

# Dual Coding Research and Recommendations for Teaching Language Learners

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**Abstract:** This article overviews the main concepts of dual coding theory, followed by an overview of some recent research pertaining to language learning in support of a dual coding approach. Thereafter, recommendations are made for language teacher to implement in their teaching, followed by a checklist for use when lesson planning.

**Keywords:** dual coding theory, dual code approach, language learning

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## 1. Introduction

Dual coding theory proposes that information is processed and represented by two distinct cognitive subsystems, one of which is a verbal system for processing language, with the other being a nonverbal system for processing non-linguistic objects and events (Paivio, 1990). According to dual coding theory, the verbal and nonverbal systems function independently, but they are interconnected such that activation in one system triggers activity in the other (Sadoski, 2005).

This theory posits that learning is most effective when both systems are engaged via presentation of information in multiple modalities. For example, presenting information both visually through pictures and diagrams, as well as verbally through written or spoken text capitalizes on the capacities of both cognitive subsystems (Mayer, 2009). Research has confirmed that adding relevant images to text enhances learning and retention in comparison to text alone across a wide variety of study materials and learner ages (Butcher, 2014).

A key assumption underlying dual coding theory is that mental images are stored separately from verbal representations and the logogens, or mental lexicon, that underlies language processing. Evidence supporting distinct verbal and nonverbal systems comes from multiple sources including neuropsychology, information processing research, and developmental psychology (Sadoski & Paivio, 2013).

In summary, dual coding theory suggests that cognition involves separate verbal and visual processing systems that handle different types of representations but work cooperatively to enhance learning. Research evidence supports assumptions of the theory and the efficacy of engaging both systems in learning through multimodal instructional methods, which will be covered in the next section.

## 2. Research on Language Learning

Dual coding theory (Paivio, 1990), which proposes that verbal and visual information is processed and represented separately yet interconnectedly, has frequently been applied to research on language learning. The theory suggests that language acquisition can be enhanced by capitalizing on the distinct verbal and visual cognitive subsystems. Several key studies over the past several decades have explored how dual coding theory can inform effective methods for various aspects of language learning.

For example, Silverman and Hines (2009) compared read-aloud vocabulary instruction to multimedia-enhanced read-aloud instruction for young learners, comparing the effects on English language learners versus non-English language learners. Both sets of learners were exposed to read-alouds with video clips targeting 100 vocabulary words over a 12-week period. They found that for non-English language learners, the added multimedia condition yielded no additional benefit over traditional instruction; however, for English language learners, the multimedia condition led to greater gains in knowledge of the target vocabulary over traditional instruction.

Moreover, Mavildi et al. (2015) investigated the effects of integrating physical exercises versus gesture in foreign language learning. In their study of 111 preschool children, they experimented with four conditions: integrated physical exercise, in which children performed physical exercises related to the vocabulary they were learning; non-integrated exercises, which involved the learners performing physical exercises that were unrelated to the vocabulary they were learning; gesturing, wherein the children used gestures to act out the vocabulary words they were learning while seated; and conventional teaching, with the learners verbally repeating the target words while seated. The children in the study were taught 14 action words over a period of a month, with memory tests conducted during, immediately following, and 6 weeks after the intervention. They found that the students in the integrated exercise condition performed the best among the four interventions in

terms of free and cued recall performance. Additionally, cued recall was similar for integrated exercise, non-integrated exercise, and gesturing groups, but all three of those were higher than the conventional group. Their results indicated that integrating physical exercise into foreign language vocabulary learning enhances memory and learning, in particular for free recall tests. This supports dual coding concepts, combining full-body movements with verbal modes.

More recently, Andrä et al. (2020) performed three experiments to investigate the effects of gesture and picture enrichment on children learning vocabulary in a foreign language. They found that gesture enrichment, which involved learners performing gestures that represented word meanings, enhanced their learning to a greater extent when compared to non-enriched learning without gestures. The benefits were seen on both translation and recall tests up to six months after training. Their second learning condition, picture enrichment, yielded similarly positive results, and both gesture and picture enrichment improved vocabulary acquisition among children in the short and long term, particularly for concrete nouns.

Studies on adults have shown similar findings. For example, Repetto et al. (2017) had adults learn vocabulary under two conditions: reading an L2 word aloud with the written L1 translation provided and performing a related gesture, versus a picture-enriched condition. Training lasted 35 minutes, after which participants who had to use gesture produced fewer translation errors in comparison with the picture-enriched condition.

Overall, existing literature strongly supports dual coding theory notions that supplying two modes of representation - both visual and verbal - facilitates learning across major components of second language acquisition from vocabulary and grammar knowledge to application in oral and written modalities. Further instructional design innovations leveraging interconnected visual and verbal processing may yield additional language learning benefits. Accordingly, recommendations for language teachers are offered in the next section.

### **3. Recommendations for Language Teachers**

Based on the tenets of and empirical support for dual coding theory, the following are 10 practical suggestions for language teachers to implement for effective instruction:

1. When introducing new vocabulary with the use of images, simultaneously present verbal definitions and pronunciations. Having students dual code words visually and verbally improves memory and leads to more lasting learning effects.
2. When images may not be readily available in the classroom, instead encourage students to mentally visualize words, characters, or scenes. As the teacher, you can provide a verbal narration in the target language while the learners mentally picture the vocabulary in their minds. Having learners connect verbal descriptions to visual imagery engages their dual processing.
3. When teaching complex grammatical concepts, create multi-modal lessons that take advantage of both visual and verbal processing. For example, prepare lessons usual visuals like diagrams, charts, and other graphic organizers that show rules or relationships. These sorts of visual representations help learners visualize the rules when there is a verbal explanation of the same concepts simultaneously.
4. Have students draw pictures and images representing vocabulary, phrases, or grammatical rules along with traditional vocabulary list-building.
5. Make use of multimedia resources that combine audio with related imagery and on-screen text captions together. Doing this allows students to see, listen, and read simultaneously.
6. Provide physical hands-on interactions with concrete learning materials requiring sensory-motor involvement beyond just visual or verbal learning. This is especially recommended for very young learners, for whom learning concrete vocabulary is highly recommended.
7. Have students act out and pantomime vocabulary or phrases as you narrate to connect their physical motion pathways with linguistic coding.
8. Ask students to mentally visualize a scene or character when reading or listening to a narrative text in the new language to increase comprehension.
9. Beyond simply having students imagine scenes in their heads, require them to orally describe the mental images they generate for vocabulary, grammar rules, and language concepts to reinforce dual coding.
10. Help students verbally label the components of visual study aids like thought maps, timelines, charts, and diagrams related to target language structures.

The following is a checklist for language teachers to use when presenting new language material to students based on dual coding research findings:

## LESSON PLANNING CHECKLIST

- Use visual aids: Include relevant images, charts, diagrams, illustrations along with verbal information.
- Incorporate written text: Such as key vocabulary terms, definitions, translations, example sentences.
- Add audio narration: Record pronunciation recordings, verbally explain terms and concepts.
- Link imagery and words: Explicitly guide students to connect visuals to vocabulary or narratives to boost retention.
- Tap prior knowledge: Activate student prior visual and verbal associations related to the new material.
- Encourage mental visualization: Prompt students to actively visualize the verbal content and create mental images.
- Have students draw: Ask students to illustrate new vocabulary, grammar rules, language ideas.
- Include body movements: Use pantomime, dramatization, gestures to act out language.
- Reinforce with repetition: Institutes spaced repetition of visual/auditory stimuli and retrieval practice.
- Assess dual coding: Test students' ability to provide verbal labels for visuals and generate mental imagery from words.
- Combine modalities: Blend reading, listening, speaking and physical interactions with the material.
- Check both systems: Evaluate student mastery of verbal knowledge and equivalent visual representations.

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**Merrilee Brinegar** received her B.A. from the University of Texas at Austin in 1999 and her M.Ed. in Educational Technology in 2008. Since 2003, she has lived and taught in South Korea and has been teaching at Hankuk University of Foreign Studies since 2008.