonemic length (Willis & Ohashi, 2012). Laufer (1997) points out that it is difficult to attribute the length of a word to its learnability, given the variety of other influences that come into play when learning words. The wider view of how the word is presented and experienced by the learner appears to be of more relevance to its learnability rather than simply how long it is.

Cognates can be defined as L2 words which resemble their L1 translation, having a similar phonological and/or orthographic form (Lotto & de Groot, 1998). The Japanese language, for example, contains many loan words from English, such as the word *pen* for the English *pen*. Not surprisingly, learning the word *pen* for Japanese students of English (and English speaking students of Japanese) is not difficult. However, when asking for a stapler or a ruler in English (*hochikisu* and *jougi* in Japanese), it soon becomes apparent that these words are not well known. English loan words in Japanese have a similar phonographic form, as English pronunciations are expressed in Japanese phonological forms, and the orthography can be similar when katakana forms are converted to *romaji* (English script). Meanings are generally the same, but (like any translational form) are not a perfect match, with differences in nuance, context, and pragmatics. Some words have been converted to

have a very different meaning, such as *cunning* (Japanese *kanningu*) not meaning sly or crafty but meaning to cheat.

de Groot and Keijzer (2000) found that, when L1 words were paired with pseudo-words, cognates were easier to learn and less susceptible to forgetting than non-cognates. Similarly, Willis and Ohashi (2012), having vocabulary tested English cognates and non-cognates on Japanese learners, stated that their results confirmed "what many teachers and learners probably 'know' intuitively, that cognateness gives learners a very large advantage in vocabulary learning" (p. 133). Cognates can be an asset to learning, especially for beginning students, as they can be easily recognized by learners. Lado (1956) regarded cognates of Spanish and English words (of which there are many due to the languages' Latin roots) to be "of value at the very elementary level" (p. 33). However, he also noted that cognates can also be a source of confusion, as "deceptive cognates" can have a similar form but a different meaning.

The use of cognates and an awareness of them can make a significant contribution towards L2/FL learning. Melka (1997) believed that learners at early stages tend to generalize cognates and so "use this principle in comprehension and production" (p. 97), yet at later stages of learning become increasingly wary of the limitations of this practice, and will hesitate and avoid using them thereby decreasing productive usage. Nation (2001) expressed the belief that the study of cognates could be of benefit to some learners, "especially where there are significant changes to the form of the words after they have been borrowed" (p. 280). Similarly, Melka (1997) stated how discovering cognates can be considered to be part of building language competency, thereby helping with L2 production and comprehension.

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2.3.6 Word cards and wordlists

One common and practical means by which learners can study words repeatedly is through the use of word cards, or flashcards. Used as a method of self-study, the cards are (in their most basic form) a set of small pieces of cardboard, with the L1 form written on one side, and the L2/FL form on the other. Adaptations can include the inclusion of example sentences using the target word, definitions, phonetic script, grammatical information, synonyms, antonyms, and the use of pictures to represent the words. Oxford and Crookall (1990) claimed, from research involving student journals, that the use of word cards is the most common vocabulary learning technique. One distinct advantage of word cards is that the L2/FL word form and meaning (the L1 translation) are not shown together. The L2/FL form must be produced from memory, and then can be checked immediately. Additionally, word cards allow for productive recall (recalling from the L1 form) as well as receptively (recalling from the L2/FL form). Nation (2013) asserts that vocabulary learning using word cards will be best supported if words are firstly learned receptively and then at a later stage learned productively.

Nation and Waring (1997) acknowledged the learning benefits of using word cards, as well as the sense of progress and achievement they can instil in learners, the motivation they can provide as students can make and tailor the cards to their own needs, and the practical benefits of being able to revise any chosen words at any time. However, they also expressed the belief that words studied by word cards (and wordlists) are only learned to a limited degree; as such a process is only a preliminary stage of learning a word. Therefore, the use of word cards should only be

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one part of a wider vocabulary program in which learner's encounter and use L2/FL words in a variety of meaningful ways, both receptively and productively.

Word cards are amicable to autonomous learning, as learners appear to have a large amount of control over their creation and usage. Studying with word cards is not restricted to classroom time, and students can personalize the material by adding such features as pictures, definitions, and example sentences at will. Despite the independent quality and strong association with self-study, students still require instruction and guidance in word card usage. Nation (2001) offered a list of ten suggestions as to how learners can be supported in the use of word cards. The first five points suggest what learners should know: (1) the importance of retrieval, including the showing of word forms and meaning separately as opposed to simultaneously, and receptive/productive retrieval; (2) the value of repetition, spaced learning, and long-term review; (3) the content which should be included on their word cards, including example sentences and collocations; (4) which words should be studied, with special consideration given to high frequency words; (5) how words should be studied, such as practicing the spoken form and the use of mnemonic techniques for difficult words. Actions for learners are also suggested: (1) changing the order of the cards, having more difficult words at the start of the pack so as to prioritize them, reorganizing packs so that known and unknown (newly introduced) words are mixed; (2) going from using smaller packs of cards to larger packs as their vocabulary develops. Lastly, more general suggestions are made: (1) an awareness of interference that can be caused when words with similar forms and meanings are learned together; (2) encouragement to transfer word card knowledge to meaning-focused language use; (3) knowledge of how to monitor and reflect upon their vocabulary development, and how to adapt their approach accordingly.

Similar to word cards, wordlists (lists of target words to be studied, often paired with equivalent L1 forms) provide the student with a means of self-study, in which a set of target words is isolated and decontextualized, and studied for memorization. Unlike word cards, both the L1 and L2/FL are presented at the same time, so (unless covered) productive and receptive recall is less likely to occur. However, as pointed out by Folse (2004a), wordlists are of value, as some students do better with words learned from wordlists (as opposed to learning words when presented in context) and actually prefer them. In a study by Schmitt (1997), of 150 Japanese university students surveyed, 54% indicated the use of wordlists, and 51% believed them to be helpful for FL vocabulary learning. Despite the popularity of wordlists amongst students, Oxford and Crookall (1990) believe that their benefits to learning are minimal, as students may be able to successfully memorize the L1 and L2 lists, yet they "might not be able to use the new words in any communicative way without further assistance" (p. 12).

The general consensus is that word cards and wordlists can have an important and valuable place in vocabulary learning, yet must be used in conjunction with more contextualized methods. Folse (2004a) asserts that students cannot just be left to their own devices to learn the words, as the teacher is still required to present the words "in interesting, meaningful ways" (p. 3). Waring and Nation (2004) acknowledge that, given the necessity of learning a considerable amount of words, word cards and wordlists should be used, but additional exposure to the words (e.g., collocates, grammar) will always be required, which further expresses the need for a complimentary relationship between contextualized and decontextualized methods.

2.4 Second/Foreign Language Vocabulary Learning with Pictorial Information

Literature concerning the use of pictures in L2/FL teaching often focuses upon the learning of vocabulary. Three types of studies feature predominantly: (1) associative – pictures presented with L2/FL words; (2) mnemonic techniques – words (and mental images) used as memory aids; (3) textual glossing – using pictures to comprehend vocabulary in text. The strong association between pictures and vocabulary learning might be due to the fact that understanding a word in an L2/FL requires the comprehension of its meaning, and pictures have the capacity to convey meaning effectively. Nation (2013) values the use of pictures in L2 vocabulary learning for their capacity to "clearly represent the underlying concept" (p. 121) of a word. The efficiency of using pictures to learn L2 vocabulary is apparent, as studies have shown that L2 words presented with an image are retained more efficiently than without (Kellogg & Howe, 1971; Lado, Baldwin & Lobo, 1967).

The literature relevant to the topic indicates that the use of pictorial forms in L2/FL vocabulary learning can be of considerable benefit to learners. This assertion is supported by theoretical models of human learning, such as that of dual code theory (Paivio, 1986), which emphasise the central role that visual processing may have in cognitive processing and memory. However, it is also apparent that L2/FL vocabulary learning by more visual means is underutilized by teachers and students, and further investigation is required to more fully realize the potential for this style of learning. Oxford and Crookall (1990) asserted that "most language teachers do not think to encourage students to apply visual skills to vocabulary learning" (pp. 17-18). Canning-Wilson (2001) described the relationship between language learning

and visuals as "reciprocal", stating that this relationship needs to "take a further direction in order to offer teachers the best methods for exploiting visual regalia in the classroom" (p. 7).

It is commonly assumed that pictures are limited to representing more concrete words, as it is difficult to visually represent abstract words which represent more intangible concepts. Some words are certainly more easily depicted than others, as a concrete word such as *skeleton* can be represented with much less difficulty than a word such as *ethics*. Despite the difficulty, it may still be possible to represent abstract words pictorially, as concrete items associated with a concept can provide the required meaning (Oxford & Crookall, 1990). For example, the word *cooperation* can be presented as a picture of two people lifting a box. This image might not be the perfect representation, but it is an expression of the "underlying concept" of the word (Nation, 2013, p. 121), and that might be enough to result in successful comprehension, usage and memorization, despite its abstract quality. Work by Chapelle (2003) supports the belief that pictures can help learners in the understanding of abstract words, even if the picture is not a strong visual representation of the referent word.

Research has also shown that words which are easier to visualize are easier to remember than words which are not (Stevick, 1996), and it has been consistently shown that concrete words are more easily remembered than abstract ones (Nelson & Schreiber, 1992). There are several theories as to why abstract words are more difficult to remember. One explanation is the dual code theory (Paivio, 1986), which in general terms theorizes that concrete words (being easy to picture) are processed in both the verbal and visual subsystems. Abstract words, however, are only

processed in the verbal subsystem (as they are difficult to visualize) so they stand a lesser chance of being remembered. Baddeley (2004) offered what he believed to be a more plausible explanation, while acknowledging that the reason remains unknown: "The concrete/abstract difference probably has something to do with the way word characteristics are stored in semantic memory, with concrete words being more richly encoded than other ones" (p. 62).

Other theories explaining how abstract and concrete words are processed have an "embodied" approach in which the semantic representations of the two types of words differ. Vigliocco et al. (2014) explained that "Whereas concrete concepts are grounded in our sensory-motor experience, affective experience is crucial in the grounding of abstract concepts" (p. 1766). The embodied approach appears to offer a reasonable proposition – concrete words (representing actual things) are more involved with physical associations, while abstract words (representing concepts and ideas) are more involved with emotional associations.

In support of these theories, Kousta, Vigliocco, Vinson, Andrews and Del Campo (2011) found an association between the valence of words (how a word is viewed as positive, negative or neutral) and how words are processed, indicating that affective processing affects the learning of abstract words more than concrete words. Further support for the approach is from a study by Vigliocco et al. (2014) which used functional magnetic resonance imaging to determine that areas of the brain believed to be associated with emotion are more active when processing abstract words. Their study concluded that "affective, not just linguistic development may be considered as precursors of the successful learning of abstract vocabulary" (p. 1775). From the

results of these two studies, it appears that emotion plays an important and differing role in the learning of concrete and abstract words.

2.4.1 The picture superiority effect

The picture superiority effect (PSE) is a general term given to the assertion that pictures are better remembered than words. Hockley (2008) believes that a history of research has confirmed the validity of the theory, as "it has been clearly established that pictures are remembered better than words in tests of recall and tests of item recognition" (p. 1351). The effect has been explained from different theoretical viewpoints, including the dual code theory (Paivio, 1986) which proposes the use of two separate subsystems (visual and verbal) that use different types of encoding to process information. Pictures are believed to be more easily remembered than verbal information because they are more likely to use both the verbal and visual channels, whereas words are more likely to use only the one (verbal) channel. The single-code model, an alternative to the dual code theory, posits that human memory does not involve two separate codes but one single code. Proponents of the single-code model, including Anderson and Bower's (1972) propositional theory of recognition memory, believe that only one semantic code exists, yet the way that pictures are processed (which differs to that of words) results in pictures being more easily remembered.

Research into using pictures to learn foreign vocabulary often uses the PSE as a theoretical basis, with the premise that the pictures will be more beneficial to learning as they are more easily remembered than linguistic forms. However, the effect has not been demonstrated with the same level of certainty when applied to FL learning. For example, Lotto and de Groot (1998) presented Italian words to Dutch speakers, with either Dutch translations or pictorial representations, and found that

learning with word forms resulted in better test performance than with pictures. They concluded that leaning L2 words with words was more effective than learning with pictures, "At least when the learners are relatively experienced foreign language learners" (p. 61).

Carpenter and Olson (2012) offer an explanation as to why studies testing the PSE in L2 vocabulary learning do not achieve the same conclusive results as studies pertaining to the PSE only. They identify two major differences between the types of study: (1) PSE experiments involve the presentation of a single item (a word or a picture), whereas L2 experiments present the L2 word paired with either an L1 or a picture; (2) PSE tests measure single item recognition or recall, whereas L1 tests rely upon cued recall from a picture or its L1 translation. Information is thereby encoded and retrieved differently between the two types of tasks. Learners may find L2 tasks more difficult as more encoding is required for both the L1 word and the picture, possibly creating an "encoding tradeoff that leads to better memory for one item at the expense of the other" (Carpenter & Olsen, 2012, p. 2). In addition, they speculate that the difference in results could be due to a disparity between the way in which the L2 word was encoded, and the way it is then retrieved. If the L2 word was learned with a picture, then it (theoretically) encoded elaborately, yet the experiment's method of retrieval may not be sensitive to this kind of encoding.

2.4.2 Pictures and L2/FL instructional materials

Pictorial information continues to play a substantial role in the teaching of foreign languages, as evident in L2/FL instructional resources of past and present. Graphics remain a constant and common feature in materials such as flashcards, posters, various forms of computer software, and textbooks. For example, one current and

widely used ESL textbook, *Four Corners Student's Book 3* (Richards & Bohlke, 2012), features clear, colorful photographs and drawings of attractive people, objects and locations on almost every page. Some pictures are supplementary to the text, assisting with the understanding and comprehension of material, such as images of the characters appearing in dialogs and stories. Other illustrations have more of an instructional role, as with speaking activities in which students relate a story based on a picture, and listening activities where a set of pictures is to be matched to the relevant audio cues. The pictures also appear to have an affective role, as they seem to attract attention and made the textbook interesting.

Perhaps with the exception of some higher level textbooks, a contemporary L2/FL learning textbook devoid of a substantial amount of illustrative material would appear to be somewhat inadequate. Recent studies into illustrations in L2/FL textbooks have focused upon gender issues, such as gender roles and representations, rather than the pedagogical value of pictures. However, evidence for the positive effects of pictures in language learning textbooks does not seem necessary, as proof of their acceptance, appeal, and value to teaching and learning is apparent in the heavy usage of graphics which persists in today's publications.

Pictures not only serve a decorative function when appearing alongside text, but also help the reader with the representation, organization, interpretation, and transformation of information. (Carney & Levin, 2002). According to Levin (1989), "Pictures interact with text to produce levels of comprehension and memory that can exceed what is produced by text alone" (p. 89). Schnotz (1993) asserted that graphics can be more helpful to learners than text, as (like mental models) they "possess inherent structural properties used for their representational properties, which is not

the case with text" (p. 248). The addition of pictures to text provides the learner with an alternative representation of meaning, thereby giving the learner a richer (that is, more meaningful) experience than by text alone.

Pictures continue to serve an important function, often in partnership with written text. Levie and Lentz (1982) offered a four point functional framework regarding the use of illustrations in text, which focused upon four functions that illustrations serve in support of written text: (1) attentional – pictures focus attention upon the written material; (2) affective – connected with enjoyment and motivational factors; (3) cognitive – facilitates learning of the text content by improving comprehension and retention, and by providing extra information; (4) compensatory – provides assistance to learners who have difficulties with text comprehension. Pictorial information used in L2/FL learning materials appear to have similar functionality, as graphics can get the students' interest, provide enjoyment, help with understanding, and support those students who are struggling with the material.

Besides textbooks, another application for pictures in L2/FL vocabulary learning is that of picture dictionaries. An example of this type of dictionary is *The Renyi Japanese Picture Dictionary* (Editions Renyi Inc., 1990). Written for English speakers, the book appears in a series for learners of a multitude of languages, including Asian and European languages. The dictionary comprises of 3336 words chosen by word frequency analysis and thematic clustering. The vocabulary is presented in written form (English and Japanese), as well as by illustrations depicting word meanings. The illustrations are small colored drawings with some detail.

The Renyi Picture Dictionary series (Editions Renyi Inc., 1990) depict a wide range of nouns, verbs and adjectives. However, some vocabulary items are not depicted, being represented with example sentences in both English and in Japanese. The introduction to the dictionaries explain that "the degree of abstraction is kept relatively low", meaning that highly abstract words were deliberately avoided in the selection of words. However, it also states that it was "necessary to include items such as *to expect* and *to forgive*". Rather than omitting such highly abstract words, simple explanatory and example sentences are used to provide context for word meaning instead of a picture. The authors of the dictionary describe the words *expect* and *forgive* as being "virtually impossible to illustrate" which is indicative as to how the producers of instructional materials are aware of the limitations of expressing a word pictorially, and this restriction appears to be based upon the word's degree of abstraction.

2.4.3 Mnemonic techniques

Mnemonic techniques (or memory assisting devices) exist in various forms and serve a variety of purposes. In the subject of L2/FL vocabulary learning using imagery, mnemonic methods play a prominent role as they often require a process of visualization. Basically, a visual mnemonic involves the use of a mental image (which may also be presented in physical form) to help recall information. This process links something which is already known to whatever needs to be recalled. For example, if a student of Japanese knows the word *hashi* for chopsticks, an image of a giant set of chopsticks crossing a river might be a reminder that *hashi* also means bridge. Mnemonics can also be audio in nature, using the sound forms of a language. For example, the rhyme: *Thirty days hath September, (etc.)* can be recited verbally or mentally to recall the number of days in the months, or the phrase: *My*

Very Eldest Mother (etc.) used to remember the order of the planets by using the first letter of the recalled words. As well as being visual and auditory, mnemonics can involve a combination of both processes, as with the keyword method (described in this section) used in L2/FL vocabulary learning.

The literature often mentions a variety of mnemonic techniques which primarily involve visualization. These include the historical loci method, where a space with several locations featuring an object in each location is imagined, for example, a large house with a different object in each room. Recall occurs when an imaginary journey is taken through the different rooms, with the objects serving as a reminder as to what needs to be recalled. Other visual mnemonic techniques mentioned include the remembering of the actual appearance of the word, or as described by Schmitt (1997) to "visualize the orthographical form of the word in an attempt to remember it" (p. 214), as well as the practice of associating groups of words with certain colors (Nyikos, 1987).

In accordance with the dual code theory, Sokmen (1997) believed that developing non-verbal representations of target material will result in greater recall than developing verbal representations alone. Learners benefit from having both verbal and non-verbal links in the connections of meaning that they have formed. Furthermore, imaginal representations provide a means by which the learner can form a personal connection to the word, as an image can make the word seem "real" to the learner, as it has entered the realm of their own personal experience. Sokmen (1997) pointed out the value of having students form their own concrete visual representations of words, as "vocabulary instruction which relates new vocabulary to past experience has the potential of enhancing memory" (p. 244).

Research has recognized the value of using processes of visualization in the learning of L2 vocabulary. Oxford and Crookall (1990) describe visual imagery as "a resource that deserves further tapping" (p. 18), as it has the potential to provide the learner with much needed context for new words. Nation (2013) believes that an image of a word may involve a deeper processing of meaning than that of L1 translations, so can therefore be more beneficial to memory, as an L1 translation "does not encourage the learner to imagine a real instance of the meaning of the word" (p. 449). Yet despite the apparent benefits to learning, it cannot be said that the deliberate visualization of target words is practiced or encouraged in L2/FL classrooms to any significant degree.

The mnemonic technique which has received the most attention from research is the keyword method, which involves the creation of an image which forms an auditory link between the target L2/FL and a word familiar to the learner. The target word and the familiar word share a similar sound, so the image brings the two words together. For example, the Japanese word for horse *uma* might be recalled by remembering the image of the actress *Uma Therman* on a horse. Using Levin's (1983) "three R's" of associative mnemonic techniques, the Japanese word *uma* is recoded to a familiar proxy: *uma* as in *Uma Therman*. The word *uma* is then related to a horse by using the image of the actress on a horse. As a path has now been established, the Japanese word for horse may be retrieved by recalling the image. Even without being trained to do so, studies (e.g., Fuentes, 1976; Manalo, 1999) have shown that people will spontaneously use the technique to remember foreign words. Therefore, the keyword method may be considered to be nothing new; a memory trick which people innately

do that may well have been used to remember foreign words for many thousands of years.

Many studies have shown the technique to be effective in the learning of words in a variety of languages, such as the teaching of Russian and Spanish to English speakers (Atkinson, 1975), English to Cantonese speakers (Yeung & Heyworth, 1992), and English to Persian speakers (Anjomafrouz & Tajalli, 2012). The keyword method has also been employed to teach material other than L2 vocabulary. Levin and Levin (1990) taught scientific terminology in English to English speakers with positive results. Pictorial mnemonics involving the keyword method have also been demonstrated to be effective in the teaching of Japanese written characters (Manalo, Muzutani, & Trafford, 2004; Matsunaga, 2003).

In general, studies have shown the effectiveness of the keyword method, as it "results in faster and more secure learning than other approaches" (Nation 2001, p. 313), yet its application to actual L2 teaching practice can be described as tenuous and insecure. Researchers have noted its proven success in helping to recall L2 vocabulary, yet have noted the scarcity of its usage in actual L2 instructional practice (Hulstijn, 1997; Oxford & Crookall, 1990). In more recent times, there is nothing in the relevant literature to indicate that this situation has significantly changed. Hulstijn (1997) gained the impression (from work with teachers and textbook writers) that the technique is unpopular because it goes against the general belief that language used in L2 courses must be of an authentic and communicative nature. To actively encourage students to imagine strange and often bizarre images might seem inappropriate to such a classroom environment.

The keyword method has been scrutinized by researchers on several points. Given the large number of words an L2/FL learner must acquire, to have a separate keyword mnemonic for each word does not seem to be realistic. As Sokmen (1997) states: "It would be hard to imagine a learner retaining very large numbers of keyword images in their mind" (p. 235). Also, Nation (2013) describes how effective use of the keyword method has been shown to require training, and points out that studies investigating the technique have lacked an adequate explanation of the training involved, and the training periods have seemingly been too short. Oxford and Crookall (1990) pointed out that the sound form of the target word and the known word may not be the same, so the auditory link between the two words might be imperfect. Furthermore, the technique has been criticized for being limited to words which can easily be pictured. According to Ellis (1997), "It is of little use with abstract vocabulary and keywords of low imagineability" (p. 137).

The keyword method, despite having received a great deal of attention, appears to (at best) be generally regarded as a useful compliment or a possible addition to L2/FL vocabulary programs. It seems to not have been accepted as standard classroom practice, nor does it appear to be extensively used in L2/FL learning. The same could be said for mnemonic techniques in general. Atkinson (1975) went so far as to say, in reference to mnemonics in general, "Beyond impressing one's students, it is difficult to identify instructional situations in which mnemonic aids are truly useful" (p. 828). Nation (2013) believes that the keyword method should not be seen as "a magic technique, but one that applies important learning principles that can also be applied in other techniques" (p. 467), including the levels of processing theory.

2.5 Simple Pictorial Representations

Imagery has been classified into two different types, depending upon the way in which the images (or signs) portray the meaning they represent. Descriptive (or figurative) representations represent their meaning without necessarily resembling what they stand for, such as with mathematical symbols and linguistic forms (i.e., written text). As defined by Schnotz (2002), "A descriptive representation consists of symbols which have an arbitrary structure and are associated with the content they represent simply by means of a convention" (p. 103). This type of representation is symbolic (using symbols to portray meaning), and contingent upon agreements involving established rules to link form with meaning. Representations can also be depictive (or literal, pictorial), in which the images actually resemble what they are meant to represent, as with drawings of actual objects, or icons bearing a basic resemblance to their referent. Depictive representations rely upon commonalities of their form to what they are representing in order to convey meaning. These similarities of form do not necessarily have to be physical qualities, as representation occurs "through common structural features on either a concrete or an abstract level" (Schnotz, 2002, p. 103). For example, a U-turn road sign can be regarded as depictive. Even though the U-shaped arrow does not exist in reality, the arrow still resembles the actual path of a U-turning vehicle.

Both types of representations have contrasting properties and their own unique preponderance to communicating a message or expressing a meaning. In terms of strengths, pictures have the advantage of being able to represent something as it actually appears, with meaning conveyed in the image itself, and not necessarily dependent upon any prior agreement as to what the images stand for. Symbols, on the other hand, once understood have the power to convey the full gamut of any

written language, or any other information system such as mathematical notation. Eysenck and Keane (1990) identified four major ways in which linguistic and pictorial representations differ:

1. Language uses discrete symbols, (i.e., letters) whereas a picture "has no obvious smallest unit" (p. 204). Pictures can be broken up arbitrarily into smaller sections (such as the parts of a car) and these sections can continue to convey meaning on their own.

2. Linguistic representations have a distinct symbol for everything they represent, as meaning is presented explicitly. For example, *the dog is in the car* conveys the concept of *in* in a word. A picture of a dog in a car conveys the meaning of *in* implicitly (having the dog in the car) without the need for a special symbol.

3. Language is governed by rules (as in grammar) in which there are different classes of symbols (i.e., nouns and verbs). Pictures do not have classifications for symbols, and can be more freely combined as they do not follow any grammatical system.

4. Linguistic representations are abstract in the sense that they can represent information from any modality (vision, touch, taste, sound) without having to bear any kind of direct relationship (i.e., resemblance) to it. A picture has more of a concrete quality, as "while the information it represents could have been acquired from a variety of perceptual sources, it is strongly associated with the visual modality" (p. 205).

2.5.1 Pictograms

Tijus, Barcenilla, Cambon de Lavelette, and Meunier (2007) define a pictogram as "a stylized figurative drawing that is used to convey information of an analogical or

figurative nature directly to indicate an object or to express an idea" (p. 2). They identify three different types of pictogram: (1) Figurative – a pictogram meant to represent something directly, and "supposed to evoke without ambiguity the object or the situation represented" (p. 2) (e.g., a cigarette meaning smoking); (2) Abstract – a pictogram which "comprises only certain aspects of the concept to evoke it in its totality" (p. 3) (e.g., an arrow bending left meaning *go left*); (3) Arbitrary – a pictogram which does not resemble its intended meaning (e.g., the international symbol for *radiation*). Pictograms can contain a combination of these forms, such as a *no smoking* sign with a figurative representation of a cigarette and smoke, and the abstract representation of a diagonal slash in front of the image analogically representing something being cut or removed.

Pictograms play an important functional role in society, communicating meaning in potentially life or death situations, such as driving, occupational health and safety, and the taking of medication. Accordingly, research concerning pictograms has been largely concerned with their applications in "real world" situations, with the bulk of studies using empirical data to establish a pictogram's ability to convey information when used as signage in public spaces designed for orientation, the usage of pharmaceutical products, road safety signs, and workplace organization (Tijus et al., 2007). British, American, European, and International standards exist to regulate the design and usage of pictograms in many fields of application, including the handling of hazardous materials, age warnings for children's toys, materials in contact with food stuffs, fire safety signs, and the use of agricultural equipment.

At the core of research into the effectiveness of pictograms is their ability to convey their intended message accurately. Studies often involve the collecting of quantitative

data through the testing of participants on their interpretation of a range of pictograms. Standardized procedures have been established for the assessment of pictogram comprehension, including that developed by the International Organization for Standardization (ISO 9186-1:2014), which uses the following scale of how accurately a graphic symbol is judged to be understood: (1) *accurately*; (2) *likely*; (3) *marginally likely*; (3) *opposite to the intended meaning*; (4) *wrongly*; (5) *response is don't know*; (6) *no response*. Acceptance of a pictogram depends upon the likely or accurate comprehension of at least 67% of respondents, whereas the American National Standards Institute (ANSI Z535.3) – which uses only four categories of *correct*, *wrong*, *critical confusion*, and *no answer* – requires an understanding of 85% (Tijus et al., 2007).

Research has identified several benefits that pictograms (as a means of communicating important messages) have to offer. A study by the Department of Trade and Industry in the UK (Davies, Haines, & Norris, 1998) identifies several advantages of pictogram usage in conveying consumer safety information, including how the images can make warnings more noticeable, be instantaneous reminders of messages already established, and be of assistance to people with literacy or visual difficulties. In relation to the use of pictograms and text, the study also states that pictograms have "the potential to be interpreted more accurately and more quickly than words", and that "they can sometimes be recognized and recalled far better than words" (p. 2). Studies with pictograms used to convey medical instructions, such as that of Dowse and Ehlers (2005), have shown pictograms to be effective in the understanding and to the adherence of instructions, and have reported high levels of positive reactions to the inclusion of pictograms.

However, the disadvantages (and even dangers) of using pictograms in consumer safety information are also apparent. A study by Barcenilla and Tijus (2002) found that only 39% of 134 participants correctly identified 14 medicinal pictograms. Davies, Haines, and Norris (1998) state how only a small number of pictograms are universally understood, as even well understood pictograms will not be interpreted accurately across all consumer groups and cultures. In addition, it takes considerable time (many years) for a pictogram to achieve its maximum effectiveness. There is also a danger that pictograms can actually be harmful, as "there is a potential for critical confusion (interpreting the opposite or often undesired meaning) which can create an additional safety hazard" (p. 2). They conclude, upon considering the majority of relevant studies, that pictograms may have some value in conveying safety information, but fail to provide a certain means by which the effectiveness of text messages can be improved.

In addition to safety information, the limitations of using pictographic images to convey information have been recognized in the development of signage used in the transportation industry. In 1974, the United States Department of Transport and the American institute of Graphic Arts collaborated to design a set of symbols to be universally recognized in transportation facilities, such as at international airports. A total set of 50 pictograms were eventually completed in 1979. Robinson (2009) notes a significant conclusion reached by the project's design committee, in which pictograms were described as being strictly limited in their applications. Effectiveness was reported as being the greatest when used to represent a service or a concession using one object, such as a bus. However, they were much less effective when used to represent a process or activity, such as ticket purchasing, as these involve complicated interactions and considerable variation between what happens in

different locations (i.e., ticket purchasing in different countries with different carriers). Robinson (2009) reports how the committee further concluded that, in order to avoid passenger confusion, "symbols should not be used alone, they must be incorporated as a part of 'an intelligent total design system', involving both symbols and alphabetic messages" (p. 138). Today, the design committee's conclusions are apparent, as exemplified by international airports featuring a basically similar set of pictograms representing the same limited number of concepts, with these signs most often accompanied by writing.

Context is seen as fundamental to the understanding of pictograms. Tijus et al. (2007) note the polysemic quality of pictograms, as one image can easily be interpreted to mean a myriad of different things. They point out that providing an image with some context will help "to disambiguate a pictogram's intended meaning" (p. 10). Pictograms have been shown to be highly context dependent; relying upon the surroundings in which they appear to accurately convey meaning. Pictograms appearing in isolation (without the aid of supporting text) apparently struggle to convey their intended meaning, yet when set within a particular environment, such as a highway, airport, or on a medicine label, their polysemetic quality is somewhat reduced, and their intended meaning is made more apparent.

Pictographic-type images have also been used as a means of L2/FL study. *The Pocket Book of Basic English* (Richards, 1945) was designed for self-study, using vocabulary from Ogden's (1930) list of 850 Basic English words. In the book, short sentences in English are presented with simple line drawings which convey the meaning of the sentences. The back cover of the book proclaims: "Here is a book for learning English the quickest and easiest way – through pictures". According to

Small (2014), Richards produced his own drawings and made them as simple as possible, to avoid what he referred to as "distractions", thus providing the learner with a limited number of cues to match the objects and the vocabulary: "Richards always conceived his designs as tapping into and paralleling the mind's natural propensity to growth" (p. 456).

This process of discovering meaning is apparent upon looking at *German Through Pictures* (Richards, Mackey, Mackey & Gibson, 1953), a version of Richard's book designed to teach German language. It appears that in order to effectively use the book, a process of translation (from German to English) is necessary so as to understand the German sentences. Once understood, the simple pictures can then be used to confirm or clarify the meaning, and then be of assistance to understanding in subsequent readings. The simple, pictographic images seem to offer the learner the basic concepts of what is being expressed in German, yet without actually knowing what the German words and sentences mean, the images appear to be of very limited value.

2.5.2 Emoji and emoticons

Simple pictures are being commonly used in everyday electronic messaging, such as with email and social media exchanges. It is apparent that non-textual forms: emoji and to a lesser extent emoticons, are becoming an increasingly prevalent and influential means of communication. For example, Levin (2016) reports on how Google has proposed thirteen new emoji designs featuring female characters to the Unicode Consortium which are believed to promote gender equality in the workplace: "As emojis have exploded in popularity in recent years, there have been ongoing debates about diversity in the available images, prompting the creation of

more racially diverse faces as well as same-sex emojis". Using pictorial forms instead of and supplementary to text does not appear to be a passing fad. Rather, emoji are gaining more of a mainstream acceptance, as reflected in the social issues the symbols have become embroiled in, such as those involving race and gender.

Emoticons are symbols which use existing textual information (e.g., letters and punctuation marks) to form depictive representations. Ptaszynski, Rzepka, Araki and Momouchi (2011) identify three different types of emoticon: (1) Western one-line type (i.e., ":-D" – smiling face); (2) Eastern one-line type (i.e., "(^_^)" – smiling face); and (3) Multi-line ASCII (American Standard Code for Information Interchange) art type, in which several lines of characters are used to make up an image when observed at a distance. Despite their extreme simplicity, emoticons are perceived by observers as pictorial information. Neurological testing has shown that cognitive processes differ when perceiving the eastern type (inverted) and western type (right way up) faces (Churches, Nicholls, Thiessen, Kohler, & Keage, 2014). Although not as prevalent as the use of emoji, especially since the advent of smartphone technology with high resolution screens, Ptaszynski et al. (2011) argue that emoticons have become "an indispensable means of support for text-based messages" (p. 1159).

Emoji are more detailed than emoticons, as they are specially designed images that are generally not constructed of existing symbols. The Unicode Foundation has officially approved hundreds of emoji, with the symbols continuing to be popular in electronic communication. As reported by Kolowich (2016), Michael Everson, a linguist and member of the Unicode Consortium, has warned of a "Great emoji flood". Everson is concerned that the approval of new emoji will be a never ending

process: "How many food items do we really need? I'm not really sure. Do we really need dinosaur heads"? Whereas a set of symbols (as with a functioning alphabet) is finite in number, pictures do not have this limitation. New images designed to represent concepts are not restricted to a linguistic system, so new symbols can be constantly produced. Attempting to accommodate emoji as a kind of universally accepted language is apparently resulting in an overload of images to be recognized.

Controversy with regards to the proliferation of emoji use appears to centre on the central issue as to whether or not emoji is a language. The concerns are a reflection of the differing characteristics of symbolic language and pictorial forms; the inherent strengths and weaknesses of representing either depictive or descriptive information. The limitations of emoji are apparent when "reading" *Emoji Dick*, the crowd-funded emoji version of the classic *Moby Dick*, as the meanings of the symbols appears to bear very little relation to the original text. However, the usefulness of emoji might be in their capacity to effectively express a concept (especially an emotion) within the context of a regular communication. According to linguist and emoji researcher Tyler Schnoebelen, as reported by Funnell (2015), using emoji is comparable to that of complimenting speech with differing elements such as pronunciation, intonation, and speed: "Similarly, you are not taking a shortcut by a putting in an emoji. It's part of the package". Emoji are unlikely to ever be a "true" system of language, yet may continue to enhance communication with their depictive qualities, of which descriptive forms do not possess.

2.6 Computer-Assisted Vocabulary Learning

Information technology continues to play a discernable role in the task of foreign language learning, from twentieth century desktop computers using CD-ROMs and floppy discs to modern day smartphones using easily downloaded applications or apps. The progress of research into CAVL appears to follow the same general explicit/implicit distinction as with other L2/FL research. Research into CAVL can often be generally categorized into two different types: (1) studies involving the recall of single vocabulary items to a cue (i.e., electronic flashcards) requiring the deliberate, intentional study of decontextualized vocabulary; (2) studies involving the use of vocabulary in context; such as the more incidental practice of checking the meaning of words while reading an electronic text, as with electronic glossing. Research has often been more concerned with incidental and contextualized approaches, with the study of more intentional and direct methods taking second place as such practices tend to be regarded outdated (Godwin-Jones, 2011). The need for more research on direct and focused vocabulary learning methods in CALL environments seems apparent (Godwin-Jones, 2011; Son, 2001).

Computer technology is arguably well suited to the task of L2/FL vocabulary learning, as noticing, retrieval and generative usage: conditions favorable for vocabulary learning, can be effectively established (Nation, 2001). Martinez and Schmitt (2010) expound the general belief that computer usage is beneficial to vocabulary leaning, as manifest in the "growing ethos among L2 pedagogy practitioners" (p. 26). Yet they qualify the belief by stating that computers are only one of a number of effective methods for L2 vocabulary learning, and point out that there is no conclusive evidence to suggest that CAVL is any more effective than, for example, regular reading using authentic material in the target language.

The literature has noted that the use of CAVL needs to consider the actual abilities of learners, and not overtly focus upon the capabilities of computers. Sorden (2005) asserts that it is important for educational software designers to keep in mind the fact that students remain limited by their own cognitive ability, in order that language learning programs are driven by what we know of the learning process and not by the technology involved. The needs of the learner should drive CALL development, not the technology, so as (to use the expression) "not to put the cart before the horse". Where it appears that there is no limit to what multimedia programs can do with visual, audio and textual information, the same cannot be said for the learners themselves.

2.6.1 Electronic flashcards

Computers are well suited to the task of effective vocabulary instruction, as they have the ability to provide "spaced repetition and the opportunity for retrieval" (Nation, 2001, p. 108). According to Baddeley (2004), memory is enhanced when the repeated presentation of material is spread out, or spaced over a period of time. This process presents somewhat of a quandary for learning, as the sooner L2 words are tested after being presented, the better the chances of successful recall, yet learning the words (i.e., forming stronger memories) will be more effective if recall occurs in the absence of any recent presentation, as the learner has to rely on themselves to recall the word. Baddeley (2004) believes that this dilemma can be overcome through a strategy of flexibility, where the target word is initially tested a short period after being presented, with the period then being gradually lengthened upon subsequent testing, the objective being "to test each item at the longest interval at which it can be reliably recalled" (p. 70). Computers have a significant pedagogical advantage in that they are capable of making the calculations required for such a

method instantly and automatically, and then present the cues for the required responses accordingly. This capacity gives electronic flashcards a major advantage over traditional paper-based systems.

The majority of electronic flashcard software uses a system of spaced repetition. The flashcard site *Cram* (cram.com) employs the Leitner system (Leitner, 1972), a learning system by which the method of spaced repetition can be practically applied. The system (using a paper-based example) basically involves cards being moved along a series of (e.g., five) boxes. Cards in the first box are checked the most, and cards in the fifth box are checked the least. Cards that are correctly answered are advanced to a less checked box, and cards that are incorrectly answered are moved back to a more frequently checked box. The system can result in lesser known-cards being checked more often, and better-known cards being checked less often. The flashcard site *Anki* (ankisrs.net) uses a similar system, with the addition of the user judging and identifying how difficult an item was to recall. The software then calculates the best time for the item's next appearance, based on Ebbinghaus' Forgetting Curve (Ebbinghaus, 1885, 1913) of human memory (see Section 2.3.6). Besides L2 vocabulary, electronic flashcards sites offer a multitude of other subjects for learning, and can be adapted by the user to actively recall any subject matter they upload. Also, many systems are multi-modal; having the ability to support sound and imagery.

Consistent with technological trends, studies concerning electronic flashcards tend to focus upon usage in mobile technology. Browne and Culligan (2008) describe a system by which students do learning activities on computers, and then (with the use of a word engine) words that are not well known are automatically sent to the

students' mobile phones for practice in a flashcard format. While not offering any empirical data with regards to language performance, they note the pedagogical and administrative advantages of such a system which uses the students' mobile phones as a medium. Godwin-Jones (2011) believes that Spaced Repetition Software (SRS) can promote learner autonomy, and is useful for students who are not immersed in their target language. However, he notes that using SRS "is not close to simulating language use" (p. 9) and so advocates the embellishing of vocabulary items with pictures, concordances, and example sentences, etc., so as to provide more language context for the vocabulary items. Miles and Kwon (2008) used such a vocabulary program in their study, where target words were presented with English definitions, model sentences and collocations accompanied by Korean translations. Productive and receptive vocabulary exercises were included, with the program set in accordance with a spaced repetition schedule. They found that participants using the CALL program outperformed other groups in non-CALL (independent and classroom) treatments.

2.6.2 Electronic glossing

Glosses serve as a convenient means by which readers can check the meaning of words and phrases without the need to constantly refer to other information sources such as dictionaries. Often appearing as a list at the beginning or end of a text, or in the margins of text, glosses are designed to support the reader in situations where it is expected that a considerable number of explanations will be required. Glossing may be used for a wide variety of purposes, from the reading of Shakespearean English to adult literacy material. For L2/FL learners, glossing can support the reader by providing definitions and synonyms of unknown words in either the L1 or the L2/FL. According to Nation (2013), textual glossing is advantageous to L2 learners as it can

enable the reading of unaltered text, removes the need for the guessing of words by providing accurate definitions, and allows for less interruption to reading than having to constantly look-up word meanings. In addition, glossing can be a motivating influence as it "draws attention to words, and thus may encourage learning" (p. 238).

Computer technology allows for glossing to appear in ways that were not previously possible with paper-based materials. Chen and Yen (2013) identify three different forms in which textual glossing in CALL environments often appears: (1) in-text annotations – explanations written in the text next to target words, (2) glossary annotations – a list of definitions of target words which is hyperlinked to the target words in the text, (3) pop-up annotations – "hidden explanatory notes adjacent to each target word" (p. 417) – visible when clicked on by the reader. They conducted a study in which 83 Chinese speaking university students read passages featuring the three annotation formats and one passage with no annotations to act as a control. They found that, for vocabulary recognition, all of the annotated texts were more effective than the control text, and that there was no significant difference between the annotation types. The beneficial effects of annotations on vocabulary, however, were not evident in participants with lower level English proficiency.

Computers enable textual glossing to be a multimedia experience, where annotations can present supporting information in pictorial, auditory, and video form. Various studies have compared the effectiveness of different anecdotal types. Yoshii and Flaitz (2002) found that a combination of picture and textual annotations in a multimedia reading setting resulted in a greater retention of target words than pictorial or textual annotations alone. Similarly, Chun and Plass (1996) found that a combination of pictorial and textual annotations in electronic reading material

resulted in a higher rate of incidental learning of German words than pictorial or textual annotations alone. These studies indicate that the understanding and comprehension of FL word meaning can be assisted by electronic glossing, especially when FL words are presented pictorially and in combination with textual information.

2.7 Theoretical Framework

The theoretical framework of the studies is based upon three cognitive models: (1) Paivio's (1986) dual coding theory; (2) Baddeley and Hitch's (1974) model of working memory, and (3) Mayer and Moreno's (1998) cognitive theory of multimedia learning, as described in Section 2.2. These three models share the common feature of having a clear division between visual and verbal (auditory) processing systems. On a very basic level, all three models propose that information is received and processed through two different channels: visually through the eyes and by auditory means through the ears. Both types of information are processed and stored differently in a temporary holding area, in which connections are made between the two different types of information. Some of this information then becomes part of a more permanent storage system (the long-term memory), where it can stay ready for possible retrieval. Central to the research project is the learning of FL vocabulary as a result of information being presented in pictorial and in language (spoken and written) forms, so the models provide bases of conjecture as to what might be taking place within the learner when experiencing FL vocabulary with pictorial information.

It is theorized that by providing the participants with associated images (the SPRs) to the target vocabulary, their visual channels will be given additional input. In accordance with the dual code theory (see Figure 2.1), target words presented in pictorial form should have a greater chance of being retained, as both visual and verbal channels are actively involved in the receiving and processing of information. If there is no pictorial representation of the target words, then the visual channel will be used to a smaller degree, thereby lessening the chances of learning the word in comparison to using the two channels more fully.

Using Paivio's (1986) dual code theory as a theoretical basis, it is proposed that SPRs might assist in the learning of FL vocabulary in the following way, as shown in Figure 2.1. A target word in SPR (1) and FL written form (2) is received by the visual systems (3), and the verbal form (4) is received by the auditory systems (5). Information from the SPR is encoded as imagens in the nonverbal processing system (6), and FL written and verbal form are encoded as logogens in the verbal processing system (7). Processing involves referential connections between the two subsystems, so the inclusion of an image may assist learning as the nonverbal subsystem is more involved in processing than in the absence of an image.

Similarly, in accordance with Baddeley's working memory model (see Figure 2.2), it is theorized that by studying with SPRs, visual information representing word meaning will be processed in the working memory's visuo-spatial sketchpad. Combined with auditory information (from listening to the target words) being processed in the phonological loop used for auditory processing, both sub-systems will be more fully engaged than if target words are only experienced in written and verbal forms.
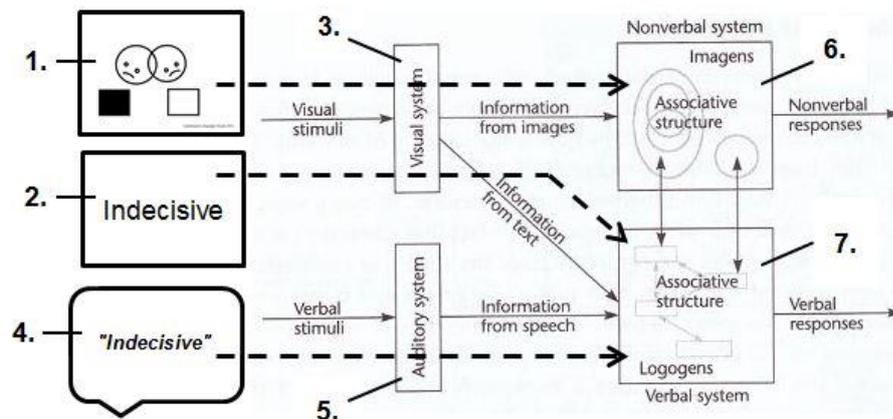
Figure 2.1. Paivio's (1986) dual code theory as a theoretical basis to learning FL

vocabulary with SPRs. Diagram adapted from Ware (2004).
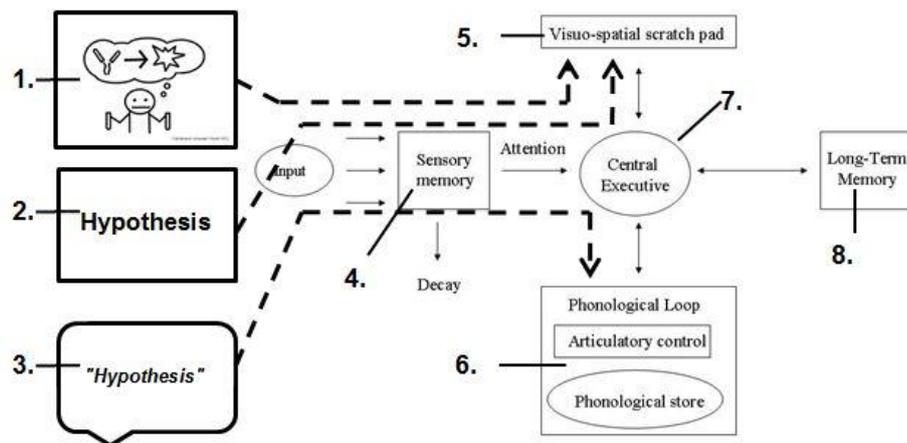
Figure 2.2. Baddeley and Hitch's (1974) working memory model as a theoretical

basis to learning FL vocabulary with SPRs. Diagram adapted from McLeod (2012).

In accordance with the working memory model, SPRs might influence the learning

of English vocabulary in the following way, as shown in Figure 2.2. The SPR (1), the

FL written form (2), and the FL verbal form (3) are received as input by the sensory

memory (4). Information attended to is received by the working memory, where the

SPR image and the FL written form are processed in the visuo-spatial sketchpad (5),

and the verbal form is processed in the phonological loop (6). Information and processing is managed by the central executive (7), from where target word information can be transferred to the long-term memory (8).

Providing visual representations of target words may promote interaction between visual and nonvisual subsystems, thereby aiding the development of the learner's understanding of the words. The dual code theory proposes that interactions between the verbal and nonverbal subsystems are the result of referential connections being made between the two systems, and the working memory model theorizes that interaction between its two subsystems, the visuo-spatial sketchpad and the phonological loop, occurs via a further component: the central executive. In accordance with these models, experiencing a pictorial representation of the target vocabulary should promote understanding by encouraging more links to be established between visual and nonvisual coding of word meaning.

Mayer and Moreno's (1998) cognitive theory of multimedia learning (see Figure 2.3) features three main processes by which information presented is taken in, processed, and retained by the learner. According to the theory, FL vocabulary might be learned with SPRs in the following way: (1) selecting – target vocabulary items are preselected in advance, allowing resources in the working memory to be less involved with determining what audio and visual information should be selected, and more concerned with actual processing; (2) organizing – pictorial information from SPRs assist in the formation of a pictorial model of the target word. This information will be organized with the corresponding verbal model, forming a coherent mental representation of the word in the working-memory; and (3) integration – the representation (a combination of both sound and image) is integrated into the

long-term memory, assimilated with information already held. The SPRs play an active role in the connection between the FL word form and the learners' existing concept and understanding of its meaning.

As shown in Figure 2.3, the presentation of SPRs (in accordance with the cognitive theory of multimedia learning) may assist the process of learning English vocabulary in the following way. The multimedia presentation consists of the target word in written FL form (1) and verbal FL form (2) presented as words, and the SPRs presented as pictures (3). The senses (4) receive the FL written form and SPR form through the eyes, and FL verbal form through the ears. The working memory (5) selects and organizes the words and pictures, creating verbal and pictorial models. Some target words are integrated with prior knowledge into the long-term memory (6).
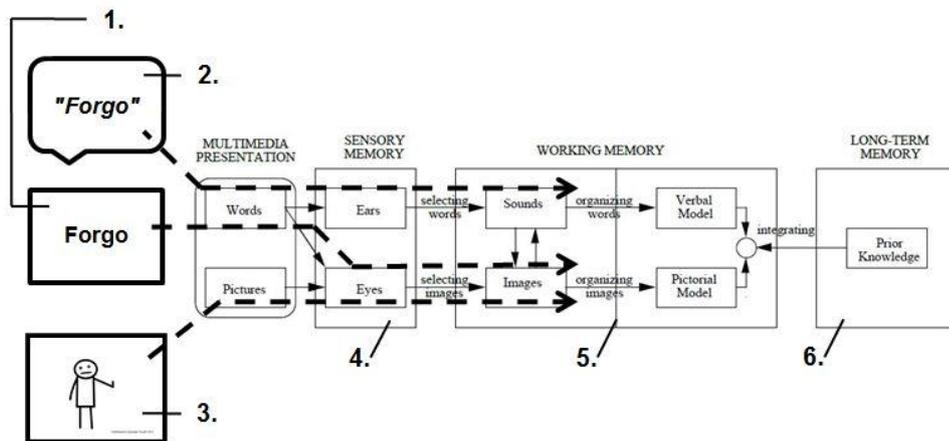
Figure 2.3. Mayer and Moreno's (1998) cognitive theory of multimedia learning as a theoretical basis to learning FL vocabulary with SPRs. Diagram adapted from Mayer (2011).

The three models used as theoretical bases for the studies agree that understanding a word involves the learner constructing their own meaning of the word. This concept

is consistent with the belief that learning new lexical items elaborately, that is processing information in different ways (such as through sound, textual form and different aspects of meaning) will result in better retention of words than if less ways are used (Hulstijn, 2001). In the studies, elaborate processing is encouraged by the simplistic nature of SPRs, as learners have to work more to establish meaning, as opposed to being presented with an easily understood representation such as an L1 translation. This approach promotes a more personalized learning experience, as the simple images encourage the learner to create their own concept of target word meaning based on their existing knowledge, or as Stevick (1996) describes "at least partly generated it using her or his own existing networks" (p. 125).

Another fundamental quality of the three theoretical models is that the systems are finite – limited in the amount of information they can take in, process, and assimilate into existing knowledge at the one time. SPRs have a very simple appearance, so by keeping pictorial information to a minimum, learners may have the benefits of being provided with an image to help them understand word meanings, yet without the possible disadvantages of overtaxing or overloading their cognitive processing systems. This speculation is consistent with what Mayer (2005) refers to as the coherence principle, which postulates the belief that students learn better when extraneous images, words and sounds are excluded rather than included in learning material. The studies will further reduce demands upon cognitive processing by restricting the use of textual information during activities, in order that students are mainly focused upon the image (the SPR) and its corresponding sound (the English spoken form) at the same time. According to Mayer and Moreno's (1998) theory, learning will be better if pictures and sound are used, rather than pictures, sound and

words (the redundancy principle), and pictures and sound will be more effective than pictures and text (the modality principle).

2.8 Summary

Chapter 2 began with an outline of three models of cognition concerning the intake, processing, retention and recall of information. The chapter then looked at L2/FL instruction in general, focusing upon the areas of current teaching trends, the linking of form and meaning, what makes an L2/FL word easy or difficult to learn, and the use of word cards and wordlists. Next, the use of pictorial information in L2/FL learning was examined, which included the picture superiority effect, and the use of pictures in instructional materials and mnemonic techniques. The chapter then concentrated upon simple pictorial representations, including emoji and emoticons. Research concerning CAVL was then reviewed, covering the topics of electronic flashcards and electronic glossing. The chapter finished with an explanation of the studies' theoretical framework.

Chapter 3. Research Design and Methods

3.1 Overview

Chapter 3 begins with a general overview of the research project, including the research design of the two studies. It then proceeds to describe the studies' participants and the ethical issues that required consideration. Next, an overview of data collection procedures is followed by a more detailed explanation of data collection instruments, and how they were used to answer the studies' three research questions. An overview of the materials used in the research project is then given, including an explanation of the learning technique employed and how its three main stages related to the activities conducted in the studies' vocabulary learning programs. In addition, an explanation is provided as to how the target vocabulary items were selected, and the design elements of the SPRs are specified. The two separate studies within the research project (Study 1 and Study 2) are then outlined, with specific details given concerning the materials used and the procedures followed. The chapter is then completed with a summary.

3.2 Research Design

The research project set out to determine the potential for simple imagery to be used in the teaching and learning of EFL vocabulary. Set within an existing university language course, participants were in two separate classes with Class A being at a higher level of English proficiency than Class B. Two classes were chosen so as to increase the overall sample size, and to provide the opportunity to compare effects

upon different proficiency levels. The two classes were subjected to a vocabulary component in which 100 English target words were expressed in pictorial form. The researcher was the sole instructor for both classes throughout the yearlong study. The research project was divided into two parts: Study 1 took place in the first semester and Study 2 in the second semester of the university's academic year. Study 2 was almost identical to Study 1 in terms of factors such as overall research design and structure, timelines, data collection procedures, learning objectives and teaching practices. The main difference between the two studies was the medium used to deliver the vocabulary program: Study 1 used all paper-based materials, whereas materials for Study 2 were electronic. Paper-based materials refer to instructional materials constructed of paper, cardboard, glue and tape, onto which the written and SPR forms were printed, as detailed in Section 3.6.1. Electronic materials refer to instructional materials in which the target words' written and SPR forms appeared on-screen. In classroom activities, the screen was a large television monitor connected to a personal computer displaying picture files and *PowerPoint* presentations. For self-study, these were online devices (smartphones and personal computers) accessed by students from which a website featuring the written and SPR forms were accessed, as detailed in Section 3.6.2.

The influence of the pictures was evaluated and assessed in accordance with the studies' three research questions shown in Section 1.2. The research questions were concerned with: (1) language performance – the influence the SPRs had upon the ability for students to recall the target vocabulary; (2) the reactions of the participants – how they felt and what they thought of learning English vocabulary using the pictures; and (3) the implications for teaching and learning – an evaluation of the research project's vocabulary learning program, from the viewpoint of both the

instructor and the students. Results from Study 1 and Study 2 vocabulary testing, surveys, focus group discussions and teaching journals were collected and analyzed with the aim of providing answers to the research questions, and thereby formulating general conclusions as to the potential for SPRs as a means of EFL vocabulary study. See Figure 3.1 for a general overview of the research project.
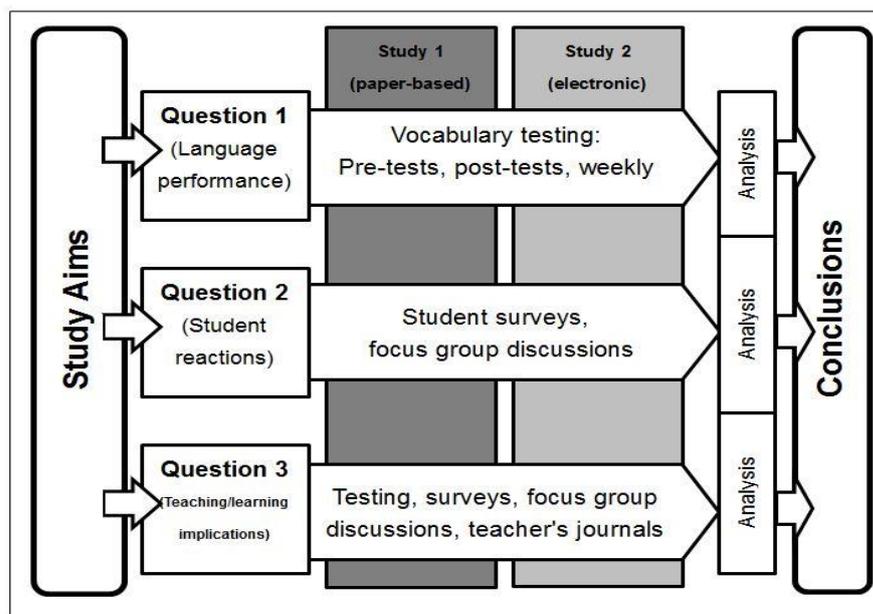
Figure 3.1. A general overview of the research project.

Heuristic research, as described by Seliger and Shohamy (1989), is a process involving the observation and recording of some aspect of language; gathering data in order to discover or identify a language phenomenon, with a view to generating hypotheses. The studies can be defined as heuristic, as they observe and record the effect of language learning programs focusing upon a particular aspect of language, involving language testing and the gathering of attitudinal and observational data. This inductive procedure aims to draw conclusions about learning EFL vocabulary with pictorial information, which could then be generalized to other learning situations. The studies were not intended to be deductive in nature, as the effect and responses of the pictures were not hypothesized in advance; preconceptions or

predictions were not made as to the effect that the leaning technique would produce. With the aim of discovery in the heuristic tradition, the studies set out to investigate and evaluate the possibilities for learning EFL vocabulary using simple imagery.

Rather than relying solely on either quantitative or quantitative data, the research project took a mixed method approach. This approach was undertaken on the assumption, as Creswell (2014) explains, "that the combination of qualitative and quantitative approaches provides a more complete understanding of a research problem than either approaches alone" (p. 32). According to Brown (2014) a mixed methods approach should only be taken when it is believed that better results will be achieved from both qualitative and quantitative research methods, as opposed to just using one method. A mixed methods approach was therefore adopted on the belief that a clearer understanding of the effect of SPRs would be gained and established from both forms of data. The research project used a convergent parallel mixed methods design (as defined by Creswell, 2014) in which the researcher collects the two forms of data at approximately the same time, and subsequently "integrates the information in the interpretation of the overall results" (p. 32). This process may have encouraged a comprehensive assessment of SPR influence and potential.

The mixed method approach also appeared to be well suited to the overall design of the research project. Benati (2015) describes quantitative research as "product-orientated" and qualitative research as "process-orientated" (p. 138). SPRs were evaluated on their capacity to influence language performance, so quantitative data from vocabulary testing provided a means by which the product – the ability to recall vocabulary, could be measured. SPRs were also assessed for their value as a means of teaching and learning, so therefore the studies were classroom based and set

within an existing course of EFL study. Qualitative data from surveys, focus group discussions and teacher's journals was used so as to develop an understanding of the process – the ways in which SPRs influenced the learning experience from a broader pedagogical perspective, which encompassed the educational experience as a whole. Qualitative data also provided what Benati (2015) regards as one of the strengths of qualitative study as opposed to quantitative study: "In depth study of a small-scale sample and methodological flexibility which help the researcher to investigate process and change" (p. 138).

An experimental design would not have been suitable, as the participant groups (the two classes) lacked a process of random selection which is essential for a truly experimental design (Brown, 2014). Classes were established in advance by the university in which the studies were conducted; in accordance with results from an exam given as part of the university's entrance procedure, as specified in Section 3.3. Consequently, the general English ability of Class A was at a higher level than that of Class B. It was therefore not appropriate to assign one class as a treatment group and another as a control group due to the lack of randomization as well as the differing general levels of English ability between the classes.

So as to accommodate the use of pre-established participant groups, the studies used a quasi-experimental equivalent time samples design, in which "the contextualization is the treatment, and it is alternately provided and withheld from the same group of students" (Nunan & Bailey, 2009, p. 97). The treatment (use of SPRs) was administered every second week in both classes throughout the course of the two studies. The equivalent time samples design was preferable to that of the time series design (in which the treatment is introduced and continued in midcourse of a study)

because, as Nunan and Bailey (2009) point out, "Multiple comparisons are possible. That is, since the treatment has been given and withheld several times, we have a better chance of detecting its effect (if any)" (p. 97).

A consistent application and evaluation of the treatment throughout the semester was desirable, as it is apparent that student performance is influenced by motivational factors such as enthusiasm at the start of the semester, and other pressures (e.g., increased workload) towards the end of the semester. Also, language performance is affected by the natural development and maturation of language skills over time. History is a factor affecting the internal validity of a study, which Benati (2015) describes as "events other than the experimental treatment that can happen during the experiment and of which the researcher is not aware" (p. 86). Seliger and Shohamy (1989) stated that a time-sampling design has the advantage of enabling the observation of patterns of change over a period of time, despite the influence of factors to be expected in a course of study, such as exposure to language outside of the classroom and the students' natural language development. However, they also noted the disadvantage of the design, in that the researcher "must be content with results obtained from one group" (p. 140).

When not being presented in pictorial (SPR) form, target words were presented in translational or L1 (Japanese) form. Words presented in translational form served as a control against which the treatment – the effect of the SPR form, could be evaluated. In this way, the L1 translations served as a kind of standard or benchmark from which the effect of SPRs could be measured. It is important to mention that the aims of the studies did not include an assessment as to which form, SPR or L1 translational, was the better for EFL vocabulary learning. Rather, L1 translations

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were used as a basis of comparison from which language performance, attitudinal responses and pedagogical factors could be evaluated. L1 translations were selected for this comparison as studying FL vocabulary using translations can easily be described as standard practice in Japanese education. This translational approach is well established and expected of Japanese students, therefore the participants began the first study already well acquainted and experienced with this type of vocabulary learning. In broad terms, the research project was designed to establish whether the use of the use of SPRs is detrimental, advantageous, or comparative to that of using L1 translations.

The internal validity of Study 1 and Study 2 greatly depended upon keeping the two treatments used in the studies – the participants' experience of L1 words and the participants' experience of the SPR words, as similar as possible, as a comparison between data (both quantitative and qualitative) from the two modes of presentation was often the context of the research project's three research questions. The research project encouraged this equivalence and other aspects of internal validity in the following ways, in accordance with Nation and Webb's (2011) list of four focus areas and questions for checking internal validity.

1. Participants – The same participants experienced both treatments.
2. Materials – Materials featuring L1s and SPRs were the same (i.e., the medium used, basic appearance, and size). Target words were different between treatments, yet over 90% were from academic word lists, and were of equivalent lengths (the number of letters). The designation of target words being represented as either L1 or SPR was done by random assignment. See Section 3.5.3 for the vocabulary section criteria.

3. Treatment – Both treatments were consistently applied to all participants (in both Class A and Class B) in so far as the participants all received as close to the same instructional program as possible. Time taken on instruction and instructional tasks were kept as similar as possible. Participants were equally familiar with the treatments as all had experienced recalling from L1 forms in secondary school, and for all (apparently) studying English vocabulary with simple pictures was a new experience. The surrounding conditions were equal for both treatments in that the location (the classroom) was the same, yet the surrounding conditions for the self-study component varied from student to student.

4. Measures – The measures were the same for both treatments (including administration and scoring), as the same vocabulary tests, surveys, focus group discussions and type of teacher's journals were used. The order of treatment effect was reduced by administering the treatments on alternating weeks, and by scheduling adequate time periods after treatments for testing and other measurements. (p. 311)

The piloting phase of the research project was conducted over a two year period prior to the commencement of Study 1, having taken place in Japanese universities within various first year English courses. During this time, instructional techniques, activities and materials were trialled, modified, and some eventually selected for use in the actual research project. Techniques, materials and activities chosen for use in the actual research project were selected according to (1) practical application within a classroom setting, (2) the capacity to have students successfully recall vocabulary, and (3) the students' positive reactions including interest and enjoyment.

Vocabulary testing methods were also developed during the research project's piloting phase. In order to have the same vocabulary testing between L1 words and SPR words, test questions were required that did not involve the use of L1 or SPR forms, so testing techniques were sought that used FL (English) written forms only. Additionally, tests were favoured which required generative recall and not based upon recognition as with multiple choice answers, as generative recall appears to be more indicative of actual language usage.

For the pre-test and post-test type questions requiring written responses, simple cloze-type questions proved to be too difficult for students to answer, and often could be answered "correctly" with a number of different answers. A testing format similar to that of Laufer and Nation's (1999) Productive Levels Test was chosen, as providing the first one to four letters of target words provided students with a clue without revealing the whole word, and usually decreased the number of possible answers to only one. This style of testing was also chosen as it has been shown to be practical, valid, and reliable (Laufer & Nation, 1999).

Written weekly tests, however, were shown in the piloting phase to be not suited to cloze style testing with first letter answer clues. The number of possible answers in weekly tests was limited to ten, so this method proved to be too easy. Testing with no first letter cues was shown to be challenging yet not overtly difficult. It also became apparent that testing from verbal cues required questions designed to be easily understood, as many students in the early stages of testing had such difficulty comprehending the L1 verbal cues that they answered very few questions or none.

Qualitative data was analysed through an inductive approach based on the general research method known as grounded theory, which according to Benati (2015) "emphasises the importance of extrapolating the main themes from the data rather than having preconceived notions regarding the data" (p. 139). Dörnyei (2007) describes grounded theory as being in contrast to a deductive approach, stating that the term indicated that "new theoretical insights were to be generated on the basis of empirical data" (p. 259). Rather than testing hypothesises, the data from student surveys, focus group discussions and teacher's journals was used to establish theories with regards to FL vocabulary learning with SPRs.

The content analysis of qualitative data was conducted in accordance with three basic stages of data coding associated with grounded theory from Strauss and Corbin (1998): (1) Open coding – Data (in textual form) was broken up into chunks of various sizes and given labels designating "actions, events, or topics" (Friedman, 2012, p. 191) thereby forming categories; (2) Axial coding – Categories of data were compared with each other so as to find patterns in the data, thereby "attempting to integrate them and group them into more encompassing concepts" (Dörnyei, 2007, p. 261); (3) Selective coding – Central themes of the data were established through a process in which "selected codes from the initial coding (e.g., the most frequent) are applied to the rest of the data set" (Friedman, 2012, p. 191).

The analysis of data from surveys, focus group discussions and teacher's journals was later validated by a process of revision as described by Seliger and Shohamy (1998). The researcher re-examined the data at least one month after the initial analysis, thereby checking "whether the same patterns and categories emerge again"

(p. 205). The categories and/or the categorized data were subsequently changed if there was disagreement with the prior analysis.

Focus group discussions were chosen as a means of qualitative data collection over that of individual or focus group interviews. This decision was taken mainly on practical grounds, as the researcher did not have the language skills to conduct interviews in Japanese, and none of the participants had the English skills to communicate fluently. Discussion sessions were in small groups with members determined by random selection, with each group being given the same three questions in written and verbal form. During the discussions, there was no verbal input from the researcher, except to communicate the questions and procedures.

One advantage of a focus group discussion without input from the researcher (who was also the teacher) was that the deference effect, which Hennink (2014) describes as "where participants say what they think a moderator wants to hear rather than their own opinion about an issue" (p. 184) may have been reduced. In addition to being reminded before the discussions that their comments had no bearing on their grades, the participants were able to speak freely in their own language. The absence of verbal input (such as prompting or additional questioning) from the instructor/ researcher might have reduced any sense of obligation felt by the participants to give the teacher certain answers (i.e., praising the SPR lessons/materials whilst holding back criticism). Hennink (2014) believes that "A permissive, non-threatening group environment is essential so that participants feel comfortable to share their views without the fear of judgement from others" (p. 2). Despite focus group discussions being conducted in lieu of participant interviews, the open style, small group, student

only exchanges held in a conversational setting may have provided a reasonable indication of the participants' thoughts, feelings and opinions.

Pre-tests and post-tests for Study 1 and Study 2 were completed by two English native-speakers, so as to check for agreement with the prescribed answers, resulting in some questions being modified. Weekly tests for both studies were completed and subsequently evaluated by one English native-speaker. Survey and focus group discussion questions were also examined by a third party in order to evaluate the internal validity of the questions including researcher bias, such as misleading questions that may have promoted or favoured the use of SPRs.

3.3 Participants

Study 1 and Study 2 were conducted at a private women's university in Tokyo, Japan. Participants were all first year students at the university, female, and between 18 and 19 years of age. Japanese was their first language, except for one native speaker of Korean who was proficient in Japanese. Students were enrolled in two classes of a compulsory foundation course, English Discussion Skills AB, as part of their degree program majoring in either linguistics or psychology. Classes and students remained the same (except for one additional student in Semester 2) for Study 1 in Semester 1 and Study 2 in Semester 2. The course focused primarily upon English language conversation, including conversational skills and strategies. The studies involved two pre-established classes, identified as Class A and Class B. Study 1 had a total of 49 participants in Class A ($N = 25$) and Class B ($N = 24$). Study 2 had a total of 50 participants in Class A ($N = 26$) and Class B ($N = 24$). The studies were set within

two 90 minute classes held once per week for 15 weeks in Semester 1, and another 15 weeks in Semester 2.

The students had completed 6 years of English study at junior and senior high school. As is typical of Japanese students, their reading and writing skills were in advance of listening and speaking skills. No participants could have been described as proficient or fluent speakers of English. Based upon the researcher's observation and interaction, the students were estimated to be A2/B1 levels of the Council of Europe's (2001) Common European Framework of Reference (CEFR) language proficiency scale in terms of general English ability. A2 proficiency can be described as an advanced beginner level, and B2 can be viewed as a lower-intermediate level of language proficiency. Class A was at a generally higher level of English proficiency than Class B, as the students were separated into classes based upon scores from a placement test conducted upon enrollment. The test was the University of Michigan's English Placement Test (Spaan & Strowe, 1993).

In accordance with ethical standards, the studies were conducted on the basic principle that the research would not be of harm to the participants. To this end, they were proposed on the premise that the introduction of a regular vocabulary program, as the study was offering, would be beneficial to the participants' educational experience. This assertion was supported by literature relating how the allocation of regular class time to systematic, directed vocabulary learning can be considered an important recommendation for L2/FL courses (Brown, 2007; Nation, 2013; Read, 2004). See Appendix S for the Study 1 and Study 2 participant information sheet and Appendix T for the Study 1 and Study 2 participant consent form.

However, a potential risk identified was the possibility that the participants may not have responded well to vocabulary instruction using simple imagery. Negative reactions may have occurred, such as a failure to learn target words effectively, or negative attitudes towards SPR usage manifesting. Such reactions may have exerted an adverse influence upon the participant's learning experience, as well as their grading for the course. This concern was mitigated by the fact that the use of SPRs constituted a minor portion of the students' overall language experience throughout the language course, as the majority of class time was devoted to regular course work unrelated to the studies. In addition, half of the words studied and tested were presented in L1 translational form, which can be described as a standard way of studying FL vocabulary. Furthermore, as stated in the participant information sheet (Appendix S), results from vocabulary testing were not counted towards the participants' end of semester grading.

3.4 Instruments and Data Collection

The research project's overall aim was to investigate and evaluate the use of SPRs as a means of EFL vocabulary learning. To achieve this aim, quantitative and qualitative data were collected so as to gain an understanding of the influence of the SPRs. The main areas of concern were the effect of Study 1 and Study 2's vocabulary learning program upon the participants' language performance, the participants' attitudinal responses (including opinions), as well as aspects concerning teaching and learning. These areas were in accordance with three research questions as follows:

Question 1 *What effect do simple images in paper form and in electronic form have upon EFL vocabulary recall rates when used in classroom and self-learning situations?* deals with language performance, more precisely, the effect that the use of SPRs had upon the participants' ability to recall target vocabulary. Data collection involved the pre-testing and post-testing of all target vocabulary: 100 words for Study 1 and 100 words for Study 2. Weekly in-class testing of 10 words per week was also conducted, in which words studied in the previous week (alternating between SPR and L1 form) were evaluated. Testing procedures and materials were identical for Study 1 and Study 2.

Question 2 *What are student responses to using simple imagery in paper form and in electronic form when used in classroom and self-learning situations?* is concerned with affective factors, including motivation, attitudes, opinions and perceptions of the participants that had arisen as a result of the their experience of Study 1 and Study 2's SPR utilizing vocabulary program. Data were collected from surveys and focus group discussions conducted upon the completion of Study 1 and subsequently Study 2. Questions focused primarily upon SPRs and their usage, relating to the vocabulary programs in general, materials, and activities in both classroom and self-study situations.

As with the performance testing in Question 1, the use of L1 translational forms (the Japanese forms) was employed as a basis of comparison in the evaluation of SPRs. Therefore, similar questions were asked concerning SPRs and L1 translations, with certain responses requiring a direct comparison and an expression of preference between the two. As with language testing, the main objective was not to establish

which mode (SPR or L1) was preferred by the participants, but to use responses to the L1 forms to assist in the evaluation of responses to the SPRs.

Question 3 *What are the potential effects of materials and activities using simple imagery on English language teaching and learning?* concerns the pedagogical aspects of the studies, focusing upon the materials and activities used in the classroom and in self-learning situations. Through the examination of the effects of SPRs and their usage within an actual EFL course, the practical benefits and limitations for the instructor and the students of such an in-course vocabulary program were investigated. These effects were then generalized to other EFL learning situations, speculating upon the potential for the practical application of SPRs to other EFL classrooms and programs.

Data relating to the teaching and learning experience were collected from the students' point of view using surveys and focus group discussions, as well as the instructor's point of view using teacher's journals. Responses from survey questions relating to SPR materials and associated activities were used to evaluate the students' opinions of the vocabulary program. Data from focus group discussions were also used to evaluate materials and activities from a pedagogical perspective. The discussion data provided the students' thoughts, opinions and attitudes focusing on (1) the materials and activities used in the classroom, (2) the SPRs, and (3) the materials and activities used in private study.

3.4.1 Pre-tests and post-tests

All 100 target words for each study (Study 1 and Study 2) were pre-tested and post-tested before and after the two studies' respective vocabulary learning programs,

using the same questions for each study. Pre-tests were intended to establish how many of the vocabulary recall questions could be successfully recalled in advance of the two vocabulary programs. Post-tests were designed to indicate the number of correct participant responses after having experienced the programs, thereby indicating which target words had been learned. The average gain in scores (the post-test average minus the pre-test average) for words experienced in SPR and in L1 form were compared using *t*-tests, so as to establish the statistical significance between the recall of words learned in the two different modes.

The tests consisted of written, cloze-type questions in which an incomplete sentence needed to be completed with a missing word. Similar to Laufer and Nation's (1999) Productive Levels Test, the first 2 or 3 letters of the required word were provided, in order to reduce the number of possible answers. It was not practical to leave a blank space for a word, or even just to give the first letter, as a number of different words could successfully complete the sentence, thereby being counted as a correct response. So as to further encourage the recall of the actual target word, the main clue or clues in the given sentence as to the meaning of the required word was highlighted in bold. Figure 3.2 shows examples of pre-test and post-test questions.

3.4.2 Weekly tests

Each lesson, 10 target words from the previous week's lesson were tested using short, quiz style in-class tests. A total of 100 target words were tested over 10 lessons. Words presented in both SPR and L1 forms were subjected to the same type of testing. Half of the tests (five tests) were in written form, using cloze type questions in which the required word needed to be filled in. Unlike the pre-tests and post-tests, the first two or three letters were not provided, as the target word required had

already been presented and experienced, so the entire word was to be recalled and written. Figure 3.3 shows an example of in-class written test questions.

1. The space station **is going around the earth**. It is in or bit_____ around the Earth.

2. These flowers **differ** in color; there **are many different types**. The flowers
    Va ry_____ in color.

3. The damage was **only on the surface, not deep**. It was only su perficial_____ damage.

4. I will **think and use my logic to solve the problem**. I will **use reasoning to work it out**.
    I will de duce it from what I already know.

5. She **spends all her free time** helping sick animals. She **buys things for them**, and **is always there to help them**. It is good to see a young person de vote_____ so much time and energy!

Figure 3.2. Extract from Study 2 Pre-tests and Post-tests (including answers).

The other five weekly in-class tests used a verbal cue, in which a sentence describing the words, usage examples or definitions were read out by the instructor, with the students required to respond by listing words (their answers) on a blank piece of paper. The score given was the total number of correct answers. Misspelt words were marked as correct, provided the word was recognizable. Figure 3.4 shows an example of verbal in-class testing questions.

1. Don't take in the washing just yet! The clothes are still _____moist_____.

2. You have to do what Mr. Tanaka tells you, because you are his subordinate.

3. Bamboo is a good material because it is flexible yet very _ridged_____.

4. Japanese is a very old language. Latin is _____likewise_____.

5. Everything he said was lies! I _____refute_____ everything he says!

Figure 3.3. Extract of Study 1 weekly test in written form (including answers).

90

> 1) He never gets angry. He never gets excited. I must say he is a very ___(something)___ person. *Answer:* **calm**
>
> 2) This is when you make a loud noise while sleeping. *Answer:* **snore**
>
> 3) I'm tired of being a teacher! I want a new _(something)_ . *Answer:* **occupation**
>
> 4) The insect looked exactly like a leaf. It is an amazing example of _(something)_ . *Answer:* **camouflage**
>
> 5) The new 'Sky-tree' is a _(something)_ feature of the Tokyo landscape. *Answer:* **predominant**

Figure 3.4. Transcript of Study 1 weekly test in verbal form (including answers).

Data from weekly testing were analyzed through comparisons of the totals and averages of correct responses. A series of 10 data points for each study, alternating between the number of recalls of words experienced in SPR and in L1 form, presented a comparison between target words experienced in the two different modes over the course of the study. Statistical analyses (using *t*-tests) were employed to establish the significance of difference between the number of successful recalls of target words presented as SPRs or as L1s.

3.4.3 Student surveys

Data concerning participant responses to the vocabulary program were collected using written surveys, conducted upon completion of Study 1 and Study 2, consisting of 21 questions each. Survey questions pertained to the SPRs, materials, activities, the vocabulary programs as a whole (for Semesters 1 and 2), and the use of electronic and paper-based materials in both classroom and self-study contexts. Questions frequently required comparisons and expressions of preference between activities and materials experienced in SPR and L1 form. See Appendix E and Appendix F for the survey questions used in Study 1 and in Study 2 respectively.

Apart from Question 21, all survey questions were in either Likert-scale or multiple-choice formats, enabling (what could be regarded as) a simple process of collection, quantification and analysis of data in comparison to using open ended responses. According to Nunan and Bailey (2009) closed style questions have the advantage of being quick and easy for participants to respond to, and allow for the gathering of "more fine-grained information about attitudes in the form of numerical data" (p. 134). Additionally, the closed item format may have strengthened the reliability of the studies' research design, as Mackey and Gass (2016) state that using closed survey questions results in "a greater uniformity of measurement and therefore greater reliability" (p. 93).

Yet closed responses also have their disadvantages. As pointed out by Busch (1993) responses from Likert scale questions can be subjective in that not all participants will have the same ideas as to what constitutes a response to the different points on a Likert scale. For example, the perceived difference between *Agree* and *Strongly Agree* will vary from person to person. However, despite this drawback, the practical benefits of having mostly closed questions in the studies appear to outweigh the disadvantages of having a large number of open style questions.

Other closed item survey questions requested expressions of preference between two items (e.g., SPR or L1 forms). Rather than having participants choose between only two options, *Both* and *Neither* were also offered as possible responses. These options provided some flexibility, as they allowed participants the freedom not to express a clear preference if they so wished. This design may have strengthened the validity of responses that expressed a clear preference, as the *Both* and *Neither* options had not been chosen indicating some degree of certainty in the participant's response.

Likert-scale questions (on a five point scale from *Strongly Disagree* to *Strongly Agree*) generally focused upon the following: (1) the liking/disliking of SPRs; (2) the perceived effectiveness of SPRs; (3) the understandability of the SPRs; (4) the desire to use SPRs in future study. Multiple-choice style questions required expressions of preference between L1 and SPRs, paper-based or electronic materials (asked upon completion of Study 2) and the frequency of private-study. Questions were designed so as to avoid common problems with survey questions as described by Dörnyei (2007). This included the use of short, simple question items using easily understandable and natural language, as well as the avoidance of ambiguous and loaded words, negative constructions and double-barreled questions.

Data from student surveys were analyzed by totaling the responses from Likert scale questions, and then calculating the percentages of the responses (*Strongly Disagree* to *Strongly Agree*) to the different survey questions. *Strongly Disagree* and *Disagree* answers were added together and regarded as negative responses, while *Agree* and *Strongly Agree* answers were added together to be regarded as positive responses. The percentages were then compared so as to establish overall participant responses to questions, including the most and least most popular responses.

Question 21 required the students to write any three words presented in SPR form they may recall, without any cues. This question was designed to investigate which SPR target words were the most commonly recalled in the absence of any cueing or formal testing procedure. The responses (the different target words) were totaled, and ranked according to frequency. Some responses were words that had been presented in L1 form (and not SPR form) so needed to be identified as such.

Following this question was an open-question section, in which students were free to respond as they wished. Students were asked to write a comment in Japanese or English, with the following prompt: *Please write a comment about the vocabulary study this semester. You can write about anything you like.* Although requiring translation and a more complicated process of analysis than the closed items, responses to the open ended questions appeared to enhance the survey data. According to Mackey and Gass (2016) open ended questions "allow respondents to express their own thoughts and ideas in their own manner" (p. 93). Open comments from participants allowed for a higher level of creative and individual expression seemingly not possible with the multiple choice responses. The comments were translated into English (where necessary), and then analyzed according to the grounded theory approach to content analysis (see Section 3.2). The number of (similar) responses in each category was calculated, and comments typifying each category were selected.

3.4.4 Focus group discussions

Focus group discussions involved groups of 3 to 4 students being given three questions in English, both in verbal and in written form. Each question included two sub-questions designed to prompt further responses relating to the main question. See Appendix G and Appendix H for the questions used in the focus group discussions for Study 1 and Study 2 respectively. Participants responded by answering, commenting upon, and discussing the questions freely amongst themselves, without any input (such as prompting or further questioning) from the researcher. In order to prevent any impediment or restrictions to answers given due to English usage, the

participants were instructed to answer in Japanese, English, or a combination of both as they wish.

The discussion questions were, as described by Hennink (2014), primarily designed "to stimulate conversation" with the aim of revealing "a range of perspectives and experiences" (p. 2). The first question referred to the materials and activities used in the classroom that featured SPRs; which ones were liked/disliked, and what the participants thought of them in comparison to the Japanese materials and activities. The second question asked about the perceived effectiveness of SPRs upon learning English vocabulary; the advantages and disadvantages of using them to learn, and how they compared to learning with L1 translations. Questions 1 and 2 were the same for Study 1 and 2. The third question focused upon the participants' experience of private-study away from the classroom, in terms of how often (if ever) and how they studied. The Question related to the use of paper wordlists for Study 1 and the Study 2 website for Study 2.

Comments and conversational exchanges resulting from the three discussion questions were sound-recorded, transcribed, and translated into English. Data relevant to the research project's three research questions was identified, and subsequently coded in a manner similar to that of coding group interview data, which according to Benati (2015) involves the noticing of "similar patterns in the respondent's answers" and then "identifying specific themes and assigning a short word or phrase for each of them" (p. 125). As a result, a number of non-predetermined categories emerged, which exemplified the main themes of the comments and exchanges resulting from the three discussion questions. Some transcriptions were then selected to typify, illustrate and highlight certain aspects of

the responses. Sample Japanese transcriptions and their English translations categorized into different topic areas from Study 1 and Study 2 are shown in Appendix U and Appendix V respectively.

3.4.5 Teacher's journals

Throughout the two programs, two teacher's journals (one for Study 1 and one for Study 2) were kept by the researcher/instructor, in which observations, thoughts, and reflections usually of the previous lesson were recorded in written form. The general focus of the journals was based upon Bailey's (1990) recommendations for keeping diary entries, which includes (as cited by McKay, 2009) "systematically recording events, details, and feelings about the current language learning or teaching experience" (p. 230). The journals mainly focused upon three areas: (1) instruction, such as the organization and practical application of materials and activities, including classroom management; (2) observed student responses, including interaction, interest and motivation, and the successful or unsuccessful recalling of target words; (3) the use of SPRs, such as reactions to different SPR designs, as well as thoughts and speculations as to how the SPRs were influencing teaching and learning. The data (the journal entries) were analysed by grouping entries into main topic areas which became apparent during the analysis. The entries were then summarized in accordance with the topic areas. Sample teacher's journal entries and their subsequent categorization are shown in Appendix W for Study 1 and Appendix X for Study 2.

The teacher's journals are an introspective method of data collection, which Nunan and Bailey (2009) define as "the process of observing and reporting on one's own thoughts, feelings, and motives, reasoning processes, and mental states". They point

out one major criticism of the technique – the inconsistency between what the subject believes and says they are doing, and what they are actually doing. The journal entries therefore were inherently subjective; open to the instructor's /researcher's disconnect between what he had written and what had actually transpired in the classroom. So as to compensate for this lack of objectivity, significant points from the journals were presented alongside and in context with other qualitative data, from student surveys and focus group discussions. In this way, journal entries were generally not treated as stand-alone data but viewed from the participants' perspective also, when used in answering Question 2 and Question 3.

3.5 Materials

The major difference between Study 1 and Study 2 was the medium of which the teaching and study materials consisted. Study 1 used paper-based materials: small word cards, large flashcards, printed wordlists, and the use of a chalkboard. Study 2 used all electronic materials: picture and *PowerPoint* files appearing on a large television monitor, as well as a website for use in private study away from the classroom. All materials were designed and produced by the researcher specifically for the research project.

In both Study 1 and Study 2, 50 target words were represented as SPRs, and another 50 target words were represented as L1 translations (Japanese words). The only difference between materials using SPRs or L1 translations was the appearance of either SPRs or Japanese writing. Testing material was the same for both studies, appearing in paper-based form. Figure 3.5 shows a general overview of Study 1 and Study 2 materials.

Study	Medium	Vocabulary Introduced			
Study 1	Paper-based	50 words Picture form		50 words Japanese (L1) form	余剰
Study 2	Electronic	50 words Picture form		50 words Japanese (L1) form	軍の
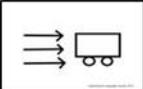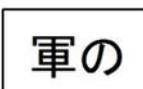
Figure 3.5. General overview of Study 1 and Study 2 materials.

SPRs were checked for an agreement between the forms presented and the meanings they were designed to represent. Three native speakers of English were given Study 1 and Study 2 weekly wordlists of ten target words, accompanied by the corresponding SPRs which were in random order. Target words and what were perceived to be the visual representations of the words (the SPRs) were then matched. The examiners were also required to identify two words from each list they regarded as being more concrete than the others, with their choices subsequently compared to those of the researcher.

L1 translations were evaluated by three small groups of four to five Japanese university first year students being given wordlists from Study 1 and Study 2. The students were required to write Japanese translations of the English words, referring to dictionaries including online dictionaries. Translations were then evaluated by examining the agreement between the researcher's translations and the students' translations.

3.5.1 Activities

Activities designed for Study 1 and Study 2 needed to not only meet the aims of the research project, but also to be consistent with the overall objectives for the language

course of which the students were enrolled. It was therefore necessary for the majority of lesson time to be spent on regular course work. With lessons being 90 minutes in duration, time spent on vocabulary instruction and weekly in-class testing totaled no more than approximately 30 minutes per session.

The general aim of the university course Discussion Skills was to improve the student's English conversational abilities. Activities done as part of the research project were designed to support this objective by having the students (1) study target words appropriate for use at university level, (2) practice pronunciation of the words, (3) practice listening to and recognizing the words, (4) attempt to comprehend explanations and directions in English, and (5) recall the words in simple communicative exchanges. In addition, through the self-learning component, the students were encouraged and provided with a means by which English vocabulary could be studied away from the classroom. These practices may have supported and encouraged an increase in English vocabulary, contributing towards the development of the participants' conversational skills.

The general pattern of the vocabulary sessions followed the design of the research project's learning technique, as outlined in Section 3.5.2. The introduction of target words in different forms mainly involved student/teacher interaction. Recall practice was a combination of student/teacher interaction as well as more student-centered activities. The final stage, recalling words from English cues only, was conducted in the testing phases of the sessions. An overview as to how the activities (in SPR and L1 modes, and paper-based and electronic forms) matched the learning technique is shown in Table 3.1 in Section 3.5.2 below.

3.5.2 The learning technique

Central to the research project was a learning technique involving recall from pictorial cues designed to use simple imagery to assist in the process of remembering English words. Along with experiencing the target words in written and verbal form, the students were offered a pictorial representation of the target words. The representations were repeatedly used as cues from which the participants were to recall the target words. For reasons detailed in Chapter 2, it was speculated that the inclusion of this visual expression of the words (in a simplistic form) would have a mnemonic effect, and therefore be an aid to learning. The aim of the technique was for the target words to be successfully recalled without the presentation of pictures, as is the case with regular language usage. An outline of the three stages of the research project's vocabulary learning technique is shown in Figure 3.6.

The three stages of the learning technique are as follows:

1) *Presentation of target words.* A list of ten English words is presented in written and in verbal form. An explanation of word meanings is given in English, while students are free to look up the words in their dictionaries. The instructor models each word's pronunciation, and the students repeat. Next, the words are presented in pictorial (SPR) form, and the image is explained in terms of how the target word is being depicted.

2) *Multiple recalls from SPRs.* Target words are verbally recalled using SPRs only as cues. Various activities using an assortment of materials aim to have target words recalled in random order; in whole-class, small group, and paired settings. In addition, recall is practiced away from the classroom in self-study situations, using printed wordlists for Study 1 and a website for Study 2.

3) *Recall from FL (English) cue.* Target words are recalled without the corresponding SPRs. Cues are in English (FL) form: written cloze type questions and verbal cues. This stage is used in the testing of target vocabulary recall.

The learning technique was pervasive throughout the research project's vocabulary program, being used in the instruction of target words presented in L1 (Japanese) form as well as SPR form. Activities using SPR and L1 forms were designed to be as similar as possible, as were the activities conducted in Study 1 and Study 2 (using paper-based and electronic material) despite the use of different mediums. Table 3.1 shows an overview of how the activities, using SPRs and L1s in paper-based and electronic form, related to the central learning technique.
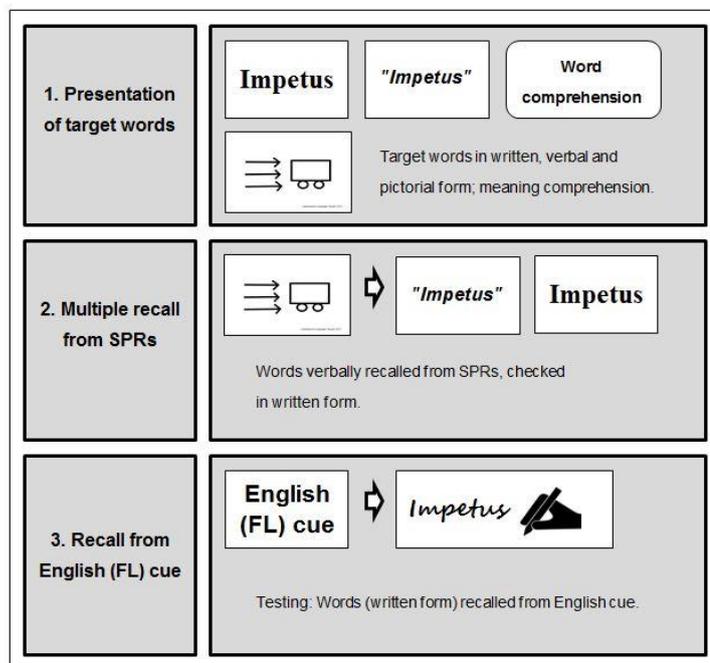
Figure 3.6. Overview of the three stages of the research project's vocabulary learning technique.

Table 3.1

Overview of Research Project Activities in Relation to the Learning Technique Stages

Technique stages	Study 1	Study 2
1. Presentation of target words	**SPR Activities:** English words on chalkboard, pronunciation practice, explanation of word meaning. SPRs on large word cards, students match SPRs with target words, explanation of SPRs.	**SPR Activities:** English words presented on monitor, pronunciation practice, explanation of word meaning, explanation of SPRs.
	L1 Activities: English words on chalkboard, pronunciation practice, explanation of word meaning. Japanese words on large word cards, students match Japanese words with target words, comment on translations.	**L1 Activities:** English word presented on monitor, pronunciation practice, explanation of word meaning, comment on translations.
2. Multiple recall from SPRs	**SPR Activities:** Recall of target words from SPR: whole-class with teacher using large word cards, in small groups (card game) and in pairs (conversation) using small word cards. Self-study (out of class): recall from SPR wordlists.	**SPR Activities:** Recall of target words from SPR: whole-class with teacher using classroom monitor, in pairs (conversation) using classroom monitor. Self-study (out of class): recall from SPRs on website.
	L1 Activities: Recall of target words from Japanese words: whole class with teacher using large word cards, in small groups (card game) and in pairs (conversation) using small word cards. Self-study (out of class): recall from L1 wordlists.	**L1 Activities:** Recall of target words from Japanese words: whole class with teacher using classroom monitor, in pairs using classroom monitor. Self-study (out of class): recall from Japanese words on website.
3. Recall from English (FL) cue	Weekly testing: Recall and writing of target 10 target words (introduced the previous lesson) from either spoken or written cues in English. Post-testing: Recall and writing of all 100 target words from cues written in English.	

3.5.3 Target vocabulary items

Target words (100 for each study) were selected in accordance with the following

criteria. Random selection was used to determine whether the words were to be

represented in L1 or in SPR form. See Appendix C for a list of Study 1 target words

and Appendix D for a list of Study 2 target words.

1. *Academic vocabulary.* Target words were mostly (77%) taken from the Academic Wordlist (Coxhead, 2000) and the University Wordlist (Nation & Xue, 1984). Other words were chosen for their suitability to tertiary level study, (e.g., *negotiation*, *mindset, unrealistic*) and words usually unfamiliar to Japanese students (e.g., *fireworks*, *flattery, hangover*).

2. *Concrete and abstract.* Two words from each group of ten (as identified in Appendices C and D) were chosen for their high level of concreteness, that is, their referent was something which tended to be more tangible than the referents for the other target words in the group. For example, the words *skeleton, fireworks, hangover, nerve* and *fossil* were classified as being more concrete, and the words *ethics*, *hypothesis*, *feasible*, and *indecisive* were classified as being more abstract, representing less tangible ideas and concepts.

3. *Word length.* Words were selected so that the lengths of words were kept approximately the same between words represented as SPRs and words represented in Japanese. For example, the words *respective* and *metabolism* contain 10 letters each, so one was designated to be represented pictorially, the other as a translation.

4. *Loan words.* Words were avoided that are in common usage in the Japanese language, in Japanese phonetic form. For example, the word *positive* was not selected as it has been adapted from English into the Japanese language in the form of ポジティブ (pojitibu).

3.5.4 SPR (simplified pictorial representation) design

A total of 100 images used in the study (SPRs) were all drawn especially for the research project, following a standard design format (see Appendix A for all SPRs

used in Study 1, and Appendix B, for all SPRs used in Study 2). The SPRs were made using *Paint.NET*, an open source picture drawing and image editing software program. Examples of SPRs are shown in Figure 3.7. Details and explanations concerning the simplistic design of the pictures can be found in Chapter 2. The images were designed with the following features:

1. Line drawings using thick lines.

2. Monochrome – black lines on white background, with the occasional use of grey.

3. A maximum of simplicity, with a minimum of detail.

4. Arrows used to express meaning, such as movement, direction, transformation, cause and effect, and expressions of time.

5. Some minimal use of symbols, e.g., letters, numbers, mathematical symbols, punctuation marks, check marks (ticks), and dollar signs.
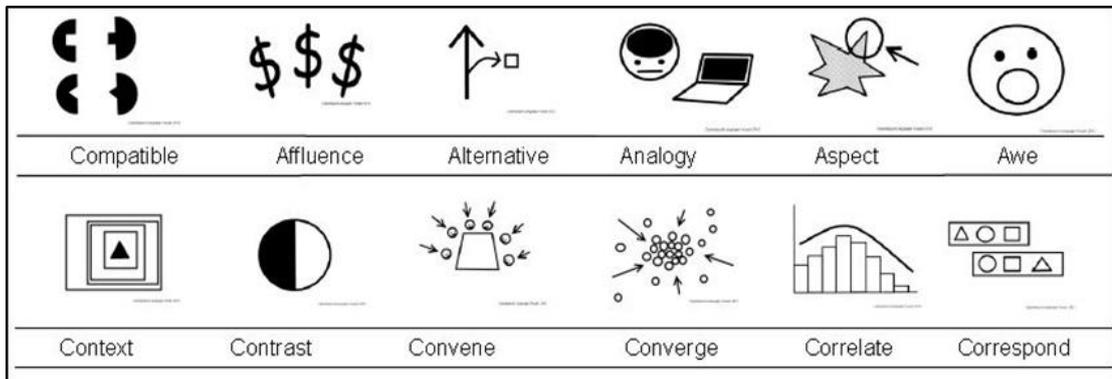
Figure 3.7. Examples of SPRs from Study 2.

3.6 Procedures

Study 1 was conducted in the first semester of the Japanese academic calendar, from April to July. Study 2 was conducted in the second semester of the Japanese

academic year, from September to January. The first 25 to 30 minutes of each lesson of a regular university course (Discussion Skills A/B) was committed to the research project's vocabulary learning program, in which administrative requirements, vocabulary learning activities, and data collection procedures were conducted. The major feature of Study 1 was that it was paper-based, that is, all materials used were constructed of paper (including cardboard, glue and tape). Study 2 materials were all electronic, consisting of information displayed on a large television monitor in the classroom, and on a website accessible on computers and smartphones out of the classroom.

3.6.1 Study 1

Study 1 materials were designed as aids to learning and teaching, used with instructional practices (e.g., the elicitation of responses from word cards, information-gap style activities) that would not be considered out of place in a regular EFL classroom. Materials were used in whole-class, small group, and paired instructional situations as set up by the teacher during the course of instruction. In addition, the wordlists were designed for self-study, to be used at the student's discretion outside of the classroom environment, such as at the participant's home. Half of all materials (representing 50 words) featured target words in English and their corresponding SPRs. The other half (representing the other 50 words) featured target words in English and Japanese translations of the target words in Japanese script.

Word cards were used in two forms, either large or small. Large word cards were A4 size cards with the SPR or L1 appearing on one side only. The cards were used by the instructor to have the class recall target words in unison, and also used with an

activity involving matching the SPR/L1 with the English form written on the chalkboard. Small word cards were business-card sized, with the English word written on one side, and the SPR/L1 on the other. Designed to be used in class by the students in a variety of activities, guesses at target words were prompted by the student showing the side with the SPR/L1, and then checked by turning the card over to reveal the target word in English.

Wordlists were used for self-study away from the classroom. These were lists on B5 paper handed to students at the end of each vocabulary session, featuring the 10 target words that had been studied in that lesson. Students were taught to cover the words printed in English, looking at the SPRs/L1s only. After saying the target word from the SPR/L1 cue only, they would then slide a cover (such as another piece of paper) down to reveal the word so as to check their answer. See Figure 3.8 for example wordlists.

Study 1 was conducted with two classes over a total of 15 weeks within a weekly 1.5 hour course per week as shown in Table 3.2. After the first week of ethics procedures were completed, a total of 100 target words were pre-tested over the next 10 weeks; 10 words per week over a 10 week period. Half of all words (50) were presented in SPR (pictorial) form, the other half in L1 (Japanese) form. The 10 words introduced in one week were tested in the following lesson of the next week. Upon completion of instruction and weekly testing, Study 1 concluded with the post-testing of all 100 target words, focus group discussions and written surveys. Table 3.2 shows the Study 1 schedule.
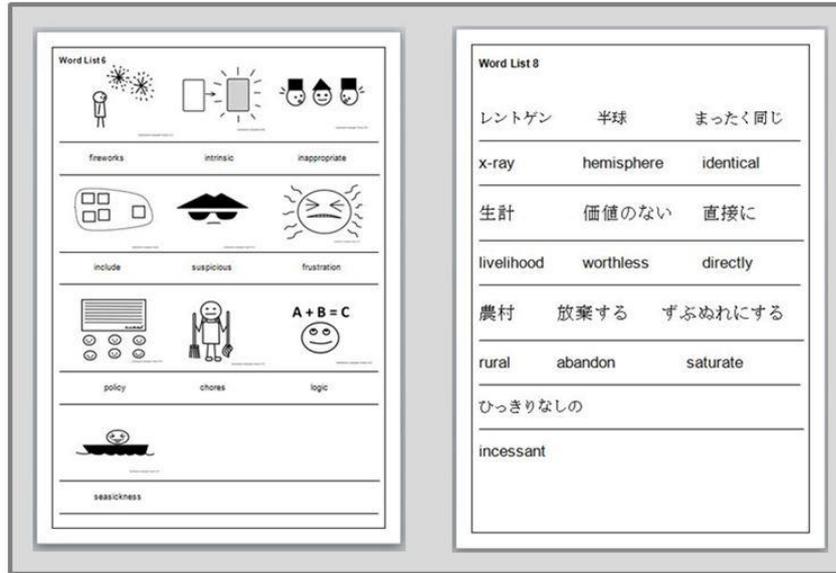
Figure 3.8. Example wordlists: Wordlist 1.6 (left) using SPRs, Wordlist 1.8 (right) using Japanese (L1 translational) form.

Lessons (once per week for 15 weeks) began with the usual administrative procedures of taking attendance and making required announcements. In the majority of the lessons, the target wordlist of 10 words from the previous lesson was then tested; taking between 5 to 10 minutes. The next 20 to 25 minutes was allocated to the instruction of the next set of 10 target words, followed by the handing out of a wordlist featuring either SPRs or L1 translations of all 10 target words studied in that lesson, with the purpose of being used for private study. The remainder of the lesson was committed to the regular course syllabus, where study focused upon the development of conversational strategies for English discussion.

Table 3.2

Study 1 General Schedule

Lesson number	Form: SPR or	Wordlist introduced	Wordlist tested	Testing type	Testing cue	Ethics, surveys and focus group

	L1					discussions
1						Ethics procedures
2			1.1 - 1.10	Pre-test		
3	SPR	1.1				
4	L1	1.2	1.1	Weekly	Verbal	
5	SPR	1.3	1.2	Weekly	Verbal	
6	L1	1.4	1.3	Weekly	Written	
7	SPR	1.5	1.4	Weekly	Written	
8	L1	1.6	1.5	Weekly	Verbal	
9	SPR	1.7	1.6	Weekly	Verbal	
10	L1	1.8	1.7	Weekly	Written	
11	SPR	1.9	1.8	Weekly	Written	
12	L1	1.10	1.9	Weekly	Verbal	
13			1.10	Weekly	Verbal	Focus group disc.
14						Focus group disc.
15			1.1 - 1.10	Post-test	Written	Participant surveys

The vocabulary program was conducted in four distinct modes of instruction: (1) whole-class activities designed to introduce and to practice the recall of target words; (2) small group activities used for further practice recall of target words from SPR or L1 cues; (3) paired activities – additional practice of recall with more of an emphasis upon communication and interaction; (4) private – study for recall practice outside of the classroom in self-study situations. Activities using materials with target words in either SPR or L1 translational form were conducted in as similar a fashion as possible. Lesson plans detailing the activities, materials used and lesson objectives used in Study 1 can be found in Appendix I.

Whole-class activities involved students seated in groups of four, with all students required to focus their attention upon the instructor and the materials. The 10 target words for the session were written in random order on the chalkboard, and then read out by the instructor and repeated by the students so as to practice the correct

pronunciation of words. Large flashcards featuring either SPRs or L1 forms of the target words were then placed at the base of the chalkboard. Students working in groups were then required to match the written words with the corresponding flash cards.

After revealing which flashcard corresponded with which word, a brief explanation of the word (including word meaning, synonyms, and usage examples) was given by the instructor. *Example: "Feasible" means that something can actually be done. Words with similar meanings are "possible" and "achievable". For example, her idea for the new product is feasible.* In addition, an explanation as to how the flashcards matched the words was given. In the case of SPRs, the picture was explained in terms of how the image expressed the meaning of the word. Example: *The picture shows a man with a house plan. He thinks he can do it [pointing to the thought-balloon] and he is able to do it [pointing at the building materials]. His plan to build the house is feasible.*

Explaining the SPRs or L1s involved a critique of the form chosen, in the case of SPRs, the strengths and limitations of the image used. Example: *"Integral" was difficult to picture, as it means something being a very important part of something else, so the design has a square being mostly taken up by this dark area. "Avoid" was easier to draw, as the line is going around or "avoiding" the circle.* For L1s, any difficulties encountered when choosing a suitable Japanese translation were explained. Example: *For "x-ray" I could have used "ekkusu-sen", yet in English x-ray usually refers to the image used by doctors. So I chose the Japanese word "rentogen".* Next, the English words were erased from the board, and the students were required to verbally recall the words with the instructor using the flashcards as

prompts. Cards were chosen in a random manner. Recall of all words was repeated once at the end of the vocabulary session as a final revision of all words.

Small group activities used small word cards in card game type activities, with each group being given 1 set of 10 word cards representing 10 target words. Each group spread their cards on their table, with the SPR or L1 face up. Students would choose a card, and then say the corresponding target word. After turning the card over to check the answer, correct cards were taken by the students, and incorrect cards left. Whoever had the most cards (the most correct answers) was the winner. A similar activity was also done in which the cards were not chosen by the students, rather, the cards were taken from the top of a shuffled pile in the center of the table.

Paired activities consisted of students moving freely around the classroom, forming pairs at random. Students had one word card each, showing it to their partner whilst having a simple verbal exchange in which one student asked (in the case of an SPR) what word the picture represented, and (in the case of an L1) what the Japanese word was in English. After answering, the roles were then reversed. Partners were then changed, enabling exchanges with several different people using several different cards.

Self-study activities were also designed to practice recall. Wordlists featuring the target words practiced in that lesson were distributed to the students at the end of the vocabulary session. Wordlists featured target words in English form, with either the corresponding SPRs or L1s. Instruction, reminders, and encouragement was given to study the words (using the wordlists) as much as possible, with the students knowing that those 10 words would be tested in the next lesson. Wordlists were used by

covering the English form of the target word, looking at the cue (the SPR or the L1) and then saying the word, then uncovering the target word to check for correctness. Students were instructed to recall the words in a random order, as opposed to recalling them in the same order each time, for reasons outlined in Section 2.3.6 of Chapter 2.

Pre-testing and post-testing were conducted under usual exam type conditions, namely no speaking, no use of notes or dictionaries, one hour time limit. Test sheets were marked and results tabulated. Test score (correct response) averages were compared using t-tests between the pre-test L1 word and SPR word scores, and the post-test L1 word and SPR word scores. The gain in pre-test and post-test scores was calculated by subtracting the pre-test scores from the post-test scores, and then the average gain between L1 words and SPRs words was compared using t-tests. The gain between total pre-test and post-test scores of individual target vocabulary items was then calculated. The words were ranked from the highest to the lowest pre-test and post-test score increases.

Weekly in-class testing was conducted at the start of the lesson, either in written or verbal modes. When written, printed question sheets were distributed to the students, and filled out under exam conditions for a maximum of 5 minutes. When verbal, the students listened to questions that were read out by the instructor, and then listed the answers on blank paper. Upon completion, the answers to the questions on the weekly tests were given verbally by the instructor so as to provide feedback to the students before the papers were collected. Test scores were analyzed by totaling the correct responses and then comparing the average SPR word test average to the L1 word test average using a t-test. Additionally, the total score received for each

individual word was calculated, and the words were then listed according to frequency ranking.

Focus discussion groups were conducted in Week 13 and Week 14. Randomized groups of 3/4 students arrived at the classroom at a predetermined time for a course required speaking test. After the speaking test each group was given a copy of the Discussion Questions handout (See Appendices G and H). The participants were verbally reminded that their comments had no bearing on their course evaluations, and that the discussion could be done in Japanese. Two recording devices (in full view of the participants) were then turned on, and Question 1 and its two supporting points were read out by the instructor. Students then discussed the point without any interference or input from the instructor. As the conversation began to wane (usually after 2/3 minutes) the instructor then read Question 2, followed by Question 3.

The recordings were analysed by a process involving a native speaker of Japanese listening to all the recordings and identifying and then transcribing dialog relating directly to the main question and the two supporting questions of each main question. The transcriptions were then translated into English. The results were summarized under six main topics.

Student surveys were conducted in Week 15. Before doing post-tests, the participants were handed the surveys and given approximately 15 to 20 minutes to complete them. Prior to starting the surveys, the students were reminded that their responses had no effect upon their grades. Data were analysed by responses to multiple choice style questions being totalled and then converted to a percentage of overall responses. Written responses were translated into English and then categorized according to

different topic areas. The numbers of similar answers to questions were grouped together so as to establish the frequency of similar responses, and results were tabulated and summarized for presentation.

The teacher's journal was written up after each lesson which had included the research project's vocabulary sessions, on the same day as the lessons. The time spent on writing each entry was from ten to twenty minutes. The journal entries had an overall focus upon (1) instruction, (2) student responses, and (3) the SPRs. Upon the completion of Study 1, data were categorized into general subject areas, and summarized for presentation.

3.6.2 Study 2

The overall structure of Study 2 was essentially the same as that of Study 1 in research design, timeframe and data collection instruments. The vocabulary program was also similar, having the same instructional aims (the learning of 50 words in SPR form, 50 words in L1 form), and consisting of whole-class, paired, and self-study activities. The major difference between Study 1 and Study 2 was the medium used for the instructional materials, which resulted in some variation in activities and instruction. Testing materials were the same (paper-based) for both studies.

Materials for Study 2 were electronic, introducing a different set of 100 target words to that of Study 1. The same type of content was featured in both studies, with English, Japanese and SPR forms being of the same design (i.e., the same fonts used and the same basic SPR design format). In the classroom, a large television monitor was used to display the materials. Outside of the classroom, materials for self-study were accessible via a website. All three types of materials were created with standard

software, freely available with a *Google* account or part of the *Microsoft Office* or *Windows 7* operating systems, and did not require any (what could be considered) advanced computer skills.

A total of ten *PowerPoint* presentations were used in Study 2, each containing one wordlist consisting of 10 target words. The target words appeared in English written form on one slide, and then in either SPR or L1 form on the next slide. Thereby, each slide in the presentation alternated between the English form and the SPR or L1 form.

Another type of material used was sets of picture files in PNG format. Ten files were contained in a desktop folder, featuring the target word in either SPR or L1 translational form. With the folder open and its window maximized, the window was set to display the files with a preview of each file at maximum size. As a result, all of the images could then be seen on the television monitor at the same time. Resting the cursor on an image enabled it to be highlighted, and it could then be opened with a mouse click. See Figure 3.9 for screenshots of example folders.

The third type of material used was a website set up using *Google sites*, a free web site creation tool and hosting service. No password or registration was required to access the site, and it was viewable on either computers or smartphones. The site featured the 10 target words introduced in the previous lesson, with words from each lesson remaining on the site, resulting in all 100 target words eventually being posted to the site. Target words (grouped according to their wordlists) appeared in English form, and by the user clicking a link underneath the English word, the SPR or L1 form was displayed. The website can be found at

https://sites.google.com/site/vocabularyresearch/. See Figure 3.10 for screenshots of the Study 2 website.

Figure 3.9. Screenshots of open folder with a PNG file highlighted; Target word in SPR form (left) and L1 form (right).

Study 2 followed the same general procedure as Study 1, with pre-testing, post-testing, weekly testing, focus group discussions and surveys being conducted to a similar schedule. Table 3.3 shows a general schedule of Study 2. Week one was concerned with matters relating to the regular language course. Weekly testing and the vocabulary program were also conducted in the first 25 to 30 minutes of each lesson.

Activities for Study 2 had the same instructional focus as Study 1, featuring the process of (1) target word introduction and explanation, (2) the repeated practice of recalling target words from either SPR or L1 cues, and (3) recalling of target words from English cues only when testing. The use of electronic materials in Study 2 necessitated different instructional activities to those of Study 1 which used paper-based materials. Activities for Study 2 were divided into three different types: whole-class, paired, and self-study, with an absence of small group activities as used in Study 1. See Appendix J for the lesson plans used in Study 2.

Table 3.3

Study 2 General Schedule

Lesson number	Form: SPR or L1	Wordlist introduced	Wordlist tested	Testing type	Testing cue	Surveys and focus group discussions
1						
2			2.1 - 2.10	Pre-test	Written	
3	SPR	2.1				
4	L1	2.2	2.1	Weekly	Verbal	
5	SPR	2.3	2.2	Weekly	Verbal	
6	L1	2.4	2.3	Weekly	Written	
7	SPR	2.5	2.4	Weekly	Written	
8	L1	2.6	2.5	Weekly	Verbal	
9	SPR	2.7	2.6	Weekly	Verbal	
10	L1	2.8	2.7	Weekly	Written	
11	SPR	2.9	2.8	Weekly	Written	
12	L1	2.10	2.9	Weekly	Verbal	
13			2.10	Weekly	Verbal	Focus Group Disc.
14						Focus Group Disc.
15			2.1-2.10	Post-test	Written	Participant surveys

Note. Lesson number 1 consisted of class administration and regular coursework.

Whole-class activities required all students to watch the classroom monitor whilst listening to the instructor. Using *PowerPoint* presentations, target words were displayed in English form, with students repeating the verbal form as modelled by the instructor, with a focus upon correct pronunciation. As per Study 1, the target word's meaning was explained through explanations, examples of usage, and synonyms. By forwarding through the presentation slides, SPRs or L1 representations of the target words were introduced. Similar to Study 1, with SPRs the instructor offered an explanation of the image in terms of how the image expressed word meaning. In the case of L1s, comments were made (e.g., difficulties experienced) relating to the translating of the words.
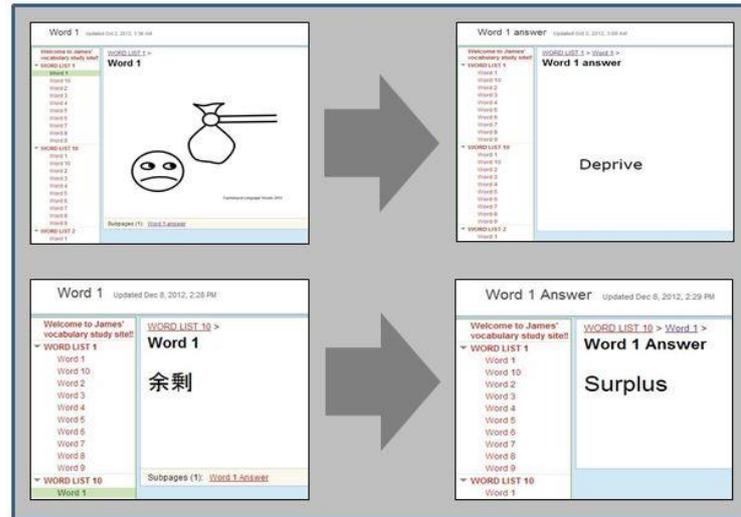
Figure 3.10. Screenshots of the website used in Study 2. SPR image and English word revealed (above); L1 translation and English word revealed (below).

The class then practiced recall of target words by the instructor using the *PowerPoint* presentation to present a cue (either SPR or L1) for each target word, and then by having all students verbally produce the target word. Then, by forwarding to the next slide, the English form was displayed, enabling students to check their responses. Recall of all 10 target words was practiced by running the presentation 2 or 3 times.

Recall was further practiced with the use of a folder containing picture files (in PNG format) of either SPRs or L1s. The instructor provided cues by opening files in random order. In addition, with the folder set to display all 10 images at once, the instructor rested the cursor on files thereby highlighting each one in random order. Recall of words was done repeatedly at an increasingly fast pace so as to make the task more challenging. Target words were revised by the class using either the presentation or the folder file at the end of the vocabulary session.

Paired activities involved the display of all SPRs or L1s on the monitor. The students chose one target word, stood up and randomly formed pairs, changing partners

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several times. With SPRs, one student described their word's SPR, and the partner had to correctly guess and recall the word without looking at the screen. With L1s, one student asked what their chosen Japanese word was in English, and the partner gave their answer without looking at the screen.

Self-study activities required the students to use the website especially designed for the study. At the end of each vocabulary session, the instructor reminded and encouraged the students to access the website. Instructions for usage were given in the first lesson, and periodically reinforced throughout the course. Instructions included how to find the required wordlist, responding to cues (both SPR and L1) verbally, and checking responses by selecting a link displaying the English written forms. Emphasis was placed upon mixing the order of words randomly, so that words were not recalled in the same order each time. In addition, the students were reminded that an example of word pronunciation can usually be obtained by searching for the word online with the term *definition*, and then by clicking on the speaker icon to hear an audio bite of the pronunciation.

Focus discussion groups were conducted in Week 13 and Week 14 of Study 1 and Study 2. Study 1 results were summarized under six main topics and Study 2 results were summarized under seven main topics. Upon the completion of Study 1 and Study 2, data were categorized into general subject areas, and summarized for presentation.

Procedures for Study 2 pre-tests, post-tests, weekly vocabulary testing, focus group discussions and surveys were the same as that of Study 1, as was the keeping of the teacher's journal. Some survey questions and focus group discussion questions were

different to Study 1 due to the use of electronic material, and the resulting changes in instruction and activities. Some questions required a comparison between Study 1 and Study 2 vocabulary programs, that is, the use of paper-based versus electronic mediums.

3.7 Summary

Chapter 3 began with a general overview of the research project, followed by a description of the research design, including some background information as to how the design was selected. Next, the setting and participants of Study 1 and Study 2 were described, as well as an account given as to the ethical considerations that required attention. Instrumentation and methods of data collection used were then given in accordance with three research questions, including details of the five methods of data collection, these being (1) pre-tests/post-tests, (2) weekly tests, (3) student surveys, (4) focus group discussions, and (5) teacher's journals.

The materials section firstly provided an overview of the materials used in Study 1 and Study 2, including an explanation as to how the vocabulary programs were required to be compatible with the university course in which it was set. An overview of Study 1 and Study 2 activities was also given, including a description of the vocabulary learning technique central to the research project, and how the activities conducted in Study 1 and Study 2's vocabulary program were designed to execute the technique. This was followed by a description of the selection criteria for Study 1 and Study 2's target words, as well as the design features of the SPRs.

Finally, details concerning the materials used and procedures followed in Study 1 and Study 2 were provided, including general schedules and procedures concerning data collection. In Study 1 (conducted in Semester1) data collection procedures consisted of a pre-test of 100 target words being given, followed by the weekly testing (in each weekly lesson for ten weeks) of a set of ten target words that had been presented in the week prior. Small groups of four to five students then took part in focus group discussions over two lessons. On the last lesson of the 15 lesson course, all 100 target words were post-tested, and a participant survey was given. Throughout the semester, a teacher's journal was kept, being updated after each lesson. Data collection procedures for Study 2 (conducted in Semester 2) were the same as those of Study 1. The Chapter also included descriptions and explanations of activities (both in-class and out of class), and how Study 1's paper-based and Study 2's electronic teaching/learning materials were used in these activities.

Chapter 4. Results

4.1 Overview

Chapter 4 begins with a chapter overview in Section 4.1. The results of Study 1 are presented in Section 4.2, starting with an overview followed by the results of Study 1 pre-testing and post-testing (Section 4.2.1), weekly testing (Section 4.2.2), attitudinal surveys (Section 4.2.3), focus group discussions (Section 4.2.4) and the teacher's journal (Section 4.2.5). The structure of Study 2 is the same as that of Study 1, so the results of Study 2 are presented in a similar way. Section 4.3 begins with a section overview, and then proceeds to present the findings of Study 2 pre-testing and post-testing (Section 4.3.1), weekly testing (Section 4.3.2), attitudinal surveys (Section 4.3.3), focus group discussions (Section 4.3.4) and the teacher's journal (Section 4.3.5).

4.2 Results of Study 1

Firstly, the results of Study 1's vocabulary testing are reported. The total scores for pre-tests and post-tests are reported for SPR words (target words presented in SPR form) and L1 words (target words presented in L1 form). A comparison is then made between participant scores from the pre-testing of SPR and L1 words, followed by a comparison between the post-testing of SPR and L1 words. The increase in scores from the pre-test to the post-test of SPR and L1 words is then compared, using the total number of correct responses to each of the 100 target words. Target words with the highest pre-test to post-test difference are presented in Table 4.4 in Section 4.2.1.

Total participant scores from weekly testing are then reported, and then a comparison is made between the SPR and L1 test score totals.

Data from the participant surveys, focus group discussions and teacher's journal are then presented. The responses to survey questions requiring multiple choice answers are tabulated and summarized according to eight specific topics. Answers to Question 22 (requiring the unprompted recall of three SPR words) are then given, which include the total number of each target word. Responses to survey questions requiring open style written responses are then tabulated, with an example and an indication as to the number of similar responses included. Next, data from focus group discussions and the teacher's journal are reported. The findings of the study's focus group discussions are then presented using comments selected that relate to the study's three research questions. The responses are summarized and categorized into six general topics. The section finishes with the presentation of data from the teacher's journal.

4.2.1 Pre-testing and post-testing

One hundred target words (50 presented in SPR form, 50 presented in L1 form) were pre-tested and post-tested before and after Study 1's vocabulary program. The total number of correct answers to pre-test and post-test questions from Class A ($N = 25$) and Class B ($N = 23$), and the increase in test scores (the difference between pre-test and post-test scoring) are shown in Table 4.1. The same participants ($N = 48$) undertook the pre-test as well as the post-test; the results from one participant from the initial sample group ($N = 49$) were disregarded as they did not undertake the post-test. See Appendix K for all Study 1 participant pre-test and post-test scores.

Table 4.1

Study 1: Averages and Increased Averages for Participant Scores for Pre-tests and Post-tests

		SPR			L1		
	N	Pre-test	Post-test	Increase	Pre-test	Post-test	Increase
Class A	25	8	36.84	28.84	6.88	35.24	28.36
Class B	23	3.7	28.09	24.39	3.91	26.48	22.57
Total	48	5.94	32.65	26.71	5.46	31.04	25.58

Note. Increase = post-test score minus pre-test score.

The average pre-test score for words presented in the SPR mode was 5.94 (SD = 3.37), higher than the average pre-test score for words presented in L1 form at 5.46 (SD = 3.58). The average post-test score for words presented in the SPR mode was 32.65 (SD = 11.40), higher than the average post-test score for words presented in L1 form at 31.04 (SD = 10.26), as shown in Figure 4.1.
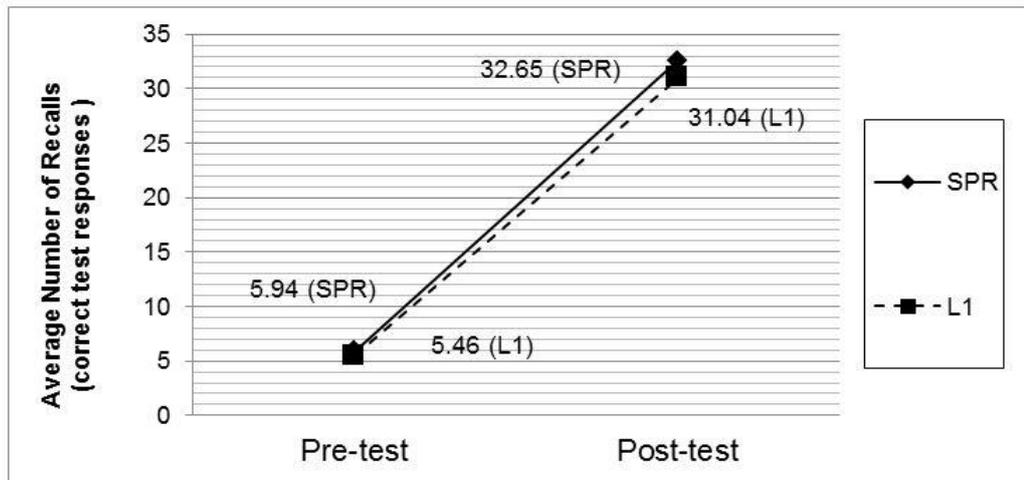
Figure 4.1. Study 1: Pre-test and post-test average scores of SPR and L1 words (N = 48).

The number of correct responses to questions requiring SPR words and questions requiring L1 words were compared using two-tailed, paired-samples *t*-tests. The significance of difference ($p < 0.05$) was determined between the SPR and L1 pre-test scores, and determined between the SPR and L1 post-test scores, as shown in Table 4.2.

Table 4.2

Study 1: Comparison of Participant Scores for SPR Target Words and L1 Target Words for Pre-test and Post-test Totals using Paired Samples t-tests

| | SPR | | | | L1 | | | | | |
	Total	*M*	*SD*	*df*	Total	*M*	*SD*	*df*	*t*-score	*p*-value*
Pre-test	285	5.94	3.53	47	262	5.46	3.58	47	1.022	0.312
Post-test	1567	32.65	11.40	47	1490	31.04	10.26	47	2.370	0.022

Note. $N = 48$ for both SPR and L1 results.
* $p < 0.05$, two-tailed.

In pre-testing (conducted before the treatment – the vocabulary program), there was no significant difference between the number of correct responses to questions requiring SPR words ($M = 5.94$, $SD = 3.53$) and questions requiring L1 words ($M = 5.46$, $SD = 3.58$): $t(47) = 1.022$, $p = 0.312$. In post-testing (conducted after the treatment) the number of correct responses for words presented in SPR form ($M = 32.65$, $SD = 11.40$) was significantly higher than the number of correct responses for words presented in L1 form ($M = 31.04$, $SD = 10.26$): $t(47) = 2.370$, $p = 0.022$.

The increase in the average number of correct responses to questions requiring each target word (100 words in total) was calculated by subtracting the word's average pre-test test score from the word's average post-test score. For SPR words (50 words in total), with a pre-test average of 5.7 and a post-test average of 31.34, the total increase in averages was 25.64 ($SD = 9.75$). For L1 words (50 words in total), with a pre-test average of 5.24 and a post-test average of 29.8, the total increase in averages was 24.56 ($SD = 8.32$).

The SPR word increase was compared to the L1 increase using a two-tailed, paired-samples *t*-test. The significance of difference ($p < 0.05$) was determined

between the SPR and L1 score increases, as shown in Table 4.3. There was no

significance difference between pre-test/post-test score increases for questions

requiring SPR target word responses ($M = 25.64$, $SD = 9.75$) and pre-test/post-test

increases for questions requiring L1 target word responses ($M = 24.56$, $SD = 8.32$):

$t(47) = 0.541$, $p = 0.591$.

Table 4.3
Study 1: Comparison of Total Score Pre-test/Post-test Increases for Target Words in
SPR Form and Target Words in L1 Form Using a Paired Samples t-test

	SPR				L1					
	Total	*M*	*SD*	*df*	Total	*M*	*SD*	*df*	*t*-score	*p*-value*
Increase	1282	25.64	9.75	49	1228	24.56	8.32	49	0.541	0.591

Notes. $N = 50$ target words each for both SPR and L1 forms.
"Increase" refers to the post-test score minus the pre-test score.
* $p < 0.05$, two-tailed.

Table 4.4 shows the target words with the ten highest pre-test/post-test score

increases. Of the 22 words, 14 were presented in the SPR form, and 8 were presented

in the L1 form. Appendix M shows a listing of all 100 Study 1 target word pre-test

and post-test totals, as well as their rankings according to the frequency of recalls.

Table 4.4
Study 1: Target Words with the Ten Highest Pre-test and Post-test Score Increases

Ranking	Increase	Target Word(s)	
		SPR	L1
1	44	Seasickness	
2	42	Dogma	
3	41	Snore	
4	40		Outcome
5	39	Finite	Toxic
6	38	Devalue, Hangover	
7	37	Vandalism, Tropical	Identical
8	36	Volatile, Temporary, Camouflage	Flattery
9	35	Unpopular, Policy, Chores	Hemisphere

Note. Gain = Post-test score minus pre-test score.

4.2.2 Weekly testing

Ten target words were tested each lesson, once per week for ten weeks. The total number of correct responses to questions requiring target words presented in the SPR form was 1644 *(N* = 49, *M* = 33.55, *SD* = 5.20), with a total weekly average of 328.8. The total number of correct responses for words presented in the L1 form was lower at 1555 (*N* = 49, *M* = 31.73, *SD* = 5.03), with a total weekly average of 311. The average weekly test scores (the number of correct responses) are presented in Figure 4.2. The total weekly test scores for individual participants are shown in Appendix K.

The number of correct participant responses to questions requiring words presented in the SPR form (*N* = 49, *M* = 33.55, *SD* = 5.20) and the number of correct participant responses to questions requiring words presented in the L1 form (*N* = 49, *M* = 31.73, *SD* = 5.03) were compared using a two-tailed, paired-samples *t*-test. The significance of difference (*p* < 0.05) was determined between the SPR and L1 scores, as shown in Table 4.5. The number of correct responses to words presented in SPR form (*M* = 33.55, *SD* = 5.20) was significantly higher than the number of correct responses to words learned in L1 form (*M* = 31.73, *SD* = 5.03): *t*(48) = 2.374, *p* = 0.0217.

The target words with the ten highest scores (the number of correct answers to questions requiring the words) are shown in Table 4.6. Of the 26 words, 13 were

presented in the SPR form, and 13 were presented in the L1 form. Appendix M

shows a complete list of Study 1 target word weekly testing totals and rankings.
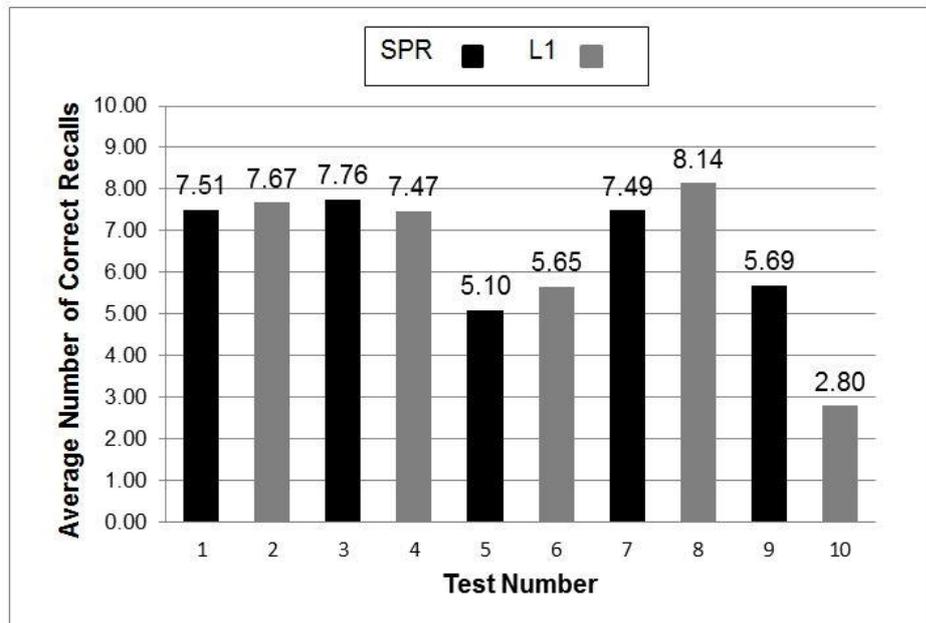
Figure 4.2. Study 1: Average number of correct responses to weekly tests (*N* = 49).

Table 4.5

Study 1: Comparison of Total Weekly Test Scores for Target Words in SPR Form and Target Words in L1 Form Using a Paired Samples t-test

	SPR				L1					
	Total	*M*	*SD*	*df*	Total	*M*	*SD*	*df*	*t*-score	*p*-value*
Score	1644	33.55	5.20	48	1555	31.73	5.03	48	2.374	0.0217

Note. N = 49 and for both SPR and L1 results.

* *p* < 0.05, two-tailed.

Table 4.6

Study 1: Target Words with the Ten Highest Weekly Test Scores

Ranking	Score	Target Word(s)	
		SPR	L1
1	50	duty	
2	48	hangover	worthless

3	47	tropical, snore	rural
4	46		envy
5	45	devalue, dilemma, agree, seasickness.	
6	44	avoid, traditional, frustration, chores, calm	
7	43		toxic, x-ray, hemisphere
8	42		parallel
9	41		extra, vindictive, unrealistic
10	40		translucent, incessant, apologize

4.2.3 Attitudinal surveys

Study 1 attitudinal surveys comprised of multiple choice questions, open written responses, and a question requesting the recall of any three words presented as SPRs. The multiple choice section consisted of three types of questions, requiring: (1) attitudinal responses, using a Likert scale; (2) preferential responses; (3) a response concerning the frequency of private study. The questions and responses for the sections are shown in Table 4.7, Table 4.8 and Table 4.9 respectively.

Table 4.7

Study 1: Responses to Survey Questions Requiring an Expression of Preference (N = 49)

Survey Question (Including survey question number.)	L1	SPR	L1 and SPR (no preference expressed)	Neither	*M*	*SD*
7. Which vocabulary sessions did you like the most?	10 (20.4%)	11 (22.4%)	27 (55.1%)	1 (2%)	2.39	0.83
8. Which vocabulary sessions do you think helped you the most to learn English words?	3 (6.1%)	7 (14.3%)	39 (79.6%)	0 (0%)	2.73	0.56
13. Which (pictures or Japanese words) did you like using the most?	8 (16.3%)	12 (24.5%)	28 (57.1%)	1 (2%)	2.45	0.78
14. Which (pictures or Japanese words) do you think helped you to remember the English words the most?	12 (24.5%)	11 (22.4%)	26 (53.1%)	0 (0%)	2.29	0.83

Survey Question							
19. Which wordlists did you like using the most in private study?	8 (16.3%)	3 (6.1%)	37 (75.5%)	1 (2%)	2.63	0.77	
20. Which wordlists do you think helped you the most with learning English words?	4 (8.2%)	3 (6.1%)	42 (85.7%)	0 (0%)	2.78	0.58	

Notes. Assigned values: 1 = L1; 2 = SPR; 3 = Both (L1 and SPR); 4 = Neither.
Percentages are rounded to one decimal place.

Table 4.8

Study 1: Responses to Survey Question 16 Requiring a Frequency Response (N = 49)

Survey Question (Including question no.)	(10+)	(5-10)	(3-5)	(1-2)	nil	*M*	*SD*
18. I did private study using the wordlists on average (*per week)	2 (4.1%)	1 (2%)	12 (24.5%)	34 (69.4%)	0 (0%)	3.59	0.73

Notes. Assigned values: 1 = (10+); 2 = (5-10); 3 = (3-5); 4 = (1-2); 5 = nil.
Percentages are rounded to one decimal place.

Table 4.9

Study 1: Survey Question Responses Requiring Likert Style Responses (N = 49)

Survey Question (Including question number)	Strongly Agree	Agree	Disagree	Strongly Disagree	*M*	*SD*
1. I liked the activities using the pictures on large flashcards and using the blackboard.	24 (49.0%)	23 (46.9%)	2 (4.1%)	0 (0%)	1.55	0.57
2. The activities using the pictures on large flashcards and using the blackboard helped me to learn the English words.	21 (42.9%)	27 (55.1%)	1 (2.0%)	0 (0%)	1.59	0.53
3. I liked the activities using the pictures on small flashcards while sitting at our desks in small groups.	32 (65.3%)	16 (32.7%)	1 (2.0%)	0 (0%)	1.37	0.52
4. The activities using the pictures on small flashcards while sitting at our desks in small groups helped me to learn the English words.	31 (63.3%)	18 (36.7%)	0 (0%)	0 (0%)	1.37	0.48
5. I liked the activities using the pictures on small flashcards while moving around the classroom forming pairs.	26 (53.1%)	21 (42.9%)	2 (4.1%)	0 (0%)	1.51	0.58
6. The activities using the pictures	24	25	0	0	1.51	0.50

on small flashcards while moving around the classroom forming pairs helped me to learn the English words.	(49%)	(51%)	(0%)	(0%)		
9. I liked the pictures.	27 (55.1%)	20 (40.8%)	2 (4.1%)	0 (0%)	1.49	0.58
10. The pictures were easy to understand.	6 (12.2%)	21 (42.9%)	21 (42.9%)	1 (2%)	2.35	0.72
11. The pictures helped me to remember the English words.	21 (42.9%)	23 (46.9%)	5 (10.2%)	0 (0%)	1.67	0.65
12. I want to use the pictures again in my English vocabulary study.	21 (42.9%)	25 (51.0%)	3 (6.1%)	0 (0%)	1.63	0.60
15. I liked using the pictures on wordlists in my private study.	10 (20.4%)	31 (63.3%)	8 (16.3%)	0 (0%)	1.96	0.60
16. I think that using the pictures on wordlists for private study helped me to learn the English words.	15 (30.6%)	30 (61.2%)	4 (8.2%)	0 (0%)	1.78	0.58
17. I want to use the pictures again for my private vocabulary study in the future.	15 (30.6%)	30 (61.2%)	4 (8.2%)	0 (0%)	1.78	0.58

Notes. Assigned values: Strongly Agree = 1; Agree = 2; Disagree = 3; Strongly Disagree = 4.

Percentages are rounded to one decimal place.

The survey results are summarized below according to eight topic areas. The total number of participants was 49 ($N = 49$).

1. Whole-class activities using large flash cards and the chalkboard: 47 participants (95.9%) agreed that they liked the activities, and 48 participants (98%) agreed that the activities were beneficial to learning.

2. Small group activities using small flashcards while seated at desks: 48 participants (98%) agreed that they liked the activities, and 49 participants (100%) agreed that the activities were beneficial to vocabulary learning.

3. Paired activities using small flashcards: 48 participants (96%) agreed that they liked the activities, and 49 participants (100%) agreed that the activities were beneficial to vocabulary learning.

4. The SPRs: 47 participants (95.9%) agreed that they liked the SPRs. 27 participants (55.1%) agreed that the SPRs were easy to understand, and 22 participants (44.9%) did not agree. 44 participants (89.9%) agreed that the SPRs were beneficial to vocabulary learning, and 46 participants (93.9%) agreed that they wanted to use the SPRs again in future vocabulary study.

5. Private study (SPR wordlists): 41 participants (83.7%) agreed that they liked using the wordlists featuring SPRs in private study. 45 participants (91.8%) agreed that the SPR wordlists were beneficial to learning, and indicated a desire to use them in future studies. 46 participants (91.8%) agreed that they would like to use SPRs for private study in the future.

6. Private Study (SPR and L1 wordlists): 37 participants (75.5%) agreed that they liked both types of wordlist, followed by 8 participants (16.3%) preferring L1 lists, 3 participants preferring SPR lists (6.1%), and 1 participant (2%) preferring neither. A majority (85.7%) agreed that both types of wordlist were beneficial to learning, followed by L1 (8.2%) and then SPR (6.1%). Most (69.4%) indicated that they studied using the wordlists one or two times per week on average,

followed by three to five (24.5%), ten or more (4.1%), and five to ten times (2%).

7. Vocabulary sessions (SPR or L1): 27 participants (55.1%) indicated a preference for both types of session, followed by 11 participants (22.4%) preferring SPR and 10 participants (20.4%) L1 sessions. 1 participant (2 %) preferred neither session. 39 participants (79.6%) indicated the belief that both sessions were beneficial to learning.

8. SPRs and L1 translations: 28 participants (57.1%) indicated a liking for both SPR and L1 forms, expressing a preference for neither. This was followed by 12 participants (24.5%) preferring SPR forms, and 8 participants (16.3%) preferring L1 forms. 1 participant (2%) liked using neither form. 26 participants (53.1%) indicated the belief that both types were beneficial to learning, followed by 12 participants (24.5%) indicating that L1 forms helped learning the most, and 11 participants (22.4%) indicating that SPR forms helped the most.

The first part of Question 22 of the participant survey required the recall of any three target words learned that were presented in SPR form. The most frequently recalled word was *tropical*, with 19 responses, followed by *hangover* with 12 responses. The other responses were as follows: *fireworks* (10 responses); *seasickness*, *vandalism* (8 responses); *chores*, *suspicious*, *dogma* (7 responses); *avoid* (5 responses); *calm*, *agree*, *volatile*, *snore* (4 responses); *finite* (3 responses); *deadline*, *arbitrary*, *duty*, *discrimination*, *scope*, *policy*, *ethics*, *integral*, *asset**, (2 responses); *negotiation*, *inappropriate*, *dilemma*, *ambiguous*, *frustration*, *logic*, *predominant*, *unpopular*, *traditional*, *deviate*, *camouflage*, *acid**, *fallacy**, *saturate**, *presume**, *envy**,

outcome*, translucent*, significant*, visual*, toxic* (1 response). Words marked

with an asterisk were presented in L1 form, not SPR form.

The second part of Question 22 of the participant survey required a written comment

in response to a general question concerning the vocabulary program, as shown in

Appendix E. Most participants (64.5%) wrote their response in Japanese only, 14%

in English only, 2% in both English and Japanese, and 5.3% gave no response.

Japanese responses were translated into English, and all responses were categorized

into six general topics, as shown in Table 4.10.

Table 4.10

Study 1: Responses to Written Open-Answer Survey Question 22 (N = 49)

Specific Point	Example Response	Frequency of Similar Responses
	Topic 1: SPRs	
1. Difficulty with understanding SPRs: General comment	1B24: Sometimes you did not understand the meanings of the pictures.	9
2. Difficulty with understanding SPRs due to cultural differences	1B1: Japanese expressions and foreigner's expressions are different; there were difficulties in understanding.	1
3. Difficulty with understanding SPRs due to individual factors	1A14: It was confusing and difficult to remember the words when the picture was separate (different) to the image you personally hold of the word.	1
4. Difficulty with understanding SPRs due to abstract quality	1A2: Some of the pictures were abstract, so it was sometimes hard to understand.	2
5. Liking of SPRs: General positive comment	1B21: (Difficult to understand), but I liked the pictures.	3
6. Learning with SPRs was enjoyable	1A16: I was able to enjoy learning the English words while using the pictures.	5
7. SPRs were helpful/ beneficial to learning	1A1: I think that you learn by looking at pictures, and this easily remains in the memory.	5
8. Desire to use SPRs in the future	1A5: I want to continue using pictures to learn words in the second semester!!	1
9. Convenience of having the SPRs already drawn	1A18: This study was good because you could study (as all the words had pictures already prepared).	1
10. Considering the SPR/ word relationship was helpful	1B5: …with the pictures, what helped me understand was: "Why is this picture and this word related?"	1
11. L1 preferable to SPR	1A12: …I think that it is easier to remember	1

	form for memorizing abstract words	abstract words using Japanese words rather than pictures.	
12. Preference for studying with SPRs over L1 form	1A20: I liked studying with the pictures better than just remembering text,…	2

Topic 2: Class Activities		
1. Whole-class activities: Benefit of verbal/visual	1A6: We could remember by using the pictures and the pronunciation (eyes and ears).	1
2. Whole-class activities: Benefit of teacher's gestures in explanation	1B1: I think that it was easy to remember from the teacher's gestures when explaining the pictures.	1
3. Small group activities: Enjoyable	1B4: I really enjoyed the games using the small cards when divided into groups	5
4. Paired activities: Positive comment	1B3: The one (activity) where we exchanged with friends was really good. I learned proper pronunciation and such.	3
5. Desire to use simple English to remember	1B7: Only, just remembering with pictures and Japanese, … so I think I wanted to use simple English-to-English.	1
6. Weekly study was boring and tiring.	1A25: However I think it was boring or tiring to learn English words every week.	1

Topic 3: Private Study		
1. Wordlists: Both SPR and L1 enjoyable	1B19: The Japanese wordlists and the picture wordlists are very fun! I could have time to study words.	1
2. Wordlists: Desire for the use of SPRs and L1s	1A11: I wanted a printout that did not just have the pictures, but had the both the picture and the Japanese.	2
3. Study: Regret not having studied more	1A24: Upon reflection, it would have been better if I had studied more seriously outside of the classroom.	2

Topic 4: The Target Vocabulary		
1. The number of target words was suitable	1B8: Every week we learned ten words; not too many, not too few; just right.	1
2. The benefit of relearning words taught in high school.	1A17: Learning words (from) high school; it was good to be able to newly learn the words that you did not know.	3
3. Desire to use target words in everyday usage	1A16: I want to use the words I have learned from this class in my everyday life.	1

Topic 5: Weekly In-Class Testing		
1. Frustration over not getting a perfect score	1B22: However, it was a little frustrating always not being able to get a perfect test score.	1
2. Desire for continued non-influence upon grading	1B13: I want to learn in the future, but I want the policy of the tests having no effect upon grading to remain.	1

Topic 6: The Course in General		
1. Positive: General comment	1A13: I don't really like to study English words, but I liked this class as it was fun every time.	11
2. Positive: social reason	1A25: It was fun to communicate with my classmates.	3

The following is a summary of the comments in accordance with the six topics.

Topic 1: The SPRs

Nine participants commented that the meanings of the SPRs were difficult to understand, with one student responding that the difficulty was due to cultural differences between Japanese and non-Japanese. Another participant wrote that it was due to the difference in understandings/perceptions of word meanings between individuals, and two others wrote that it was due to the abstract quality of the images. Despite the problems with understanding, three participants commented that they liked the SPRs; five responded that the SPRs made vocabulary learning enjoyable, another five thought the SPRs were helpful to learning, and one participant desired their continued usage. Having the pictures drawn in advance was appreciated by one participant, and having to consider the SPR/target word relationship was regarded as beneficial to learning by another. One participant wrote that L1 translations would have been preferable to SPRs for the memorization of more abstract words, and two participants expressed their preference for studying with pictures as opposed to text only.

Topic 2: Class Activities

One participant wrote that the whole-class activities involving the large flashcards and the chalkboard facilitated learning as the experience was visual and verbal, and another student commented that the teacher's use of gesture when explaining word meaning was also helpful. Five participants thought that the small group activities involving students seated and using small word cards were enjoyable, and three participants liked the paired activities in which students moved around exchanging information. One student commented that besides using SPRs and Japanese forms for memorization, it would have been beneficial to include simple explanations in

English. Another participant indicated a disliking for the activities, writing that vocabulary learning each week was boring and tiring.

Topic 3: Private Study

One participant commented that she found both the SPR and L1 wordlists to be enjoyable. Two participants wrote that wordlists with SPRs and Japanese text would have been preferable, and two others expressed regret for not having spent more time doing private study for the vocabulary program. No other comments were made on the topic of private study.

Topic 4: The Target Vocabulary

A total of five participants commented on the target vocabulary. One participant commented that ten was an appropriate number of target words given each week. Three participants expressed an appreciation for having the opportunity to relearn words experienced in high school. Another participant wrote that she would like to use the target words in her everyday life.

Topic 5: Weekly In-Class Testing

One participant wrote of how she was frustrated not being able to receive a perfect score in weekly tests. Another participant expressed a desire for the policy of not having the weekly testing score effect course grading to be continued in Semester 2. No further comment was made on the topic of weekly in-class testing.

Topic 6: The Course in General

Eleven participants made the comment that the course was generally a positive experience. Three participants wrote that they enjoyed the course as it had allowed for interaction with classmates.

4.2.4 Focus group discussions

Twelve groups of four to five students were given three questions as shown in Appendix G. Comments were recorded and translated into English. Data relevant to the three research questions was identified, and then classified according to six general topics. Responses are summarized and example quotations are given within the following six topics.

Topic 1: SPR usage and motivation.

The participants expressed the belief that the SPRs were of assistance to their vocabulary learning as the pictures provided more motivation and support than just studying with textual forms. Student 1A18 (Class A, Group 5) preferred using SPRs to using text alone, stating that "it was easier to remember the pictures than using a word book". The student believed that remembering the picture "helped" her in the memorization of the target word, as by remembering the SPR, she was "encouraged to remember the English". Another student indicated a similar view of SPRs as being more supportive of her learning than text alone: "It helped. If I did not have it, I would not have remembered. I feel better if there are pictures to look at rather than just the text. " (Class B, Group 2, Student 1B10).

The belief that SPRs provided motivation for learning was apparent despite problems with understanding SPR meanings. Student 1B18 (Class B, Group 5) stated that she found the pictures to be motivational despite difficulties encountered when trying to

comprehend the meaning of some SPRs. Her lack of understanding was due to what she perceived as a non-correspondence between the meanings of the SPR's presented and the "Japanese" meaning. However, the student expressed gratitude for the presence of the SPRs, stating that if using textual forms only "motivation does not appear", and indicating that the SPRs made her learning a more positive experience: "I was able to feel as if I wasn't studying." Student 1A9 (Class A, Group 1) also expressed the difficulties of understanding some SPR meanings, yet said that she liked the SPRs as they were "easier to remember" than written forms. Despite difficulties with understanding the meaning of some pictures, the student stated that she was "somehow" able to gain a general understanding of what the pictures meant.

Student 1B4 (Class B, Group 6) stated that she also sometimes had difficulties with understanding SPR meanings, yet responded positively towards them: "Sometimes I could not understand the pictures, however, the pictures were good because I enjoyed them and they had an impact." She told of how she enjoyed the SPRs due to their novelty, saying, "It was the first time to remember using pictures, so it was fun and you could remember". She also described the images as being visually pleasing, using the word Japanese word *kawaii* (*cute* in English) to describe them.

Topic 2: Perceived advantages of using SPRs to remember the target words
Student 1A5 (Class A, Group 1) regarded the SPRs as being beneficial to the comprehension and memorization of the target words, as she said that she put more effort into establishing the word meaning than just being given the Japanese translation. Referring to the activity in which large flash cards of SPRs were to be matched with their respective L1 written form, she explained how using the SPRs was "better for remembering" the word meanings as "you had to use your head". As

with other students, she found some of the pictures difficult to understand, and therefore found the matching activity to be difficult, yet claimed that "having the pictures made it easier to understand". She also stated how she believed that her realization of SPR meanings resulted in the memorization of the target words: "If you understand, you think 'I see…'. You remember once and you do not forget".

Three students also expressed the belief that the SPRs were of benefit to the process of memorization, claiming that the images left more of an "impression" so were remembered for a longer period of time than Japanese translations: "The pictures remain longer in the memory; they were interesting" (Class A, Group 1, Student 1A5); "Up until now, I was only remembering by translating Japanese to English, but I think that pictures leave an impression that easily remains" (Class B, Group 4, Student 1B15); "When you look at the picture, it is easy for an impression to remain, it is easy to remember" (Class B, Group 2, Student 1B23). Student 1B20 (Class B, Group 1) also regarded the SPRs as beneficial to memorization, as the "images tend to remain" in the memory, in spite of occasional difficulties in understanding word meaning due to "Japanese people's image" of words being different to the meanings presented.

The participants also described how they studied using the SPRs in order to remember the target words. One student (Class B, Group 3, Student 1B9) said how she would study with the SPRs in the lesson, and then confirm the target word meanings in Japanese at home, believing that the practice was more beneficial to remembering than just using Japanese translations. Another student believed that pictures were more impressive and more easily remembered than written forms, yet still preferred to use a dictionary (in English) in preparation for testing: "The pictures

leave a better impression than writing, so it is easier to form a tie and easier to remember. But even if I remember it, I still feel it is better to use an English-to-English dictionary in a test" (Class A, Group 5, Student 1A3).

Topic 3: The limitations of SPRs

Several students, including Student 1A4 (Class A, Group 6) and Student 1B22 (Class B, Group 2) voiced the opinion that the SPRs were easy to remember, yet some SPRs were difficult to understand. Students expressed the reasons why they thought there were difficulties with understanding. Student 1A24 (Class A, Group 3) stated her belief that pictures could help with memorization as long as they were easy to understand, yet this was not the case with pictures of a more abstract quality that were sometimes difficult to understand. A similar response was given by Student 1A13 (Class A, Group 6), who said that the pictures were easier to understand than the Japanese translations as they "were easier to enter your head", yet "abstract things represented as pictures were difficult to understand".

In addition to the level of abstraction, Student 1A14 (Class A, Group 2) expressed the opinion that the target word's capacity to be understood (and thereby be useful as an aid to memory) also depended upon the degree of similarity between the English meanings and Japanese word meanings. Despite these conditions, the student claimed that some SPRs had actually worked for her as a mnemonic: "However, when trying to recall words, the card's picture sometimes comes to mind; the pictures can be quite helpful".

Two students expressed the belief that SPRs were an unsuitable method of English vocabulary learning. Student 1A22 (Class A, Group 1) said that since the vocabulary

testing involved English only, pictures were not an effective means of study as "the pictures only inspire". She asserted that students would be better off looking up words for themselves (assumedly with a dictionary) as pictures "are not connected to words". Student 1A6 (Class A, Group 6) acknowledged that the SPRs were easy to remember and were helpful to word memorization, yet were insufficient: "But just using the pictures is not enough to understand". She added that using an English-to-English dictionary would have been the easiest means of understanding word meanings.

Student 1B1 (Class B, Group 1) stated how the SPRs were difficult to understand if the personally held image of the target word varies from the one presented. She specified differences in perception of word meaning between "Japanese and foreigners" as being the reason for the misunderstanding, as well as her belief that "it is difficult to represent adjectives as pictures". Similarly, Student 1A7 (Class A, Group 3) also asserted that the differences between "Japanese and foreigner's culture" was the cause of misunderstanding, as well as some meanings being "too abstract". She did, however, express the opinion that realizing the differences in cultural perceptions is useful: "But, it may be good to know about these kinds of things, I think".

Topic 4: Preference for Japanese translations over SPRs

Several students indicated a rejection of using SPRs in favour of Japanese translations. Student 1B8 (Class B, Group 2) would have preferred "correct" translations of the target words, and Student 1B19 (Class B, Group 3) said that the pictures were sometimes incomprehensible, so Japanese would have been better. Student 1B6 (Class B, Group 4) acknowledged that the SPRs were more easily

remembered than translations, yet rejected the SPRs due to their ambiguity in expressing word meaning. She preferred Japanese forms as they were less ambiguous: "Japanese is better for easily understanding this or that kind of meaning".

Topic 5: Desire for the inclusion of Japanese translations

The combined use of pictures and Japanese translations was suggested by Student 1A1 (Class A, Group 4) as pictures are easy to visualize, yet difficult to understand: "The pictures make it easier to form an image. But there were times when they were difficult to understand; both the pictures and the Japanese words are better". Student 1A22 (Class A, Group 4) believed that, even though the SPRs were more easily remembered, combining them with Japanese translations and English forms would have been preferable due to difficulties with understanding the images.

Other students (Class B, Group 6, Student 1B16; Class A, Group 5, Student 1A3) specified their belief of how the materials used should have included a Japanese translation in order to assist with the understanding and memorization of target words. One participant (Class A, Group 3, Student 1A15) told of how she wrote Japanese translations alongside the SPRs and the English words on wordlists, on the belief that the three modes together were the most effective for memorization. She also claimed to have remembered by having the audio and visual form of the target words: "I came to remember from the word entering my ear, and the image from the word's picture".

Topic 6: Classroom Activities

Student 1B15 (Class B, Group 4) expressed her liking for the activities with small flashcards involving interaction with classmates, and perceived the activities to be beneficial to learning: "I could remember because it had the feel of a game, you could get images from the pictures, I think it was good for memorizing the words". The same activities were liked by Student 1B5 (Class B, Group 5), who commented that "swapping the cards with everyone was fun; it was easy to remember. The questions made me remember" despite some difficulties with understanding word meaning. Student 1B2 (Class B, Group 6) also enjoyed the activities, as besides communicating with others and making friends, she and her classmates "could understand by explaining the meanings in English". Other students (Class B, Group 1, Student 1B11; Class B, Group 2, Student 1B23; Class A, Group 1, Student 1A9) also indicated their liking for the activities for social reasons, primarily due to having been given the opportunity to communicate and make friends with classmates.

Student 1A25 (Class A, Group 2) also appreciated the social aspects of the activities, as she could hear and learn the names of classmates and was able to communicate with them. However, she commented that after three weeks, the activities "got a little tiring". Despite recognizing the benefits of repeating the words for memorization, she appeared to become bored: "I thought it was too much. Each and every time, it was the same". The student stated that communicative activities once every two weeks would have been preferable.

4.2.5 Teacher's journal

The teacher's journal for Study 1 consisted of anecdotal notes, observations and thoughts related to the vocabulary sessions in the study as recorded by the instructor

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(who was also the researcher). The following is a summarized version of the notes taken, categorized into five main areas of interest:

1. Activities and materials

Some students appeared enthusiastic about using the SPRs, as a few students (in both groups) had made their own flashcards featuring the SPRs from wordlists, without the practice having been suggested. Most students in both classes appeared to enjoy the activities involving pair work and information exchange every time it was conducted. The activities which involved describing the SPRs to partners appeared to be particularly enjoyable. Having the students guess the meanings of the target words (by matching the SPR and the L1 written forms) in small groups seemed to be a positive learning experience, as the students were focused on the words and communicating with the inclusion of negotiation and speculation. Students in two/three groups in both classes appeared to want to be able to interact with the cards more, for example, by making up their own original card games.

2. SPRs and L1s

An apparent advantage of the L1 forms is that the word meanings are fixed and clear. With SPRs, the meanings need to be established and confirmed. The students were observed exerting considerably more time and effort when matching L2 written forms to SPR forms, than they did with matching L2 forms to L1 translations. There did not seem to be any significant advantage in using either SPR or L1 forms for cues; once the target word was learned, both types of cues worked equally well. However, when recalling target words from previous weeks, recall from SPR cues sometimes appeared to be stronger than recall from L1 cues. The students appeared to like using the L1 forms because they were clear and familiar, and seemed to like

using the SPRs because they were a new experience and did not involve any written forms.

3. Instruction

When presenting the L1 form, the meaning was clear; the learning experience had a sense of completion, as if there was nothing more to be done. With SPRs, the meaning was sometimes unclear (especially with more abstract words) so there was a feeling that the learning was unfinished, and needed to continue. When presenting the Japanese written forms, translational decisions undertaken were mentioned (i.e., which word was chosen and why), as well as any major differences between the English and Japanese meanings of the word. With SPRs, by explaining the image, Japanese was excluded. Yet the explanation was not fully reliant upon English, as the picture was a source of information in itself. Scrutinizing an SPR's ability to represent its referent word felt appropriate, as the class' attention could be fully focused on the target vocabulary, and the idea could be conveyed that the picture was one possible expression of word meaning. Discussing the strengths and weaknesses of the Japanese translations provided a similar focus upon the target vocabulary.

4. Class A and Class B comparison

Class A (the more advanced group) took noticeably less time to complete target word matching activities, for both L1 and SPR forms, than Class B (the lower group). Class A students also appeared to generally enjoy the whole-class matching activities more, and were better able to recall words from previous weeks, whereas Class B sometimes found the activity to be very challenging. When teaching, Class A was challenged more, with faster pacing and more complicated explanations. Class B was supported more, with the lessons taught at a slower pace (e.g., more time given to

complete activities) and a simpler explanation of target words given. Both classes seemed to equally enjoy the more communicative and interactive activities.

5. Factors related to ease of remembering target words

As the course progressed, it became increasingly evident that the longer words were the most difficult to recall, with shorter words being relatively easier. Word length appeared to be more of an influence than the concreteness of the word. How difficult the target word was to pronounce appeared to be another determining factor, as words that were difficult for Japanese speakers to say seemed to carry an extra burden when being learned. Prior familiarity and experience with the target vocabulary did not seem to be as much of an influence, as once the meaning an unfamiliar word had been understood, it could be recalled as well as a more familiar word. Generally, words that appeared to be easiest to remember were short and easy to pronounce, and the most difficult were long and difficult to pronounce.

4.3 Results of Study 2

The results of Study 2 are presented using the same structure as for Study 1. Results of vocabulary testing are reported, in which participant scores from the pre-test, post-test, and weekly testing of SPR and L1 words are compared. A comparison is also made between the increases in the number of correct responses to SPR and L1 target words. Also, target words with the highest pre-test to post-test increases and the highest weekly testing scores are reported in Table 4.14 in Section 4.3.1 and Table 4.16 in Section 4.3.2. Next, data from participant surveys are tabulated and summarized, in sections concerning multiple choice questions, the recalling of three target words, and open style written responses. Results from the study's focus group

discussions are then presented, summarized and organized into seven general topics. Finally, data from the teacher's journal are reported, with comments being summarized and categorized into four main subject areas.

4.3.1 Pre-testing and post-testing

One hundred target words (50 presented in SPR form, 50 presented in L1 form) were pre-tested and post-tested before and after the vocabulary program. The same participants *(N = 48)* undertook the pre-test as well as the post-test; the results of two participants from the initial sample group (*N*=50) were disregarded as they did not undertake the post-test. The total number of correct answers to pre-test and post-test questions from Class A (*N* = 25) and Class B (*N* = 23), and the increase in test scores (the difference between pre-test and post-test scores) are shown in Table 4.11. See Appendix L for all participant pre-test and post-test scores.

Table 4.11

Study 2: Averages and Increased Averages for Participant Scores for Pre-tests and Post-tests

	N	SPR			L1		
		Pre-test	Post-test	Increase	Pre-test	Post-test	Increase
Class A	25	3.24	25.44	22.2	3.84	28.24	610
Class B	23	1.96	9.26	168	1.78	10.65	204
Total	48	2.63	17.69	723	2.85	19.81	814

Note. Increase = post-test score minus pre-test score.

The average pre-test score for words presented in the SPR form was 2.63 (*SD* = 2.93), lower than the average pre-test score for words presented in the L1 mode at 2.85 (*SD* = 2.25). The average post-test score for words presented in the SPR mode was 17.69 (*SD* = 13.34), lower than the average post-test score for words presented in the L1 form at 19.81 (*SD* = 12.82), as shown in Figure 4.3.
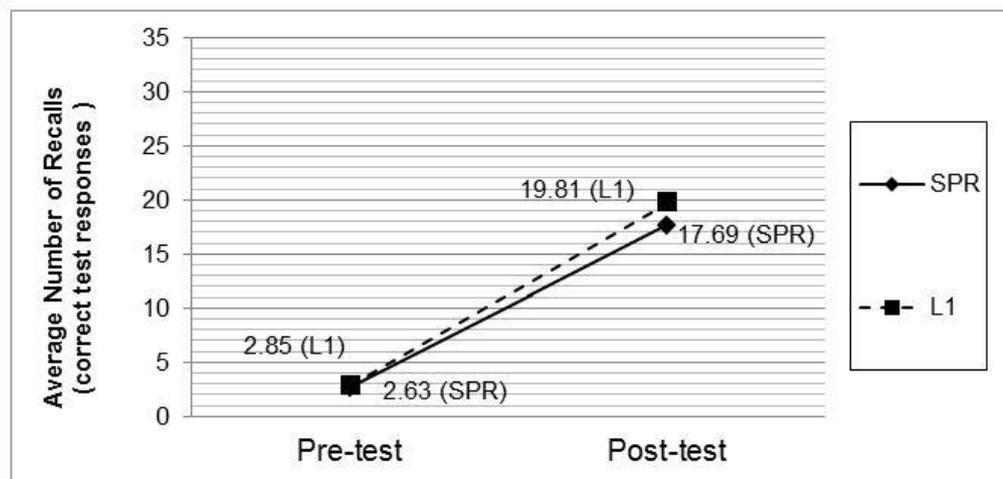
Figure 4.3. Study 2: Pre-test and post-test average scores of SPR and L1 words (*N* = 48).

The number of correct responses to questions requiring SPR words and questions requiring L1 words were compared using two-tailed, paired-samples *t*-tests. The significance of difference ($p < 0.05$) was determined between the SPR and L1 pre-test scores, and determined between the SPR and L1 post-test scores, as shown in Table 4.12.

In pre-testing (conducted before the treatment – the vocabulary program), there was no significant difference between the number of correct responses to questions requiring SPR words (*M* = 2.63, *SD* = 2.93) and questions requiring L1 words (*M* = 2.85, *SD* = 2.25), *t*(47) = -0.68, *p* = 0.50. In post-testing (conducted after the treatment) the number of correct responses for words presented in the L1 form (*M*=19.81, *SD* = 12.82) was significantly higher than the number of correct responses for words presented in the SPR form (*M* = 17.69, *SD* = 13.34): *t* (47) = -3.65, *p* = 0.00066.

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Table 4.12

Study 2: Comparison of Participant Scores for SPR Target Words and L1 Target Words for Pre-test and Post-test Totals using Paired Samples t-tests

	SPR				L1					
	Total	*M*	*SD*	*df*	Total	*M*	*SD*	*df*	*t*-score	*p*-value*
Pre-test	126	2.63	2.93	47	137	2.85	2.25	47	-0.68	0.50
Post-test	849	17.69	13.34	47	951	19.81	12.82	47	-3.65	0.00066

Note. N = 48 and for both SPR and L1 results.

* $p < 0.05$, two-tailed.

The increase in the number of correct responses to questions requiring each target word (100 words in total) was calculated by subtracting the word's average pre-test score from the word's average post-test score. For SPR words (50 words in total), with a pre-test average of 2.52 and a post-test average of 16.98, the total increased average was 14.46 (*SD* = 7.50). For L1 words (50 words in total), with a pre-test average of 2.74 and a post-test average of 19.02, the total increased average was *M* = 16.28 (*SD* = 7.76).

The SPR word increase was compared to the L1 word increase using a two-tailed, paired-samples *t*-test. The significance of difference ($p < 0.05$) was determined between the SPR and L1 score increases, as shown in Table 4.13. There was no significant difference between pre-test/post-test score increases for questions requiring SPR target word responses (*M* = 14.46, *SD* = 7.50) and pre-test/post-test increases for questions requiring L1 target word responses (*M* = 16.28, *SD* = 7.76): $t(49)$ = -1.542, p = 0.130.

Table 4.14 shows the target words with the ten highest pre-test/post-test score increases. Of the 15 words, 5 were presented in the SPR form, and 10 were presented

in the L1 form. See Appendix N for a complete list of Study 2 target word pre-test

and post-test totals and rankings.

Table 4.13

Study 2: Comparison of Total Score Pre-test/Post-test Increases for Target Words in SPR form and Target Words in L1 Form Using a Paired Samples t-test

	SPR				L1					
	Total	*M*	*SD*	*df*	Total	*M*	*SD*	*df*	*t*-score	*p*-value*
Increase	723	14.46	7.50	49	814	16.28	7.76	49	-1.542	0.130

Notes. N = 50 target words each for both SPR and L1 forms.

"Increase" refers to the post-test score minus the pre-test score.

* *p* < 0.05, two-tailed.

Table 4.14

Study 2: Target Words with the Ten Highest Pre-test and Post-test Score Increases.

Ranking	Increase	Target Word(s)	
		SPR	L1
1	36	vein	
2	33		cactus
3	32		pole
4	31		metabolism
5	30	skeleton	
6	29		ignorance, sole
7	27		vary
8	26	kindred, fossil	thereby, passive
9	25	orbit	
10	24		manipulate, obtain

Note. Gain = Post-test score minus pre-test score.

4.3.2 Weekly testing

Ten target words were tested each lesson, once per week for ten weeks. The total number of correct responses to questions requiring target words presented in SPR form was 1239, with a total weekly average of 247.80 ($N = 50$, $SD = 40.10$). The total number of correct responses for words presented in L1 form was lower at 1106, with a total weekly average of 221.2 ($N = 50$, $SD = 72.92$). The average weekly test scores (the number of correct responses) are presented in Figure 4.4. The total weekly test scores for individual participants are shown in Appendix L.

The number of correct participant responses to questions requiring words presented in SPR form ($N = 50$, $M = 24.78$, $SD = 7.46$) and the number of correct participant responses to questions requiring words presented in L1 form ($N = 50$, $M = 22.12$, $SD = 6.51$) were compared using two-tailed, paired-samples t-tests. The significance of difference ($p < 0.05$) was determined between the SPR and L1 scores, as shown in Table 4.15. The number of correct responses to words presented in SPR form ($M = 24.78$, $SD = 7.46$) was significantly higher than the number of correct responses to words learned in L1 form ($M = 22.12$, $SD = 6.51$): $t(49) = 2.301$, $p = 0.0029$.

Table 4.15

Study 2: Comparison of Total Weekly Test Scores for Target Words in SPR Form and Target Words in L1 Form Using a Paired Samples t-test

	SPR				L1					
	Total	*M*	*SD*	*df*	Total	*M*	*SD*	*df*	*t*-score	*p*-value*
Score	1239	24.78	7.46	49	1106	22.12	6.51	49	2.301	0.0029

Note. $N = 50$ and for both SPR and L1 results.

* $p < 0.05$, two-tailed.

The target words with the ten highest scores (the number of correct answers to questions requiring the words) are shown in Table 4.16. Of the 18 words, 10 were

presented in the SPR form, and 8 were presented in the L1 form. See Appendix N for

a complete listing of Study 2 target word weekly testing totals and rankings.
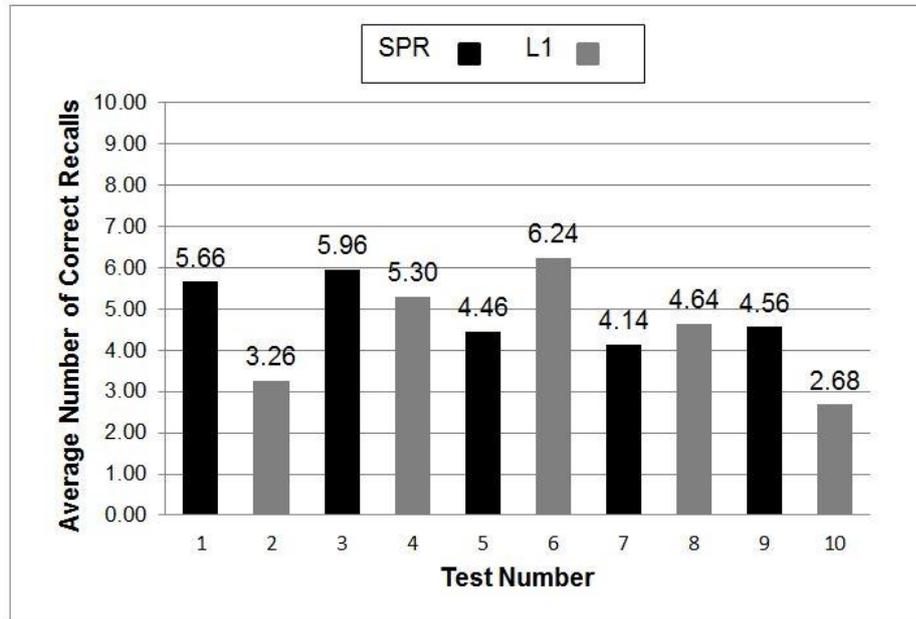
Figure 4.4. Study 2: Average number of correct responses to weekly tests

($N = 50$).

Table 4.16

Study 2: Target Words with the Ten Highest Weekly Test Scores.

Ranking	Score	Target Word(s)	
		SPR	L1
1	47	fossil	metabolism
2	45	superficial	
3	44	orbit	cactus
4	41		moist
5	39		magnitude
6	37		pole, colleague
7	36	reside, irrigate, nerve	
8	35	bias, retain	
9	34		likewise, adjacent
10	33	forgo, affluence	

4.3.3 Attitudinal surveys

Study 2 attitudinal surveys comprised of multiple choice questions, open written responses, and a question requesting the recall of any three words presented as SPRs. The multiple choice section consisted of three types of questions, requiring: (1) attitudinal responses, using a Likert scale; (2) preferential responses; (3) a response concerning frequency of personal behavior. The questions and responses for the sections are shown on Table 4.17, Table 4.18 and Table 4.19 respectively.

Table 4.17

Study 2: Survey Question Responses Requiring Likert Style Responses (N = 50)

Survey Question (including question number)	Strongly Agree	Agree	Disagree	Strongly Disagree	*M*	*SD*
1. I liked the activities using the pictures on the monitor (TV) with the whole class.	22 (44%)	28 (66%)	0 (0%)	0 (0%)	1.56	0.5
2. The activities using the pictures on the monitor (TV) with the whole class helped me to learn the English words.	21 (42%)	25.0 (50%)	4.0 (8%)	0 (0%)	1.66	0.63
3. I liked the activities using the pictures on the monitor (TV) in pairs around the classroom.	21 (42%)	26 (52%)	3 (6%)	0 (0%)	1.64	0.6
4. The activities using pictures on the monitor (TV) in pairs around the classroom helped me to learn the English words.	20 (40%)	29 (58%)	0 (0%)	1 (2%)	1.64	0.6
7. I liked the pictures.	20 (40%)	29 (58%)	1 (2%)	0 (0%)	1.62	0.53
8. The pictures were easy to understand.	5 (10%)	26 (52%)	17 (34%)	2 (4%)	2.32	0.71
9. The pictures helped me to remember the English words.	14 (28%)	31 (62%)	5 (10%)	0 (0%)	1.82	0.6
10. I want to use the pictures again	14	31	4	1	1.84	0.65

in my English vocabulary study.	(28%)	(62%)	(8%)	(2%)		
13. I liked using the pictures on the website.	8 (16%)	24 (48%)	15 (30%)	3 (6%)	2.26	0.8
14. I think that using the pictures on the website helped me to learn the English words.	10 (20%)	29 (58%)	8 (16%)	3 (6%)	2.08	0.78
15. I want to use this kind of website again for my private vocabulary study in the future.	10 (20%)	28 (56%)	11 (22%)	1 (2%)	2.06	0.71

Notes. Assigned values: Strongly Agree = 1; Agree = 2; Disagree = 3; Strongly Disagree = 4. Percentages are rounded to one decimal place.

Table 4.18

Study 2: Responses to Survey Questions Requiring an Expression of Preference (N = 50)

Survey Question (including survey question number)	L1	SPR	L1 and SPR (no preference expressed)	Neither	*M*	*SD*
5. Which vocabulary sessions did you like the most? (Check a box)	13 (26%)	8 (16%)	29 (58%)	0 (0%)	2.32	0.87
6. Which vocabulary sessions do you think helped you the most to learn English words?	9 (18%)	2 (4%)	38 (76%)	1 (2%)	2.62	0.8
11. Which did you like using the most?	14 (28%)	8 (16%)	28 (56%)	0 (0%)	2.28	0.88
12. Which do you think helped you to remember the English words the most?	13 (26%)	13 (26%)	22 (44%)	2 (4%)	2.26	0.9
17. Which did you like using the most on the website?	3 (6%)	3 (6%)	42 (84%)	2 (4%)	2.86	0.57
18. Which (on the website) do you think helped you the most with learning English words?	4 (8%)	4 (8%)	42 (84%)	0 (0%)	2.76	0.59
Survey Question (including survey question number)	Paper	Electronic	Both	Neither	*M*	*SD*
19. Compare Semester One and	20	11	19	0	1.98	0.89

	(40%)	(22%)	(38%)	(0%)		
Semester Two. Which did you like using the most?						
20. Which did think helped you to learn the English words the most?	20 (40%)	7 (14%)	23 (46%)	0 (0%)	2.06	0.93

Notes. Assigned values: 1 = L1; 2 = SPR; 3 = Both (L1 and SPR); 4 = Neither.

Percentages are rounded to one decimal place.

Table 4.19

Study 2: Responses to Survey Question 16 Requiring a Frequency Response (N = 50)

Survey Question (Including question no.)	(10+)	(5-10)	(3-5)	(1-2)	nil	*M*	*SD*
16. How often did you use the website on average?	2 (4%)	1 (2%)	7 (14%)	36 (72%)	4 (8%)	3.78	0.79

Notes. Assigned values: 1 = (10+); 2 = (5-10); 3 = (3-5); 4 = (1-2); 5 = nil.

Percentages are rounded to one decimal place.

The survey results are summarized below according to eight topic areas.

1. Activities: All participants (100%) agreed that they liked the whole-class activities using the large monitor. 46 participants (92%) agreed that the activities helped their vocabulary learning. 47 participants (94%) liked the paired activities using the large monitor, and 49 participants (98%) agreed that the activities helped their vocabulary learning.

2. SPRs: 49 participants (98%) agreed that they liked the SPRs. 31 participants (62%) agreed that the SPRs were easy to understand, and 45 participants (88%) agreed that the SPRs helped with the remembering of target words. 45 participants (90%) agreed that they want to use the pictures in future vocabulary

study.

3. Private Study: 32 participants (64%) agreed that they liked using the SPRs on the website. 39 participants (78%) agreed that the SPRs on the website helped their vocabulary learning. 38 participants (76%) agreed that they wanted to use a similar website for private study in the future. 42 participants (84%) indicated a liking for both SPRs and L1 forms on the website, with preferences expressed for SPRs from 3 participants (6%) and for L1s from another 3 participants (6%). 2 participants (4%) liked neither. With regards to the frequency of website usage on an average weekly basis, 36 participants (72%) indicated they had used the website once or twice, followed by 7 participants (14%)indicating three to five times, 2 participants (4%) more than ten times, and one participant (2%) five to ten times per week.

4. SPR sessions and L1 sessions: 29 participants (58%) expressed a liking for both SPR and L1 vocabulary sessions, followed by a preference for L1 sessions by 13 participants (26%) and a preference for SPR sessions by 8 participants (16%). In response to asking which session helped the most, 38 participants (76%) indicated that both SPR and L1 sessions helped. 9 participants (18%) indicated that L1 sessions helped, 2 participants (4%) indicated that SPR sessions helped, and 1 participant (2%) indicated that neither session helped.

5. SPRs and L1s: In response to asking which mode's (SPR or L1) usage was liked the most; 28 participants (56%) did not specify a preference, indicating a liking for both. L1 usage was preferred by 14 participants (28%), and SPR usage was preferred by a lower number of 8 participants (16%). In response to being asked

which mode helped the most to remember target words, 22 participants (44%) did not specify a preference, indicating that both modes helped. L1s were specified as being more effective by 13 participants (26%); the same for SPRs. Neither SPRs nor L1s were preferred by 2 participants (4%).

6. Semester 1 (paper-based materials) and Semester 2 (electronic materials): 20 participants (40%) expressed a preferred liking for the usage of paper-based materials, followed by 19 participants (38%) not specifying a preference and indicating a liking for both, and 11 participants (22%) expressed a preference for the usage of electronic material. In response to being asked which medium was the most helpful to vocabulary learning, 23 participants (46%) did not specify a preference, and indicated that both were helpful. Twenty participants (40%) indicated that paper-based materials were more helpful, and 7 participants (14%) indicated that electronic materials were more helpful.

The first section of Question 22 of the participant survey required the recall of any three target words learned in Semester 2 that were presented in SPR form. The most frequently recalled word was *skeleton* with 17 responses, followed by *awe* and *cactus** with 8 responses each. The other responses were as follows: *vein*, *tropical*** (7 responses); *orbit*, (6 responses); *fireworks***, *dogma*** (5 responses); *fossil*, *moist**, *nerve*** (4 responses); *forgo*, *hangover*** (3 responses); *respective*, *reverberate*, *orient*, *regime*, *converge*, *infrastructure*, *satellite**, *chores***, *deadline***, *duty ***(2 responses); *legislate*, *superficial*, *compatible*, *subsidiary*, *comprehensive*, *aspect*, *irrigate*, *alternative*, *overlap*, *deprive*, *exert*, *devote*, *bias*, *fluctuate*, *correspond*, *purchase**, *benefit**, *thereby**, *obtain**, *aristocrat**, *metabolism**, *passive**, *straightforward*, predict***, *vindictive***, *phenomenon***,

abstract**, *traditional***, *seasickness*** (1 response). Words marked with one

asterisk were presented in L1 form, not SPR form. Words marked with two asterisks

were from Study 1, not Study 2.

The second section of Question 21 of the participant survey required a written

comment in response to a general question concerning the vocabulary program, as

shown in Appendix F. Most participants (64%) wrote their response in Japanese only,

2% in English only, 20% in both English and Japanese, and 14% gave no response.

Japanese responses were translated into English, and all responses were categorized

into seven general topics, as shown in Table 4.20.

Table 4.20
Study 2: Survey Open Answer Responses (N = 50)

Specific Point	Example Response(s)	*f*
	Topic 1: SPRs	
1. Liked in general	2B10: The pictures were interesting and unique.	4
2. Easy to understand	2B17: The pictures were simple and easy to understand, and they were cute.	1
3. Difficult to understand; yet liked.	2A3: I like using the pictures but, I sometimes didn't understand. Thank you!	6
4. Difficult to understand; yet perceived to be helpful.	2A25: I think the pictures helped me a lot to remember English words, but sometimes it was difficult to understand what the pictures meant.	2
5. Difficult to understand for cultural reasons.	2B5: However, I think that Japanese people's and Australian's value of words is different. So, the meaning we hold does not match the meaning we are given; …	2
6. Preference for L1 forms; easier to understand.	2B17: Japanese is better as you can understand the meaning from one look, so it is easy to remember.	1
7. No preference for L1 or SPR forms; easy to learn with.	2B13: Also, whether Japanese or pictures, I did not feel there was much difference between them when it came to easiness of learning.	1
	Topic 2: Class activities	
1. General positive response	2B21: Then I like the class activities for learning English words too.	1
2. Positive for whole-class activities	2B4: I really enjoyed it when the whole-class would brainstorm problems.	2
3. Positive for social reasons	2B6: However, there were many opportunities to interact with classmates, so it felt as if you could study while having fun.	6

5. The TV monitor was good for learning as information could be presented rapidly.	2A24: With the monitor in the classroom, the words and pictures could be switched many times and quickly; it was good as I was able to remember.	4
6. Preference for flashcards over the TV monitor.	2B1: When you had the flashcards at hand, you could check things; with the TV you could not check things.	1
4. General reference for paper materials over electronic materials.	2B13: Unlike the previous semester, because there was no paper, it was difficult to study.	3

Topic 3: Self-study

1. Positive: Website access	2B21: English: The website was useful for me. I could use it wherever I was.	3
2. Negative: Website (Internet) access	2B3: However, connecting to the Internet was a nuisance; I didn't study very much. I regret that a little.	3
3. Website difficult to use	2B8: Using the website to remember words was a little bit annoying.	5
4. Paper wordlist preferred (general)	2B12: I want to study using wordlists.	1
5. Paper wordlists preferred due to ease of access	2B18: Accessing the website was a nuisance; I couldn't see it when I wanted to see it; paper was easier for studying.	3
6. Paper materials preferred due to ease of use	2B8: Personally, I thought the cards were easier (than the website) to learn with.	4
7. Website not liked due to absence of writing	2A15: …write it out; this was the best way to learn. The website was inconvenient as you could not write.	1
8. Suggestion for audio function on website	2B7: If the website should continue to be used, I think that it would be good to have a device for hearing pronunciation.	1

Topic 4: Vocabulary items

1. The amount of words was appropriate	2B19: It was very helpful. In one week, 10 (words) even for a short time; I was able to review, so I was able to continue.	2
2. The target words selected were useful	A16: As university students, we learned words (that we should learn) by using pictures and a website.	2

Topic 5: Weekly In-Class Testing

1. Weekly testing enjoyable	2A6: The word tests were fun!	1

Topic 6: Course in general

1. General positive comment	2A10: I love your class. Thank you very much!!!	5
2. General positive comment for vocabulary component	2A18: Having become a university student, you hardly ever take the time to study vocabulary only. I think it is a good thing that we had time to be able to check words every week. Thank you for the year.	4
3. Preference for Study 1 over Study 2	2B18: I liked the way we did vocabulary study better in the first semester.	4

Note. f = Frequency of similar responses.

The following is a summary of the comments in accordance with seven topics.

Topic 1: The SPRs

Four participants said they liked the SPRs for general reasons, with one participant commenting that the SPRs were easy to understand. Six participants commented on how they liked the pictures even though they were difficult to understand, and two participants said that the SPRs were helpful to learning despite the difficulties. Two students expressed the view that the lack of understanding was due to cultural differences. One participant preferred using Japanese translations due to ease of understanding, and another regarded both forms as similarly easy to learn.

Topic 2: Class activities

A liking for the vocabulary program's class activities was expressed by one participant, and two participants made specific mention of liking the whole-class (teacher focused) activities. Six participants commented that they liked the activities for social reasons, as the activities provided the opportunity to interact with classmates. Four participants indicated a liking for the use of the large TV monitor, yet one participant preferred the use of small word cards. A general preference for paper-based materials as used in Semester 1 was expressed by three participants.

Topic 3: Self-study

Three participants commented that the website was convenient as it could be viewed in different locations; however another three expressed the view that connecting to the Internet was inconvenient. Five participants stated that studying with the website was problematic as it was difficult to use. Printed wordlists would have been preferable to using the website. Three participants expressed a preference for printed

wordlists over the website due to ease of access, as the Internet was not as readily available. Paper materials were preferred to the website due to ease of usage by four participants. One student expressed the belief that the best way to learn vocabulary is to write, so the website was inconvenient as nothing could be written. Another student believed that the website needed an audio function to provide examples of target word pronunciation.

Topic 4: Vocabulary items

Two participants expressed the opinion that the number of words studied each week (ten) was appropriate. Another two participants wrote that they considered the target words selected to be appropriate for study.

Topic 5: Weekly in-class testing

Two participants commented on the in-class vocabulary tests. One wrote of how she found the tests to be enjoyable; the other commented on how she wanted to continue the testing in the future as long as the test scores continued not to have an effect upon final course grading.

Topic 6: The course in general

Five participants stated that they liked the course, Discussion Skills B, in which the study took place.

Topic 7: The vocabulary program

Four participants expressed their appreciation and indicated a sense of value for the course having had a regular vocabulary component. Another four participants wrote

that they preferred the vocabulary program in Semester 1 which used paper-based materials to that of Semester 2 which used using electronic materials.

4.3.4 Focus group discussions

Groups of four to five students were given three questions as shown in Appendix H. Comments were recorded and translated into English. Data relevant to the studies' three research questions were identified, and then classified according to six general topics. Responses are summarized and example quotations are given within the following seven topics.

Topic 1: The SPRs were easy to remember, difficult to understand

Several students, including Student 2B11 (Class B, Group 6) and Student 2B4 (Class B, Group 5), commented that the SPRs were generally easy to remember yet difficult to understand. The SPRs were appreciated for being easy to remember compared to the L1 translations, yet the association between the words and their corresponding SPR was not always clear: "I liked them. The pictures left a more lasting impression, and were easy to remember. However, the words and the pictures sometimes did not match." (Class A, Group 4, Student 2A1).

Student 2A20 (Class A, Group 5) commented that for her the process of memorization became more difficult for words with more complex meanings. She described how the simple pictures could be quickly remembered, however, "meanings are complicated and so the pictures become complicated, so it is difficult". Another student (2A5, Class A, Group 3) stated that sometimes she could not understand the relationship between the SPR and its associated target word, believing that it is inappropriate to express words with difficult meanings pictorially: "There

were times when you looked at the pictures and the meanings did not match. I thought that it was unreasonable to picture these words". Student 2B3 (Class B, Group 6) enjoyed studying with the SPRs, yet would have preferred the inclusion of English written forms with each SPR, as "this is good for understanding meaning".

Topic 2: The advantages of SPRs despite the lack of understanding

Despite the difficulty with understanding the meanings of some SPRs, Student 2B18 (Class B, Group 3) indicated that the more easily understood SPRs had a mnemonic effect upon her: "I think that it is good how the easy-to-understand pictures come to mind. There were also times when you could remember difficult words from the picture's image". A mnemonic effect was also noted by Student 2A18 (Class A, Group 1), commenting that recalling the understandable SPRs resulted in the recalling of the target word. She preferred pictures to written forms (not indicating L1 or L2 forms) as the pictures were more understandable and "enter the head more easily". Student 2A24 (Class A, Group 5) also preferred the SPRs to written forms, stating that the SPRs were more enjoyable and "better than learning with writing as they remain in the head better", yet also said that difficulties with meaning occurred due to her belief that "there are pictures that do not fit the Japanese meanings".

Student 2A16 (Class A, Group 4) specified differing Japanese and non-Japanese perceptions as being the reason for difficulties with expressing abstract words pictorially: "Japanese people and foreign people's consciousness (awareness) is different; it is difficult to picture an abstract word". As with other students (Student 2B18; Student 2A24) comments regarding the limitations of SPRs were followed up with a response indicating a belief that the SPRs were still of value to their learning, as the student proceeds to state that the pictures had more of an "impact" and

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provided a better "visual sensation than writing only". Student 2B21 (Class B, Group 4) regarded the difference in cultural perceptions as a valuable learning experience in itself: "I liked it. It was good as we came to study the difference between the way that pictures are represented by Japan and by foreign countries".

Topic 3: The advantages of L1 translations

Student 2B17 (Class B, Group 3) expressed a preference for the use of L1 (Japanese) forms over that of pictorial forms, due to the meaning of Japanese forms being easier to understand. Student 2B12 (Class B, Group 1) also wanted L1 written forms, yet wanted them included with the SPRs so as to aid in the understanding of SPRs which could not be understood. Even though the SPRs had more of an impact, Japanese was preferable as the process of translating/interpreting the meaning of words was less difficult: "The pictures left an impression, but were troubling when the meaning was not understood. It is easier to change from Japanese". (Class A, Group 2, Student 2A25). Another student (Class B, Group 1, Student 2B14) stated how the pictures were easier to recall and "remain in the memory" better than Japanese forms, yet preferred the Japanese forms as pictures were subject to misunderstanding. Student 2B1 (Class B, Group 2) also preferred Japanese forms due to their understandability, and further specified that "Pictures depicting human relations were difficult to understand".

Topic 4: The disadvantage of using Japanese translations

Comments on the difficulty with understanding SPRs were sometimes followed up by an appreciation and an expression of preference for their usage, which included a criticism of the usage of Japanese forms. Student 2B21 (Class B, Group 4) commented on how she belies that Japanese (being familiar to the learners) "enters

the head" easily and so is a "boring" experience. She prefers pictures as "it was good as you could learn visually", implying that the SPRs had more of an impact upon learning. A similar view was expressed by Student 2A13 (Class A, Group 6) who commented on how pictures have the advantage of allowing for visual learning: "Pictures are better for forming an image, so you don't forget". The student also stated how Japanese has the advantage of being more understandable, yet "leaves a weak impression" upon the learner.

Topic 5: The classroom activities

Several students (Class B, Group 5, Student 2B9; Class B, Group 4, Student 2B20; Class B, Group 6, Student 2B5) said they enjoyed classroom activities, in small groups and in pairs, which involved communicative exchanges and social interactions. Student 2B9 liked being "able to have conversations using the words" and Student 2B20 liked making friends with classmates. Another student expressed the belief that the interactive style was beneficial to the process of memorization. "In a group, checking the word together; it felt as if it was a proper way of remembering. It was fun to be able to explain the picture in words". (Class A, Group 1, Student 2A4).

Student 2A26 (Class A, Group 6) appreciated the "quiz format" of some activities. However, Student 2A25 (Class A, Group 2) felt that the questions used in group work were too simple, and would have preferred the questions to have been more opinionative: "With discussion, it was always the same simple questions, so with the group work, I would have preferred to share my opinions more".

Topic 6: Materials used in-class

Two students (Class A, Group 1, Student 2A3; Class B, Group 2, Student 2B23) commented on how information displayed on the large screen television monitor was easily visible. Student 2B16 (Class B, Group 3) did not like the large monitor, and expressed the belief that the large flash cards as used in Semester 1 were of more benefit to memorization: "I didn't like the TV. The game we did before (where you turned the cards over) was better for remembering". Student 2A11 (Class A, Group 3) also thought the monitor was easily seen, but would have preferred the inclusion of paper-based materials as they were "convenient when checking", that is, the small word cards could be turned over to reveal the associate word in written form.

Topic 7: Materials used in private-study

Positive responses to the website included that of Student 2A8 (Class A, Group 4) who said that she used the site frequently on her smartphone, including studying on the commuter train. She liked how looking at the SPRs prompted her to try and recall the target words: "We can see the pictures only on the website; when I saw it, I thought 'What is it?' It was good to be able to have this thought". Along with portability, Student 2B20 (Class B, Group 4) commented that since the website required self-motivation, it was a positive learning experience. "The website was convenient as you could check (study with it) on the move. You could not do it unless you were self-motivated, so this in itself was a good study experience". Another participant felt that using the SPRs in private-study was effective in aiding memory, and liked how the images were readily provided: "It was good because when learning on your own, you did not have to draw a picture, and when you look at the picture, it is impressive, so you are able to remember". (Class A, Group 6, Student 2A17).

Three students criticized the website for being too difficult to use, as access to a personal computer was required. Student 2B6 (Class B, Group 5) commented on how the website was difficult to use as opening it was time consuming and "the system was difficult to use (as it was one word at a time)". Student 2A3 (Class A, Group 1) did like being able to access the website at home, but also commented that "starting the computer is a nuisance". Student 2A7 (Class A, Group 5) also said she liked the website, however, she stated that "it was difficult to use so I didn't end up using it much". All three students commented on how smartphones were more preferable to personal computers, for reasons ranging from convenience, portability, and ease of usage due to touch screens.

Four students (Class A, Group 3 Student 2A21; Class B, Group 1, Student 2B15; Class B, Group 3, Student 2B17; Class B, Group 5, Student 2B9) also criticized the website for being difficult to access, inconvenient, and too time consuming to open. All of these students further commented that they preferred the paper wordlists as used in Semester 1, as they were more portable: "Printed handouts were better, as you could carry them around" (Student 2B17), and more accessible: "Printed handouts were good as you could look at it immediately" (Student 2B9), than the website.

4.3.5 Teacher's journal

The teacher's journal for Study 2 consisted of anecdotal notes, observations and thoughts related to the vocabulary sessions in the study as recorded by the instructor who was also the researcher. The following is a brief summary of the notes taken, under four main subject areas.

1. Instruction

The SPRs were increasingly used by the instructor to explain word meaning. It appeared beneficial to not have the influence of the L1, as using the translations seemed to provide an "easy way out" when explaining word meaning. SPRs were preferred as they were more accommodating to a personal explanation of the word. Class B (the lower level class) generally responded well to the SPRs, as they enjoyed guessing word meaning. This response may have been due to the images providing an alternative means (i.e., no use of Japanese) of studying English vocabulary.

Gesturing was used by the instructor and the students to express the meaning of the SPRs. This method appeared to be effective in communicating and reinforcing the meaning of the images. For example, the students appeared to enjoy gesturing the word *retain*, as the meaning of the SPR could be recreated by a single action of holding two clenched fists near the body.

Two distinct instructional approaches developed for each class when using SPRs. Class A (the higher level class) was given more of a focus upon word meaning, as they seemed to have a greater interest in it. They liked to explore the target word meanings, and listen to the accompanying explanations. For Class B, the focus became more upon pronunciation; almost more of a stimulus-response approach. The connection between image and form was concentrated upon, as too much time spent on explaining word meaning seemed to confuse the lower class. Both classes took notes increasingly; this action did not appear to interfere with instruction.

2. Recall

Students were able to recall from SPRs on the monitor at an increasingly rapid pace. Recall when using the L1s did not seem to be any faster than recall using the SPRs. Class A (the higher level class) was often far more successful in identifying the target words from the L1 translations than Class B (the lower level class). Class A seemed to actually enjoy the challenge, whereas Class B was reluctant to even guess the answers. The influence of word length upon the ability to recall (longer words being more difficult) was very apparent in both classes.

When using SPRs, Class A recalled target words well and were quick to learn them, whereas Class B (in comparison) often struggled to learn words, such as *infrastructure* and *irrigate.* Both groups were able to recall words learned in previous sessions reasonably well, and seemed to enjoy the challenge. When reviewing all previously encountered SPR words by recalling them from the SPRs, Class A was fairly successful, and Class B found it difficult. Class B was generally less able to recall words, yet their pronunciation appeared to be better than that of Class A's. This difference may have been due to them concentrating more upon producing correct spoken forms, and less upon understanding word meaning.

3. Activities

Both classes appeared to find an information gap style activity, in which students described the SPRs to each other, to be challenging yet enjoyable. The activity seemed to necessitate the forming of mental images of the SPRs. The use of Japanese appeared to be minimalized or eliminated as students were concentrating only upon the image and the use of English.

The activities involving the whole class were easier to conduct with a large monitor than by using large word cards. The monitor was less cumbersome and enabled faster recall, as the SPR/L1 form could be selected by simply clicking the computer mouse. This action allowed for less well known words to be repeated more often. Guessing the word from the SPR and the (spoken) first letter of the word was enjoyed and occasionally successfully done by Class A, yet Class B found the activity to be very difficult. The paired activity (in which one person looked at the monitor and their partner tried to guess the word from a description of the SPR) worked well in both classes. The screen was easily viewable for all students and the partners who were required not to look at the screen acted as they were supposed to.

4. SPRs and L1s

The advantage of the SPRs appears to be that word meaning is created from a picture, and not from a Japanese word. Perhaps this quality allows for a greater opportunity for concept formation. With L1 translations, the meaning is clearer, but students do not have to "work" to understand the meaning as much. Whereas with an SPR, the meaning is not so clear, so students apparently need to exert more effort to understand the meaning, as they have repeatedly demonstrated.

Explaining word meaning from an image seemed to have more possibilities (and was a "richer" experience) than explaining from a translation. The explanation of the SPRs in itself became an important part of the teaching. The lessons involved meaning being generated from a picture and not an L1 or an L2 form, so Japanese and English seemed to be on more of an equal standing. The understanding and comprehension of target words was greatly assisted when explaining the meaning from L1 forms. However, students then appeared to focus their attention solely upon

the Japanese form, and then apply their "Japanese" understanding of the word to the English form.

4.4 Summary

In Study 1 (using paper-based materials), the number of successful recalls for words presented in SPR form (SPR words) was significantly higher than those presented in L1 form (L1 words) in the post-test. There was no significant difference between the gain in pre-test to post-test scores for SPR and L1 words. In weekly testing, the total number of correct recalls for SPR words was significantly higher than for those of L1 words. Student surveys overall indicated generally positive responses for materials and activities in classroom and self-learning settings using SPRs, as well as the vocabulary program in general. Survey written responses were also generally positive towards SPRs and their usage; however, many students indicated that the SPRs were difficult to understand. In focus group discussions, 19 students (38.7%) made specific mention of the SPRs being difficult to understand, in which the limitations of using pictures to represent words were expressed, yet the SPRs were positively received and perceived to be helpful to learning. Preference for and the inclusion of L1 translational forms was also expressed, as well as the liking of classroom activities for social reasons. The teacher's journal often noted the differences between teaching with SPRs and teaching with L1 translational forms, factors which appeared to make words easy or difficult to learn, and the differences between the higher level group (Class A) and the lower level group (Class B).

In Study 2, which used electronic materials, the number of successful recalls for words presented in L1 form was significantly higher than those presented in SPR

form in the post-test. Similar to Study 1, there was no significant difference between the gain in pre-test to post-test scores for SPR and L1 words. In weekly testing, the total number of correct recalls for SPR words was significantly higher than for those of L1 words. Student attitudinal surveys were generally positive towards SPR materials, activities, and the vocabulary program as a whole, yet the general preference for the use of L1 forms over SPRs was larger than that of Study 1. The students also indicated a preference for the paper-based materials of Study 1. In the written survey, responses to SPR materials and activities used in the classroom were generally positive, yet responses to the self-learning component of the vocabulary program were generally negative, with a preference for paper-based wordlists being expressed. In focus group discussions, the students detailed the advantages and disadvantages of learning with pictorial/L1 forms and electronic/paper-based materials. The teacher's journal noted the difference in instructional approaches, classroom activities and student learning with using SPR and L1 forms, and relayed observations concerning instruction using SPRs with electronic materials.

Chapter 5. Discussion

5.1 Overview

Chapter 5 is organized in the order of and in accordance with the research project's three research questions. Question 1 examines quantitative data from the Study 1 and Study 2 testing of vocabulary recall, firstly in terms of participant recall, and then by focusing upon the recall of individual words. Question 2 addresses the participant responses to the research project's vocabulary learning programs, firstly focusing upon responses to the SPRs, and then responses to SPR usage in classroom and self-study situations both in electronic and paper-based forms. Question 3 is concerned with the potential of SPRs for teaching and learning, discussing the results of the studies in terms of three specific areas: activities and materials, instruction, and learning. Finally, the limitations of the studies are explained, and the chapter is summarized.

5.2 Effects of Simple Imagery on Vocabulary Recall

The research project's first research question is: *What effect do simple images in paper form and in electronic form have upon EFL vocabulary recall rates when used in classroom and self-learning situations?* In order to answer Question 1, data were received from the pre-tests, post-tests, and weekly testing of target vocabulary. In Study 1, in comparison to the L1 words, the SPR words were significantly higher in weekly test scores, significantly higher in post-test scores, and there was no significance of difference between the gains in pre-test and post-test scores. In Study

2, again in comparison to the L1 words, the SPR words were significantly higher in weekly test scores, significantly lower in post-test scores, and there was no significance of difference between pre-test post-test score gains.

In general, results from testing undertaken a considerable time after the initial presentation of words was comparable, as pre-test and post-test score gains for both Study 1 and Study 2 were not significantly different. SPR scores were significantly higher in the post-test in Study 1; however, the SPR scores were significantly lower in the post-test in Study 2. Post-testing was conducted after the ten week courses had been completed, so it could be assumed that these results are more of a measure of recall after a longer term of retention.

Weekly scores, on the other hand, showed a significantly higher rate of recall for SPR words in both Study 1 and Study 2. Tests were conducted one week after every in-class vocabulary session. Therefore, weekly test results could be regarded as being more of a test of recall after a shorter term of retention. Additionally, the weekly tests differed from the pre-tests and post-tests in that half of the tests used cues spoken in English, and all the weekly tests evaluated only ten words, whereas the pre-tests and post-tests evaluated all 100 target words.

From these results, it can initially be purported that presenting target words in SPR form has not been detrimental to the participant's vocabulary learning, as the studies had not demonstrated that words presented in L1 form are generally more likely to be recalled. The results have also suggested a division between words which were tested a longer time (weeks, sometimes months) after being presented in class and those tested a shorter time (one week) after being presented in class. These timeframes

only represent the times in which the target words were used in class, as students were free to study words as they wish in the time between testing. Therefore, regarding the pre-testing/post-testing as an evaluation of a longer period of retention and weekly testing as a shorter period should only be considered in general terms.

Despite the mixed results of vocabulary testing, weekly SPR word recall was significantly higher for both Study 1 and Study 2. Given that testing was conducted one week after each presentation of ten target words, it could be argued that the experience of the words in the vocabulary sessions still had some influence upon learners. On this assumption, the possible reasons for the higher rate of recall of SPR words will be speculated upon.

The tendency for SPR words to have been recalled more often than L1 words in weekly testing may have been due to the SPR words having been processed by students both visually and verbally, as theorized in the dual code theory. In simple terms, when words were presented in L1 form, only the learners' verbal (or language related) cognitive channels may have been active in the processing of the words, whereas presentation in SPR form involved cognitive processing through both verbal and visual channels. In accordance with the theory, the inclusion of visual processing may have increased the chances of the words being retained in the long-term memory, as both the verbal and nonverbal subsystems were active when experiencing SPR words, as opposed to the verbal subsystem only when experiencing L1 words.

Despite evidence for the dual code theory with regards to vocabulary learning (Shen, 2010), it cannot be assumed that the dual coding of information was the sole reason for the higher recall of SPR words. Other studies such as Lotto and de Groot (1998)

have shown the opposite, that L1 translations are more effective than pictures when learning L2/FL vocabulary. It is reasonable to assume that the SPR words did involve more of a visual experience, but would this visual quality be the reason why SPR words were recalled at a significantly higher rate in weekly tests?

Apart from (but not excluding) the visualization of target words, another reason for the higher recall of SPR words may have been due to the learners having had a more involved (or complex) experience of the words. Japanese translations might not have been processed by learners to the same "depth" as the pictorial forms, as with the levels of processing theory which theorizes that retention in memory is dependent upon the degree to which encoded memory traces are elaborated (Craik & Tulving, 1975). To the students, the presentation of Japanese forms may have been mundane and unimpressive; a continuation of the usual translational style of Japanese high school education. However, the SPRs may have given the students a comparatively more meaningful and "elaborate" experience; being cartoon-like illustrations and having been experienced for the first time.

The weekly tests and the Study 1 post-test may have demonstrated a stronger influence of SPRs over that of L1 forms, yet Study 1 and Study 2 pre-test/post-test gains indicated no such advantage for SPRs. Moreover, the Study 2 post-test indicated that L1 forms were more effective than SPRs. The results from Study 1 and Study 2 testing reflect the mixed results of other studies with regards to teaching L2/FL vocabulary with pictures, as sometimes pictures have been shown to be effective (Kellogg & Howe, 1971; Lado, Baldwin, & Lobo, 1967) and other times not (Lotto & de Groot, 1998). Pictures have been consistently demonstrated to be easier to remember than written text (Hockley, 2008) as with the picture superiority

effect (see Section 2.4.1), and participants in both studies frequently reported on how easy the SPRs were to remember. However, as with other studies, any advantages of presenting words in pictorial form for learning and eventual recall were not consistently demonstrated.

In order to investigate the results further, it seems necessary to examine data concerning each separate vocabulary item. Along with the frequency of recall in testing, the abstract or concrete quality of individual target words needs to be taken into consideration, as the level of abstraction is a major influence upon how well words can be remembered (Baddeley, 2004). In Study 1 and Study 2 combined, 20% of the words were pre-identified as being more concrete than the other words, yet 60% of the target words ranked tenth highest in recall were concrete and 6.25% of the target words ranked tenth lowest were concrete. This result demonstrates that concrete words had an advantage over abstract words, which is consistent with many studies (e.g., de Groot & Keizjer, 2000) which have shown that concrete words are easier to remember and recall than abstract ones.

The three target words with the highest number of recalls in Study 1 were: (1) *seasickness* (SPR), (2) *snore* (SPR), and (3) *hangover* (SPR), all of which were concrete. The three highest words in Study 2 were: (1) *metabolism* (L1), (2) *cactus* (L1), and (3) *fossil* (SPR). *Metabolism* was abstract, and *cactus* and *fossil* were concrete. The three words with the lowest scores in Study 1 were: *interfere* (L1), *compel* (SPR) and *sanction* (L1), and in Study 2: *commit* (L1), *implicate* (SPR) and *incorporate* (L1). All of these lowest recalled words were abstract.

These target words indicate that words which were concrete and represented as SPRs

were the most common type of word recalled. The word *Metabolism* was abstract and presented in L1 form. However, the word's high rate of recall may have been due to it being an unexpected cognate, as the term *Metaborikku shindorōmu* meaning *metabolic syndrome* in English was in high usage in the Japanese language at the time of the research project. Of the words with the ten highest rankings, 43.47% were the same type of word (concrete and in SPR form) despite these types of words being 10% of the total target words in Study 1 and Study 2.

Concrete words, besides being more easily remembered, are more easily represented pictorially than abstract words. Student attitudinal responses (see Section 4.2 and Section 4.3) gave a clear indication that students had some difficulty understanding the meanings of the SPRs, particularly for target words with complicated and/or abstract meanings. However, the SPRs representing concrete words (i.e., representations of actual things) were much easier to comprehend and therefore may have provided a more understandable and thereby a more meaningful experience of the words. In contrast, abstract words were not easy to represent visually, making the SPRs more difficult to understand. This experience may have been less meaningful, resulting in referent words being recalled less successfully as evident in the lowest ten ranked words which were all abstract with the exception of one word.

A further indication that concrete words had more of a tendency to be successfully recalled compared to abstract words was indicated from responses to Question 22 of the written surveys. Participants were asked to recall three words presented in SPR form without any given cue. In Study 1, the five most common responses were (in order of frequency) *tropical* (SPR), *hangover* (SPR), *fireworks* (SPR), *seasickness* (SPR), and *vandalism* (SPR), all of which were concrete. In Study 2, the five most

common responses were *skeleton* (SPR), *awe* (SPR), *cactus* (L1), *vein* (SPR) and *tropical* (SPR), all of which were concrete except for *awe*. The high frequency of the word *awe* may have been due to it having been depicted as a facial expression, which may have been easily visualized like an emoji which expresses emotion.

Target words recalled from the student surveys and the words with the highest recalls from the vocabulary tests had a common feature in that the words appeared capable of evoking vivid mental images. These mental images seem to have emotional qualities, and can possibly be associated with the participants' personal experiences. The words *hangover*, *seasicknes*s, and *cactus* were recalled frequently in both surveys and in tests. *Hangover* could be associated with parties, drinking, sickness, and vomiting. *Seasickness* could be associated with the ocean, boats, sickness, and vomiting. *Cactus* was the only word in the list of five represented as an L1, and it was not considered to be a cognate as the Japanese word *sabaku* is used rather than an English loan word. Interestingly, this word can also be described with similar emotive and personal qualities, such as desert, dry, and being pricked by a cactus. Other words recalled in the surveys all appeared to have similar emotive and personable qualities, such as *fireworks*, *skeleton*, *tropical* and *vandalism*.

These aforementioned words all appear to have the potential to evoke an actual (or imagined) personal memory. For example, the word *fireworks* may have encouraged memories of seeing fireworks and of attending Japanese summer festivals which usually feature fireworks. Sokmen (1993) suggested that associations formed when learning L2 words are heavily influenced by attitudinal and emotional factors, as well as by personal memories. Studies (Kousta, et al., 2011; Vigliocco, et al., 2014) have indicated that emotion plays an important role in the acquisition of L2 vocabulary.

Therefore, it might be the case that the participants of Study 1 and Study 2 used a strong mental image (which was possible due to the concrete nature of the words) to form a kind of personal connection with the word, thereby facilitating understanding and comprehension of the concept of the word on a personal level. This process may have enabled the words from the student surveys to be recalled in the absence of any prompting.

The keyword method appears to use imagery in a similar way, as the mnemonic technique's effectiveness is assisted by the use of strong mental images. Hulstijn (1997) recommended that images used to connect L2 target words with L1 forms be created "in a salient, odd, or bizarre fashion in order to increase its memorability" (p. 204). The SPRs that were frequently recalled may have had a similar effect, as the images provided by the drawings were sufficient to create strong mental images that assisted in target word memorization and recall.

5.3 Student Responses to Vocabulary Learning Using Simple Imagery

The research project's second research question is: *What are student attitudinal responses to using simple imagery in paper form and in electronic form when used in classroom and self-learning situations?* As a general answer to Question 2, the students responded positively to the SPRs. An overall liking was communicated for the SPRs and their usage, as well as a general desire expressed to use the images in future English vocabulary study. The simple pictures appeared to provide an interesting and non-threatening approach to L2 vocabulary learning, as the students described the SPRs as being interesting, cute, unique and enjoyable. One student

(1A16) commented that she was "able to enjoy learning the English words while using the pictures", and another student (1B19) said that she was "thankful" for the SPRs, stating that studying with written forms alone did not provide motivation, yet the SPRs did. The novelty of studying English vocabulary using pictures as opposed to written forms was also expressed: "It was the first time to remember using pictures, so it was fun and you could remember" (Student 1A19).

Study 1 began with participants having recently completed Japanese secondary education in which English study has a strong emphasis upon formal testing and translational approaches. It is reasonable to assume that many students began their first year of university with some anxiety towards their English study. Ellis (1994) believes that the presence or absence of anxiety in L2 learning does not necessarily result in successful or unsuccessful learning outcomes, yet language anxiety is still an important factor in L2 learning. According to Ellis and Shintani (2014), language anxiety can be facilitating and therefore can have a positive effect upon learning, yet it is generally regarded as having a debilitating effect. The general appeal of the SPRs as expressed by the participants (which consistently outweighed the level of disliking) may have contributed to the alleviation of negative attitudes towards English study and may have increased motivation to learn.

The general appeal of the SPRs could partly have been due to them being a clear departure from the students' usual means of English study. In a study by Kikuchi (2009), the use of the grammar-translation method was identified as one of five main de-motivating factors for Japanese university students, all of whom had experienced six years of Japanese secondary schooling. Kikuchi (2013) also identifies "being unable to memorize vocabulary" as another source of demotivation for Japanese

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students. The engagement with simple, cartoon-like pictures – not unlike the emoji that students use in social media communications – may have motivated the students to learn, and not de-motivated them as appears to be the case with the grammar-translation method.

Although the SPRs were generally liked and appreciated by the participants, a common criticism of the SPRs centred on a lack of understanding as to what the images actually represented. As stated by Student 2A25, "I think the pictures helped me a lot to remember the English words, but sometimes it was difficult to understand what the pictures meant". The SPRs were perceived to be beneficial to learning because the images were generally easy to remember, yet the lack of understanding for some pictures was viewed as a disadvantage to learning.

One reason specified by the participants for the lack of understanding of the SPRs was the difference in Japanese and in non-Japanese perceptions of word meanings. Problems occurred when the students' Japanese concept of a word, or "Japanese people's image" (as stated by Student 1B20) did not match that of the one presented by the SPR. The differences between Japanese (people) and non-Japanese concepts of word meanings caused a disparity between the ways in which the target words were understood. This semantic disagreement was reflected in the differences between the way in which the words were portrayed in the SPR and the students' mental image of the words.

Nisbett (2003) wrote of how Japanese and American perceptions of pictorial information can be demonstrated to be notably different. Japanese (and "East Asians" in general) have a more holistic view of what they see, placing greater emphasis

upon context and the relationships between different elements. In contrast, Americans (and "Westerners" in general) tend to have more of an analytical view, focusing primarily upon individual elements. This general disparity between the instructor's analytical "Western" view and the students' holistic "East Asian" view may have been at the core of the differences in perceptions and understandings of the SPRs and their corresponding meanings.

Danesi (2017) notes the difficulties with expressing ideas pictorially across nations and cultures, as emoji images were originally created to transcend linguistic barriers yet were soon adapted by different peoples to mean different things and used in different ways. He believes that emoji "invariably involve some evaluation of the referent – personal or culture based – that will vary across the world, from positive to negative" (p. 118). SPRs appear to have the same inherent difficulties.

SPRs might be more easily understood and thereby be more effective for learning if designed with an adequate awareness and understanding of the students' language and culture. Designing SPRs for one group of learners (such as Japanese students) might require the work of Japanese artists/designers. Original drawings from the students themselves could also be utilized. A pool of students' SPR designs could be kept and developed so as to build a collection of SPRs that reflect the students' linguistic, cultural and personal perceptions of target words.

However, as pointed out by Davies et al. (1998), successful pictograms designed for public signage are misunderstood by all consumer groups from a variety of cultures despite years of usage. Therefore, expressing concepts pictorially with a cultural awareness does not appear to be any guarantee that the images will be understood.

Accommodating cultural perceptions may be of assistance to student understanding, yet the task of representing a concept pictorially (especially in simple form) remains inherently problematic.

Presenting a target word as a picture is, in effect, offering a translation of the word. In the studies, the instructor – who was also the designer of the images – "translated" the English words by producing images which in his best estimation (as an Australian English speaker) encapsulated the word meanings. As Nation (1978) stated: "A translation into the mother tongue represents the same processes as a translation into a picture, a description in English, and so on" (p. 172). Translating vocabulary from any language to another while keeping the exact same meaning is a notoriously difficult and sometimes impossible task. An English speaker's interpretation of how an English word might appear in illustrative form presented to Japanese speakers will have similar issues and inaccuracies. This conflict was often evident in the students' attitudes and opinions of the SPRs.

However, the students appreciated the difference and valued it as a learning experience: "I liked it. It was good as we came to study the difference between the way that pictures are represented by Japan and by foreign countries" (2B21). The difference in meaning (as expressed by the SPRs) gave the participants an opportunity for a comparative study of Japanese and English vocabulary. This feature of the learning experience may have been helpful, as building awareness between the mother tongue and the second language is beneficial to L2 learning (Swan, 1997). By representing the target words pictorially, the differences in meaning became salient, thereby adding a comparative linguistic and cultural dimension to the learning experience.

The participants also identified the abstract nature of the target words as being another source of difficulty with understanding the SPRs. Some participants stated a clear awareness of the limitations of expressing abstract words pictorially, with one student (1A14) commenting that the level of abstraction correlates with its ability to be understood. Other students made similar responses, yet commented on the target words' level of complexity rather than their abstract quality. Conflict existed between the students' understanding of word meaning and the word meanings as proposed by the SPRs. One student (2A25) went so far as to say that it was "unreasonable" to express some words pictorially. Along with being too abstract, ambiguity of meanings and differences in personally held opinions of word meanings were other reasons given by the participants for the lack of understanding of the SPRs.

The students often made a general distinction between words that could be successfully illustrated and others that could not; seemingly based upon the students' ability to match their internal understanding of the word with the external representation of the word as presented by the SPR. The higher occurrence of the more understandable concrete vocabulary represented as SPRs and the lower occurrence of abstract vocabulary (in either SPR or L1 form) successfully recalled in testing reflected this distinction. SPRs that were more easily understandable, with a clearer link between the image and referent, were apparently more efficient in acting as aids to learning than SPRs with uncertain meanings.

Despite difficulties with understanding, the majority of the students in both studies (as indicated in the participant surveys) agreed that SPRs were helpful to vocabulary

learning, and agreed that they would like to use SPRs in future studies. The students on multiple occasions expressed the belief that SPRs were easy to remember, and were remembered more easily than L1 forms due to the impression they made. The memorability of pictures was also judged to be superior to that of L1 forms: "The pictures leave a better impression than writing, so it is easier to form a tie and easier to remember" (Student 1A3). Pictures were also thought to be easier to input than L1s, with one student commenting on how she believed that "Pictures enter the head more easily" (Student 1A13).

The participants expressed a belief and confidence in the SPRs' capacity to be remembered easily. A study by Kornell, Rhodes, Castel, and Tauber (2011) demonstrated the ease-of-processing heuristic, which theorizes that learners will assume that if something is easy to cognitively process, then it will be well remembered. In their study, the participants' presumption that words in large type font would be easily remembered was shown to be an incorrect assumption. As Kornell explains, successful learning is more the result of effort, and less the level of difficulty of the information being received: "The way we encode information is not based on ease; it's based on meaning" ("Think you'll ace that test?", 2011). The ease-of-processing heuristic has also been demonstrated in L2 vocabulary learning using pictures as cues for recall. In a study by Carpenter and Olsen (2012), their participants overestimated their ability to recall Swahili words that were presented as pictures. Their study concluded that pictures could be useful for learning L2 vocabulary, provided the learner's overconfidence in the capacity for pictures to be remembered (and therefore the associated words to be learned) is reduced.

Participants in both Study 1 and Study 2 did appear to display the ease-of-processing

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heuristic, as their comments indicated a bias towards the pictures in terms of being more easily remembered than the L1 forms. Yet this view was mitigated by the assertion that some pictures were difficult to understand. In Carpenter and Olsen's (2012) study, all 43 target words used were concrete (*arm*, *ball*, *beach*, etc.), so it is likely that all pictures used were easily comprehended. The participant's ability to understand the pictures in that study may have been a minor factor. However, the research project mostly used academic vocabulary items which were mainly abstract, so not all the SPRs were easily understood; with some apparently not understood at all. The participants' bias and overconfidence in their ability to remember the SPRs, and thereby consider the images to be helpful to learning, apparently extended only so far as to the SPRs that could be understood, that is, easily linked to their intended meanings. The abstract nature of the majority of the target words appeared to have prevented the ease-of-processing heuristic from exerting a large influence upon the learning experience.

Participant responses involved the making of comparisons and expressions of preference between the SPRs and the L1 forms. The possible responses to these questions included an expression of clear preference for either form, as well as the *both* option of not choosing a preference for either form: an indication that either SPR or L1 forms were agreeable. In Study 1 and Study 2, the *both* answer was the most frequent response to all SPR/L1 comparative questions, including those pertaining to self-study. The consistency of the *both* response can be interrupted to mean that participant attitudes towards SPRs and L1s were generally comparable, that is, the students were generally content to use either form and perceived them both to be equally helpful to their vocabulary study. In general, the SPRs were neither preferred over translations, nor rejected in favour of translations, reflecting

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the ambivalence that the students had towards SPRs (i.e., liked but difficult to understand).

Responses to SPR and L1 forms can be further investigated by examining the results of survey requestions in which participants gave a clear preference for either form. In Study 1, more participants preferred the SPRs over the L1 forms with regards to (1) vocabulary sessions liked the most, (2) vocabulary sessions perceived to be the most helpful to learning, and (3) a general liking for the forms. In Study 2, however, these results were all reversed, as more participants indicated preferences for the L1 forms.

This change in preference for L1 forms may have been due to the novelty of the SPRs having waned in Semester 2, and possibly due to some students wanting the certainty of meaning and familiarity that Japanese forms have over pictures. Even though many students maintained an appreciation for the SPRs in Semester 2, some participants were more outspoken in their preference for Japanese forms, and the reason given usually involved the difficulty in understanding the SPRs. For example: "Japanese is better as you can understand the meaning in one look, so it is easy to remember" (2B17). The difference in medium between Study 1 (paper-based) and Study 2 (electronic) may have also been a significant influence upon student responses (see Section 5.4.1).

Regardless of an increase in the number of preferences for L1 forms, the majority of participants did not indicate a preference for SPR or L1 forms, and the number of positive responses for activities and materials using SPRs (in both in-class and self-learning situations) for Study 1 and Study 2 were always in the majority. When asked which form was the most helpful to vocabulary learning, 12 students in Study

1 preferred L1s and 11 students preferred SPRs, and in Study 2 the numbers were the same (13) for both SPRs and L1 forms. It is apparent that despite the sustained criticism for the SPRs, the generally positive response to the SPRs and their usage remained constant throughout the course of the research project, regardless of whether the medium used was paper-based or electronic, or whether study with SPRs was in or out of the classroom. See Section 5.4.1 for details of student responses to activities and materials.

5.4 Implications for Teaching and Learning

The research project's third research question is: *What are the potential effects of materials and activities using simple imagery on English language teaching and learning?* The vocabulary programs in themselves, aside from the use of SPRs, were viewed by the instructor as being worthwhile components in the yearlong English Discussion Skills course. Having time set aside every lesson for direct vocabulary learning and testing provided the course with structure and established a productive routine without interfering with the university course's (non-research) objective of improving English conversational ability. As Nation (2013) states, direct and indirect vocabulary learning should be viewed as complimentary and not in opposition to each other, as "A well-balanced language program has an appropriate range of opportunities to learn from message focused activities and from direct study of language items" (p. 348). For research purposes, the target vocabulary for the studies was not included in the regular coursework (i.e., not included in the textbook or used in non-research activities). However, it is speculated that had the target words been included in the class' regular syllabus, and therefore also studied more indirectly in reading, speaking and discussion activities, the direct and indirect approaches to

learning the target words would have had a complimentary and productive relationship of benefit to the language course as a whole.

Devoting a regular period of time to vocabulary study was valued by the students as well as by the instructor. Along with a total of 16 positive comments (11 in Study 1 and 5 in Study 2) for the course in general from the open response section in the student surveys, four students in the Study 2 survey expressed their appreciation for having a regular vocabulary component. Student 2A18 commented that since becoming a university student, she found it difficult to find time to study English vocabulary, so was grateful for the course providing the opportunity to study vocabulary every week. Only one student had a negative comment towards the program in general, writing that having vocabulary study every week was "boring and tiring" (1A25). This particular student had the highest level of English conversational ability of all the research project's participants, so this response (albeit only one participant) could be some indication that a similar vocabulary program may not be received as positively with classes of advanced level students.

5.4.1 Activities and materials

Student attitudes towards classroom activities and materials were generally positive, as between 92% to 100% of students chose *Strongly Agree* or *Agree* in response to all questions concerning the general liking or perceived effectiveness of classroom activities in both Study 1 and Study 2. For self-study activities and materials, the positive responses were also in the majority but lower: between 83.7% to 91.8% for Study 1, and 64% to 78% for Study 2. It can therefore be determined that responses to the self-learning activities were also positive, but not to the same extent as the classroom activities.

From a practical standpoint, the implementation of a course of study similar to that of the two studies' vocabulary programs would initially require a considerable amount of preparation. In Study 1, the making of large flash cards, multiple sets of small word cards, and wordlist handouts consumed a substantial amount of time and resources. Study 2 was similar in that presentation software required preparation and the setting up and updating of a website, yet the electronic materials proved to take less time and effort than the paper-based materials. Moreover, the SPR designs required a specific design format. Images can normally be fairly easily resourced from the Internet, yet the simple images needed to represent abstract concepts are a specialized requirement. A program using SPR type materials would require the availability of appropriate designs and materials.

When engaged in whole-class activities, the instructor found the large flashcards to be somewhat cumbersome. Using the large television monitor to present the SPR and the L1 forms allowed for more flexibility, as information could easily be presented and highlighted at varying paces: from slow to very fast. The rapid presentation of material using the monitor was appreciated by some students (8%) as indicated from the Study 2 open answer survey (see Section 5.4.2). Files could be quickly and easily accessed non-sequentially by the instructor, enabling presentation in any order. This quality of the electronic materials was beneficial to vocabulary learning as vocabulary items should be learned in differing orders (Nation, 2013). Unlike the large flashcards, the graphic files displaying the SPRs could easily be accessed as the instructor desired, enabling better known words to be presented less often and less well known words more often. Use of the monitor allowed the instructor to tailor the way in which the information was presented to suit the immediate needs of the

classes.

The use of the monitor in whole-class activities can be evaluated in relation to the three basic elements of Mayer and Moreno's (1998) cognitive theory of multimedia learning. Firstly, the experience was dual channel in that it primarily involved the simultaneous input of aural and visual information. Secondly, the activity involved simple pictures and listening to single words, thereby accommodating the limited capacity of cognitive processing systems. And thirdly, the highly simplistic quality of the SPRs encouraged active processing in that meanings were not always clear, so students were encouraged to make an active cognitive effort in order to understand word meanings. Furthermore, use of the television monitor reflected some of the principles of the theory: Coherence Principle – SPRs were highly simplistic forms, so extraneous material (such as details and color) were excluded; Redundancy Principle – The image (the SPR) and the narration were presented simultaneously, never the image, the narration and the L2 written form at the same time; Segmenting Principal – The presentation of material could be controlled and paced according to learner needs; Modality Principle – Graphics (the SPRs) and narration were the instructional focus rather than graphics and printed text.

Small group activities required movable desks and chairs so as to form separate groups. When groups were matching SPR forms to L2 forms, the large flash cards were advantageous as they could be spread out along the chalkboard, so all SPRs could be clearly seen at once, unlike with the monitor. Card game-type activities were not possible when using electronic material. Paired activities required sufficient space for all students to be able to move around the classroom at the same time. Information-exchange type activities were easily done with each person holding and

sometimes exchanging small word cards. The paired activities were adapted for use with electronic materials, with one student looking at the monitor, choosing and referring to one SPR, and their partner being instructed not to look at the monitor. Pair work using the television monitor was very similar to that of pair work using small word cards, with students appearing to have the same levels of engagement and enjoyment of the tasks.

A major reason for the positive responses to paired and group activities appeared to be social factors, as the students commented on their liking for interaction and involvement with each other, physically moving to meet one another, having the opportunity to communicate, and being able to establish friendships. In a study by Kikuchi and Sakai (2009), survey data indicated that the use of non-communicative teaching methods was a demotivating factor for Japanese high school students. The research project's participants may therefore have been appreciative of the communicative teaching approach used in the activities.

With all of the research project's participants being young women, gender may also have been a significant factor. According to Maltz and Borker (1982) women and girls place a strong emphasis and importance upon social relations when using language in comparison to males. It could therefore be further assumed that the interactive nature of the activities was a major reason for the positive responses to small group and pair work, and not so much the use of pictures. However, regardless of the reasons for the students enjoying the activities, the SPRs did demonstrate the capacity to provide a means by which these interactions could take place.

In Study 1, the use of wordlists necessitated the preparation, printing and distribution

of the lists of ten words each week. The L1 and SPR wordlists were generally received positively. However, 16.3 % of the students indicated that they did not like using the SPR wordlists; the highest negative response for a question concerning Study 1 materials and activities. Two students commented that the wordlists should have featured Japanese translations of words and not just pictures, indicating that difficulty with understanding the SPRs may have been a major cause for the considerable amount of dislikes. The frequency of self-learning with the wordlists could not be considered to be high, as the majority of the students (69.4%) indicated that they used them one or two times per week, and 24.5% indicated usage of three to five times per week.

Wordlists are beneficial to learners as they assist in the initial stages of learning L2 words, thereby building a solid basis for future encounters and usage of the words (Folse, 2004b; Nation & Waring, 1997). As wordlists normally combine L1 words with translations, the research project's SPR wordlists provided an extra challenge in that recall was prompted from pictorial information and not from L1 vocabulary. The participants were all highly likely to have had experience with translational wordlists from junior/senior high school study, so it was not surprising that some expressed the desire for Japanese forms. How often and how the wordlists were used away from the classroom in self-learning situations was beyond the control of the instructor, as exemplified by Student 1A15 who said that she had written Japanese translations on her SPR wordlists. However, the wordlists consisting of ten target words each week did provide a focus and an aim for study, and provided a means and an expectation for autonomous learning. Wordlists used in L2 vocabulary teaching have been described as being "neither detrimental nor miraculous" (Folse, 2004b, p. 36). Similarly, the research project found wordlists (even those featuring L1 words and

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simple pictures only) to be a central and valued component of the Study 1 vocabulary program, yet neither a negative nor a highly effective influence upon the programs, as evident from student attitudes and indications of the low frequency of usage in self-learning situations.

In Study 2, the website needed to be set up and updated weekly, which took less time and effort for the instructor than making paper wordlists. Students generally responded positively to questions concerning the website, with 64% to 78% of participants either *agreeing* or *strongly agreeing* in terms of the general liking, the perceived helpfulness to leaning, and the desire for future usage of the site. Despite the generally positive response, the website was apparently not used very often, as most students (72%) indicated having only used the site for self-learning once or twice per week on average.

Some students (12%) as indicated in Study 2 open survey responses identified the accessibility of the website as being an important factor in their attitudes towards it. At the time of the study, participants in the research project who owned smartphones were in the minority, so for many students access to the website could only be made through personal computers. For some of those students without smartphones, the website was considered a nuisance as access to a personal computer was required, and it took time to start it up. For some students who possessed smartphones, the ease of accessibility was identified as being an advantage. One student (Student 2A8) liked the portability that the site allowed, stating that she was able to study whilst on the train. Another student (2A3) commented on how the smartphone provided flexibility as to when the site could be accessed: "You can check it when you have time". With nearly all Japanese university students currently possessing a

smartphone, the results of the research project could be viewed as outdated. Yet the study, having occurred at a time when most students in Japanese universities did not have smartphones, suggests that accessibility is a key determinant as to how students might accept computer technology for self-study.

The research project also gave the opportunity for a general comparison to be made between paper-based and electronic materials. From the instructor's point of view, both mediums had clear strengths and weaknesses. Paper-based materials were tangible; enabling the physical manipulation of materials which was of practical value in activities. However, the amount of time and effort in the preparation and organization of paper-based materials was substantial. Electronic materials, on the other hand, required less time and effort to prepare. Their presentation (on the classroom monitor) allowed for more flexibility in terms of speed and content delivery, and the online capability of the website removed temporal and spatial restrictions on usage. However, the electronic materials were restrictive in that nothing could physically be held, making activities such as card game-type activities not possible. With regards to presenting target vocabulary as SPRs in either paper-based or electronic form, the instructor did not notice any discernible differences between the two mediums.

As determined from survey data, the students indicated a greater liking for paper-based materials, with 40% indicating a preference for Semester 1 (paper-based) materials, and 22% indicating a preference for Semester 2 (electronic) materials. The students also indicated that paper-based materials were more helpful to learning, with 40% indicating a preference for paper-based materials and 14% for electronic materials. In classroom activities, one student (2B16) believed that the

large flashcards were better for learning than the television monitor. Another student (2A11) liked the television monitor, but would have preferred the inclusion of written materials as they can be easily checked. In self-learning situations, the portability and ready availability of paper was preferred to electronic forms: "Printed handouts were good as you can look at it immediately" (Student 2B9). It is speculated that the electronic forms may have been more popular if all participants had possessed smartphones, and if professionally produced electronic flashcard applications had been used. However, the attitudinal responses of Study 2 indicate that, despite the advantages of electronic materials, the students still appreciated and desired the use of paper-based materials as were used in Study 1.

5.4.2 Instruction with SPRs

The use of SPRs appeared to provide an adequate means by which vocabulary could be studied explicitly. Target words were isolated and highlighted, thereby gaining the students' attention and making the words the focus of the lesson. By presenting each target word in pictorial form it was in effect decontextualized, having been "Removed from its message context to be focused on as a language item" (Nation, 2013, p. 103). Appearing as a depictive representation, the target words could also be described as having been re-contextualized, that is, having been taken from their usual communicative function as a language item (a spoken or written word) and "re-presented" as a picture, thereby expressing the words within a visual context.

The SPRs provided alternative means by which word meaning could be taught. By describing and explaining the pictures, the target words were (consequently) being described and explained. Rather than only relying upon Japanese and/or English written form, the students concentrated on the images and listened to the instructor's

English commentary in order to gain an understanding of the target words' meanings. The SPRs gave a tangible quality to the target vocabulary, as the words had been transformed into actual visual representations which could then be used to demonstrate word meanings. Schmitt (1997) believes that, in accordance with the dual code theory (Paivio, 1986), encouraging the imaging of a word is beneficial to learning as the building of non-verbal representations should result in greater retention than verbal representations alone. Although some images were difficult for students to understand (for reasons discussed in Section 5.2), the SPRs nonetheless appeared to provide each target word with its own non-verbal basis for understanding and a focus for instruction.

The inclusion of pictorial representations may provide the opportunity for a richer experience of target vocabulary than what a teacher might normally do in order to communicate word meaning, such as writing L2/FL words on the chalkboard, giving brief explanations and/or translations, or having students repeat spoken forms. Requiring students to give more consideration to target vocabulary is in line with Craik and Tulving's (1975) belief that "retention depends critically on the qualitative nature of the encoding operations performed" (p. 268). The meanings of the SPRs were not all clear, as the pictures were simplistic and the target words mostly non-concrete. Expressing word meanings as simple pictures may have promoted a deeper and more elaborate experience than simply providing a translation, as more cognitive effort was seemingly required to "work" to find word meaning. Leow (2015) believes that increased cognitive effort may result in a higher level of awareness that is "typically associated with hypothesis testing, rule formation, and conscious activation of prior knowledge" (p. 218). All of these associated processes appear to promote the successful acquisition of target vocabulary.

The students demonstrated awareness and an appreciation of the apparent value of learning words through the discovery of word meaning: "With the pictures, what helped me understand was – 'why is this picture and word related? '" (Student 1B5). Part of the classroom instructional procedure involved groups of students matching SPRs and L1 written forms. This type of activity provided the instructor with a good opportunity to explain word meanings, and was appreciated by one student (2B4) as a shared learning experience, as she "really enjoyed it when the whole class would brainstorm problems". The uncertainty of target word meanings, due to them being expressed as simple pictures, could therefore be viewed as an advantage to learning, as providing L1 translations did not appear to initiate the same level of interest and curiosity. Whether or not this deeper level of processing actually occurred is speculative, yet it can be argued that teaching with pictorial forms enabled the instructor to present and have students contemplate the target word meanings in ways which otherwise might not have been possible.

The capacity for SPRs to be used in the teaching of word meaning became more apparent when contrasted with the use of L1 (Japanese) forms. The Japanese words had clarity, familiarity, less ambiguity, and more certainty with regards to meaning. However, from an instructor's point of view, the Japanese forms did not allow for the same level of engagement with the students as the SPRs did. When an L1 form was presented, the instructor's role in explaining word meaning seemed to have come to an end, as students were able to continue studying independently using their L1 knowledge (including the use of a dictionary). However, with an SPR, understanding the target word was more of an ongoing task, as more engagement with the instructor and the image were required in order to build an understanding of the target word's

meaning. The images had a sense of being more "open ended" than the L1 translations, as the unclear meanings seemed to foster speculation, criticism, interest, surprise, agreement and disagreement, all of which focused attention upon word meaning. This quality of the SPRs may have provided the students a more meaningful or richer experience of the target words.

Nation (2013) believes that pictures and L1 translations have similar disadvantages in that they are both inaccurate in communicating the exact meanings of vocabulary and are both open to misinterpretation. These inaccuracies became apparent in the preparation of materials for the study, as translating target words often involved making an educated guess as to which Japanese words were most appropriate, and designing the SPRs often involved a process of rejection, modification, and deciding upon an appropriate image. When teaching, target word meanings never appeared to be fully understood; more so with the SPRs than the L1 forms. In agreement with Nation (2013), translations had the advantage of being "quick, simple, and easily understood", whereas pictures seemed to provide a more meaningful encounter: "An instance of the meaning of the word and this is likely to be remembered" (p. 121).

In both studies, the students in Class A were at a generally higher level of English proficiency than those of Class B, and as a result, the instructional approach taken for each class diverged as the studies progressed. Class A seemed to need to be challenged more, whereas Class B required more of a supportive role from the instructor. When teaching Class A, the instructor put more of an emphasis upon meaning, as the students appeared to have more of an interest in the meanings of target words as depicted in the SPRs: "They [Class A] liked to explore the meanings, and listen to the explanations" (Study 2 Journal entry). For Class B, instructional

emphasis was placed upon the forming of a connection between the SPR and the target word, seemingly making instruction more of a stimulus-response type approach, in which there was an emphasis upon simply using the SPRs as stimuli to produce the correct pronunciations of target words. Unlike Class A, emphasis was not placed upon meaning, as "Too much time spent on word meaning seemed to confuse them" (Study 2 Journal entry). Class A was quick to learn and appeared to recall words from the SPRs based upon their understanding of the target words. Class B seemed to rely more upon a more rote style of recall from the SPRs, with their pronunciation having been observed as having a higher level of accuracy than that of Class A.

The differing instructional approaches taken and the strengths of each class matched Craik and Lockhart's (1972) levels of processing theory in that the two classes appeared to be functioning at different levels of cognitive processing. Class A was able to focus more upon the semantic level of processing, as their level of English proficiency allowed them to concentrate upon what the words and their corresponding SPR actually meant, and not so much on what they looked like (the structural level) or what they sounded like (the phonetic level). Class B, on the other hand, struggled more at the semantic level of processing (i.e., the meanings of the SPRs and the target words), and so appeared to focus more upon the shallower phonetic level, which involved producing the correct sounds to match the given stimuli: the SPR. These observations suggest that, since SPRs deal primarily with word meanings, instruction using SPRs needs to consider the level at which learners can best handle the studying of word form and meaning. A teaching approach can then be taken which suits the needs of the students in accordance with their current level of English proficiency.

5.4.3 Learning with SPRs

The research project's vocabulary learning programs were centred on the practice of recalling target words verbally from a pictorial cue. Although this action was not tested empirically, anecdotal data from the teacher's journals indicated certain tendencies, including observations made when all students were recalling words from the instructor's large flashcards. One observation noted that once students appeared to have learned target words (i.e., had repeatedly demonstrated that they were able to recall the words without difficulty) there did not seem to be any difference in the success of subsequent recalls (in terms of speed and accuracy) between whether the words were being recalled from an SPR or L1 cue. The reaction to the cues had the appearance of a more behaviouristic type response to a stimulus, which worked equally well regardless of the type of cue. At first glance, the pedagogical value of such a "shallow" style of vocabulary learning is questionable, as little attention appears to have been paid to word meaning. However, in opposition to Craik and Lockhart's (1972) levels of processing theory, even rote style learning has been shown to have the potential to result in long term retention (Baddeley, 1978; Elgort, 2011).

Learning by responding to images flashed on the screen could be described as being similar to that of studying vocabulary using word cards, as students respond to a given cue and the response is then immediately checked for correctness. This method of using a classroom monitor has advantages over word cards, as the words chosen and the speed of presentation can be controlled by the instructor, and students can be involved in group responses thereby sharing the leaning task. In addition, the students are required to verbalize responses every time rather than just responding

mentally. Repeating words verbally has been shown to encourage retention in the long-term memory (Ellis & Beaton, 1993).

The studies' learning activities involved repeatedly hearing and verbalizing the target words in combination with visual expressions of the words, so may have established conditions beneficial to vocabulary retention. In accordance with cognitive/memory models (Baddeley & Hitch, 1974; Paivio, 1986), both the learner's visual and verbal subsystems were actively involved in the processing of word form and meaning, encoding both audio and visual information for eventual storage in the long-term memory. It was observed that when the classes reviewed target words from previous lessons, the SPR words were generally recalled more successfully, being remembered after having been presented in the lessons (in some cases) several weeks prior. The tendency for a higher number of recalls of SPR words during class activities may have been due to these words having been more successfully encoded in the long-term memory than words presented in L1 form. In accordance with Paivio's (1986) model, the learner's non-verbal (visual) subsystem may have been more actively involved in the process of building referential connections between it and the verbal subsystem, as a result of the inclusion of pictorial representations of the target words.

Small group activities and paired activities were successful in that the students responded positively to the activities (see Section 5.4.1) and the students generally focused on and completed the required activity tasks every lesson. A large part of the students' positive responses to the activities could be attributable to social factors, as the interactive and communicative nature of the activities allowed for a considerable amount of socialization, which is arguably of great value to first year university

students. Aside from social factors, the activities resulted in what appeared to be intensive explicit vocabulary study, with the de-contextualization of word forms, a deliberate and concentrated effort to understand word meanings, and the strengthening of form and meaning through repeated retrievals.

A brief evaluation of the research project's classroom activities is given below in accordance with the five main points of Nation and Webb's (2011) technique feature analysis. The points are addressed in relation to specific questions on the technique's checklist and further details of the technique's main points (Nation 2013, pp. 101-114).

1. *Motivation*: The target words (being mostly academic) were not of high interest to students. However, the SPRs (being simple cartoon-like pictures) were of interest. The card game-type activities were inherently motivating, as were the guessing activities done in pairs. Each activity had the same basic achievable goal: to recall target words from images only. However, the opportunities for students to select words, such as when target words were chosen for the paired activities, were minimal.

2. *Noticing*: Target words were decontextualized so could be studied and (in the case of paper-based materials) manipulated individually. All activities were focused primarily on the target words. Negotiations of word meaning were limited to small groups working together to match form and meaning, and pairs trying to guess each other's target words. Definitions of word meanings were given in whole-class activities only, with the definitions being as brief and as simple as possible, and focused on one meaning of the target words.

3. *Retrieval*: The retrieval of L2 spoken forms was at the centre of every activity. Retrieval was not selective but productive, yet the target words were chosen from a limited number of possible items – the list of ten weekly target words. Activities required multiple retrievals, and the spacing of retrievals was controlled by the instructor in whole-class activities, yet the spacing was dependent upon the pace of the activities in small groups and pairs.

4. *Creative use*: Target words were not produced for creative use, such as the production of original sentences. However, pair activities (in Study 2) did involve students describing an SPR verbally or using gesture in order for their partner to guess the referent target word. Although not producing the target word, the elicitation of the target word required some creative language and nonverbal communication.

5. *Retention*: The linking of form and meaning was central to all activities, as the L2 form was required to be recalled from the word meaning expressed pictorially. Imaging was fundamental to the activities, yet the images were supplied and not drawn by the learners. Interference was avoided by concentrating upon one specific meaning of the word, and target words with similar meanings were studied in separate lessons.

Explicit vocabulary studies involve the removal and de-contextualization of words from language usage, so it is expected that explicit learning activities (such as using wordlists) will not be as communicative as implicit style activities. The studies had an explicit approach to L2 vocabulary learning, yet activities were designed to be

communicative and interactive so as to provide a suitable language learning environment. The inconsistency of having explicit vocabulary study take place in a communicative setting may have resulted in (from the assessment above) the activities having possessed a more than adequate quantity of the noticing, retrieval and retention of target words, yet having a minimal amount of creative and generative usage of target words.

The use of pictures in vocabulary leaning activities can result in learners generating and interacting in the target language, such as with information transfer activities and split-information tasks featuring illustrations as described in Nation (2013). These types of activities are suited to implicit rather than explicit style learning, as the tasks require vocabulary to be elicited from speakers and used in context with other words so as to complete communicative tasks. The research project's activities differed in that pictures were decontextualized and used to practice vocabulary recall, yet this explicit style of vocabulary study was conducted within an (albeit limited) interactive and communicative learning environment. For the most part, the interactive activities worked reasonably well in terms of student participation and attitudinal responses to the activities (see Section 5.4.1), with the majority of students having given positive responses to all small group and paired activities. However, one student (2A25), who incidentally had the highest level of English conversational ability of all the research project's participants, did indicate a desire for more naturalistic interactions.

Central to both studies is the learning technique which involves the recall of target words from simple images only (see Section 3.5.2). The system was primarily designed to practice recall without the presentation of the L1, and to possibly act as a mnemonic, with the learner's mental images of the SPRs assisting in the recall of

EFL target vocabulary. The overall aim of the learning technique is to establish and reinforce a link between a target word's written/spoken form and its meaning.

Overall, the students voiced no real objection to studying target words using the research project's learning technique, focusing their comments mainly on the SPRs themselves and not on the way in which the images were used. Problems or difficulties with SPRs were reported as being due to a lack of understanding and comprehension; as the SPRs had a limited capacity to represent all of the target word meanings effectively. Apart from this criticism, studying with the SPRs – and therefore presumably using the technique – was generally perceived by the students to be helpful and beneficial to learning (see Section 5.5.3).

Three students asserted that the SPRs had a mnemonic effect upon their learning: "When trying to recall words, the card's picture sometimes comes to mind; the pictures can be quite helpful" (1A14); "Recall the picture, and you can recall the word" (2A18). One student (2B18) had reported a mnemonic effect from SPRs representing the more "difficult" (assumedly highly abstract) vocabulary also. However, apart from these examples, any mnemonic style effects from using the SPRs were generally not reported.

The use of SPRs did not appear to have the same mnemonic effect as the keyword method, as the students in both studies did not generally report using mental images of the SPRs when recalling target words. A major difference between the two learning methods is that the keyword method involves a direct link (such as an acoustic similarity) being made between the L1 word and an L2/FL equivalent word via an image, whereas SPRs are specifically designed to not have any (intentional)

L1 involvement. The use of an image to connect the L1 and L2/FL lexical items might be the main reason that studies have demonstrated the effectiveness of the keyword method over that of learning from pictures alone, in the case of English speaking children learning L1 words and definitions (Levin, McCormick, Miller, Berry, & Pressley, 1982) and Persian speaking women learning concrete English words (Tavakoli & Gerami, 2012).

The technique used in the research project can be defined as a visual mnemonic, as Schmitt (1997, p. 212) identifies one type of visual mnemonic as involving the learning of new words "by studying them with pictures of their meaning instead of definitions". The simplistic form of the SPRs may have made them easy to remember, as indicated by a total of eight students in focus group discussions (four in Study 1 and four in Study 2) having commented that the SPRs were easy to remember . However, their simplicity also made them inherently difficult to express abstract concepts; unlike the keyword method which relies upon an L1 translation as an expression of word meaning. Although three (aforementioned) participants did report mnemonic-type effects, in cannot be concluded from the studies that SPRs can be used an effective memory device for learning FL vocabulary.

Any potential for SPRs to be used as a type of mnemonic might be dependent upon the instructional approach taken with their usage. Hulstijn (1997) believes that the teaching of strategies and a building of metacognitive awareness is required when mnemonic techniques (including the keyword method) are used in the classroom. Accordingly, SPRs and the associated learning technique may exert more of a mnemonic effect if learners are given specific instruction and practice as to how to develop a means of remembering and recalling words using the simple images.

The research project's learning technique appeared to achieve certain instructional objectives. The students were focused upon word meanings, and engaged in repeated retrievals of the target words from a cue that required an understanding of word meaning that was not an L1 form. The extent to which the students actually used their L1 in recall is speculative. According to Nation (2013), L1 words and their L2 equivalent words are linked directly to each other, with this connection existing whether L2 words are learned through L1 translations or pictures. It can therefore be assumed that the L1 played a major role in the learning process, right through to the final stage (in testing) when there was no SPR form presented. However, regardless of the cognitive processes by which the students were learning, the research project's learning technique provided a means by which the target vocabulary could be studied without reliance upon the presentation of L1 forms.

5. 5 Limitations

The results of Study 1 and Study 2 need to be taken within the context of the limitations of the studies. Being classroom-based research (occurring within an existing language program), the participants were susceptible to the many extraneous factors which could affect learning. The amount and manner in which the participants studied outside of the classroom was beyond the control of the researcher, as were other factors such as the influence of other English courses that the participants were concurrently attending at the university.

In addition, the enthusiasm, eagerness and commitment of the students was not the same throughout the academic year, as the typical pressures of first year university

students, such as workloads from other courses, social development, the influence of extra-curricular activities, exerted their usual influence as the academic year progressed. The general decline in focused effort may have been further enhanced by the realization that the vocabulary testing had no effect upon their grading. These factors may have resulted in a significant decline in effort and interest in vocabulary study throughout the year, which may have affected test results.

Another limitation concerned the external validity of the studies. As all participants were a specific demographic – 18 year old Japanese female first year university students, there is limited confidence in generalizing the results to other participant groups. A higher level of generalization might be possible with similar groups such as Japanese high school students and second year university students, yet such a generalization could only be confidently extended to females. The studies showed positive attitudinal responses from young Japanese women studying in all female classes in Japan, the country in which emoji (a form of communication using simple pictures) originated. Generalizing these results to other learning situations and demographics requires caution and further investigation due to sample bias.

The external validity of the study may have further been reduced by the research design employed in the studies, in which the treatment was repeatedly applied over the course of Semester 1 and Semester 2. Sapp (2014) identifies the lessening of external validity as the major weakness of the equivalent time-samples design, as "subjects tend to adjust to the independent variables; thus, lessening external validity of this design" (p. 32). Generalizing the research project's results to other learning situations needs to take into account how different groups will vary in their adjustment and adaptation of the studies' vocabulary program.

5.6 Summary

Chapter 5 began with an overview of the chapter in Section 5.1. Results from
vocabulary testing were then discussed in Section 5.2 which indicated that the SPRs
were not detrimental and may have some potential for learning. Next, the results
were examined with regards to cognitive models, speculating upon the influence of
the additional visual information from the SPRs. The advantages of concrete words
and the disadvantages of abstract words presented as SPRs were investigated, and the
positive effects of the target words' emotional and personal qualities upon recall
were also discussed.

Section 5.3 examined the participant responses, discussing how the SPRs favourable
responses may have been due to them being interesting, novel, and non-threatening,
thereby alleviating learner anxiety. Reasons for the main negative response to SPRs –
problems with the understanding of meaning, is then investigated in terms of cultural
and personal understandings, the difficulty of translation, the abstract nature of target
vocabulary, and student beliefs towards learning.

Section 5.4 examined the implications for teaching and learning with SPRs,
beginning with the positive influence that the explicit vocabulary component had
upon the studies' EFL course. Section 5.4.1 focused on materials and activities,
including the use of the in-class monitor which was examined in accordance with
Mayer and Moreno's (1998) theory. Next, social aspects were identified as being the
reason for positive responses to the interactive classroom activities. Private study
materials (paper wordlists and the website) were then discussed, with convenience

and accessibility being identified as significant factors in their usage. A general comparison of paper-based materials and electronic materials was then made, which included the importance of the tactile quality of paper-based materials.

Section 5.4.2 concerned instruction, firstly discussing the explaining of word meaning using the SPRs, which included the presentation of alternative forms of meaning, a focusing of instruction, and a rich learning experience in which students had to "work" to find meaning. The discussion included the metacognitive awareness displayed by the students regarding pictorial information, and how the uncertainty of SPR meaning had some advantages for learning, with the SPRs (being a type of translation) having provided more opportunities for engagement with target words than L1 forms. The section then examined the different instructional approaches taken for the studies' two classes. The higher level class (Class A) was challenged more with a focus on meaning, and the lower level class (Class B) was supported more with a focus on developing the link between the SPR and FL form, consistent with the levels of processing theory.

Section 5.4.3 discussed learning with SPRs, noting the behaviouristic style of learning regardless of presentation in L1 or SPR form. The possible advantages to learning from using the classroom monitor were examined, and speculation was made as to the role of visual and verbal input in accordance with cognitive models. The apparent success of interactive/communicative classroom activities due to social factors was then discussed, followed by an evaluation of the studies' classroom activities, which were found to involve high levels of noticing, retrieval and retention, and low levels of creative and generative language use. The section then focused upon the research project's SPR learning technique, which had the main

disadvantage of the SPRs not being sufficiently understood. The technique was then evaluated as a mnemonic, with the SPRs found to be easy to remember yet sometimes difficult to understand. The keyword method was said to be more effective. The advantages of the technique were then discussed, including the focusing on word meaning, repeated retrieval, and the non-reliance upon L1 forms.

Section 5.5 discussed the limitations of the research project, which included the influence of extraneous factors upon the studies such as student motivation and experiences of English external to the program. The external validity of the studies was also discussed, including issues with sample bias and the studies' equivalent time-samples design.

Chapter 6. Conclusions and Implications

6.1 Conclusions

The studies have both reached three main general conclusions: (1) presenting target vocabulary in SPR form, in comparison to presenting words in L1 form, is not detrimental to recall and can be beneficial; (2) student opinions and attitudinal responses towards SPRs and their usage as a means of studying English vocabulary are generally positive; (3) SPRs can provide an effective means by which FL vocabulary can be taught and learned explicitly.

Firstly, presenting target vocabulary in simple pictorial form is not detrimental to recall, and is comparable to that of presenting words in L1 (translational) form. Target words presented in SPR form display a tendency to be recalled at a significantly higher rate than target words presented in L1 form for words tested one week after their initial classroom presentation. Testing after a longer period of time (as with pre-tests and post-tests in both studies) results in more mixed results, with no general tenancy for either form to have a higher rate of recall. Overall, presenting words in SPR form will not have a negative effect upon recall, and can result in a similar or higher rate of recall compared to presenting words in L1 form.

The level of abstraction of referent vocabulary has a major influence upon the recall of words expressed in simple pictorial form. Concrete words are more apt to being represented pictorially than abstract words, making their pictorial representations more understandable when representing target words. Being more comprehendible,

the meaning of SPRs that represent concrete words are learned and remembered more easily. Abstract words expressed in SPR form are susceptible to misunderstanding due to the difficulties associated with the expression of complex and intangible concepts in one simple pictorial form. As a general rule, the higher the level of concreteness of word meaning being expressed as an SPR, the greater the chance of the word being successfully recalled.

However, abstract words can be presented in simple pictorial form and still be effective for learning. Despite difficulties with the understanding of meaning, some even highly abstract words can be successfully represented as SPRs, that is, the meaning of the referent word and the way in which the meaning of the word is being expressed by the SPR can be understood. A picture's capacity to express word meaning depends upon its ability to successfully convey the meaning of the referent word to the observer. When the meaning of an image is understood, then even the simplest of pictures can represent a highly abstract concept. For example, an illustration consisting of a straight, thick arrow underneath three thin, waving arrows can successfully represent the word *principle*, once the basic concept of how the arrows represent the concept of *principle* is understood.

Vocabulary with emotional connotations, that is, words that students can seemingly relate to on a personal level, tend to be recalled easily when represented as SPRs. Target words with more of an emotional impact, such as *tropical*, *hangover*, and *skeleton*, are recalled more successfully than words with less of a potential to make an emotional and personal connection with the learners. Concrete words are generally easily recalled, yet words that have emotional/personal connotations in addition to being concrete have a higher tendency to be recalled.

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The second main conclusion of the studies is that student attitudes to materials and activities using SPRs are generally positive. Students often express interest and focus their attention upon the SPRs, and generally enjoy activities in which SPRs are used, especially when lessons are interactive and communicative. The positive responses appear to motivate learning, and may contribute towards a reduction in learner anxiety in the classroom. The attitudinal responses to SPRs in self-learning situations are generally not as positive as responses to the classroom usage of SPRs, yet are not overtly negative. The lower level of positive responses for self-learning may have been due to the lack of social interaction in private study, as social factors were identified as being a significant factor in responses to classroom activities.

Students find SPRs to be easy to remember yet difficult to understand. The images themselves are easily remembered due to their simplistic form, yet the assigned meanings of the images (and thereby the meanings of the referent words) can be difficult to understand due to problems associated with representing words with complex meanings pictorially. Difficulties with understanding will also be the result of inherent differences between the target language and the student's L1, including and involving differing socio-cultural values and expectations. Conflicts can also appear when a personally held belief of what a word means does not match the image presented. Comprehending an SPR requires a realization of how the image represents the referent word. The learner's opinion of the representation, that is, their agreement as to whether or not the SPR matches their personal understanding of the word, is a crucial factor when an image is being used to express target word meaning.

The third main conclusion is that SPRs are a useful means by which FL vocabulary

can be studied explicitly. SPRs can promote and support the deliberate and intentional study of vocabulary items, as target words expressed pictorially are subject to a process of de-contextualization and isolation from other vocabulary items. Through being expressed as simple images, target words can become a focus for the lesson, a topic of discussion, and can be examined and dealt with as single entities. The SPRs encourage the target words to become more like objects: "tangible" items to be used in the lesson, thereby focusing attention and stimulating interest upon word form and meaning.

SPRs can act as an effective cue for the recall of words. FL vocabulary can be verbally recalled repeatedly and rapidly in a variety of different learning situations using SPRs as cues, thereby establishing and reinforcing links between FL form and meaning. Recall of the FL form from SPR cuing can occur without the presentation of any L1 or FL forms, which could be accommodating to learning situations in which L1 translations are being avoided, or if recall of the FL verbal form without the presentation of FL written form is preferable. However, as SPRs express word meanings pictorially, there is an inherent tendency for the intended meanings of the images to not be understood. It is therefore necessary to make the task of recall less difficult and more achievable for learners. This can be done by limiting the number of target words presented in the one instructional session (i.e., ten words as used in the studies) thereby restricting the number of possible recalls.

Having SPRs open to evaluation and scrutiny by the instructor and students is beneficial to learning. A pictorial representation is one possible expression of a word, influenced by the artist's own thoughts (i.e., personal opinions and understandings) of the target word. It can be viewed as a translation of meaning (Nation, 1978) and is

therefore open to similar difficulties concerning the re-expression of meaning as experienced in language translation. If an SPR is treated as more of an interpretation of the target word and less as a correct representation, then the SPR is more open to the learners' speculation and consideration. This flexible approach can help to alleviate frustrations which may arise due to conflicts between the students' personally held views of word meaning and the meaning being presented through the SPR. Also, the experience can provide further opportunities for learning, as contrasts and comparisons can explicitly be made between the students' L1 and the target FL on linguistic and cultural bases.

SPRs can be used in a variety of classroom activities in electronic and in paper-based form, in whole-class, small group, paired, and in self-learning situations. Group and paired activities can involve active participation in that students are required to move around the classroom, engage with multiple partners, and exchange information. Activities using SPRs result in a high level of target word recall yet are generally lacking in generative and creative usage of the FL. However, SPRs can be used in communicative and interactive style classroom activities, where student motivation and learning can gain the benefits of social interactions. Simple pictures can be used in self-study, as cues for recall in a manner similar to that of using L1 translational forms as cues, on paper wordlists and on a website. However, using SPRs for self-study is generally not as appealing to students as using SPRs in classroom activities, as the familiar practice of using L1 translational forms can be preferred.

SPRs provide a means by which target word meanings can be explained, as an instructor can expound target word meanings by describing the SPR and giving an explanation as to how the SPR represents the word. The picture offers an expression

of the word; a tangible reference from which word meaning can be communicated. The SPRs can provide an alternative means of explaining word meaning to that of using L1 translations or English examples and definitions. Also, explaining meaning using a picture can serve as an efficient supplement to other means of explanation, such as the use of example sentences or providing synonyms of the target word.

When studying with SPRs, students with higher proficiency levels of English tend to focus on word meaning and students with lower proficiency levels tend to focus on word form. Higher level students show more interest in engaging with the meaning of target words, appearing to place greater value upon their understanding of the target words as expressed by the SPRs. Lower level students, on the other hand, display more of an interest in producing correct responses to the SPRs, focusing more upon the pronunciation of the target words.

SPRs are of limited use as a mnemonic for the learning of FL words. SPRs generally display a limited capacity to act as a visual mnemonic, in which the mental recall of an SPR results in the recall of its referent FL form. However, SPRs can offer learners a simple visual image to be employed as a visual reference in the memorization and recall of FL vocabulary. Studying with SPRs is more of a visualization technique, acting as a general aid to vocabulary learning and retention rather than being more of a specific mnemonic method such as the keyword method, which appears to have a far superior mnemonic effect upon FL vocabulary learning.

6.2 Implications

The studies demonstrated that presenting words in a simplistic pictorial form was not

detrimental to vocabulary learning, as there were no data to suggest that using SPR

forms resulted in a consistently lower number of recalls than using L1 translational

forms. SPRs did show some superior effects upon recall to that of L1 forms, yet these

results were not consistent. It could therefore be suggested that the use of SPRs has

the capacity to result in a higher rate of recall than the use of L1 forms. As the higher

rate of recall for SPR words was evident in the weekly testing of both Study 1 and

Study 2, it can be further suggested that the effects of classroom activities using

SPRs upon recall are generally more pronounced days rather than weeks after the

lessons. For English vocabulary learning in general, the research project therefore

suggests that the presentation of target vocabulary in simplistic pictorial form has the

potential to be beneficial to learning, especially if recall of target vocabulary occurs

recently (i.e., one week) after the introduction of target words.

The SPRs and their associated learning technique displayed some potential as a

means by which FL vocabulary can be learned, as the system had the capacity to be

used in a variety of activities, and resulted in a considerable amount of multiple FL

vocabulary recall. Despite some difficulties with understanding the images, the SPRs

appeared to be an adequate and alternative cue for recall, as the images could

represent the target word meanings sans a linguistic form of the words. How and to

what extent the learners' visual processing systems were involved, as proposed in

theoretical models such as Paivio's (1981) dual code theory, is speculative.

The general consensus amongst researchers is that the working memory has domain

specific processing systems (Wen, 2016), yet the division and actual workings of

these subsystems, including those concerned with processing visual information and

those dedicated to processing language, remains largely unknown. Despite these

uncertainties, it is reasonable to suggest that the inclusion of study with SPRs does introduce a visual element into the process of vocabulary learning. Rather than being considered a type of mnemonic as with the keyword method, SPRs could be regarded as more of a visual instructional tool; a means by which FL words can be presented and studied, and a method of producing recall that can be used in instructional, interactive, and self-learning situations.

The studies have also demonstrated that FL students respond well to pictorial information. This general finding alone might not be so significant given the frequent and continued inclusion of graphics in L2/FL teaching material, which strongly suggests that pictures are already an integral part of L2/FL learning. However, and more specifically, the research has demonstrated that simple symbol-like images, even when representing words with complex and abstract meanings, can be well received by students throughout a full academic year of study. With SPRs generally having been consistently liked, considered helpful to learning, and not having been rejected in favour of L1 translational forms, the students' acceptance of SPRs suggest that presenting target words in a simple pictorial form (in both electronic and paper-based mediums) may have possibilities pertaining to student interest and motivation.

The finding that some pictures were difficult to understand matched the belief that teaching vocabulary using pictures to represent words is difficult in that some words are not "picturable" (Nation, 2013, p. 449). Student responses corroborated the idea that concrete words are easy and abstract words are difficult to express pictorially. Responses indicated that participants had a keen awareness of the limitations of using pictures to represent words, as factors such as the level of concreteness, the

complexity of meaning, ambiguity, language/cultural differences, and personal opinions were all identified as reasons for the lack of and misunderstanding of some SPRs.

The students' perceptions and awareness of the limitations of expressing words pictorially have implications for the use of SPRs in other learning programs, as it is reasonable to assume that other students would have similar difficulties with comprehending the meanings of some (especially the more abstract) SPRs. From the onset of any such program, it would be preferable that teachers and students be made aware that word meanings represented pictorially will not always be properly understood. A critical and evaluative explanation of how an SPR represents a vocabulary item can give the word more of a worldly context, therefore allowing the class to have a more involved engagement with the picture and the target vocabulary. An instructional approach in which the meaning of the simple pictures is subject to investigation and enquiry, and the understanding of word meaning is established through a "guided discovery" style of teaching might be beneficial to learning.

This suggested approach could also be applied to using images of any type to represent vocabulary for the purpose of FL instruction. Rather than being introduced as a correct or the best expression of a target word representing a thing, idea, or concept in the target language, an image should be presented in a manner which opens it to scrutiny and speculation. Such an approach discourages the picture from being set within ridged boundaries of meaning, allowing and encouraging flexibility in the way that the picture is seen to express its referent word. Students may then have more opportunities to use their metacognitive awareness of the strengths and weaknesses of presenting words as pictures (as was demonstrated in both studies)

when developing their individual comprehension and understanding of word meaning. Within the appropriate instructional context, a lack of understanding and an awareness of the limitations of expressing vocabulary pictorially may actually provide significant learning opportunities; helpful to learning and not necessarily a hindrance.

A key factor as to how well the SPRs represented their referent vocabulary was the target words' concrete or abstract quality. As the studies chose mainly academic vocabulary as target words, most target words were considerably abstract with complicated meanings. The prevailing notion regarding the visualization of vocabulary is that concrete words can be pictured fairly easily and abstract ones cannot, so this idea could be one reason why there is an absence of studies in which abstract words are taught pictorially within a classroom setting. Studies that represent abstract words with pictures (e.g., Shen, 2010) are often testing a theoretical model or a specific effect, not focusing upon a long term instructional program. This research has demonstrated that abstract words (i.e., academic vocabulary) can be represented pictorially in a simplistic form and used in a similar way to that of L1 translations in an FL/L2 vocabulary program without having a detrimental effect upon learning outcomes. While certainly not free of limitations (such as difficulties with understanding) the research is significant in that it has challenged the assumption that teaching vocabulary using pictures should be restricted to the teaching of more easily "picturable" target words only.

Pictures (especially simplistic ones) being depictive representations cannot compete with the descriptive quality of words, as according to Robinson (2007), "Reading and writing are intimately and inextricably bound to speech" (p. 17). Text therefore has

virtually the same capacity to communicate the meaning of highly abstract concepts as accurately and efficiently as speech. However, being analogous to the actual things or concepts they are representing, pictures can express meanings to learners in ways in which symbolic forms are simply not capable of. While it certainly appears to be the case that not all words can be easily picturized, the general belief that abstract words cannot be effectively pictured should not prevent students from having the experience of an illustrative form of any FL word they are trying to learn.

Concrete words in comparison to abstract words were demonstrated to be more easily recalled, in agreement with other studies such as that of de Groot and Keizjer (2000). Concrete words represented as SPRs were also found to be recalled at a higher rate than concrete words represented as L1 translations. This finding implies that concrete words do not necessarily have to be presented in the learners' L1, as these words can be presented pictorially (for the purpose of explicit vocabulary learning) with reasonable assurance that the images will be understood. Presenting concrete vocabulary items in pictorial form would be conducive to learning situations in which it is desirable to present target word meanings without using the students' L1, enabling learners to focus on the images and the FL spoken and written forms, making presentation of or referral to L1 forms unnecessary.

Furthermore, in line with studies linking the acquisition of abstract words to emotion (Kousta et al., 2011; Vigliocco et al., 2014), words that appear to have emotional connotations and a preponderance to be linked to personal memories were shown to be easier to remember and more likely to be recalled than less emotional words when represented pictorially. For example, the word *seasickness* (which had the highest rate of recall in Study 1) can encourage thoughts of a boat trip, feeling ill, and

vomiting. Words that are capable of evoking emotional responses, especially if they are also concrete, are well suited to being presented pictorially as they are easy to understand, recognize and recall which may have implications for the design and approaches of FL vocabulary instruction.

Using vocabulary in simple pictorial form might best be viewed as a supplementary vocabulary learning strategy; one of a variety of methods which can adopted, modified or rejected by learners to support a range of individual learning needs and preferences. Viewing SPRs in this manner is consistent with the opinion (Folse, 2004b) that since no vocabulary learning technique is superior to any other, learners should be made aware of a variety of vocabulary learning techniques in order to have the opportunity to choose strategies that suit them individually. Given that some students respond well to visual information as opposed to language forms, as Nation (2013) explains, the provision of both words and pictures might be preferable to just catering to the majority of students who may prefer word forms only.

Using SPRs, students and instructors can experience vocabulary study in an alternative manner to methods previously experienced, with the simple images encouraging a different style of understanding and interaction with target words. Such a learning system may enrich the students' engagement with word meaning and enhance other more implicit techniques, (e.g., intensive reading/listening and communicative activities). Any generalization of the studies' results to other learning programs needs to take into account that SPRs were not the sole means of vocabulary study, so the method might not necessarily be beneficial to learning if used in the absence of other methods. An FL program might therefore benefit from the addition of an SPR vocabulary learning system designed to support and compliment other

vocabulary learning approaches and techniques, which may involve target

vocabulary being experienced in a variety of ways including SPR form.

With regards to materials, the research project demonstrated that simple pictorial

forms can be integrated into teaching and learning resources, both paper-based and

electronic. The large flash cards held the class' interest and attention; wordlists were

appreciated for their simplicity and clear learning aims, and the students (even at

university level) appeared to enjoy using small word cards in game-type activities.

The in-class monitor displayed potential as an effective instructional device, as it

acted as a kind of large electronic flashcard. The website showed a possible way in

which vocabulary could be practiced online, yet did not appear to have any

significant potential as a study tool as advances in mobile technology and electronic

flashcard software make the system appear outdated. However, the participants'

attitudes towards and usage of the website indicated that accessibility and

convenience are important factors that may determine the degree to which students

will accept and do self-learning with CALL systems.

The use of paper-based materials in Study 1 and electronic materials in Study 2

provided an opportunity for a comparison to be made between the two mediums.

Despite the remarkable and ever-advancing capabilities of electronic medium, the

studies showed that there is still an important place in EFL learning for materials

such as printed wordlists and paper-based word cards and large flashcards. From data

concerning the usage of materials and from student attitudes, it can be deduced that

paper-based materials maintain a strong pedagogical value. The tangible quality of

paper-based items affords them a significant advantage over electronic materials; for

example, they can be picked up, swapped, turned over, easily carried and accessed

instantly.

The findings of the research project suggest that paper-based materials should be regarded as being on an equal standing to that of electronic materials; neither second place nor a kind of poorer alternative. Other studies have reached similar conclusions, such as Nikoopour and Kazemi (2014) who found no significant difference in learning outcomes between paper and electronic flashcards, and a study by Sage, Rausch, Quirk and Halladay (2016) who concluded that "paper and digital flashcards are equally viable options for students" (p. 431). It could be inferred from the research project (in line with these other studies) that a teacher wanting to introduce a flashcard study component into an EFL program should not automatically assume that an electronic flashcard smartphone application, with the latest multimedia features and learning systems such as spaced repetition, will naturally be the best choice. The advantages of paper-based materials, including their tactile quality, simplicity and accessibility of usage, suggest that paper should not be underestimated even in comparison to the remarkable qualities of electronic media.

The use of simple imagery (of an iconic and symbolic quality) in teaching may be in line with current trends of how people interact with information. Meanings represented in simple pictorial form appear to be playing a substantial role in everyday life, as evident with the use of emoji becoming an increasing popular means of communication worldwide (Danesi, 2017). This acceptance of symbolic forms can also be seen in the use of iconography in computer technology, such as icons used in Internet browsers and smartphone applications. SPRs may have the capacity to provide a means by which this familiar mode of information could be applied to FL learning. SPRs may especially be well suited to a younger

demographic of learners (as with the studies' participants) who grew up alongside 21st Century computer/information technology, and therefore might be particularly amicable to engagement with pictographic and ideographic forms of information.

SPRs may have potential as a means of learning FL vocabulary as they are appealing to students, can be applied to a variety of activities and learning situations, are compatible and complimentary to other vocabulary learning techniques, and are conducive with current technological trends with regards to information being presented in symbolic form. Yet unlike most other symbols, SPRs do not have the end goal of having the learner know what the image means. Rather, the SPR is a disposable tool to eventually be cast aside, through which word meanings can be presented, explained, explored and comprehended, and word forms can be understood, practiced, remembered and recalled.

6.3 Directions for Further Research

The potential for the use of simple imagery as a means of FL vocabulary learning could be further investigated by examining the effect of SPRs upon other participant groups. A study by Webber (1978), for example, demonstrated that children had a higher rate of recall for FL (Indonesian) words paired with line drawings than for FL words paired with English translations, indicating that SPRs could have possible applications in the area of FL learning for children. A study by (Oshima, 2013) used pictures in the absence of Japanese translations to teach English vocabulary to seventh grade students in a Japanese junior high school. The study displayed some potential for learning with regards to the development of English pronunciation skills, further indicating the possibilities for pictorial information to be used in the teaching

of FL vocabulary to young learners.

SPRs could also be tested with learners (of any age) who lack literacy skills in their L1 and/or FL. Studying with SPRs emphasises the role of visual and audio cognitive processing with less reliance upon literacy skills. Therefore, the effects of SPRs upon learners with literacy difficulties, as with those who are functionally illiterate in their L1 or have a learning disability such as dyslexia, would be of interest.

Other learners with special needs could also benefit from SPRs. Studies conducted with Finnish students (Kalaja, Alanen & Dufva, 2008) and Japanese students (Suzuki & Childs, 2016) have demonstrated the potential for FL students to use self-drawn pictures to express their thoughts and feelings visually without reliance upon speaking and writing. In a similar vein, SPR type images drawn by students might be of value to learners who have difficulties and personal issues with more conventional styles of study (e.g., introverted students, students with learning difficulties, visual learners) who may prefer and benefit from learning a FL through visual means as opposed to text based instruction.

Research into the use of SPRs in L2 or FL vocabulary learning would benefit from studies involving experimental conditions more contained and controlled than those of the research project. Study 1 and Study 2 were classroom-based, so while having the advantages of testing SPRs in an actual educational setting, they were required to fit into a university culture and were open to a range of extraneous factors. If studies were conducted focusing exclusively upon participant exposure to SPRs and vocabulary testing, such as a study with a more experimental structure involving individual participants using a CALL system, then more precise data concerning the

effect of SPRs upon L2 or FL vocabulary retention and recall could be collected. This type of data would be of particular value to research investigating how and to what extent pictorial information can be used to effectively represent words with abstract meanings.

Although the research project was primarily concerned with pedagogical applications, SPRs may be of some value to research in the field of cognitive science and L2/FL learning. Wen (2015) believes that working memory remains at the very forefront of cognitive science, with the current "emerging consensus" being that working memory is "a cover term that subsumes multiple structures, including domain-specific mechanisms (e.g. sound and visuospatial)" (p. 21). Therefore, models theorizing a division between the processing of phonological information and visual information in the working memory remain viable. Studies of visual working memory persist (e.g., Allen, Castella, Ueno et al., 2015; Allen, Baddeley, Hitch, 2017) yet according to Baddeley (2015) research in the field of L2 learning with visual working memory (i.e., the visuospatial sketchpad) is small compared to the extensive number of studies into phonological processing.

SPR style images could possibly be used to provide visual input for experiments into working memory. A study by Kim, Christianson, & Packard (2015) into visual working memory used letter rotation as well as Chinese characters with one character stroke highlighted. Another study by Allen, Baddeley & Hitch (2017) also instigated visual processes in working memory, using simple shapes and simple images of everyday objects (e.g., a hat, a chair) for experiments involving disruption and distraction of cognitive processing. SPRs could be used in similar way, as the images might provide a simple yet meaningful visual representational unit for the working

memory. The pictures could be used in studies investigating visual working memory through methods such as interference tasks involving the rotation of mental images. As SPRs are designed to be visual forms of FL vocabulary, they might be suitable materials for studies into visual working memory in L2/FL learning.

Another field of interest for future research is the use of SPRs in CAVL. Given that in many countries (certainly in Japan) most if not all adult students in a classroom now possess a smartphone, the study of SPRs as electronic flashcards should focus upon usage in smartphone applications rather than on websites. Moreover, a study by Nikoopour and Kazemi (2014) found better results for learning when flashcards were used in mobile phones rather than on a website, apparently due to the portability and high accessibility of smartphones. Recently, there has been many studies in the use of electronic flashcards in language teaching, such as the evaluation of application programs such as *Memrise* (Wu, 2015) and a study into the factors that influence a teacher's willingness to integrate electronic flashcards into their learning programs (Alnajjar & Brick, 2017). However, there is a dearth of studies into flashcard applications that focus primarily upon learning with pictorial information, so future studies using SPR type images might be a suitable means of investigating this aspect of electronic flashcard usage.

Also of interest is the collaborative function of some electronic flashcard applications. Wu (2015) noted that the crowdsourcing feature of *Memrise* which enabled students to create and share "mems" – animated gifs, pictures, or explanations of word meaning complied by the students themselves. His study participants (American college students) indicated that this feature "saved them time, and made vocabulary learning more effective, interesting and engaging" (p. 59). Using SPRs in this

collaborative style is worth investigating, as it would enable students to draw and share their original SPR designs. These images would reflect the students' mental images of the target vocabulary – as influenced by personally held opinions and cultural influences – thereby increasing the likelihood of the SPRs being understood. Students could also see the words from other people's perspectives, and the less artistic students could benefit from those who are more visually inclined. Additionally, the social aspect of study (which appeared to be highly important to the research project participants) might be enhanced and encouraged through the distribution and sharing of self-generated images.

Future investigations into the potential of SPRs as instructional aids would also benefit from research concerning emoji. Recent studies (Miller et al., 2015; Danesi, 2017) have shown the strengths and limitations of emoji usage, and these results share similarities with the research project's findings. Both types of simple images have difficulties with the communication of intended meaning due to their pictorial form. SPRs and emoji are both susceptible to misinterpretation, as they are heavily influenced by individual and cultural perceptions, have similar difficulty expressing abstract concepts, and are both highly dependent upon context in order to be properly understood. As stated by Danesi (2017) "The emoji phenomenon has, indirectly, shown that ambiguity may be unavoidable in language or any other representational or communicative code" (p. 169). However, SPRs and emojis also share significant advantages, such as the interest and enjoyment users generally feel from engagement with pictorial information. Given their similar qualities, and the potential for SPRs to be used in electronic settings, any future research into SPRs should take into account and learn from the continuing influence and development of emoji.

A further area of interest is the teaching of FL vocabulary explicitly in an interactive setting. The studies' instructional programs used simple pictures in information exchange and card game type activities, with participants appearing to have gained positive effects from the interpersonal exchanges that seemingly enhanced their motivation. Further studies could investigate and develop techniques for teaching FL vocabulary explicitly using simple pictorial information within a communicative context, encouraging the generation of language forms and interaction between students despite the explicit approach to learning. This type of research could contribute to the development of instructional methodologies that help to reduce division and encourage the blending of implicit and explicit approaches to FL vocabulary learning.

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Appendices

Appendix A: Study 1 SPRs

Cephalopod Language Visuals 2012

Appendix B: Study 2 SPRs

Cephalopod Language Visuals 2012

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Appendix C: Study 1 Target Words

Study 1 Target Words

Wordlist 1 (SPR)	Wordlist 2 (L1)	Wordlist 3 (SPR)	Wordlist 4 (L1)	Wordlist 5 (SPR)
tropical (c)	visual	avoid	presume	discrimination
predict	parallel (c)	integral	doubt	negotiation
temporary	obsolete	volatile	unrealistic	typical
arbitrary	ruin	dilemma	maintenance	insolent (c)
concurrent	extra (c)	dogma	significant	scope
devalue	vindictive	abstract	envy (c)	impetus
deadline	mindset	tolerance	innovate	subsidiary
finite	stand out	traditional	translucent (c)	agree
additional (c)	outcome	hangover (c)	insist	vandalism (c)
duty	reluctant	unpopular (c)	consequent	assign

Wordlist 6 (L1)	Wordlist 7 (SPR)	Wordlist 8 (L1)	Wordlist 9 (SPR)	Wordlist 10 (L1)
toxic (c)	fireworks (c)	x-ray (c)	occupation (c)	compel
phenomenon	intrinsic	hemisphere (c)	incentive	sanction
provoke	inappropriate	identical	predominant	interfere
controversy	include	livelihood	snore (c)	apologize
contaminate	suspicious	worthless	principle	asset
differentiate	Frustration	directly	camouflage	enduring
flattery	policy	rural	calm	fallacy
virtual	chores	abandon	deviate	vertical (c)
distort (c)	logic	saturate	ambiguous	collide
sans	seasickness (c)	incessant	ethics	acid (c)

(c) denotes words identified as high in concreteness.

Appendix D: Study 2 Target Words

Study 2 Target Words

Wordlist 1 (SPR)	Wordlist 2 (L1)	Wordlist 3 (SPR)	Wordlist 4 (L1)	Wordlist 5 (SPR)
Inconsistent	transmit	forgo	explicit	suppress
reside (c)	military (c)	bias	vary	fluctuate
superficial	ignorance	irrigate (c)	impose	awe
tangible	insight	infrastructure	straightforward	context
modify	pole	converge	colleague (c)	legislate
respective	prevail	perpetual	manipulate	orbit (c)
skeleton (c)	purchase (c)	eliminate	criteria	implicate
alternative	incorporate	subsidy	inhibit	vein (c)
deprive	sustain	affluence (c)	framework (c)	conceive
devote	deduce	hypothesis	metabolism	comprehensive

Wordlist 6 (L1)	Wordlist 7 (SPR)	Wordlist 8 (L1)	Wordlist 9 (SPR)	Wordlist 10 (L1)
subordinate	discreet	Emancipate	aspect	surplus
refute	orient (c)	prime	kindred	equilibrium
specify	overlap (c)	magnitude	retain	enhance
rigid	reverberate	ethnic (c)	correlate	apparatus
proprietor	correspond	detriment	indigenous	commit
cactus (c)	imply	adjacent	exert	adequate
moist (c)	feasible	equivalent	convene	obtain (c)
sole	regime	benefit	fossil (c)	aristocrat (c)
instance	analogy	satellite (c)	compatible	behalf
likewise	contrast	thereby	nerve (c)	passive

(c) denotes words identified as high in concreteness.

Appendix E: Study 1 Participant Survey Questions

Please answer the following questions about the vocabulary study we have done this semester.
Important: The answers you give will have no effect or influence upon your grade for this course.

SA = Strongly Agree   A = Agree   D = Disagree   SD = Strongly Disagree

1.   I liked the activities using the pictures on large flashcards and using the
        black-board.

        SA   A   D   SD

2.   The activities using the pictures on large flashcards and using the black-board
        helped me to learn the English words.

        SA   A   D   SD

3.   I liked the activities using the pictures on small flashcards while sitting at our desks
        in small groups.

        SA   A   D   SD

4.   The activities using the pictures on small flashcards while sitting at our desks in
        small groups helped me to learn the English words.

        SA   A   D   SD

5.   I liked the activities using the pictures on small flashcards while moving around the
        classroom forming pairs.

        SA   A   D   SD

6.   The activities using the pictures on small flashcards while moving around the
        classroom forming pairs helped me to learn the English words.

        SA   A   D   SD

7.   Which vocabulary sessions did you like the most? *(Tick a box)*
        ☐ Sessions using Japanese words.
        ☐ Sessions using pictures.
        ☐ Both: I liked sessions using Japanese words and sessions using the pictures.
        ☐ Neither: I did not like sessions using Japanese words or sessions using the pictures.

8.   Which vocabulary sessions do you think helped you the most to learn English
        words? *(Tick a box)*
        ☐ Sessions using Japanese words only.
        ☐ Sessions using the pictures only.
        ☐ Both: I liked sessions using the pictures and sessions using Japanese words.
        ☐ Neither: I did not like the sessions using the pictures or sessions using Japanese
        words.

9.   I liked the pictures.

        SA   A   D   SD

10.   The pictures were easy to understand.

                         SA   A   D   SD

11.   The pictures helped me to remember the English words.

                         SA   A   D   SD

12.   I want to use the pictures again in my English vocabulary study.

                         SA   A   D   SD

13.   Which did you like using the most? *(Tick a box)*

☐   The Japanese words.

☐   The pictures.

☐   Both: I liked using the Japanese words and the pictures about the same.

☐   Neither: I did not like using the Japanese words or the pictures.

14.   Which do you think helped you to remember the English words the most? *(Tick a box)*

☐ The Japanese words.

☐ The pictures.

☐ Both: The Japanese words and the pictures helped me to remember about the same.

☐ Neither: The Japanese words or the pictures did not help me to remember.

15.   I liked using the pictures on word-lists in private study.

            * Private study means study away from the classroom, such as at your home.

                         SA   A   D   SD

16.   I think that using the pictures on word-lists for private study helped me to learn the English words.

                         SA   A   D   SD

17.   I want to use the pictures again for my private vocabulary study in the future.

                         SA   A   D   SD

18.   I did private study using the word-lists on average: *(Tick a box)*

☐ More than ten times a week (10+)

☐ Five to ten times a week (5-10)

☐ Three to five times a week (3-5)

☐ Once or twice a week (1-2)

☐ Never (0)

19.   Which word-lists did you like using the most in private study?

☐ The Japanese word-lists only.

☐ The picture word-lists only.

☐ Both: The Japanese word-lists and the picture word-lists.

☐ Neither: I did not like the Japanese word-lists or the picture word-lists.

20.   Which word-lists do you think helped you the most with learning English words?

☐ The Japanese word-lists only.

☐ The picture word-lists only.

☐ Both: The Japanese word-lists and the picture word-lists helped me about the same.

☐ Neither: The Japanese word-lists or the picture word-lists did not help me.

21. Try to remember any three English words that you learned <u>using the pictures</u>, and write them here:_____   _____   _____

Free comment: *Please write a comment about the vocabulary study this semester. You can write about anything you like.* ***<u>Japanese is OK!</u>***

_____

_____

_____

_____

End of student survey

Appendix F: Study 2 Participant Survey Questions

Please answer the following questions about the vocabulary study we have done.

Important: The answers you give will have no effect or influence upon your grade for this course.

SA = Strongly Agree   A = Agree   D = Disagree   SD = Strongly Disagree

21.   I liked the activities using the pictures on the monitor (TV) with the whole class.

SA   A   D   SD

22.   The activities using the pictures on the monitor (TV) with the whole class helped me to learn the English words.

SA   A   D   SD

23.   I liked the activities using the pictures on the monitor (TV) in pairs around the classroom.

SA   A   D   SD

24.   The activities using pictures on the monitor (TV) in pairs around the classroom helped me to learn the English words.

SA   A   D   SD

25.   Which vocabulary sessions did you like the most? *(Check a box)*

☐ Sessions using Japanese words.

☐ Sessions using pictures.

☐ Both: I liked sessions using Japanese words and sessions using the pictures about the same.

☐ Neither: I did not like sessions using Japanese words or sessions using the pictures.

26.   Which vocabulary sessions do you think helped you the most to learn English words? *(Check a box)*

☐ Sessions using Japanese words only.

☐ Sessions using the pictures only.

☐ Both: Sessions using the pictures and sessions using Japanese words helped about the same.

☐ Neither: Sessions using the pictures or sessions using Japanese words did not help.

27.   I liked the pictures.

SA   A   D   SD

28.   The pictures were easy to understand.

SA   A   D   SD

29.   The pictures helped me to remember the English words.

SA   A   D   SD

30.   I want to use the pictures again in my English vocabulary study.

SA   A   D   SD

31.   Which did you like using the most? *(Check a box)*

☐ The Japanese words.

☐ The pictures.

☐ Both: I liked using the Japanese words and the pictures about the same.⬚

☐ Neither: I did not like using the Japanese words or the pictures.

32. Which do you think helped you to remember the English words the most? *(Check a box)*

☐ The Japanese words.

☐ The pictures.

☐ Both: The Japanese words and the pictures helped me to remember about the same.

☐ Neither: The Japanese words or the pictures did not help me to remember.

33. I liked using the pictures on the website.

SA   A   D   SD

34. I think that using the pictures on the website helped me to learn the English words.

SA   A   D   SD

35. I want to use this kind of website again for my private vocabulary study in the future.

SA   A   D   SD

36. How often did you use the website on average? *(Check a box)*

☐ More than ten times a week (10+)

☐ Five to ten times a week (5-10)

☐ Three to five times a week (3-5)

☐ Once or twice a week (1-2)

☐ Never (0)

37. Which did you like using the most on the website? *(Check a box)*

☐ The Japanese words only.

☐ The pictures only.

☐ Both: I liked the Japanese words and the pictures about the same.

☐ Neither: I did not like the Japanese words or the pictures.

38. Which (on the website) do you think helped you the most with learning English words? *(Check a box)*

☐ The Japanese words only.

☐ The pictures only.

☐ Both: The Japanese words and the pictures helped me about the same.

☐ Neither: The Japanese words or the pictures did not help me.

39. **Compare Semester 1 and Semester 2.** Which did you like using the most? *(Check a box)*

☐ Paper materials (large word-cards, small word cards, word lists).

      ☐ Electronic materials (TV monitor, website).

      ☐ Both: The paper materials and the electronic materials helped me about the same.

      ☐ Neither: The paper or the electronic materials did not help me.

40.   Which did think helped you to learn the English words the most? *(Check a box)*

      ☐ Paper materials (large word-cards, small word cards, word lists).

      ☐ Electronic materials (TV monitor, website).

      ☐ Both: The paper materials and the electronic materials helped me about the same.

      ☐ Neither: The paper materials or the electronic materials did not help me.

21.   Try to remember any three English words that you learned <u>using the pictures</u>, and write them here:

_____   _____   _____

Free comment: *Please write a comment about the vocabulary study this semester. You can write about anything you like.* ***Japanese is OK!***

_____

_____

_____

End of student survey. Thank you! (^___^)'

Discussion Questions

Please read the following questions and then discuss (Japanese OK).

Note: Your comments and opinions will have no effect on your grade for the semester whatsoever.

1. What is your opinion of the materials used and the activities done in the classroom that used the pictures?

- *Which materials and activities did you like/dislike?*

- *How were the materials and activities using the pictures compared to the materials and activities using the Japanese words?*

2. Do you think that the pictures helped you to learn the English words?

- *Advantages (good points) / disadvantages (bad points).*

- *How did the pictures help you to learn the English words compared to the Japanese words?*

3. How often and how did you study away from the classroom with the word-lists?

- *Do you think the word-lists with pictures helped you or did not help you to learn the English words?*

- *How were the word-lists with pictures compared to the word-lists with Japanese words?*

Discussion Questions

Please listen to the following questions and then discuss (Japanese OK).

Note: Your comments and opinions will have no effect on your grade for the semester whatsoever.

1. What is your opinion of the activities (whole-class and paired) done in the classroom that used the pictures on the television monitor?

- *Which activities did you like/dislike?*

- *How were the activities using the pictures compared to the materials and activities using the Japanese words?*

2. Do you think that the pictures helped you to learn the English words?

- *Advantages (good points) / disadvantages (bad points).*

- *How did the pictures help you to learn the English words compared to the Japanese words?*

3. How often did you use the website and where?

- *Did you like or dislike using the website?*

- *Do you think the website pages with pictures helped you or did not help you to learn the English words? (how were they compared to the Japanese words?)*

Study 1 Lesson Details

Lesson 1: Explanation of study and distribution of ethics forms.

Lesson 2: (1) Collection of ethics forms. (2) Pre-test. Students given 45 minutes to complete test; usual test conditions.

Lesson 3: Vocabulary instruction (SPR mode) Wordlist 1.1.

Activity 1

Instructional aim/focus: Introduction of English written and phonetic form, practice of verbal form, students match TWs with SPRs.

Materials: 10 large flash cards (cardboard and paper, 30.6 x 22.0 cm). SPR on one side, 1 set of 10 cards.

Procedure: Whole-class activity. Students seated in groups of four.

a) Teacher writes TWs on chalkboard. Teacher pronounces words and students repeat. Students permitted to look-up words in dictionaries.

b) Large SPR flashcards are lined up at the bottom of the chalkboard. TWs and cards are assigned numbers, which are written on the board. Groups are given time to guess which SPR matches each TW.

c) Groups give answers, correct answer revealed.

d) Teacher gathers up flashcards, and then uses the cards to elicit TWs from students verbally. If necessary, hints are given in the form of the first letter of the TW, then the second letter, third letter, etc. until a student or students answer correctly, or the answer is given by the teacher.

e) Brief explanation (in English) of word meaning including usage examples and synonyms. A brief explanation is given as to why the image was chosen, and how it relates to the word meaning.

f) Teacher reviews all cards, saying the TW with students repeating, aiming for correct pronunciation.

Activity 2

Instructional aim/focus: Practice of recall of TW from SPR cue.

Materials: 6 sets of 50 small flash cards (cardboard and paper, cello tape covering, 9.1 x 5.4 cm) SPR one side, TW the other side

Procedure: Small group activity (same groups of 4).

a) Small flash cards, one set of the target words per group. All cards are spread out on the table, SPR side up. Each student selects a card, and then states the TW. Student checks the word by turning over the card. If correct, card is kept. If incorrect, the card is turned back over. The student with the most cards 'wins'.

b) As per the first game, yet cards are shuffled and put in a pile. Students must choose the top card. If incorrect, then the card goes to the bottom of the deck.

Activity 3

Instructional aim/focus: Producing TWs from an SPR cue in a conversational setting.

Materials: Small flash cards, dialog (to be written on the board). See Appendix for dialog used.

Procedure: Paired activity.

a) Dialog written board.

b) Dialog practiced with teacher.

c) Students choose any one card, and then move around the classroom, pairing at random, and saying the dialog while holding the card SPR side facing their partner. Partners are changed multiple times.

Activity 4

Instructional aim/focus: Brief revision of target words, preparation of self-study.

Materials: Large flash cards, word list 1.1.

Procedure: Whole-class activity:

a) Instructor elicits all 10 TW from SPRs on large flash cards.

b) Wordlists are handed out for private study, instructions given for use of wordlists.

Instructions for use of wordlists: Use a piece of paper to cover the TWs. Look at the pictures only and try to say the English word. Slide the paper down to check your response. Change the order of the words, so that you do not recall the words in the same order each time.

Lesson 4: 1) Test of Wordlist 1.1. (Verbal)

Procedure:

a) Students given 1 plain sheet of paper each.

b) Cues read out by the teacher, students attempt to recall and write the TW.

c) Teacher reads out the answers (TWs), students check their responses.

d) All test papers collected.

2) Vocabulary instruction (L1 mode) Wordlist 1.2

Activity 1

Instructional aim/focus: Introduction of English written and phonetic form, practice of verbal form, students match TWs with Japanese words (L1 translations).

Materials: 10 large flash cards (cardboard and paper, 30.6 x 22.0 cm). Japanese words on one side.

Procedure: Whole-class activity. Students seated in groups of four.

a) Teacher writes TWs on chalkboard. Teacher pronounces words and students repeat.

b) Large SPR flashcards are lined up at the bottom of the chalkboard. TWs and cards are assigned numbers, which are written on the board. Groups are given time to guess which Japanese word matches each TW.

c) Groups give answers, correct answers revealed.

d) Teacher gathers up flashcards, and then uses the cards to elicit TWs from students verbally. If necessary, hints are given in the form of the first letter of the TW, then the second letter, third letter, etc. until a student or students answer correctly, or the answer is given by the teacher.

e) Brief explanation (in English) of word meaning, including usage examples and synonyms. Also, a brief explanation of any translational issues is related, including why one Japanese word was chosen over another. Students may use dictionaries during the explanation.

f) Teacher reviews all cards, saying the TW with students repeating, aiming for correct pronunciation.

Activity 2

Instructional aim/focus: Practice of recall of TW from L1 cue.

Materials: 6 sets of 50 small flash cards (cardboard and paper, cello tape covering, 9.1 x 5.4 cm) L1 one side, TW the other side

Procedure: Small group activity (same groups of 4).

a) Small flash cards, one set of the target words per group. All cards are spread out on the table, L1 side up. Each student selects a card, and then states the TW. Student checks the word by turning over the card. If correct, card is kept. If incorrect, the card is turned back over. The student with the most cards 'wins'.

b) As per the first game, yet cards are shuffled and put in a pile. Students must choose the top card. If incorrect, then the card goes to the bottom of the deck.

Activity 3:

Instructional aim/focus: Producing TWs from an L1 cue in a conversational setting.

Materials: Small flash cards, dialog (to be written on the board). See Appendix for dialog used.

Procedure: Paired activity.

a) Dialog written board.

b) Dialog practiced with teacher.

c) Students choose any one card, and then move around the classroom, pairing at random, and saying the dialog while holding the card L1 side facing their partner. Partners are changed multiple times.

Activity 4

Instructional aim/focus: Brief revision of target words, preparation of self-study.

Materials: Large flash cards, word list 1.2.

Procedure: Whole-class activity:

a) Instructor elicits all 10 TW from SPRs on large flash cards.

b) Wordlists are handed out for private study, instructions given for use of wordlists.

Instructions for use of wordlists: Use a piece of paper to cover the TWs. Look at the Japanese words only and try to say the English word. Slide the paper down to check your response. Change the order of the words, so that you do not recall the words in the same order each time.

Lesson 5: 1) Test of Wordlist 1.2 (Verbal). *Procedure:* Refer to Lesson 4.

2) Vocabulary instruction of Wordlist 1.3 (SPR mode). *Procedure:* Refer to Lesson 3.

Lesson 6: 1) Test of Wordlist 1.3 (Written).

Procedure: Students seated.

a) Distribution of testing sheets.

b) Students given 4 minutes to write answers. No talking or dictionary usage.

c) The teacher reads out the correct answers, students check their responses.

d) Test papers collected.

2) Vocabulary instruction wordlist 1.4 (L1 mode). *Procedure:* Refer to Lesson 4.

Lesson 7: 1) Test of Wordlist 1.4 (Written). *Procedure:* Refer to Lesson 6.

2) Vocabulary instruction of Wordlist 1.5 (SPR mode). *Procedure:* Refer to Lesson 3.

Lesson 8: 1) Test of Wordlist 1.5 (Verbal). *Procedure:* Refer to Lesson 4.

2) Vocabulary instruction Wordlist 1.6 (L1 mode). *Procedure:* Refer to Lesson 4.

Lesson 9: 1) Test of Wordlist 1.6 (Verbal). *Procedure:* Refer to Lesson 4.

2) Vocabulary instruction Wordlist 1.7 (SPR mode). *Procedure:* Refer to Lesson 3.

Lesson 10: 1) Test of Wordlist 1.7 (Written). *Procedure:* Refer to Lesson 6. 2) Vocabulary instruction Wordlist 1.8 (L1 mode). *Procedure:* Refer to Lesson 4.

Lesson 11: 1) Test of Wordlist 1.8 (Written). *Procedure:* Refer to Lesson 6.

2) Vocabulary instruction Wordlist 1.9 (SPR mode). *Procedure:* Refer to Lesson 3.

Lesson 12: 1) Test of Wordlist 1.9 (Verbal). *Procedure:* Refer to Lesson 4.

2) Vocabulary instruction Wordlist 1.10 (L1 mode). *Procedure:* Refer to Lesson 4.

Lesson 13: 1) Test of Wordlist 1.10 (Verbal). *Procedure:* Refer to Lesson 4.

2) Student focus group discussions.

Procedure:

a) Students sit in a group of 5.

b) Students reminded of the use of the recording device (as per the ethics guidelines), and also reminded that their comments have no effect upon their grade.

c) Students are given handouts with discussion questions.

d) Teacher reads the first question.

e) Students given adequate time to answer in the form of group discussion (in Japanese).

f) Step d) and e) are repeated for all 3 questions.

Lesson 14: 1) Test of Wordlist 1.10 (Verbal) continued*. Procedure:* Refer to Lesson 4.

2) Student focus group discussions continued. *Procedure:* Refer to Lesson 13.

Lesson 15: Post-test *Procedure:* As per Pre-test. Refer to Lesson 2.

Lesson 16: Student surveys. *Procedure:* Surveys distributed, filled out by students, and then collected.

Appendix J: Study 2 Lesson Details

Study 2 Lesson Details

Lesson 1: 1) Study ethics guideline reminder and general course administration

Lesson 2: 1) Pre-test. Students given 45 minutes to complete test; usual test conditions (no talking, no dictionary usage).

Lesson 3: 1) Vocabulary instruction (SPR mode) Wordlist 2.1.

Activity 1

Instructional aim/focus: Introduction of TWs in written, phonetic and SPR form: practice of verbal form, comprehension of meaning, practice of recall from SPR.

Materials: Large television monitor, *PowerPoint* presentation featuring 10 words (wordlist 2.1) in English (L2) form and SPR form.

Procedure: Whole-class activity.

a) Teacher scrolls through words, reads TWs and students repeat.

b) Teacher forwards slide to each word, explains meaning of the TW (in English) using definitions, synonyms usage examples. Students permitted to look-up word in dictionaries.

c) Teacher forwards slide to TW's SPR; describes the picture and explains how it relates to the TW's meaning.

d) Teacher displays each SPR, students recall TW verbally. If necessary, hints are given in the form of the first letter of the TW, then the second letter, third letter, etc. until a student or students answer correctly, or the answer is given by the teacher.

Activity 2

Instructional aim/focus: Verbal recall of TW from SPR cues only, in random order.

Materials: Large television monitor, 'folder' on 'desktop' containing TWs (Wordlist 2.1) in SPR form (files in *.png* format). Files are displayed in *Windows 8* 'Large Icon' mode.

Procedure: Whole-class activity.

a) Teacher highlights files in random order. Students recall TWs from SPRs as per Activity 1, step.

b) Teacher rests the cursor on files at random, students recall TW from highlighted SPR, done at an increasingly fast pace.

Activity 3

Instructional aim/focus: Producing TWs from an SPR cue in a conversational setting.

Materials: Large television monitor, 'folder' on 'desktop' containing TWs (Wordlist 2.1) in SPR form (files in *.png* format). Files are displayed in *Windows 8* 'Large Icon' mode.

Procedure: Paired activity.

a) Dialog written board. See Appendix for dialog.

b) Dialog practiced with teacher.

c) Students choose any SPR, and then move around the classroom, pairing at random, and saying the dialog with their partners. Partners are changed multiple times.

Activity 4

Instructional aim/focus: Brief revision of target words, preparation of self-study.

Materials: 1. *PowerPoint* presentation (as per Activity 1). 2. *Google sites* website containing *.png* files and text. Found at: https://sites.google.com/site/vocabularyresearch/home.

Procedure: Whole-class activity:

a) Teacher revises all words using *PowerPoint* file as per Activity 1.

b) Students given *Google sites* address and instructions for usage: 1) Go to site (no need for password). 2) Click on the relevant wordlist on the left of the page. 2) Click on a word on the left of the page, for example, 'Word 7'. 3) Look at the image, and say the word. 4) Click under the word, for example 'Word 7 answer', and the word will appear. Check to see if you are correct. Click on another word on the left of the screen, for example 'Word 2' and repeat steps 3 and 4. Additional: Change the order of the words at random; don't use the same order. If you need to hear the pronunciation of the word, put the word in the Google search engine with the word 'definition'. Click on the sound icon for a sound-bite of the word. Practice as much as you can, preferably every day.

Lesson 4: 1) Vocabulary instruction (L1 mode) Wordlist 2.2.

Activity 1

Instructional aim/focus: Introduction of TWs in written, phonetic and SPR form: practice of verbal form, comprehension of meaning, practice of recall from L1.

Materials: Large television monitor, *PowerPoint* presentation featuring 10 words (wordlist 2.2) in English (L2) form and (L1) Japanese form.

Procedure: Whole-class activity.

a) Teacher scrolls through words, reads TWs and students repeat.

b) Teacher forwards slide to each word, explains meaning of the TW (in English) using definitions, synonyms usage examples. Students permitted to look-up word in dictionaries.

c) Teacher forwards slide to TW's L1 translation; explains any translational issues that may have occurred when selecting a Japanese word to represent the TW.

d) Teacher displays eachL1 word, students recall TW verbally. If necessary, hints are given in the form of the first letter of the TW, then the second letter, third letter, etc. until a student or students answer correctly, or the answer is given by the teacher.

Activity 2

Instructional aim/focus: Verbal recall of TW from L1 cues only, in random order.

Materials: Large television monitor, 'folder' on 'desktop' containing TWs (Wordlist 2.1) in L1 (Japanese) form (files in *.png* format). Files are displayed in *Windows 8* 'Large Icon' mode.

Procedure: Whole-class activity.

a) Teacher opens files in random order. Students recall TWs from L1 translation as per Activity 1, step.

b) Teacher rests the cursor on files at random, students recall TW from highlighted L1 word, done at an increasingly fast pace.

Activity 3

Instructional aim/focus: Producing TWs from an L1 translational cue in a conversational setting.

Materials: Large television monitor, 'folder' on 'desktop' containing TWs (Wordlist 2.1) in L1 translational form (files in *.png* format). Files are displayed in *Windows 8* 'Large Icon' mode.

Procedure: Paired activity.

a) Dialog written board. See Appendix for dialog.

b) Dialog practiced with teacher.

c) Students choose any Japanese, and then move around the classroom, pairing at random, and saying the dialog with their partners. Partners are changed multiple times.

Activity 4

Instructional aim/focus: Brief revision of target words, preparation of self-study.

Materials: 1. *PowerPoint* presentation (as per Activity 1). 2. *Google sites* website containing *.png* files and text. Found at: https://sites.google.com/site/vocabulary research/home.

Procedure: Whole-class activity:

a) Teacher revises all words using *PowerPoint* file as per Activity 1.

b) Students given *Google sites* address and instructions for usage: 1) Go to site (no need for password). 2) Click on the relevant wordlist on the left of the page. 2) Click on a word on the left of the page, for example, 'Word 7'. 3) Look at the Japanese word, and say the word. 4) Click under the word, for example 'Word 7 answer', and the word will appear. Check to see if you are correct. Click on another word on the left of the screen, for example 'Word 2' and repeat steps 3 and 4. Additional: Change the order of the words at random; don't use the same order. If you need to hear the pronunciation of the word, put the word in the Google search engine with the word 'definition'. Click on the sound icon for a sound-bite of the word. Practice as much as you can, preferably every day.

Lesson 5: 1) Test of Wordlist 2.2 (Verbal). *Procedure:* Refer to Lesson 4.

2) Vocabulary instruction of Wordlist 2.3 (SPR mode). *Procedure:* Refer to Lesson 3.

Lesson 6: 1) Test of Wordlist 2.3 (Written).

Procedure:

a) Distribution of testing sheets.

b) Students given 4 minutes to write answers. No talking or dictionary usage.

c) The teacher reads out the correct answers, students check their responses.

d) Test papers collected.

2) Vocabulary instruction wordlist 2.4 (L1 mode). *Procedure:* Refer to Lesson 4.

Lesson 7: 1) Test of Wordlist 1.4 (Written). *Procedure:* Refer to Lesson 6.

2) Vocabulary instruction of Wordlist 2.5 (SPR mode). *Procedure:* Refer to Lesson 3.

Lesson 8: 1) Test of Wordlist 1.5 (Verbal). *Procedure:* Refer to Lesson 4.

2) Vocabulary instruction Wordlist 2.6 (L1 mode). *Procedure:* Refer to Lesson 4.

Lesson 9: 1) Test of Wordlist 2.6 (Verbal). *Procedure:* Refer to Lesson 4.

2) Vocabulary instruction Wordlist 2.7 (SPR mode). *Procedure:* Refer to Lesson 3.

Lesson 10: 1) Test of Wordlist 2.7 (Written). *Procedure:* Refer to Lesson 6.

2) Vocabulary instruction Wordlist 2.8 (L1 mode). *Procedure:* Refer to Lesson 4.

Lesson 11: 1) Test of Wordlist 2.8 (Written). *Procedure:* Refer to Lesson 6.

2) Vocabulary instruction Wordlist 2.9 (SPR mode). *Procedure:* Refer to Lesson 3.

Lesson 12: 1) Test of Wordlist 2.9 (Verbal). *Procedure:* Refer to Lesson 4.

2) Vocabulary instruction Wordlist 2.10 (L1 mode). *Procedure:* Refer to Lesson 4.

Lesson 13: 1) Test of Wordlist 2.10 (Verbal). *Procedure:* Refer to Lesson 4.

2) Student focus group discussions. *Procedure:*

a) Students sit in a group of 5.

b) Students reminded of the use of the recording device (as per the ethics guidelines), and also reminded that their comments have no effect upon their grade.

c) Students are given handouts with discussion questions.

d) Teacher reads the first question.

e) Students given adequate time to answer in the form of group discussion (in Japanese).

f) Step d) and e) are repeated for all 3 questions.

Lesson 14: 1) Test of Wordlist 2.10 (Verbal) continued. *Procedure:* Refer to Lesson 4.

Student focus group discussions continued. *Procedure:* Refer to Lesson 13.

Lesson 15: Post-test *Procedure:*   As per Pre-test. Refer to Lesson 2.

Lesson 16: Student surveys*. Procedure:* Surveys distributed, filled out by students, and then collected.

Appendix K: Study 1 Participant Test Scores

Table K1

Study 1 Class A Pre-test and Post-test Participant Scores (N=25)

ID	Pre-test			Post-test			Increases		
	SPR	L1	Total	SPR	L1	Total	SPR	L1	Total
1A1	12	2	14	47	44	91	35	42	77
1A2	14	13	27	27	29	56	13	16	29
1A3	4	4	8	38	40	78	34	36	70
1A4	10	5	15	43	40	83	33	35	68
1A5	10	11	21	48	47	95	38	36	74
1A6	10	11	21	48	49	97	38	38	76
1A7	5	11	16	44	33	77	39	22	61
1A8	9	6	15	46	46	92	37	40	77
1A9	6	1	7	18	20	38	12	19	31
1A10	10	10	20	27	28	55	17	18	35
1A11	5	3	8	35	30	65	30	27	57
1A12	14	3	17	41	46	87	27	43	70
1A13	6	8	14	38	32	70	32	24	56
1A14	9	8	17	44	40	84	35	32	67
1A15	6	3	9	32	27	59	26	24	50
1A16	3	8	11	39	35	74	36	27	63
1A17	6	10	16	40	37	77	34	27	61
1A18	9	6	15	39	41	80	30	35	65
1A19	9	7	16	32	33	65	23	26	49
1A20	7	7	14	43	36	79	36	29	65
1A21	8	12	20	29	31	60	21	19	40
1A22	6	2	8	36	39	75	30	37	67
1A23	9	7	16	34	28	62	25	21	46
1A24	4	8	12	7	9	16	3	1	4
1A25	9	6	15	46	41	87	37	35	72
Total	200	172	372	921	881	1802	721	709	1430
M	8	6.88	14.88	36.84	35.24	72.08	28.84	28.36	57.2
SD	2.93	3.42	4.80	9.78	9.10	18.48	9.42	9.78	18.03

Note. ID=Participant Identification number.

Table K2

Study 1 Class B Pre-test and Post-test Participant Scores (N=23)

ID	Pre-test			Post-test			Increases		
	SPR	L1	Total	SPR	L1	Total	SPR	L1	Total
1B1	2	2	4	25	25	50	23	23	46
1B2	1	2	3	17	22	39	16	20	36
1B3	8	8	16	25	21	46	17	13	30
1B4	4	6	10	19	24	43	15	18	33
1B5	4	4	8	40	34	74	36	30	66
1B6	5	9	14	36	29	65	31	20	51
1B7	1	2	3	34	18	52	33	16	49
1B8	4	3	7	34	37	71	30	34	64
1B9	0	0	0	13	7	20	13	7	20
1B10	5	3	8	27	32	59	22	29	51
1B11	2	1	3	9	11	20	7	10	17
1B12	9	10	19	26	28	54	17	18	35
1B13	4	5	9	45	38	83	41	33	74
1B14	3	4	7	7	9	16	4	5	9
1B15	1	1	2	42	37	79	41	36	77
1B16	0	0	0	19	21	40	19	21	40
1B17	0	1	1	24	26	50	24	25	49
1B18	8	7	15	39	40	79	31	33	64
1B19	5	4	9	47	41	88	42	37	79
1B21	2	0	2	29	24	53	27	24	51
1B22	5	7	12	31	26	57	26	19	45
1B23	7	9	16	41	36	77	34	27	61
1B24	5	2	7	17	23	40	12	21	33
Total	85	90	175	646	609	1255	561	519	1080
M	3.70	3.91	7.61	28.09	26.48	54.57	24.39	22.57	46.96
SD	2.67	3.15	5.62	11.47	9.62	20.46	10.87	8.99	18.97

Note. ID=Participant Identification number.

Table K3

Study 1 Class A Participant Weekly Test Scores (N=25).

ID	T1 SPR	T2 L1	T3 SPR	T4 L1	T5 SPR	T6 L1	T7 SPR	T8 L1	T9 SPR	T10 L1	*Total*	*M*	*SD*
1A1	6	5	**8**	7	3	5	9	7	7	2	59	5.9	2.07
1A2	5	9	9	6	6	6	10	9	4	7	71	7.1	1.92
1A3	7	8	8	9	7	5	10	9	7	1	71	7.1	2.43
1A4	3	10	10	10	4	7	9	10	6	6	75	7.5	2.54
1A5	10	9	10	9	6	6	8	8	5	1	72	7.2	2.64
1A6	8	8	8	10	9	8	10	10	5	6	82	8.2	1.60
1A7	10	**8**	10	9	5	5	10	9	6	2	74	7.4	2.62
1A8	8	8	8	9	6	6	10	9	4	2	70	7	2.37
1A9	5	7	8	**8**	5	4	7	6	7	1	58	5.8	2.04
1A10	9	9	9	9	5	4	10	10	10	1	76	7.6	2.97
1A11	8	7	7	9	8	8	7	8	4	8	74	7.4	1.28
1A12	7	**8**	7	**8**	5	6	**9**	7	6	1	64	6.4	2.11
1A13	9	**8**	4	8	4	4	9	8	5	6	65	6.5	2.01
1A14	10	10	6	8	6	5	10	10	7	2	74	7.4	2.58
1A15	7	6	7	8	4	5	9	9	7	0	62	6.2	2.56
1A16	9	7	10	10	5	6	10	9	8	7	81	8.1	1.70
1A17	8	9	6	9	8	7	10	10	6	5	78	7.8	1.66
1A18	10	10	8	8	8	5	9	8	4	2	72	7.2	2.52
1A19	9	8	9	8	6	6	8	8	5	2	69	6.9	2.07
1A20	10	10	10	9	3	4	6	10	8	1	71	7.1	3.21
1A21	9	9	8	9	4	7	5	9	8	5	73	7.3	1.85
1A22	8	9	8	6	5	5	6	6	5	1	59	5.9	2.12
1A23	6	9	8	5	5	3	7	6	5	1	55	5.5	2.20
1A24	8	8	4	5	5	7	7	5	6	1	56	5.6	2.01
1A25	10	10	10	7	7	7	10	7	7	1	76	7.6	2.62

Note. ID = Participant identification number; T = Test number. Average class scores (rounded to one unit) due to participant absence are in bold face.

Table K4

Study 1 Class B Participant Weekly Test Scores (N=24).

ID	T1 SPR	T2 L1	T3 SPR	T4 L1	T5 SPR	T6 L1	T7 SPR	T8 L1	T9 SPR	T10 L1	*Total*	*M*	*SD*
1B1	9	6	9	5	4	**6**	7	9	5	0	60	6	2.79
1B2	5	7	5	9	2	6	7	10	4	2	57	5.7	2.67
1B3	7	8	9	6	6	5	7	8	6	4	66	6.6	1.51
1B4	10	9	9	9	5	7	7	7	7	3	73	7.3	2.11
1B5	5	9	7	5	4	5	8	6	6	5	60	6	1.56
1B6	9	7	6	10	7	6	6	9	4	1	65	6.5	2.64
1B7	7	4	7	6	6	6	8	9	**5**	0	58	5.8	2.49
1B8	8	8	10	10	**5**	3	6	9	5	1	65	6.5	3.03
1B9	2	5	6	8	6	4	4	10	6	5	56	5.6	2.22
1B10	8	10	8	9	4	5	6	9	6	0	65	6.5	2.99
1B11	7	4	6	3	4	6	3	5	3	3	44	4.4	1.51
1B12	6	7	10	7	4	6	8	10	5	5	68	6.8	2.04
1B13	10	8	10	8	3	7	7	8	4	4	69	6.9	2.47
1B14	9	4	9	**7**	5	7	6	8	3	4	62	6.2	2.15
1B15	7	7	5	10	4	6	7	8	5	1	60	6	2.45
1B16	5	8	4	4	5	5	4	7	5	4	51	5.1	1.37
1B17	8	2	7	4	2	5	4	6	3	7	48	4.8	2.15
1B18	10	6	8	5	6	5	6	10	8	6	70	7	1.89
1B19	7	10	6	8	6	**6**	8	9	6	5	71	7.1	1.60
1B20	6	5	6	5	5	4	7	8	6	0	52	5.2	2.15
1B21	5	10	7	7	4	5	7	6	6	0	57	5.7	2.58
1B22	5	7	10	6	5	9	9	7	8	1	67	6.7	2.63
1B23	9	8	9	6	4	6	7	9	6	1	65	6.5	2.55
1B24	5	8	7	6	**5**	**6**	3	5	5	3	53	5.3	1.57

Note. ID = Participant identification number; T = Test number. Average class scores (rounded to one unit) due to participant absence are in bold face.

Appendix L: Study 2 Participant Test Scores

Table L1

Study 2 Class A Pre-test and Post-test Participant Scores (N=25)

ID	Pre-test			Post-test			Increases		
	SPR	L1	Total	SPR	L1	Total	SPR	L1	Total
2A2	7	10	17	42	42	84	35	32	67
2A3	1	1	2	17	22	39	16	21	37
2A4	2	3	5	34	37	71	32	34	66
2A5	13	7	20	46	39	85	33	32	65
2A6	6	7	13	49	48	97	43	41	84
2A7	14	5	19	37	41	78	23	36	59
2A8	1	2	3	26	24	50	25	22	47
2A9	0	1	1	16	20	36	16	19	35
2A10	1	2	3	12	22	34	11	20	31
2A11	4	5	9	29	30	59	25	25	50
2A12	5	5	10	28	29	57	23	24	47
2A13	1	2	3	15	21	36	14	19	33
2A14	2	2	4	19	19	38	17	17	34
2A15	1	3	4	22	20	42	21	17	38
2A16	3	1	4	31	34	65	28	33	61
2A17	3	5	8	31	31	62	28	26	54
2A18	0	4	4	25	35	60	25	31	56
2A19	2	3	5	25	33	58	23	30	53
2A20	1	3	4	9	21	30	8	18	26
2A21	4	7	11	9	14	23	5	7	12
2A22	1	5	6	36	37	73	35	32	67
2A23	1	4	5	6	12	18	5	8	13
2A24	6	6	12	14	18	32	8	12	20
2A25	1	2	3	45	45	90	44	43	87
2A26	1	1	2	13	12	25	12	11	23
Total	81	96	177	636	706	1342	555	610	1165
M	3.24	3.84	7.08	25.44	28.24	53.68	22.2	24.4	46.6
SD	3.65	2.34	5.45	12.49	10.53	22.68	11.06	9.84	20.45

Note. ID=Participant Identification number.

Table L2

Study 2 Class B Pre-test and Post-test Participant Scores (N=23)

ID	Pre-test			Post-test			Increases		
	SPR	L1	Total	SPR	L1	Total	SPR	L1	Total
2B1	1	2	3	6	7	13	5	5	10
2B2	1	0	1	5	3	8	4	3	7
2B3	5	3	8	15	9	24	10	6	16
2B4	1	2	3	4	9	13	3	7	10
2B5	4	2	6	10	7	17	6	5	11
2B6	4	5	9	15	19	34	11	14	25
2B7	1	2	3	2	7	9	1	5	6
2B8	1	1	2	6	9	15	5	8	13
2B9	1	0	1	2	0	2	1	0	1
2B10	3	3	6	11	15	26	8	12	20
2B11	0	1	1	5	11	16	5	10	15
2B12	3	1	4	12	9	21	9	8	17
2B13	5	2	7	31	33	64	26	31	57
2B14	1	0	1	4	7	11	3	7	10
2B15	3	0	3	26	22	48	23	22	45
2B16	0	0	0	1	1	2	1	1	2
2B17	0	1	1	1	2	3	1	1	2
2B18	2	2	4	24	23	47	22	21	43
2B20	1	0	1	5	6	11	4	6	10
2B21	0	4	4	10	15	25	10	11	21
2B22	1	1	2	4	12	16	3	11	14
2B23	5	6	11	11	14	25	6	8	14
2B24	2	3	5	3	5	8	1	2	3
Total	45	41	86	213	245	458	168	204	372
M	1.96	1.78	3.74	9.26	10.65	19.91	7.30	8.87	16.17
SD	1.69	1.65	2.93	8.23	7.86	15.70	7.19	7.42	14.35

Note. ID=Participant Identification number.

Table L3

Study 2 Class A Participant Weekly Test Scores.

ID	T1 SPR	T2 L1	T3 SPR	T4 L1	T5 SPR	T6 L1	T7 SPR	T8 L1	T9 SPR	T10 L1	*Total*	*M*	*SD*
2A1	4	**4**	5	2	4	6	3	2	4	1	35	3.5	1.51
2A2	9	4	7	5	8	7	4	7	6	1	58	5.8	2.35
2A3	3	3	3	8	6	7	8	8	3	2	51	5.1	2.51
2A4	10	5	10	5	4	5	5	8	5	0	57	5.7	2.98
2A5	7	5	8	4	8	9	7	7	5	5	65	6.5	1.65
2A6	6	8	8	10	8	10	8	8	6	5	77	7.7	1.64
2A7	6	3	10	8	7	7	3	6	5	4	59	5.9	2.23
2A8	4	4	7	3	4	5	6	5	3	1	42	4.2	1.69
2A9	2	5	0	2	2	7	2	4	2	0	26	2.6	2.17
2A10	7	3	10	6	5	**7**	1	0	4	3	46	4.6	3.03
2A11	9	5	7	5	2	7	7	5	4	4	55	5.5	2.01
2A12	8	1	10	7	5	**7**	6	5	**5**	0	54	5.4	3.03
2A13	8	3	8	**6**	3	8	2	7	7	5	57	5.7	2.31
2A14	8	4	7	4	7	7	**5**	5	5	3	55	5.5	1.65
2A15	4	3	6	7	6	4	4	4	4	1	43	4.3	1.70
2A16	9	5	6	10	7	10	3	9	8	5	72	7.2	2.39
2A17	8	4	7	7	8	10	**5**	6	6	3	64	6.4	2.07
2A18	6	2	5	7	7	8	6	7	5	6	59	5.9	1.66
2A19	7	3	7	5	**6**	6	4	**5**	3	4	50	5	1.49
2A20	8	3	8	6	7	8	5	2	5	4	56	5.6	2.17
2A21	4	3	4	5	3	3	4	2	3	1	32	3.2	1.14
2A22	3	1	7	4	5	5	6	5	4	2	42	4.2	1.81
2A23	6	2	7	3	3	4	4	3	5	1	38	3.8	1.81
2A24	8	4	7	8	7	7	2	5	4	2	54	5.4	2.32
2A25	7	5	6	8	7	7	5	6	8	7	66	6.6	1.07
2A26	5	**4**	1	3	4	4	**5**	**5**	7	1	39	3.9	1.85

Note. ID = Participant identification number; T = Test number. Average class scores (rounded to one unit) due to participant absence are in bold face.

Table L4

Study 2 Class B Participant Weekly Test Scores.

ID	T1 SPR	T2 L1	T3 SPR	T4 L1	T5 SPR	T6 L1	T7 SPR	T8 L1	T9 SPR	T10 L1	*Total*	*M*	*SD*
2B1	6	**3**	6	**5**	0	7	3	4	5	0	39	3.9	2.42
2B2	8	4	4	4	2	6	1	3	4	3	39	3.9	1.97
2B3	5	1	5	7	3	4	4	3	6	1	39	3.9	1.97
2B4	5	0	1	4	3	6	4	2	4	3	32	3.2	1.81
2B5	4	2	1	4	4	2	3	0	1	0	21	2.1	1.60
2B6	2	5	7	3	2	9	2	3	4	3	40	4	2.36
2B7	4	2	2	6	2	6	5	3	**6**	**5**	41	4.1	1.73
2B8	1	3	7	4	3	4	3	5	5	0	35	3.5	2.01
2B9	1	1	2	6	0	8	5	6	5	4	38	3.8	2.66
2B10	2	4	7	5	3	7	**4**	6	4	1	43	4.3	2.00
2B11	0	5	1	5	6	7	3	1	2	2	32	3.2	2.39
2B12	8	3	7	7	5	5	1	7	4	4	51	5.1	2.18
2B13	7	2	10	6	4	8	2	4	6	2	51	5.1	2.77
2B14	5	3	3	6	4	**6**	0	1	3	2	33	3.3	2.00
2B15	10	1	6	8	6	6	6	3	6	3	55	5.5	2.59
2B16	8	3	6	5	2	4	6	3	5	2	44	4.4	1.96
2B17	1	**3**	4	3	2	4	4	4	2	3	30	3	1.05
2B18	7	2	7	6	8	9	5	4	4	5	57	5.7	2.11
2B19	8	3	10	5	6	9	8	7	5	5	66	6.6	2.17
2B20	5	2	7	4	2	3	2	7	6	3	41	4.1	2.02
2B21	9	3	7	4	4	6	3	6	3	5	50	5	2
2B22	1	2	4	1	5	4	4	5	3	0	29	2.9	1.79
2B23	7	4	8	7	2	4	8	5	6	6	57	5.7	1.95
2B24	3	6	**5**	2	0	3	1	4	5	1	30	3	2

Note. ID = Participant identification number; *T* = Test number. Average class scores (rounded to one unit) due to participant absence are in bold face.

Appendix M: Study 1 Target Word Recalls

Table M

Study 1 Target Word Testing Recalls

	Pre-test		Post-test		Pre/post-test increase			Weekly Testing		
	Total	*M*	Total	*M*	Total	*M*	Rank	Total	*M*	Rank
Wordlist 1 (SPR)										
tropical	7	0.15	44	0.92	37	0.77	7	47	0.96	3
Predict	5	0.10	17	0.35	12	0.25	32	34	0.69	16
temporary	0	0.00	36	0.75	36	0.75	8	26	0.53	24
arbitrary	0	0.00	23	0.48	23	0.48	21	32	0.65	18
concurrent	0	0.00	23	0.48	23	0.48	21	34	0.69	16
devalue	0	0.00	38	0.79	38	0.79	6	45	0.92	5
deadline	19	0.40	39	0.81	20	0.42	24	28	0.57	22
finite	0	0.00	39	0.81	39	0.81	5	36	0.73	14
additional	8	0.17	36	0.75	28	0.58	16	32	0.65	18
duty	34	0.71	45	0.94	11	0.23	33	49	1.02	1
Wordlist 2 (L1)										
visual	20	0.42	38	0.79	18	0.38	26	32	0.65	18
parallel	14	0.29	43	0.90	29	0.60	15	42	0.86	8
obsolete	0	0.00	27	0.56	27	0.56	17	32	0.65	18
ruin	9	0.19	39	0.81	30	0.63	14	35	0.71	15
extra	18	0.38	42	0.88	24	0.50	20	41	0.84	9
vindictive	0	0.00	34	0.71	34	0.71	10	41	0.84	9
mindset	0	0.00	20	0.42	20	0.42	24	30	0.61	20
stand out	1	0.02	12	0.25	11	0.23	33	35	0.71	15
outcome	5	0.10	45	0.94	40	0.83	4	34	0.69	16
reluctant	5	0.10	27	0.56	22	0.46	22	31	0.63	19
Wordlist 3 (SPR)										
avoid	7	0.15	34	0.71	27	0.56	17	44	0.90	6
integral	1	0.02	10	0.21	9	0.19	34	32	0.65	18
volatile	0	0.00	36	0.75	36	0.75	8	31	0.63	19
dilemma	0	0.00	29	0.60	29	0.60	15	45	0.92	5
dogma	3	0.10	45	0.94	42	0.88	2	32	0.65	18
abstract	6	0.13	31	0.65	25	0.52	19	38	0.78	12

tolerance	2	0.04	30	0.63	28	0.58	16	21	0.43	27
traditional	16	0.33	41	0.85	25	0.52	19	44	0.90	6
hangover	2	0.04	40	0.83	38	0.79	6	48	0.98	2
unpopular	10	0.21	45	0.94	35	0.73	9	39	0.80	11
Wordlist 4 (L1)										
presume	2	0.04	33	0.69	31	0.65	13	34	0.69	16
doubt	9	0.19	25	0.52	16	0.33	28	32	0.65	18
unrealistic	0	0.00	34	0.71	34	0.71	10	41	0.84	9
maintenance	4	0.08	36	0.75	32	0.67	12	35	0.71	15
significant	6	0.13	34	0.71	28	0.58	16	27	0.55	23
envy	16	0.33	45	0.94	29	0.60	15	46	0.94	4
innovate	0	0.00	22	0.46	22	0.46	22	35	0.71	15
translucent	1	0.02	31	0.65	30	0.63	14	40	0.82	10
insist	0	0.00	7	0.15	7	0.15	36	26	0.53	24
consequent	0	0.00	15	0.31	15	0.31	29	27	0.55	23
Wordlist 5 (SPR)										
discrimination	2	0.04	25	0.52	23	0.48	21	32	0.65	18
negotiation	14	0.29	38	0.79	24	0.50	20	30	0.61	20
typical	36	0.75	44	0.92	8	0.17	35	20	0.41	29
insolent	1	0.02	18	0.38	17	0.35	27	37	0.76	13
scope	0	0.00	26	0.54	26	0.54	18	20	0.41	29
impetus	1	0.02	20	0.42	19	0.40	25	8	0.16	40
subsidiary	0	0.00	28	0.58	28	0.58	16	14	0.29	34
agree	35	0.73	48	1.00	13	0.27	31	45	0.92	5
vandalism	0	0.00	37	0.77	37	0.77	7	21	0.43	27
assign	2	0.04	21	0.44	19	0.40	25	17	0.35	31
Wordlist 6 (L1)										
toxic	5	0.10	44	0.92	39	0.81	5	43	0.88	7
phenomenon	6	0.13	37	0.77	31	0.65	13	21	0.43	27
provoke	0	0.00	32	0.67	32	0.67	12	25	0.51	25
controversy	1	0.02	21	0.44	20	0.42	24	23	0.47	26
contaminate	1	0.02	22	0.46	21	0.44	23	25	0.51	25
differentiate	0	0.00	23	0.48	23	0.48	21	35	0.71	15
flattery	2	0.04	38	0.79	36	0.75	8	28	0.57	22
virtual	0	0.00	25	0.52	25	0.52	19	11	0.22	37

distort	2	0.04	15	0.31	13	0.27	31	16	0.33	32
sans	0	0.00	29	0.60	29	0.60	15	35	0.71	15

Wordlist 7
(SPR)

fireworks	6	0.13	33	0.69	27	0.56	17	38	0.78	12
intrinsic	0	0.00	8	0.17	8	0.17	35	26	0.53	24
inappropriate	0	0.00	13	0.27	13	0.27	31	38	0.78	12
include	7	0.15	22	0.46	15	0.31	29	28	0.57	22
suspicious	0	0.00	26	0.54	26	0.54	18	33	0.67	17
frustration	12	0.25	35	0.73	23	0.48	21	44	0.90	6
policy	5	0.10	40	0.83	35	0.73	9	38	0.78	12
chores	3	0.06	38	0.79	35	0.73	9	44	0.90	6
logic	5	0.10	38	0.79	33	0.69	11	25	0.51	25
seasickness	2	0.04	46	0.96	44	0.92	1	45	0.92	5

Wordlist 8
(L1)

x-ray	24	0.5	48	1.00	24	0.50	20	43	0.88	7
hemisphere	7	0.15	42	0.88	35	0.73	9	43	0.88	7
identical	5	0.10	42	0.88	37	0.77	7	37	0.76	13
livelihood	0	0.00	25	0.52	25	0.52	19	30	0.61	20
worthless	15	0.31	44	0.92	29	0.60	15	48	0.98	2
directly	22	0.46	25	0.52	3	0.06	37	34	0.69	16
rural	21	0.44	43	0.90	22	0.46	22	47	0.96	3
abandon	1	0.02	19	0.40	18	0.38	26	38	0.78	12
saturate	0	0.00	24	0.50	24	0.50	20	39	0.80	11
incessant	1	0.02	17	0.35	16	0.33	28	40	0.82	10

Wordlist 9
(SPR)

occupation	10	0.21	42	0.88	32	0.67	12	20	0.41	29
incentive	0	0.00	12	0.25	12	0.25	32	19	0.39	30
predominant	0	0.00	14	0.29	14	0.29	30	27	0.55	23
snore	0	0.00	41	0.85	41	0.85	3	47	0.96	3
principle	4	0.08	25	0.52	21	0.44	23	13	0.27	35
camouflage	2	0.04	38	0.79	36	0.75	8	27	0.55	23
calm	9	0.19	36	0.75	27	0.56	17	44	0.90	6
deviate	0	0.00	20	0.42	20	0.42	24	29	0.59	21
ambiguous	8	0.17	32	0.67	24	0.50	20	35	0.71	15
ethics	1	0.02	22	0.46	21	0.44	23	10	0.20	38

Wordlist 10
(L1)

compel	4	0.08	28	0.58	24	0.50	20	0	0.00	42
sanction	1	0.02	18	0.38	17	0.35	27	8	0.16	40
interfere	0	0.00	8	0.17	8	0.17	35	6	0.12	41
apologize	25	0.52	40	0.83	15	0.31	29	40	0.82	10
asset	0	0.00	26	0.54	26	0.54	18	12	0.24	36
enduring	0	0.00	28	0.58	28	0.58	16	9	0.18	39
fallacy	0	0.00	24	0.50	24	0.50	20	8	0.16	40
vertical	4	0.08	28	0.58	24	0.50	20	15	0.31	33
collide	0	0.00	27	0.56	27	0.56	17	16	0.33	32
acid	5	0.10	39	0.81	34	0.71	10	19	0.39	28

Note. Rank = The order of the frequency of recalls, the highest being number 1.

Appendix N: Study 2 Target Word Recalls

Table N

Study 2 Target Word Testing Recalls

	Pre-test		Post-test		Pre/post-test increase			Weekly Testing		
	Total	*M*	Total	*M*	Total	*M*	Rank	Total	*M*	Rank
Wordlist 1 (SPR)										
inconsistent	1	0.02	8	0.17	7	0.14	27	24	0.48	17
reside	2	0.04	25	0.52	23	0.46	11	36	0.72	7
superficial	2	0.04	23	0.48	21	0.42	13	45	0.90	2
tangible	0	0.00	15	0.31	15	0.30	19	31	0.62	11
modify	3	0.06	21	0.44	18	0.36	16	25	0.50	16
respective	1	0.02	11	0.23	10	0.20	24	18	0.36	23
skeleton	9	0.19	39	0.81	30	0.60	5	30	0.60	12
alternative	16	0.33	36	0.75	20	0.40	14	18	0.36	23
deprive	3	0.06	15	0.31	12	0.24	22	25	0.50	16
devote	2	0.04	17	0.35	15	0.30	19	30	0.60	12
Wordlist 2 (L1)										
transmit	1	0.02	15	0.31	14	0.28	20	21	0.42	20
military	8	0.17	23	0.48	15	0.30	19	7	0.14	33
ignorance	3	0.06	32	0.67	29	0.58	6	25	0.50	16
insight	0	0.00	6	0.13	6	0.12	28	5	0.10	35
pole	5	0.10	37	0.77	32	0.64	3	37	0.74	6
prevail	1	0.02	17	0.35	16	0.32	18	17	0.34	24
purchase	7	0.15	30	0.63	23	0.46	11	18	0.36	23
incorporate	0	0.00	5	0.10	5	0.10	29	4	0.08	36
sustain	3	0.06	15	0.31	12	0.24	22	6	0.12	34
deduce	0	0.00	10	0.21	10	0.20	24	8	0.16	32
Wordlist 3 (SPR)										
forgo	1	0.02	18	0.38	17	0.34	17	33	0.66	10
bias	4	0.08	25	0.52	21	0.42	13	35	0.70	8
irrigate	4	0.08	26	0.54	22	0.44	12	36	0.72	7
infrastructure	1	0.02	9	0.19	8	0.16	26	26	0.52	15
converge	0	0.00	11	0.23	11	0.22	23	28	0.56	14
perpetual	2	0.04	13	0.27	11	0.22	23	26	0.52	15

eliminate	7	0.15	25	0.52	18	0.36	16	26	0.52	15
subsidy	1	0.02	8	0.17	7	0.14	27	31	0.62	11
affluence	3	0.06	20	0.42	17	0.34	17	33	0.66	10
hypothesis	4	0.08	24	0.50	20	0.40	14	16	0.32	25

Wordlist 4

(L1)

explicit	0	0.00	13	0.27	13	0.26	21	12	0.24	28
vary	2	0.04	29	0.60	27	0.54	7	30	0.60	12
impose	1	0.02	12	0.25	11	0.22	23	22	0.44	19
straightforward	0	0.00	16	0.33	16	0.32	18	21	0.42	20
colleague	14	0.29	33	0.69	19	0.38	15	37	0.74	6
manipulate	0	0.00	24	0.50	24	0.48	10	17	0.34	24
criteria	0	0.00	18	0.38	18	0.36	16	16	0.32	25
inhibit	0	0.00	7	0.15	7	0.14	27	30	0.60	12
framework	0	0.00	16	0.33	16	0.32	18	21	0.42	20
metabolism	3	0.06	34	0.71	31	0.62	4	47	0.94	1

Wordlist 5

(SPR)

suppress	0	0.00	5	0.10	5	0.10	29	14	0.28	27
fluctuate	0	0.00	5	0.10	5	0.10	29	23	0.46	18
awe	0	0.00	21	0.44	21	0.42	13	24	0.48	17
context	0	0.00	10	0.21	10	0.20	24	15	0.30	26
legislate	0	0.00	15	0.31	15	0.30	19	25	0.50	16
orbit	6	0.13	31	0.65	25	0.50	9	44	0.88	3
implicate	0	0.00	3	0.06	3	0.06	31	4	0.08	36
vein	1	0.02	37	0.77	36	0.72	1	31	0.62	11
conceive	0	0.00	7	0.15	7	0.14	27	17	0.34	24
comprehensive	0	0.00	5	0.10	5	0.10	29	14	0.28	27

Wordlist 6

(L1)

subordinate	0	0.00	8	0.17	8	0.16	26	29	0.58	13
refute	0	0.00	10	0.21	10	0.20	24	22	0.44	19
specify	0	0.00	8	0.17	8	0.16	26	19	0.38	22
rigid	0	0.00	17	0.35	17	0.34	17	25	0.50	16
proprietor	0	0.00	8	0.17	8	0.16	26	29	0.58	13
cactus	1	0.02	34	0.71	33	0.66	2	44	0.88	3
moist	26	0.54	36	0.75	10	0.20	24	41	0.82	4

sole	1	0.02	30	0.63	29	0.58	6	25	0.50	16
instance	2	0.04	14	0.29	12	0.24	22	23	0.46	18
likewise	0	0.00	13	0.27	13	0.26	21	34	0.68	9
Wordlist 7 (SPR)										
discreet	1	0.02	5	0.10	4	0.08	30	10	0.20	30
orient	21	0.44	34	0.71	13	0.26	21	25	0.50	16
overlap	0	0.00	15	0.31	15	0.30	19	14	0.28	27
reverberate	0	0.00	10	0.21	10	0.20	24	29	0.58	13
correspond	0	0.00	14	0.29	14	0.28	20	11	0.22	29
imply	1	0.02	17	0.35	16	0.32	18	21	0.42	20
feasible	0	0.00	19	0.40	19	0.38	15	22	0.44	19
regime	0	0.00	17	0.35	17	0.34	17	24	0.48	17
analogy	0	0.00	16	0.33	16	0.32	18	9	0.18	31
contrast	12	0.25	24	0.50	12	0.24	22	20	0.40	21
Wordlist 8 (L1)										
emancipate	0	0.00	13	0.27	13	0.26	21	19	0.38	22
prime	1	0.02	9	0.19	8	0.16	26	17	0.34	24
magnitude	0	0.00	20	0.42	20	0.40	14	39	0.78	5
ethnic	16	0.33	32	0.67	16	0.32	18	31	0.62	11
detriment	0	0.00	7	0.15	7	0.14	27	9	0.18	31
adjacent	0	0.00	12	0.25	12	0.24	22	34	0.68	9
equivalent	8	0.17	26	0.54	18	0.36	16	18	0.36	23
benefit	4	0.08	19	0.40	15	0.30	19	16	0.32	25
satellite	10	0.21	33	0.69	23	0.46	11	23	0.46	18
thereby	0	0.00	26	0.54	26	0.52	8	15	0.30	26
Wordlist 9 (SPR)										
aspect	5	0.10	19	0.40	14	0.28	20	16	0.32	25
kindred	0	0.00	26	0.54	26	0.52	8	2	0.04	38
retain	1	0.02	16	0.33	15	0.30	19	35	0.70	8
correlate	0	0.00	4	0.08	4	0.08	30	10	0.20	30
indigenous	0	0.00	4	0.08	4	0.08	30	22	0.44	19
exert	1	0.02	15	0.31	14	0.28	20	25	0.50	16
convene	0	0.00	10	0.21	10	0.20	24	26	0.52	15
fossil	9	0.19	35	0.73	26	0.52	8	47	0.94	1
compatible	0	0.00	0	0.00	0	0.00	33	11	0.22	29

nerve	2	0.04	21	0.44	19	0.38	15	36	0.72	7

Wordlist 10
(L1)

surplus	1	0.02	22	0.46	21	0.42	13	9	0.18	31
equilibrium	0	0.00	9	0.19	9	0.18	25	15	0.30	26
enhance	0	0.00	16	0.33	16	0.32	18	1	0.02	39
apparatus	0	0.00	13	0.27	13	0.26	21	15	0.30	26
commit	0	0.00	1	0.02	1	0.02	32	3	0.06	37
adequate	0	0.00	14	0.29	14	0.28	20	18	0.36	23
obtain	17	0.35	41	0.85	24	0.48	10	15	0.30	26
aristocrat	0	0.00	19	0.40	19	0.38	15	28	0.56	14
behalf	0	0.00	21	0.44	21	0.42	13	17	0.34	24
passive	2	0.04	28	0.58	26	0.52	8	12	0.24	28

Note. Rank = The order of the frequency of recalls, the highest being number 1.

Appendix O: Study 1 Most Frequently Recalled Words

Rank	Target Word	Word length	SPR/ L1	Pre-test/ Post-test score gain and ranking	Weekly test score total and ranking	Pre/Post-test gain plus weekly test total
1	Seasickness (c)	11	SPR	44 (1)	45 (5)	89
2	Snore (c)	5	SPR	41 (3)	47 (3)	88
3	Hangover (c)	8	SPR	38 (6)	48 (2)	86
4	Tropical (c)	8	SPR	37 (7)	47 (3)	84
5	Devalue	7	L1	38 (6)	45 (5)	83
6	Toxic (c)	5	L1	39 (5)	43 (7)	82
7	Chores	6	SPR	35 (9)	44 (6)	79
8	Hemisphere (c)	10	L1	35 (9)	43 (7)	78
9	Worthless	9	L1	29 (15)	48 (2)	77
10	Vindictive	10	L1	34 (10)	41 (9)	75
10	Unrealistic	11	L1	34 (10)	41 (9)	75
10	Finite	6	SPR	39 (5)	36 (14)	75
10	Envy (c)	4	L1	29 (15)	46 (4)	75
	Total	100				
	Average	7.69				

Note. 'Word length' = the number of letters in each word.

Appendix P: Study 1 Least Frequently Recalled Words

Rank	Target Word	Word length	SPR/ L1	Pre-test/ Post-test score gain and ranking	Weekly test score total and ranking	Pre/Post-test gain plus weekly test total
1	Interfere	9	L1	8 (35)	6 (41)	14
2	Compel	6	SPR	24 (20)	0 (42)	24
3	Sanction	8	L1	17 (27)	8 (40)	25
4	Impetus	7	SPR	19 (25)	8 (40)	27
5	Typical	7	SPR	8 (35)	20 (29)	28
6	Distort	7	L1	13 (31)	16 (32)	29
7	Incentive	9	SPR	12 (32)	19 (30)	31
7	Ethics	6	SPR	21 (23)	10 (38)	31
8	Fallacy	7	SPR	24 (20)	8 (40)	32
9	Insist	6	L1	7 (36)	26 (24)	33
10	Intrinsic	9	SPR	8 (35)	26 (24)	34
10	Principle	9	SPR	21 (23)	13 (35)	34
	Total	90				
	Average	7.5				

Note. 'Word length' = the number of letters in each word.

Appendix Q: Study 2 Most Frequently Recalled Words

Rank	Target Word	Word length	SPR/ L1	Pre-test/ Post-test score gain and ranking	Weekly test score total and ranking	Pre/Post-test gain plus weekly test total
1	Metabolism	10	L1	31 (4)	47 (1)	78
2	Cactus (c)	6	L1	33 (2)	44 (3)	77
3	Fossil (c)	6	SPR	26 (8)	47 (1)	73
4	Pole (c)	4	L1	32 (3)	37 (6)	69
4	Orbit (c)	5	SPR	25 (9)	44 (3)	69
5	Vein (c)	4	SPR	1 (36)	11 (31)	67
6	Superficial	11	SPR	21 (13)	45 (2)	66
7	Skeleton (c)	8	SPR	30 (5)	30 (12)	60
8	Reside (c)	6	SPR	23 (11)	36 (7)	59
8	Magnitude	9	L1	20 (14)	39 (5)	59
9	Irrigate (c)	8	SPR	22 (12)	36 (7)	58
10	Vary	4	L1	27 (7)	30 (12)	57
	Total	81				
	Average	6.75				

Note. 'Word length' = the number of letters in each word.

Appendix R: Study 2 Least Frequently Recalled Words

Rank	Target Word	Word length	SPR/ L1	Pre-test/ Post-test score gain and ranking	Weekly test score total and ranking	Pre/Post-test gain plus weekly test total
1	Commit	6	L1	1 (32)	3 (37)	4
2	Implicate	9	SPR	3 (31)	4 (36)	7
3	Incorporate	11	L1	5 (29)	4 (36)	9
4	Insight	7	L1	6 (28)	5 (35)	11
4	Compatible	10	SPR	0 (33)	11 (29)	11
5	Discreet	8	SPR	4 (30)	10 (30)	14
5	Correlate	9	SPR	4 (30)	10 (30)	14
6	Detriment	9	L1	7 (27)	9 (31)	16
7	Enhance	7	L1	16 (18)	1 (39)	17
8	Sustain	7	L1	12 (22)	6 (34)	18
8	Deduce	6	L1	10 (24)	8 (32)	18
9	Suppress	8	SPR	5 (29)	14 (27)	19
9	Comprehensive	13	SPR	5 (29)	14 (27)	19
10	Military (c)	8	L1	15 (19)	7 (33)	22
	Total	118				
	Average	8.43				

Note. 'Word length' = the number of letters in each word.

Appendix S: Participant Information Sheet

Participant Information Sheet

Dear Student,

This semester, you are invited to participate in the following research: *Simplified Pictorial Representations in Second Language Vocabulary Acquisition and Explicit Web-Based Vocabulary Learning.* As well as teaching the class, I (James Bates) will be using part of our studies for doctorial research, through an Australian university: The University of Southern Queensland. The study is about investigating the effectiveness of using visual information (simple pictures) to learn English vocabulary. The research findings could be used in the development of second language teaching, by increasing our understanding of how visual information (pictures) might be used to study foreign words effectively.

- ● **Your involvement:**
- Activities: You will be required to spend 5 to 10 minutes each lesson learning 10 English words, using pictures one week, and Japanese translations of the words the next week. Also, you will be required to study words out of class, such as at home for homework, using both handouts and material you can access on the Internet.
- Testing: A test of 120 words will be given at the start and at the end of the semester. A small (5 minutes) test will be given each lesson (either in written or spoken form) for 10 words learned the previous lesson, for 12 lessons.

*NOTE: The work required and the testing involved is part of our normal study requirements for this semester, so you will have to do this work even if you choose not to be a participant in the study.

- Survey**:** All participants will be asked to fill in a written survey at the end of the semester. The survey will ask about: 1) if you like/dislike the pictures 2) if you think the pictures are useful 3) how often you used the pictures out of class.
- Interviews: Only a few students per class will be invited to participate in an individual interview.

*NOTE: If you choose not to participate in the study, you will not have to do the survey, and will not be asked to do an interview.

- ● **Possible benefits and risks:** Studying English words directly (deliberately) by using pictures and Japanese translations may help you to increase your English vocabulary. However, you may not like using the pictures or the Japanese translations, and they might not help you to increase your vocabulary.

*NOTE: Results from the vocabulary tests, surveys and interviews will not be used (or influence) your final grade for the semester. Only what is stated in the syllabus (such as attendance, participation, reports, etc.) will have any effect on your grade this semester.

- ● **Privacy:** All of your test results, your survey/interview responses, as well as any other information about you (I will be keeping a teacher's journal) will be private and confidential. You will not be identified personally, and no information will be connected to you by name. Your name will not be shared with anyone else or used in any publication. Interviews will be sound recorded, then deleted after being transcribed. At the end of the semester, I will give the class a general description (without identifying individuals) of the study results verbally.

- **Voluntary participation and withdrawal:** You do not have to participate in this study; it is <u>purely voluntary.</u> If you choose not to be a participant, your grade for the semester will <u>not be affected at all.</u> You can stop participating from the study at <u>any time no problem</u>, **however you will still have to do the required study and tests as these are part of the course regardless of your participation.**

- **Important:** Should you have any concern about the conduct of this research project, please contact the USQ Ethics Officer, Office of Research & Higher Degrees, University of Southern Queensland, West Street, Toowoomba QLD 4350, AUSTRALIA Telephone +61 7 4631 2690, email <u>ethics@usq.edu.au</u>.

Appendix T: Participant Consent form

University of Southern Queensland

The University of Southern Queensland

Consent Form

TO: *Participants*

Full Project Title: Simplified Pictorial Representations in Second Language Vocabulary Acquisition and Explicit Web-Based Vocabulary Learning

Researcher: James Bates

- I have read the Participant Information Sheet and the nature and purpose of the research project has been explained to me. I understand and agree to take part.
- I understand the purpose of the research project and my involvement in it.
- I understand that I may withdraw from the research project at any stage and that this will not affect my status now or in the future.
- I confirm that I am over 18 years of age.
- I understand that while information gained during the study may be published, I will not be identified and my personal results will remain confidential. I understand that information from my test results and survey/interview responses will be kept together, with my name being recorded as a number know only to the researcher. I understand that all tests will be handed back to myself after the information is recorded, and surveys will be destroyed after the information has been recorded.
- I understand that I could be asked to be audio taped during the study.
- I understand that the audio recording will be deleted after being transcribed.

Name of participant………………………………………………………….......

Signed…………………………………………………..**Date**……………………….

If you have any ethical concerns with how the research is being conducted or any queries about your rights as a participant please feel free to contact the University of Southern Queensland Ethics Officer on the following details.
Ethics and Research Integrity Officer
Office of Research and Higher Degrees
University of Southern Queensland
West Street, Toowoomba 4350 *Ph: +61 7 4631 2690 Email: **ethics@usq.edu.au***

Appendix U: Study 1 Sample Focus Group Discussion Japanese Transcriptions and English Translations

Topic 1: SPR usage and motivation

役だった。あれがなければ覚えていない。文字だけより絵があった方が見る気になる。

It helped. If I did not have it, I would not have remembered. I feel better if there are pictures to look at rather than just the text.

(Student 1B10, Class B, Group 2)

絵がたまにわからないけれど、絵は楽しいしインパクトがあっていい。

Sometimes I could not understand the pictures, however, the pictures were good because I enjoyed them and they had an impact.

(Student 1B4, Class B, Group 6)

Topic 2: Perceived advantages of using SPRs to remember the target words.

今までは、日本語を英語に訳して覚えていたけれど、絵だと印象に残りやすいからいいと思った。

Up until now, I was only remembering by translating Japanese to English, but I think that pictures leave an impression that easily remain.

(Student 1B15, Class B, Group 4)

文字より絵の方が印象に残るから、結びつきやすくて覚えやすい。でも、それで覚えても、テストでは英英辞典を使った方がいいと感じる。

The pictures leave a better impression than writing, so it is easier to form a tie and easier to remember. But even if I remember it, I still feel it is better to use an English to English dictionary in a test.

(Student 1A3, Class A, Group 5)

Topic 3: The limitations of SPRs.

単語によって、絵で覚えられる時と覚えられない時がある。日本語が一致していたら、わかりやすい。たまに、何でこの絵なの？と思う時がある。言葉が抽象的であればあるほど、絵がすごい難しくなってしまう。
　でも、単語を思い出そうとした時に、あのカードの絵が思い浮かぶことも

あり、絵で助けられることもかなりあった。
Depending on the word, sometimes you can use the pictures to remember, and sometimes you cannot. If the Japanese matches, it is easy to understand. Sometimes you think: why this picture? The more abstract the word is, the more (really) difficult the picture gets. However, when trying to recall words, the card's picture sometimes comes to mind; the pictures can be quite helpful.
(Student 1A14, Class A, Group 2)

カードは好きだけど、あの絵が抽象的すぎて絵の指しているものがわからない時がある。日本人と外国人の文化の違いで意味が違う場合があると思う。でも、そういうのを知るうえではいいかも知れない。
I liked the cards, but sometimes I could not understand them because they were too abstract. Japanese and foreigner's culture is different; I thought there were times when the meaning were different. But, it may be good to know about these kinds of things, I think.
(Student 1A7, Class A, Group 3)

Topic 4: Preference for Japanese translations over SPRs.

絵の方が記憶に残りやすい。でも色々な意味に捉えられるから良くないこともある。日本語の方がこういう意味なんだとわかりやすい。
The pictures were better for remaining in the memory. However, various meanings could be taken, so this was not good. Japanese is better for easily understanding this or that kind of meaning.
(Student 1B6, Class B, Group 4)

絵と英語だけより、日本語の正しい訳があればよい。
I like it better if there is a correct Japanese translation, rather than a picture and an English word.
(Student 1B8, Class B, Group 2)

Topic 5: Desire for the inclusion of Japanese translations.

絵の方がイメージしやすい。でも、わかり難いときがあるから、絵と日本語の両方あった方がいい。
The pictures make it easier to form an image. But there were times when they were difficult to understand; both the pictures and the Japanese words are better.
(Student 1A1, Class A, Group 4)

覚えるときは絵が描いてあっても、横に日本語で書いて、日本語と英語と絵の三つ一緒に覚えた方が覚えられる。耳に入ってきた単語の絵をイメージして、覚えるようにした。

When remembering, I wrote Japanese on the side of the picture. Japanese, English and a picture; three things together was better to remember, I could remember. I came to remember from the word from the image and the word entering my ear.
(Student 1A15, Class A, Group 3)

Topic 6: Classroom activities

好き、でもちょっと飽きた。２週間に一回位でいいかな。最初の頃は、歩き回って人を探して名前を聞いたりして、クラスメートの名前を覚えられて良かったし、そこで話せるからいいけど、３週間もやっていると単語が…　確かに覚えられるし、大事は大事で、繰り返すのはいいけど、やり過ぎてる感じはする。毎回毎回、同じだから飽きた。

I liked it, but it got a little tiring. Once every two weeks may have been better. At first, it was good to walk around and hear names; you could learn the names of classmates, and it was good to be able to speak, but after three weeks, words….., you could certainly remember, it is important, repeating was good but, I thought it was too much. Each and every time, it was the same.
(Student 1A25, Class A, Group 2)

ゲーム感覚で覚えられるし、絵があることでイメージが出来るから、単語を覚えるのにはいいと思う。

I could remember because it had the feel of a game, you could get images from the pictures, I think it was good for memorizing the words.
(Student 1B15, Class B, Group 4)

Appendix V: Study 2 Sample Focus Group Discussion Japanese Transcriptions and English Translations

Topic 1: The SPRs were easy to remember, difficult to understand.

好き。絵があった方が印象に残って覚えやすい。でも単語と絵が一致しないときもある。

I liked them. The pictures left a more lasting impression, and were easy to remember. However, the words and the pictures sometimes did not match.

(Student 2A1, Class A, Group 4)

わかりやすい絵とわかり難い絵があった。絵を見て意味が一致しないときがあった。無理に絵にすることはないと思った。

There were pictures that were easy to understand and pictures that were difficult to understand. There were times when you looked at the pictures and the meanings did not match. I thought that it was unreasonable to picture these words.

(Student 2B3, Class B, Group 6)

Topic 2: The advantages of SPRs despite the lack of understanding.

絵はわかりやすいのと、わかり難いのがあった。わかりやすい絵は頭に浮かぶからいいと思う。難しい単語は絵をイメージして覚えられるときもある。

The pictures were easy to understand, yet some were difficult to understand. I think that it is good how the easy-to-understand pictures come to mind. There were also times when you could remember difficult words from the picture's image.

(Student 2B18, Class B, Group 3)

好き。絵があった方が楽しいし、文字で覚えるよりも絵の方が頭に残る。でも、日本語の意味と絵が合わないことがある。

I liked them. It was more enjoyable when there were pictures; learning with pictures is better than learning with writing as they remain in the head better. However, there are pictures that do not fit the Japanese meanings.

Student 2A24, Class A, Group 5)

Topic 3: The advantages of L1 translations.

絵は印象に残るが、絵の意味がわからない時は困る。日本語の方が変換しやすい。

The pictures left an impression, but were troubling when the meaning was not

understood. It is easier to change from Japanese.
(Student 2A25, Class A, Group 2)

絵の意味がわからないから、日本語があったほうがいい。人間関係（血縁）の絵はわかり難かった。
The picture meaning of the pictures was not understood, so Japanese is better. Pictures depicting human relations were difficult to understand.
(Student 2B1, Class B, Group 2)

Topic 4: The disadvantage of using Japanese translations.

ときどきわからない絵もあるけれど、視覚的に覚えられるから良い。日本語は親しみがあるから頭に入ってくるけれど、でもそれだとつまらないから絵があったほうがいい。
Sometimes, there were pictures that you could not understand, but it was good as you could learn visually. Japanese has familiarity so it enters the head, however when there is just that is boring, so it is better to have the pictures.
(Student 2B21, Class B, Group 4)

　クイズ形式のは楽しかった。絵のほうがイメージがつくから忘れない。でも、わかり難い絵もあった。日本語のほうがわかるけど、印象はうすい。
The quiz format was good. Pictures are better for forming an image, so you don't forget. However, there were pictures that were difficult to understand. Japanese is more understandable, but leave a weak impression.
(Student 2A13, Class A, Group 6)

Topic 5: The classroom activities.

単語をグループで確認しあうと、ちゃんと覚えようという気持ちになる。絵を単語で説明することが楽しく出来た。
In a group (of people), checking the word together; it felt as if it was a proper way of remembering. It was fun to be able to explain the picture in words.
(Student 2A13, Class A, Group 6)

ディスカッションは、いつも同じ質問で単純だから、もっとグループワークで自分の意見を言い合う方がいい。
With discussion, it was always the same simple questions, so with the group work, I would have preferred to share my opinions more.
(Student 2A25, Class A, Group 2)

Topic 6: Materials used in-class.

テレビは好きじゃなかった。前にやったゲームのようにカードをめくるほう
が覚えられた。
*I didn't like the TV. The game we did before (where you turned the cards over) was
better for remembering.*
(Student 2B16, Class B, Group 3)

テレビは見やすくて良かった。でも紙があった方が、ちょっと確認する時に
便利。両方あった方がいい。
*It was good as you could see the TV easily. But having paper was a little better, as it
was convenient when checking. Having both would have been better.*
(Student 2A11, Class A, Group 3)

Topic 7: Materials used in private-study.

インターネットサイトは移動中に確認ができるから便利。自分から能動的に
やらないといけないが、それはそれで勉強するいいキッカケになるから良い。
*The internet-site was convenient as you could check (study with it) on the move. You
could not do it unless you were self-motivated, so this in itself was a good study
experience.*
(Student 2B20, Class B, Group 4)

自分で覚えるときは絵を描かないので、絵を見て印象づけて覚えられたのが
良かった。

*It was good because when learning on your own, you did not have to draw a picture,
and when you look at the picture, it is impressive, so you are able to remember.*
(Student 2A17, Class A, Group 6)

Appendix W: Study 1 Example of Teacher's Journal Entries and Classification

Topic 1: Activities and materials

(5/10) *Students seemed to want to 'play' with the cards. Need to give them some time to do this*; (5/24) *Noticed that (in both classes) some students making their own flash card decks with rings using my material*; (6/7) *The 'describe your drawing' activity was quite successful for both classes, students seemed to enjoy it*; (6/21) *They never tire of the 'stand and swap' activity. They appear to enjoy it every time.*

Topic 2: SPRs and L1s

(5/10) *Recall seems easier (at this stage) using L1*; (6/14) *Advantage of L1: the meaning is fixed and clear. Disadvantage of SPRs: The meaning needs to be established*; (6/21) *It is easier for them to match L1 to L2 as the L2 has an established meaning. For SPRs they really have to work harder, but is this a positive thing?*

Topic 3: Instruction

(5/10) *One student asked about the SPR for 'Integral'. I explained it to the class*; (5/24) *Whole class, introducing pictures. Using a matching activity instead of students writing the words from the first letter. Reasonable successful*; (6/21) *Nice to let them try to establish the meanings in groups (discussion in Japanese is ok, because they need to establish meaning).*

Topic 4: Class A and Class B comparison

(5/24) *Class A pictures (large flash cards) on blackboard. Students had to guess the word by writing the word above the pictures – given the first letter. Not very successful, students struggling. Class B same matching activity reasonably successful. Should have them focus on the word meanings more*; (6/7) *Class A very responsive, quite enjoyed the tasks. Not so much for Class B.*

Topic 5: Factors related to ease of remembering target words

(6/21) *Surprised that students did not know some words like 'occupation'. The most difficult words seem to be those that are completely unknown and long*; (6/14) *Noticed a natural tendency for short words to be remembered more easily, harder for words that were difficult to pronounce. 'Envy' was easily recalled:(emotional?).*

Appendix X: Study 2 Example of Teacher's Journal Entries and Classification

Topic 1: Instruction

(10/11) *I am using the pictures to explain the meaning more, good not to have the L1 influence*; (11/1) *With Class A, I tend to focus more on the picture and the meaning, with Class B the focus is on the picture and pronunciation*; (11/22) *I think I prefer using the pictures as the L1 translation just provides an 'easy' way out. The SPRs allow me to give a personal explanation of it. The SPR is not an exact expression of meaning. It is a guess, an example*; (11/29) *The screen work was productive in that I could nominate which word is to be said very easily (more easily than word cards). This enables me to concentrate more on those that are difficult.*

Topic 2: Recall

(10/11) *Recall (when displaying the L1s) did not seem to be faster than SPR recall*; (10/18) *With SPRs, Class A recalled words well, and quick to learn. Not so with the lower class – really struggled to learn 'infrastructure' and 'irrigate'. All seem to be getting faster with rapid recall from pictures on screen;* (11/29) *The effect of word length upon remembering the word and recall is extremely pronounced in both classes.*

Topic 3: Activities

(10/25) *Class A liked guessing the words from L1s – quite skilful at remembering the words. Got some humorous feedback from some of the translations*; (11/15) *Class A enjoyed the 'describe and guess' activity. It seems that they have to form an image in their heads and rely on that image*; (11/29) *We used gesturing a lot more based on the visual image. This worked quite well, and I felt as if they were reinforcing their visual image of the SPRs. Even no speaking and just gesturing (the word 'retain') was fun and quite effective, as if the SPR was being recreated by the psychical action alone.*

Topic 4: SPRs and L1s

(11/15) *Explaining from an image has more possibilities than explaining from an L1. The explanation of the SPRs is becoming an important part of the teaching*; (11/18) *When using L1 word, the main focus seems to be upon the kanji (L1) and then relating it to the L2 word. The advantage of the SPRs is that the meaning is created from the picture, and not the L1. Perhaps this allows for a greater chance of concept formation.*