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Raising EFL Learners' Awareness of L2 Lexical Errors and Correct Usage: A Dual Coding Approach

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This study investigated the effects of dual coding elucidation on raising learners' awareness of L2 lexical errors and correct usage. Participants included 135 Korean EFL middle school students assigned to either a single-coding or dual-coding group. The single-coding group studied the incorrect and correct usage of target lexical items under a verbal-code-only condition. The dual-coding group studied the incorrect and correct usage under a verbal-plus-visual-code condition. Participants completed posttests at two intervals: immediately after studying the materials and four weeks later. Analyses revealed that dual coding elucidation had significant positive effects on facilitating learners' awareness of lexical errors and correct usage; these effects remained over time. The results also indicated no significant correlations between learning style and the effectiveness of visuals. Qualitative data demonstrated that students perceived visuals as being helpful in improving accurate lexical use and their engagement in learning vocabulary. The article concludes by discussing the facilitative role of visual encoding in L2 lexical knowledge development, thus expanding on the dual coding theory.

Key words: correct usage, dual coding theory, L2 vocabulary

1. INTRODUCTION

In the process of second language (L2) learning, learners produce various types of errors. Several researchers have reported that lexical errors are the most frequent type in L2 learner writing (e.g., Ahn & Kang, 2015; Coxhead, 2011; Lee, 2016; Lennon, 1991; Paquot, 2010), negatively influencing L2 writing quality (e.g., Astika, 1993; Ellis, 1994; Engber, 1995; Llach, 2011). In fact, native speakers regard lexical mistakes as the most problematic (e.g., Santos, 1988) because such errors hinder communication even more than

grammatical mistakes (Gass & Selinker, 2001; Schmitt, 2000). As a result, L2 researchers have sought methods to improve the accuracy of learners' vocabulary use, mostly focusing on corrective strategies, such as recast and written corrective feedback (e.g., Chandler, 2003; Jeong & Ma, 2012; Kim, 2015; Lyster & Ranta, 2001). While these methods principally follow verbal approaches (single coding), this study attempts to add visual support to the verbal information and apply a dual coding methodology—pictorial elucidation of correct and incorrect usage—to facilitate learners' awareness of lexical errors and accurate usage.

Pictorial elucidation is a method of elaborating on verbal information using drawings or pictures to enhance learning and information retention (Boers, Lindstromberg, Littlemore, Stengers, & Eyckmans, 2008). A considerable number of studies have demonstrated that pictures promote vocabulary acquisition via semantic elaboration on words and idioms (e.g., Fahime, 2016; Vasiljevic, 2015). According to Jiang (2000), the majority of lexical errors stem from one of two issues: semantic differences between the L2 lexical item and its first language (L1) equivalent and semantic differences between two L2 lexical items that share similar L1 translations. Therefore, pictorial elucidation that illustrates the conceptual differences between two confusing lexical items as well as their correct and incorrect usages could advance learners' comprehension of the unique semantic features of L2 lexical items while facilitating their ability to use the items more precisely.

With regard to the effectiveness of using visuals for lexical knowledge development, Paivio's (1971, 1986, 2007) dual coding theory (DCT) holds that imagery facilitates the learning process. Paivio argued that cognition consists of verbal and nonverbal (imagery) systems that are functionally independent yet interconnected. When these two systems collaborate to process information, the combination produces qualitatively different mnemonic representations. The verbal and visual codes function additively so that mental imagery stimulates semantic elaboration of verbal information and consequently enhances the performance of human memory. Thus, according to the DCT, knowledge presented through both verbal and visual codes has a better chance of being remembered than information expressed in one modality alone. In terms of learning lexical items, this theory predicts that providing vocabulary words with corresponding images would be more effective in promoting item recall than using only a single code.

To date, a large body of research has reported the positive effects of pictures on establishing form-meaning connections, an initial stage in vocabulary development (e.g., Bisson, van Heuven, Conklin, & Tunney, 2015; Hwang & Choi, 2015). However, in addition to the form-meaning link, learners need to incorporate various aspects of word knowledge in order to use items appropriately (Schmitt, 2008). Despite the promise of pictorial elucidation, few researchers have sought to expand the utility of pictures to broader dimensions; in fact, there is a dearth of research when it comes to the potential of

pictures to contribute in developing more advanced types of lexical knowledge. This study focuses on the correct usage of lexical items, ultimately seeking to investigate how pictorial elucidation may influence awareness of lexical errors and correct usage. Illustrating the semantic differences between correct and incorrect usages might help raise students' awareness of lexical errors, thus assisting them in using these lexical items more accurately.

The existing DCT research has focused primarily on children or adult participants (e.g., Jung & Choi, 2012; Shen, 2010), yet many L2 learners in educational settings are adolescents. In addition, scholars have demonstrated that the effects of pictures on vocabulary acquisition sometimes are mediated by other individual difference factors, such as learning styles (e.g., Boers et al., 2008). Previous studies have been inconclusive regarding the relationship between pictorial effect and learning style: some indicate that pictures facilitate visual learners' understanding (e.g., Boers et al., 2008), while others suggest that such images become distractions for those susceptible to visual stimuli (e.g., Boers et al., 2009). To address these issues, the present study includes adolescent participants of varying learning styles (i.e., ranging from verbal to visual) when determining if illustrations of incorrect and correct vocabulary usage raise learners' awareness of lexical errors and accurate usage. In so doing, this study seeks to expand DCT's pedagogical applications to the diverse aspects of lexical knowledge development while examining if DCT is appropriate for a wide range of learners. Based on these introductory remarks, the following section discusses relevant findings in the existing literature regarding the role of pictures in developing lexical knowledge.

2. REVIEW OF THE RESEARCH

2.1. The Effects of Pictorial Elucidation on L2 Lexical Acquisition

L2 research has yielded mixed results regarding the role of pictures in lexical acquisition. Some researchers have criticized pictures for distracting learners' attention (e.g., Boers, Píriz, Stengers, & Eyckmans, 2009); other scholars advocate for their use in motivating and supporting students' learning processes (e.g., Fahime, 2016). In a study involving American university students, Shen (2010) compared the effectiveness of verbal encoding (i.e., definition and sentence) and verbal-plus-imagery encoding (i.e., definition, sentence, and picture) in learning concrete and abstract Chinese words. Though the study uncovered no differences in the retention of concrete words due to imagery, it did indicate that imagery codes significantly affected the retention of abstract words' meaning and shape. In a similar study examining the effects of visual stimuli on adult L2 learners' receptive

vocabulary knowledge (i.e., meaning recall), Farely, Ramona, and Liu (2012) reported that the picture group outperformed the non-picture group on both short- and long-term measures when learning abstract Spanish words.

Expanding beyond previous scholars' work with adult participants, Hwang and Choi (2015) studied child participants to compare the effectiveness of pictorial and verbal instruction on the retention of unfamiliar word using two treatment conditions: (1) word-plus-picture presentation and (2) word-plus-voice presentation. They found that the word-plus-picture group, receiving pictures as cues, demonstrated significantly higher retention of receptive word knowledge. Jung and Choi (2012) reported similar results with sixth grade participants.

In a more recent investigation using eye-tracking data, Bisson et al. (2015) confirmed the usefulness of pictorial information in vocabulary learning. In their study, the time spent looking at the pictures was a significant predictor of delayed meaning recall scores. Participants achieved significantly higher delayed recall for words presented with pictures and L1 definitions than for words presented with L1 definitions only. The researchers concluded that pictures likely trigger activation of semantic representation, thereby helping establish more robust form-meaning connections. Including the factor of varied verbal contextual support, Samburskiy (2015) also reported that dual coding elucidation exerted significant positive effects on idiom comprehension. However, varying amounts of contextual support made no significant difference: a larger number of words surrounding idioms resulted in less retention. To explain this finding, the researcher posited that learners tend not to process lengthy verbal information attentively, resulting in distraction. Teaching Korean learners of Persian, Fahime (2016) also found that including pictures for new Persian words in reading passages significantly improved receptive Persian vocabulary knowledge and made learning more enjoyable when compared to providing texts only.

Other studies have considered the effects of images on lexical acquisition and obtained contrasting results with no picture superiority effect. For instance, in a study by Lotto and de Groot (1998), participants were assigned to two conditions (word plus definition vs. word plus picture) and tested on their productive vocabulary knowledge (i.e., writing target words). They found that the word-plus-picture group had longer retrieval times and lower recall scores than the word-plus-definition group. This finding suggests that picture presentation was a less effective method for the study's adult foreign language learners. Using another productive measure (i.e., gap-fill tests), Boers et al. (2009) also demonstrated that pictorial elucidation failed to result in improved performance in students' idiom production compared to written explanations. The researchers speculated that pictures aid semantic elaboration but may not contribute to gaining productive lexical knowledge, instead distracting learners' attention to lexical forms.

Contrary to the findings of Lotto and de Groot (1998) and Boers et al. (2009), Vasiljevic

(2015) obtained a significant positive effect of illustration on Japanese EFL students' idiom production on both short- and long-term measures. Employing both receptive and productive knowledge measures, Szczepaniak and Lew (2011) corroborated Vasiljevic's findings. In their study with Polish ESL university students, they demonstrated a facilitative role for pictorial elucidation on short- and long-term retention of both idiom form (productive) and meaning (receptive). These studies suggest that illustrations of idiom meanings may aid in the processing of idioms, including their forms, thus strengthening the retention of productive lexical knowledge. In a study with American undergraduate students, Carpenter and Olson (2012) also reported the advantage of pictures over L1 translation in both receptive and productive Swahili word learning.

Taken together, L2 studies, largely conducted with children and adults, demonstrate the robust effects of pictures on receptive lexical knowledge acquisition, while findings have been inconclusive concerning pictures' impact on gains in productive knowledge. The literature also presents mixed results regarding the interaction of pictorial effects and learner variables, an issue that the following section will take up in more detail.

2.2. The Effects of Pictorial Elucidation and Learning Style

A considerable body of research has reported that learning outcomes are influenced by individual differences, such as aptitude, motivation, and learning style (e.g., Dörnyei, 2005). One factor that long has been assumed to affect the impact of images on memory is students' learning styles. Learning style has been defined as learners' "consistent ways of responding to and using stimuli in the context of learning" (Claxton & Ralston, 1978, p. 7) and as their "natural, habitual, and preferred ways of absorbing, processing, and retaining new information and skills" (Kinsella, 1995, p. 171). Thus, differences in learning styles among individual learners might enhance or reduce the effectiveness of pictorial elucidation.

Studies have used various measures of learning styles, reporting mixed results regarding the role of learning style and the mnemonic effect of imagery instruction. For instance, Smith, Miller, Grossman, and Valeri-Gold (1994) used the Style of Learning and Thinking test (Torrance, Reynolds, Ball, & Reigal, 1979) to examine whether left- or right-brain thinkers benefitted differentially from pictures in terms of vocabulary retention. They found that both the left-brain and right-brain thinkers benefitted similarly from the inclusion of images. Less likely to use imagery code in their information processing, left-brain thinkers had both verbal and picture traces for each word. Right-brain thinkers, more likely to use visual code, had their own mental images reinforced by pictures. Thus, both types of thinkers benefitted from the addition of pictures. However, as a limitation of the study, the authors noted that the Style of Learning and Thinking test was not a

sophisticated measure of hemispheric preference.

Other researchers have obtained different results when considering the relationship between images and learning style in lexical acquisition. For example, Levin, Divine-Hawkins, Kerst, and Guttmann (1974) developed their own instrument to assess learning style and found that the performance of visual learners increased when teachers used pictures with fourth grade students; however, that of verbal learners declined. Similar results were observed by Boers et al. (2008), who used a Style of Processing scale (Childers, Houston, & Heckler, 1985). Boers et al. (2008) found that visual learners obtained significantly higher scores compared to verbal learners in the picture condition. These findings suggest that learning style variables play a part in the relative effectiveness of images.

In a subsequent study, Boers et al. (2009) addressed the lack of validity in the Style of Processing scale and employed their own questionnaire. When the researchers correlated students' learning style with their productive lexical knowledge test scores, they found a seeming contradiction: a significant negative correlation between the participants' visual learning style and their production of idioms supported with pictorial elucidation. They suggested that visual learners tend to process lexical information through images, causing pictures to have a distracting effect when it comes to learning the structural properties of lexical items. However, this study must be interpreted carefully due to the use of a researcher-designed learning style measure without instrument validation.

More recently, using the VAK (visual, auditory, kinesthetic) test of learning styles (Chislet & Chapman, 2005), Vasiljevic (2012) reported no significant correlations between students' learning styles and the effectiveness of visuals. She also noted, however, that the results should be interpreted cautiously because the VAK learning style test has limited reliability. Similarly, Samburskiy (2015) found no correlations between visual learning style and imagery effectiveness. However, the researcher used Boers et al.'s (2009) unvalidated learning style questionnaire, thus limiting the study. Overall, research findings have been inconclusive regarding the relationship between imagery effect and learning style in lexical development, which may partly be attributable to learning style measures lacking psychometric robustness. Thus, the current study further investigates the nature of this relationship by employing the Index of Learning Style (Felder & Solomon, 1991), which has been validated as a reliable and valid instrument for assessing learning styles (e.g., Felder & Spurlin, 2005; Litzinger, Lee, Wise, & Felder, 2007).

In summary, the literature supports the beneficial effects of pictures on the acquisition of L2 words and idioms though some studies indicate that images may have distracting effects or do little to improve productive lexical knowledge. Research findings remain inconclusive regarding how learning style mediates pictorial effects. In addition, the DCT research to date has focused primarily on children and adult participants, with scarce

attention paid to adolescents who constitute a large percentage of L2 learners. Based on the literature, this study attempts to expand previous research by exploring whether or not pictorial elucidation facilitates adolescent EFL students' awareness of lexical errors and correct usage in connection with their learning styles (i.e., ranging from verbal to visual). This empirical investigation could advance our understanding regarding the applicability of DCT to various dimensions of lexical knowledge development with a range of learners. To attain this goal, the research seeks to respond to the following questions:

1) Does pictorial elucidation raise adolescent EFL learners' awareness of lexical errors and correct usage of lexical items?
2) If so, are the effects of pictorial elucidation observed over time?
3) What is the relationship between students' learning styles and the effectiveness of pictorial elucidation in raising awareness regarding the correct usage of lexical items?

3. METHODS

3.1. Participants

Six intact ninth-grade classes in a Korean middle school participated in the study (n = 135). Participants had studied English as a Foreign Language (EFL) for more than seven years on average. Students were placed into two groups: three classes were assigned to the verbal-code-only condition (henceforth, verbal group) (n = 68), and the remaining three classes were assigned to the verbal-plus-visual code condition (henceforth, pictorial group) (n = 67). The verbal group consisted of 31 males and 37 females, and pictorial group consisted of 28 males and 39 females.

3.2. Materials

3.2.1. Target lexical items

Twenty-five pairs of lexical items (Appendix) were chosen from *Is That What You Mean?* (Hancock, 1990). This book provides an overview of words and idioms that L2 learners commonly confuse, explaining the incorrect and correct usages through humorous cartoons. The book principally covers pairs of two lexical items that share similar L1 translations but have different semantic specifications. It also includes pairs of two lexical items that have similar forms but different meanings. The target lexical item pairs were selected based on prior field test responses from 10 advanced non-participant students.

These students were asked to read sentences containing the lexical errors addressed in the book and to correct the errors. The researcher used this task to ensure that the actual study participants were unlikely to know the correct usage of the target lexical items. For some pairs of lexical items, the advanced students lacked knowledge regarding the conceptual differences and correct usages; in these cases, the researcher selected high-frequency items whenever possible because participants might already have established initial form-meaning links. This linkage could allow participants to focus on comparing correct and incorrect usages according to conceptual differences rather than decoding low-frequency words. Based on the frequency rank information from *The Corpus of Contemporary American English: 20,000 Word List* (Davies & Gardener, 2010), 90% of the target words appear in the list of the 2,000 most frequent items. The researcher selected high-frequency lexical items in order to provide pedagogical value to the study's young EFL learners.

Two weeks prior to the experiment, participants' prior knowledge was assessed regarding the correct usage of the 25 pairs of target lexical items. In this pretest, students were instructed to read sentences with incorrect usages of the lexical items and correct the lexical errors. All corrections were scored as follows: 0 = incorrect; .5 = partially correct; 1 = correct. Results from the pretest revealed virtually no prior knowledge and no significant differences in scores between the pictorial and verbal groups (pictorial: M = .16, SD = .42; verbal: M = .14, SD = .40; $t(133)$ = .24, p = .811).

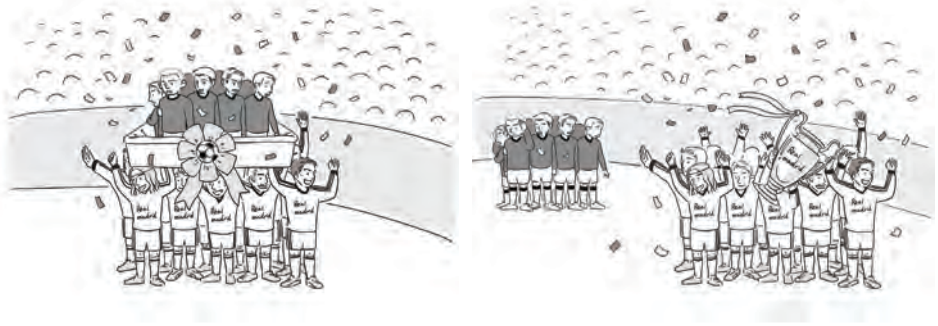
3.2.2. Booklets

In this study, the instructional method of using verbal code refers to presenting target lexical items with relevant verbal materials, such as sentences and written explanations (verbal group). The method of using verbal-plus-visual code refers to presenting target lexical items with sentences, written explanations, and relevant pictures (pictorial group). Thus, for the 25 pairs of target lexical items, the researcher prepared two types of booklets. The booklet for the pictorial group contained sentences with the target lexical items corresponding to cartoons depicting the incorrect and correct usages as well as written descriptions explaining the errors in the students' first language. For example, the pair of target items *win* and *beat* share a similar L1 translation "이기다 (i-gi-da)," and the sample sentences read, "*Real Madrid won Manchester United in today's soccer match*" (incorrect usage) and "*Real Madrid beat Manchester United in today's soccer match*" (correct usage). As shown in Figure 1, one cartoon depicted Manchester United being given to Real Madrid to take away as a prize, whereas the other cartoon depicted Real Madrid defeating Manchester United. The written L1 description included the following explanation: both *win* and *beat* are translated as "이기다 (i-gi-da)" in Korean. However, *win* means to acquire something as a prize for defeating other people in a competition, whereas *beat*

denotes defeating someone in a competition. Therefore, *win* is the incorrect usage and *beat* is appropriate in this context. For the verbal group, the booklet contained verbal information only—sentences with the target lexical items and written L1 descriptions explaining the errors. All participants were instructed to read their respective booklets individually.

FIGURE 1

Sample Visual Illustration of a Target Lexical Item



Real Madrid ***won*** Manchester United in today's soccer match.

Real Madrid ***beat*** Manchester United in today's soccer match.

3.2.3. Measures

The immediate posttest for both groups consisted of 25 sentences, each containing one lexical error (i.e., incorrect use of lexical item). Students were asked to correct the error. Although there was one lexical error in each sentence, the participants were not informed that each sentence contained only one error. Continuing with the previous example, for the pair of target items, *win* and *beat*, the posttest sentence read, *I like playing tennis with John, but he often wins me*. Here, students were expected to correct *wins* to *beats*. The lexical gain was scored as follows: 0 = incorrect; .5 = partially correct; 1 = correct. Responses were scored as partially correct in the case of spelling mistakes (e.g., writing *beets* instead of *beats*) (Cronbach's α = .85).

A posttest questionnaire also was administered to investigate participants' perceptions regarding visuals in raising awareness of correct usage. At the end of the immediate posttest, pictorial group students responded to a one-item yes/no question asking whether or not they thought pictorial elucidation helped them to improve their understanding of appropriate lexical usage. In a subsequent open-ended question, they also were required to provide a written explanation for their answers, thus providing qualitative observations regarding the instructional use of visuals.

The Index of Learning Style (ILS) (Felder & Solomon, 1991) also was administered to

measure students' learning styles. This instrument identifies four dimensions (active-reflective, sensing-intuitive, visual-verbal, and sequential-global) through 44 items. Each dimension is measured via 11 items with dichotomous response options. For this study, only the eleven items of the visual-verbal dimension were translated into participants' L1 (Korean) and used to gauge their learning style. For the visual-verbal dimension, for instance, the following sentence was presented: *I prefer to get new information in* (1) pictures, diagrams, or maps, or (2) written directions or verbal information. Between the two options, participants were instructed to select the one option that best applied to them. The learning style was expressed with values between -11 (Verbal) and +11 (Visual) (Cronbach's α = .76). Rather than arbitrarily classifying participants into verbal and visual learners, the researcher used the learning style score as a continuous variable.

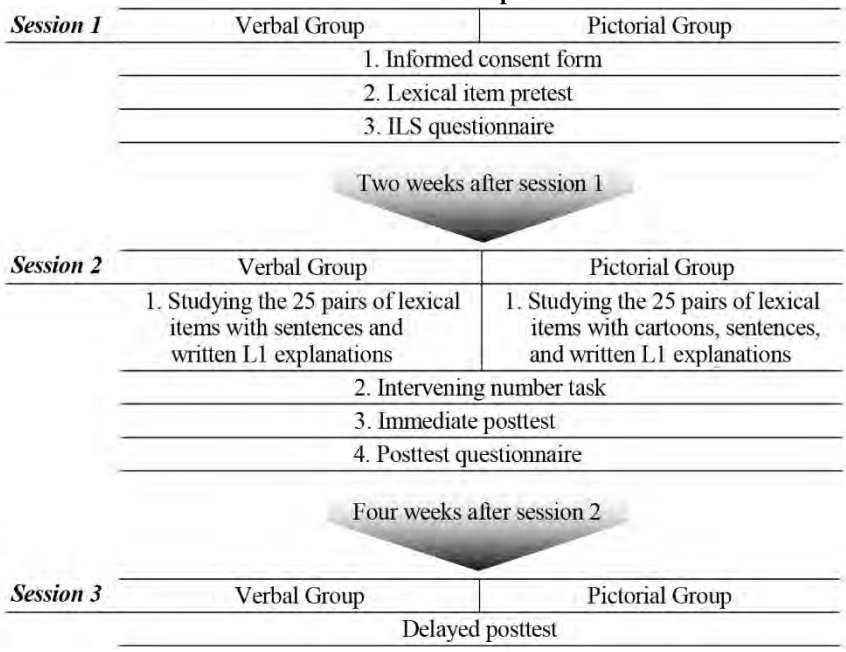
The L2 proficiency measure consisted of the reading section of the National Academic Achievement Test of English developed by Korea Institute for Curriculum and Instruction. The test was composed of 19 reading passages, each approximately 100 words long and followed by one multiple-choice question designed to test students' ability to comprehend main ideas. This test score was included as a covariate in order to control for initial group differences in L2 proficiency (Cronbach's α = .93).

3.3. Procedures

This study was conducted in three sessions over a period of seven weeks. Parental permission forms were obtained prior to the beginning of the sessions. During session 1, students first were informed about the study and its procedures. They then were given a chance to ask questions and completed the informed consent. Students also completed the lexical item pretest and the ILS questionnaire. Two weeks later, during session 2, each student in the pictorial group was given the booklet containing the 25 pairs of lexical items accompanied by the corresponding cartoons, sentences, and written L1 explanations. Each student in the verbal group was given the booklet with the same 25 pairs of lexical items accompanied by sentences and written L1 explanations. The students were given 20 minutes to study the materials individually; then, they performed an intervening number task to minimize the effect of immediate memory for the target items. Finally, students completed the immediate posttest and posttest questionnaire. Four weeks later, they took the same posttest to measure their long-term retention of correct lexical usage. Figure 2 summarizes the study's procedures.

FIGURE 2

Procedures for the Experiment



3.4. Analysis

A repeated measure analysis (one between and one within factor design) was conducted to test the significance of the main effects of coding (verbal code vs. verbal-plus-visual code) and the time (immediately after studying the materials vs. four weeks later) on the dependent variables associated with correct lexical item usage. Coding was a between-subject factor, and time was a within-subject factor. L2 proficiency served as a covariate. For significant interactions, follow-up mean comparisons were made to investigate interaction effects. The data met the assumptions of the one between and one within factor design. Pearson correlation also was applied to correlate the students' learning style scores with their immediate and delayed posttest scores. Through this analysis, the researcher sought to determine the relationship between learning style and the effectiveness of pictorial elucidation in raising awareness of accurate lexical item usage. An alpha level of .05 was used for all analyses.

4. RESULTS AND DISCUSSION

4.1. The Effects of Dual Coding Elucidation on Learners' Awareness of Lexical Errors and Correct Usage of Lexical Items

Table 1 displays the descriptive statistics for the independent variable, covariate, and control variable. An independent-samples *t* test revealed that there was no significant difference in L2 proficiency between the pictorial and verbal groups, $t(133) = .01$, $p = .990$. Results from the learning style measure (ILS) also revealed no significant difference in scores between the pictorial and verbal groups, $t(133) = .25$, $p = .805$. These results suggest that the two groups were equivalent with respect to L2 proficiency and learning style. Results from the lexical usage pretest also revealed virtually no prior knowledge and no significant differences in scores between the pictorial and verbal groups, $t(133) = .24$, $p = .811$, suggesting that this study controlled for the potentially confounding effect of prior lexical usage knowledge.

TABLE 1

Descriptive Statistics for Independent Variable, Covariate, and Control Variable

	Pictorial		Verbal	
	M	*SD*	*M*	*SD*
Learning Style	2.81	4.58	2.62	4.28
L2 Proficiency	69.08	20.16	69.03	20.04
Prior Lexical Usage Knowledge	.16	.42	.14	.40

Table 2 presents the descriptive statistics for the dependent variables, including gain and retention in correct usage of lexical items. On the immediate posttest, the mean scores for the pictorial and verbal groups were 16.28 out of 25 items (65.12%) and 12.90 out of 25 items (51.60%), respectively. On the delayed posttest, these scores decreased to 7.48 (29.92%) and 5.74 (23.00%), respectively. Overall, the pictorial group demonstrated greater gain and retention than the verbal group.

TABLE 2

Descriptive Statistics for Dependent Variables

	Pictorial		Verbal	
	M	*SD*	*M*	*SD*
Immediate Posttest	16.28	6.76	12.90	6.82
Delayed Posttest	7.48	4.42	5.74	4.28

The first research question asked whether or not pictorial elucidation helped to raise awareness regarding the correct usage of lexical items. The results (Table 3) indicate a

significant main effect of pictorial elucidation with a moderate to large effect size, F (1,132) = 14.66, $p < .001$, $\eta_p^2 = .10$, demonstrating that students in the pictorial group corrected significantly more errors than those in the verbal group.

TABLE 3

Results for the Effect of Dual Coding Elucidation on Correct Usage of Lexical Items

	F	*df*	η_p^2	*p*
Coding	14.66	1/132	.10	.001
Coding × Time	4.80	1/132	.04	.030

The findings of this study corroborate the results of multiple L2 studies demonstrating the beneficial effects of pictures on lexical knowledge development (e.g., Bisson et al., 2015; Szczepaniak & Lew, 2011). Paivio's (1971, 1986, 2007) dual coding theory provides a plausible explanation of these results by positing that the combination of verbal and visual code produces a qualitative difference in information processing; in turn, the subsequent formation of an elaborated representation enhances human learning and memory. In this study, the cartoons portraying the correct and incorrect usage seem to have stimulated semantic elaboration of the differences between the two expressions, consequently giving rise to improved lexical error correction. Jiang (2000) explained that in the early stage of the form-meaning mapping process, learners link a new L2 word form to its L1 translation; however, the L1 translation does not always match the unique conceptual representation of the L2 word. This mismatch between the L1 translation and the specific concept connected to the L2 word can lead to lexical errors. Continuing with the previous example, the words *win* and *beat* share a similar L1 translation "이기다 (i-gi-da)." However, there are conceptual differences between the two words; *win* means to acquire something as a prize for defeating other people in a competition, while *beat* denotes defeating someone in a competition. This similar L1 translation but divergent conceptual content can become a source of confusion between the two words, causing lexical errors.

The booklet illustrates the conceptual differences between two words as well as their incorrect and correct usage in a humorous manner, with one cartoon depicting Manchester United being given to Real Madrid to take away as a prize and the other cartoon depicting Real Madrid defeating Manchester United. This pictorial elucidation of correct and incorrect lexical usage seems to draw learners' attention more forcefully to the semantic specification of the L2 lexical item compared to verbal explanations alone. In this way, it promotes semantic restructuring and more precise form-meaning remapping while learning L2 vocabulary. The findings of the present study suggest that learners sometimes confuse correct and incorrect usages when establishing initial form-meaning connections for lexical

items; however, visual presentations may help them notice conceptual differences between two expressions more clearly, thus enabling them to use the items correctly. Previous studies have reported on the effects of dual coding on acquiring new vocabulary in terms of establishing a form-meaning link, which is an initial stage in vocabulary development (e.g., Shen, 2010; Farely et al., 2012). Nonetheless, this study is the first to provide empirical evidence regarding the positive impact of dual coding on raising awareness of lexical errors and the correct usage of lexical items. These findings suggest that DCT can be applied to various dimensions of vocabulary learning.

In addition to the quantitative results, the qualitative data obtained from the open-ended question also illustrate students' positive perceptions of pictorial elucidation. The majority (90%) in the pictorial group reported that they found pictorial elucidation useful in improving their accurate use of vocabulary. As illustrated in Table 4, participants' remarks demonstrated the advantages of pictorial elucidation, such as cartoons, in terms of both cognitive and motivational aspects. They stated that cartoons more clearly contrasted how correct and incorrect usage differ in meaning, compared to verbal explanations only. These statements suggest that the cartoons raised their awareness of lexical errors and reinforced their memory regarding correct usage. They further noted that humorous cartoons made the learning process enjoyable and increased their concentration on the material.

TABLE 4

Students' Perceptions of Pictorial Elucidation Using Cartoons

	Students' Remarks
More Proficient Learners	• Presenting confusing words with the corresponding humorous cartoons that illustrated why the mistakes were funny raised my awareness of common errors and allowed me to use the words more carefully. • The common mistakes that foreign language learners make in vocabulary use were very helpful information to me. Also, cartoons showed me how the incorrect use of words can lead to comical miscommunications. It was striking to me, and I was able to acquire the differences in meaning while being entertained. This is a very effective way to improve the correct use of vocabulary. • Although I read explanations on confusing words, I continued to confuse and make the same mistakes repeatedly. The cartoons, however, were more impressive, clearly showing the meaning differences when the words were used correctly and incorrectly. They really helped with my memory regarding accurate vocabulary use.
Less Proficient Learners	• The cartoons helped me understand more easily why one expression is right while the other is wrong. • The association between the expressions and the cartoons enabled me to remember the words better and for longer than verbal explanations alone. • Cartoons made the material more approachable and intriguing. Because it was fun, I was able to focus on the material without losing concentration from beginning to end.

In contrast, the researcher observed that students in the verbal group often made statements like "*I read the material, but I do not remember the content*" immediately after

reading the booklet. This phenomenon seems to reveal that verbal explanations alone were less memorable than supplementing verbal explanations with visual presentations in adolescent learners' cognition; consequently, there were fewer error corrections in the verbal group compared to the pictorial group. In attending to the impact of visuals on adolescent learners' lexical knowledge development, this study expands prior DCT research, which has overlooked adolescent learners. It also lends support to the pedagogical potential of cartoons as visuals for engaging vocabulary instruction.

4.2. The Effects of Dual Coding Elucidation over Time

The second research question considered whether or not the effects of pictorial elucidation continued over time. The results (Table 3) revealed that the significant effects of pictorial elucidation indeed were maintained. Although there was a significant interaction between coding and time, $F(1,132) = 4.80$, $p = .030$, $\eta_p^2 = .04$, the follow-up mean comparison revealed that the difference between the pictorial and verbal groups was significant on both the immediate and delayed posttest (four weeks later). On the immediate test, there was a significant mean difference between the pictorial and verbal group, $t(133) = 2.90$, $p = .004$, $d = .50$. On the delayed test, there was a significant mean difference between the pictorial and verbal group, $t(133) = 2.33$, $p = .021$, $d = .40$.

These positive effects of pictorial elucidation on the long-term memory differ from Lotto and de Groot (1998) and Boers et al. (2009), studies reporting that pictures distract students from focusing on the word itself, thus hindering acquisition. However, the present study corroborates the findings of other researchers (Bisson et al., 2015; Farely et al., 2012; Shen, 2010; Vasiljevic, 2015) who note the significant positive effects of images on the long-term retention of unfamiliar vocabulary. Indeed, an example in Figure 3 shows how a student still remembered the cartoon illustrating *run over* vs. *run into* on the four-week delayed posttest, actually recreating the image while detecting and correcting the lexical error. This example suggests that pictures may provide additional retrieval cues for remembering verbal information and function as mnemonic devices rather than having distracting effects. The robust effects of the verbal-plus-visual encoding on understanding the correct usage of lexical items—even after a long delay—support dual coding theory, suggesting that processing information via both verbal and visual codes favorably affects long-term memory performance. This finding corroborates Paivio's (1971, 1986, 2007) proposition that the use of images increases retention over an extended period. In this study, the elaboration of verbal information through images is assumed to have enhanced long-term retention of lexical knowledge regarding correct usage, making the stored information less susceptible to attrition.

FIGURE 3

Samples of a Provided Cartoon and a Student's Drawing on the 4-Week Delayed Posttest

I ***ran over*** Chris in town yesterday. It was great to see him again.

I had not seen Chris for three years, and then I ***ran over (→into)*** him in the middle of London!

4.3. The Relationship Between Students' Learning Styles and the Effectiveness of Dual Coding Elucidation

The third research question asked how learning styles relate to the effectiveness of pictorial elucidation in raising awareness of the correct lexical usage. Pearson correlation results (Table 4) revealed that, for the pictorial group, there was a nonsignificant correlation between learning style and immediate posttest scores (r = .08). There was also a nonsignificant correlation between learning style and delayed posttest scores (r = .01).

TABLE 4

Correlation Between Learning Style and Effectiveness of Pictorial Elucidation

	Immediate Posttest	Delayed Posttest
	r	*r*
Learning Style	.08	.01

These findings parallel those of Vasiljevic (2012) and Samburskiy (2015), demonstrating no significant correlations between visual learning style and the effectiveness of visuals. The results imply that visual learners did not necessarily benefit more from pictorial elucidation compared to verbal learners. Considering the overall beneficial effects of pictures on error correction, it seems that the role of visual code in cognition might impact adolescent learners' memory performance more strongly than learning styles. In addition, students' engagement induced by visuals might augment the elaborative effects of visuals, far outweighing the influence of learning styles.

This study offers several implications for language educators in facilitating L2 lexical development. First, dual coding elucidation had a significant positive impact on adolescent

learners' understanding of the correct usage of lexical items. This finding should encourage language instructors who mainly follow a verbal approach to use more balanced teaching methods. They might add visuals to raise students' awareness of lexical errors and to assist them in using vocabulary more accurately. Material writers might also include visuals in textbooks as well as in multimedia-assisted language learning materials when they address lexical error issues. Furthermore, as shown in the adolescents' qualitative observations, using humorous cartoons as visuals provides affective and cognitive advantages, making the learning process more enjoyable and increasing concentration. Schmitt (2010) emphasized the importance of engagement in vocabulary learning such that "anything that leads to more and better engagement should improve vocabulary learning…thus promoting engagement is the most fundamental task for teachers and material writers" (p. 29). Given that maximizing engagement underlies all effective vocabulary teaching and learning, it is worth considering the use of humorous cartoons as visuals in various phases of vocabulary instruction.

Some limitations related to the present study should be acknowledged. First, this study used only one measure to assess accurate lexical usage: students corrected lexical errors in sentences. The use of multiple measures to assess lexical knowledge from a partial-to-full range would provide a fuller picture of dual coding effects on lexical development. In particular, writing sentences utilizing the target lexical items would better measure whether or not learners can use the items correctly when employing them productively. Unfortunately, this type of test was difficult to administer to the present study's middle-school participants due to their limited L2 production ability and class-time limits. In addition, this study employed visuals using cartoons, which provide enjoyment in addition to elaboration of verbal information, achieving the pedagogical objective of offering interesting materials to students. To provide a clearer picture of the effects of the visual code and its pedagogical implications, future research might use less interesting pictures or drawings in order to address methodological constraints.

5. CONCLUSION

The present study investigated the effects of dual coding elucidation on raising adolescent EFL students' awareness of lexical errors and correct usage of lexical items. This research contributes to the literature in several ways. First, it provides further empirical evidence for the DCT (Paivio, 1971, 1986, 2007) by demonstrating that dual coding aids not only in gaining new vocabulary but also in developing more advanced types of lexical knowledge (e.g., going beyond initial form-meaning connections by understanding conceptual differences between two L2 lexical items that share similar L1

translations and their correct usages). It further supports the DCT's applicability to various aspects of vocabulary knowledge development. By involving adolescent EFL learners previously overlooked in the DCT literature, this study also expands upon the current database of research into the effects of dual coding while highlighting the DCT's pedagogical potential for a range of learners. Finally, this study suggests that pictorial elucidation with cartoons is worthy of consideration for effective vocabulary instruction. Students' engagement with humorous cartoons in vocabulary learning facilitates their acquisition of the lexical knowledge central to second/foreign language development.

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APPENDIX

Target Lexical Items

	Incorrect Usage	Correct Usage
Pair 1	steal	rob
Pair 2	win	beat
Pair 3	match	suit
Pair 4	wound	injure
Pair 5	backside	back
Pair 6	little	few
Pair 7	say	tell
Pair 8	lay	lie
Pair 9	by	with
Pair 10	a paper	paper
Pair 11	educate	bring up
Pair 12	overtake	take over
Pair 13	at last	finally
Pair 14	search	search for
Pair 15	grow up	grow
Pair 16	run over	run into
Pair 17	out of work	out of order
Pair 18	throw at	throw to
Pair 19	have a toast	have toast
Pair 20	remind of	remind about
Pair 21	fill in	fill in for
Pair 22	put up	put up with
Pair 23	give one's hand	give someone a hand
Pair 24	keep the eye on	keep an eye on
Pair 25	break ice	break the ice

Applicable levels: Secondary

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