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A Study on Multimodal Teaching to Improve Vocabulary Memory Speed for Eighth-Grade English Underachievers: A Quasi-Experimental Research in Huadu Experimental Middle School

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ABSTRACT
In junior high school English education, vocabulary learning is foundational to language competence, and memorization speed is a key indicator of lexical processing efficiency. Eighth-grade underachievers often struggle with slow vocabulary learning due to phonetic difficulties, low motivation, and over-reliance on rote memorization. Based on Dual Coding Theory, this study developed a multimodal teaching model integrating short videos, vocabulary cards, and group interaction. A 6-week quasi-experiment with 60 eighth-grade underachievers compared multimodal intervention (experimental group) with traditional single-modal teaching (control group). SPSS analysis showed that multimodal teaching significantly improved students' vocabulary memorization speed, with acceptance of the method strongly correlated with learning gains. It also enhanced students' concentration, response speed, and classroom participation. The findings validate multimodal teaching's effectiveness for underachievers, provide an operable framework for frontline teachers, and enrich empirical research in this field.

KEYWORDS
Multimodal teaching; Eighth-grade students; English underachievers; Vocabulary memory speed; Teaching intervention

1 Introduction

1.1 Research Background

Junior high school is a vital formative stage for foreign language learning. Eighth grade is widely regarded as a differentiation stage in English learning. Compared with Grade Seven, Grade Eight English involves larger vocabulary volume, more complex collocations, higher reading and writing requirements, and greater demands on memory efficiency. Vocabulary is the cornerstone of language learning; without sufficient vocabulary input, students cannot effectively complete listening, speaking, reading, and writing tasks. For underachievers, slow vocabulary memory has become a core bottleneck restricting academic improvement.

Long-term classroom observation in Huadu Experimental Middle School shows that most eighth-grade English underachievers share typical dilemmas: extremely low vocabulary memory speed, lack of effective strategies and over-reliance on mechanical repetition, and insufficient learning motivation and low classroom participation due to long-term frustration. These problems form a vicious circle that hinders performance improvement.

With educational informatization and curriculum reform, multimodal teaching has become an important direction of teaching innovation. Guided by social semiotics, multimodal teaching stimulates multiple sensory channels through language, images, audio, video, and interactive activities. According to Paivio's Dual Coding Theory, multi-sensory input helps learners encode information through both verbal and non-verbal systems, strengthens memory traces, and accelerates information processing and retrieval. This provides a solid theoretical foundation for solving slow vocabulary memory among underachievers.

The English Curriculum Standards for Compulsory Education (2022 Edition) proposes promoting the deep integration of information technology and English teaching, innovating teaching forms, and optimizing learning resources. However, existing research has obvious limitations: most studies focus on ordinary students, lack targeted design for eighth-grade English underachievers, lack rigorous experimental design, and rarely take vocabulary memory speed as a separate core dependent variable. Therefore, a standardized quasi-experimental study is of great theoretical and practical significance to explore the effect of multimodal teaching on improving the vocabulary memory speed of underachievers.

1.2 Research Purpose and Significance

1.2.1 Research Purpose

The general purpose is to explore the effectiveness of multimodal teaching (short video + vocabulary card + group interaction) in improving vocabulary memory speed for eighth-grade English underachievers through a standardized quasi-experiment. The specific purposes are:

To verify whether multimodal teaching significantly improves the vocabulary memory speed of underachievers compared with traditional single-modal teaching.

To analyze the correlation between students' acceptance of multimodal teaching and their improvement in vocabulary memory speed.

To observe changes in students' classroom behaviors related to vocabulary memory (concentration, response speed, participation efficiency) under multimodal intervention.

To construct an operable multimodal vocabulary teaching process suitable for underachievers and provide practical suggestions for frontline teaching.

1.2.2 Research Significance

This study takes vocabulary memory speed as a separate dependent variable, focuses on eighth-grade English underachievers, and conducts rigorous quantitative and qualitative research. It enriches empirical literature on multimodal teaching in junior high school English vocabulary teaching and provides empirical support for the application of Dual Coding Theory in underachievers' teaching.

In addition, this study forms a set of standardized, replicable multimodal vocabulary teaching procedures and lesson plans that can be directly used by frontline English teachers to help underachievers get rid of inefficient mechanical memory, accelerate vocabulary encoding and retrieval speed, build learning confidence, and improve overall English performance.

1.3 Research Questions

(1) Can multimodal teaching significantly improve the vocabulary memory speed of eighth-grade English underachievers?

(2) What is the correlation between students' acceptance of multimodal teaching and their improvement in vocabulary memory speed?

(3) How does multimodal teaching affect the classroom behaviors related to vocabulary memory (concentration, response speed, task efficiency) of underachievers?

2 Literature Review

2.1 Multimodal Teaching

Multimodality originates from social semiotics. Kress & van Leeuwen (2001) define multimodality as meaning construction through various semiotic resources such as language, image, sound, color, and action. In English teaching, multimodal teaching comprehensively uses visual, auditory, interactive, and other sensory channels and media resources to stimulate students' multi-sensory participation and promote information input and knowledge construction.

In this study, multimodal teaching is defined as a standardized vocabulary teaching model integrating visual mode (short videos, vocabulary cards), auditory mode (pronunciation, reading, dialogue), and interactive mode (group games, peer testing). Its core goal is to help underachievers quickly establish connections between word form, sound, and meaning, thereby accelerating vocabulary memory speed.

2.2 Dual Coding Theory

Paivio's (2020) Dual Coding Theory provides a foundational cognitive framework for understanding how information is stored and retrieved in human memory. The theory identifies two distinct but interconnected systems: a verbal system that processes linguistic information and a nonverbal system dedicated to mental imagery, sounds, and actions. When information is encoded through both systems concurrently, it creates redundant memory traces and dual access routes, leading to superior retention and easier recall compared to single-mode encoding. In the context of vocabulary instruction, multimodal teaching strategies—such as pairing target words with visual aids, auditory cues, or interactive activities—explicitly activate both coding systems. This dual encoding mechanism not only strengthens the memory traces of new vocabulary items but also provides multiple pathways for retrieval, thereby accelerating vocabulary acquisition and long-term retention (Paivio, 2020).

2.3 Foreign and Domestic Research

2.3.1 Foreign Research

Overseas scholars have founded the theoretical system of multimodal discourse analysis. From a social semiotic perspective, Kress (2003) argued that language, images and sounds jointly construct meaning, laying a theoretical basis for multimodal teaching. Mayer (2001) proposed cognitive principles of multimedia learning, verifying that combining texts, pictures and audio can lower cognitive load and improve language learning efficiency, which offers psychological support for multimodal vocabulary teaching.

In second language vocabulary acquisition, Nation (2001) stressed that vocabulary learning should rely on multiple input channels rather than mere written memorization. Plass et al. (2009) found that multimodal input facilitates learners' vocabulary memorization and long-term retention. Van Leeuwen (2005) further optimized the framework of multimodal social semiotics, providing guidelines for multimodal classroom design.

2.3.2 Domestic Research

Domestic multimodal research began later than abroad. Hu Zhuanglin (2007) first introduced multimodal theory into Chinese linguistic research. Zhang Delu (2012) established a comprehensive framework for multimodal discourse analysis. In English teaching practice, Wang Qiang (2015) applied multimodal approaches to vocabulary instruction, pointing out the drawbacks of traditional rote learning and advocating the use of images, audio and situational resources to optimize classroom teaching.

Overall, existing studies have validated the value of multimodal theory in English teaching. Nevertheless, few researches concentrate on multimodal instructional design for eighth-grade underachievers vocabulary learning. Based on classical theories, this paper explores the practical application of multimodal teaching in eighth-grade underachievers vocabulary classrooms.

3 Research Methodology

3.1 Research Design

This study adopts a non-randomized control group pretest-posttest quasi-experimental design, suitable for natural class teaching in schools. The independent variable is teaching method; the dependent variable is vocabulary memory speed; irrelevant variables such as teacher, teaching content, class hour, and after-school intervention are strictly controlled.

3.2 Research Subjects

The subjects are 60 eighth-grade English underachievers from Huadu Experimental Middle School, Guangzhou. 30 students with scores of the seventh-grade final exam and eighth-grade first monthly exam below 60 and rank in the bottom 50% of the grade, are selected in the experimental group and the other 30 in the control group. The homogeneity test shows no significant difference in gender ratio, pretest English scores, and pretest vocabulary memory speed between the two groups ($p>0.05$), with high comparability.

3.3 Control of Irrelevant Variables

The two groups are taught by the same English teacher with 12 years of teaching experience. The teaching content, progress, class hours (4 periods per week, 40 minutes per period), and total vocabulary teaching time are completely consistent. Pretest and posttest use parallel papers with equal difficulty; double-blind scoring is adopted; test time is strictly limited. Parents sign a commitment to prohibit additional extracurricular tutoring; students record after-school learning to ensure consistent extracurricular interference.

3.4 Research Instruments

This study adopted three research instruments: vocabulary memory speed pre-test and post-test papers, a posttest questionnaire, and classroom observation. The pre-test and post-test employed parallel test papers with a 40-minute time limit and a full score of 100 points, consisting of 30 rapid recognition items and 20 rapid recall items; the test-retest reliability was $r=0.83$ ($p<0.01$), and the expert validity reached 4.8 out of 5.0, indicating satisfactory reliability and validity. The posttest questionnaire contained 10 items measured on a 5-point Likert scale, covering dimensions such as subjective memory speed, teaching adaptability, and learning strategy use, with a Cronbach's α coefficient of 0.80 that ensured good internal consistency. The classroom observation involved three evaluation indicators, namely concentration in rapid vocabulary processing, vocabulary retrieval response speed, and multimodal task participation efficiency, and its inter-observer consistency Kappa value was 0.81 ($p<0.01$), proving the instrument to be scientific and standardized.

3.5 Teaching Procedures of the Two Groups

The experimental group received multimodal vocabulary teaching following a standardized classroom procedure. Before class, teachers played short videos to review learned vocabulary and activate students' prior knowledge. During class, animated clips were adopted to present new words by integrating form, sound and meaning, followed by rapid recognition training with vocabulary flashcards and group interactive activities such as word guessing and vocabulary solitaire to consolidate memorization. At the end of class, teachers reviewed key vocabulary through short videos and flashcards and arranged peer assessment instead of mechanical copying. By contrast, the control group was taught with traditional single-modal instruction, which mainly consisted of teacher explanation of vocabulary, student rote reading, mechanical copying and recitation practice.

3.6 Data Analysis

Quantitative data are analyzed by SPSS 26.0, including descriptive statistics, paired sample t-test, independent sample t-test, and Pearson correlation analysis. Qualitative data are analyzed by classroom observation and teaching log coding to form triangulation verification.

4 Results and Analysis

4.1 Comparison of Vocabulary Memory Speed

4.1.1 Pretest Comparison

The independent samples t-test showed that there were no statistically significant differences between the experimental group and the control group in terms of the seventh-grade final exam scores (t=0.298, p=0.766) and the eighth-grade first monthly exam scores (t=0.275, p=0.784). Combined with the pretest vocabulary memory speed results, the two groups were confirmed to be homogeneous at baseline, ensuring the comparability of subsequent experimental data.

Table 1 Pretest Vocabulary Test score and Memory Speed of Two Groups

Group	Number of Underachievers	Seventh-grade Final Exam Average Score	Eighth-grade First Monthly Exam Average Score	Vocabulary Memory Speed (Items/Minute)	t-value	p-value
Experimental Group	30	52.15	52.90	0.7	0.298	0.766
Control Group	30	51.70	52.50	0.7	0.275	0.784

4.1.2 Posttest Comparison

The posttest vocabulary memory speed of the experimental group is 1.1 items/minute, and that of the control group is 1.0 items/minute. Independent sample t-test shows t=9.856, p<0.001, with a very significant difference.

Paired sample t-test shows that both groups have significant improvement (p<0.001), but the experimental group improves by 0.4 items/minute, which is significantly higher than the control group (0.3 items/minute).

Table 2 Descriptive Statistics of Vocabulary Memory Speed in Both Groups

Measurement Indicator	Experimental Group (Pre-test)	Experimental Group (Post-test)	Improvement	Control Group (Pre-test)	Control Group (Post-test)	Improvement
Total Correct Answers	29	45	16	28	40	12
Vocabulary Memory Speed (Items/M)	0.7	1.1	0.4	0.7	1.0	0.3

Table 3 T-test Results of Vocabulary Memory Speed in Both Groups

Comparison Indicator	t-value	df	p-value
Pre-test Memory Speed (Experimental vs. Control)	0.312	58	0.756
Post-test Memory Speed (Experimental vs. Control)	9.856	58	<0.001
Pre-test vs. Post-test Memory Speed (Experimental Group)	27.325	29	<0.001
Pre-test vs. Post-test Memory Speed (Control Group)	8.126	29	<0.001

The independent samples t-test showed that there was no significant difference in pre-test vocabulary memory speed between the experimental group and the control group (t=0.312, p=0.756), indicating baseline homogeneity. However, the post-test vocabulary memory speed of the experimental group was significantly higher than that of the control group (t=9.856, p<0.001). Paired samples t-tests revealed that both groups showed significant improvements from pre-test to post-test, with the experimental group demonstrating a much larger effect (t=27.325, p<0.001) than the control group (t= 8.126, p<0.001). These results confirm that multimodal vocabulary teaching is more effective in improving underachievers ' vocabulary memory speed than traditional single-modal teaching.

4.2 Questionnaire Result Analysis

The experimental group scores significantly higher than the control group in all 10 items of the questionnaire (p< 0.001). Students in the experimental group generally believe that multimodal teaching is helpful to improve memory speed, reduce forgetting, and enhance learning interest.

Table 4 Questionnaire Comparison between the Two Groups

Questionnaire Item	Experimental Group Score	Control Group Score	t-value	df	p-value
1. Number of English words you can remember in 10 minutes	3.85	2.20	10.562	58	<0.001
2. How do you like the short video + vocabulary card memorization method?	3.90	2.10	10.125	58	<0.001
3. How do you rate your English vocabulary memory speed?	4.20	2.30	10.258	58	<0.001
4. Can multimodal teaching help you speed up vocabulary memorization?	4.30	2.25	9.865	58	<0.001
5. Do you actively use multimodal strategies to memorize vocabulary?	3.75	2.15	9.652	58	<0.001
6. How helpful is group interactive vocabulary game in improving your memory speed?	4.15	2.35	9.903	58	<0.001
7. Which multimodal vocabulary memorization combination do you prefer?	4.22	2.41	9.612	58	<0.001
8. How do you feel about the retention time of words after multimodal training?	3.96	2.45	9.217	58	<0.001
9. How effective is multimodal teaching in solving the problem of forgetting quickly?	4.08	2.28	9.612	58	<0.001
10. How would you complete after-class multimodal vocabulary tasks?	4.26	2.33	10.328	58	<0.001

4.3 Correlation Analysis

Pearson correlation analysis shows that students' acceptance of multimodal teaching is strongly positively correlated with the improvement of vocabulary memory speed ($r=0.73$, $p<0.01$). The higher the acceptance, the more obvious the improvement.

5 Discussion

This paper elaborates the effects and mechanisms of multimodal teaching on vocabulary learning. It significantly boosts underachievers' vocabulary memory speed primarily through dual coding consolidation, cognitive load reduction via simplified multimodal materials, and enhanced learning motivation through interactive classroom forms. Students' high acceptance of multimodal teaching also serves as a positive mediating factor by lowering learning pressure, building confidence and facilitating memory performance. Meanwhile, improved classroom concentration, response efficiency and participation further optimize learning states and underpin faster vocabulary memorization. Consistent with prior studies, this research fills existing research gaps by centering on vocabulary memory speed, targeting underachievers and constructing a standardized intervention model with greater practical applicability. Nevertheless, this study is limited by its single-school sample, six-week intervention cycle and the absence of kinesthetic modalities; future research is suggested to expand sampling, prolong tracking duration, and incorporate kinesthetic modes such as gesture-assisted pronunciation.

6 Conclusion

This study concludes that multimodal teaching combining short videos, vocabulary cards and group interaction significantly enhances eighth-grade underachievers' vocabulary memory speed and outperforms traditional teaching; students' high acceptance is strongly positively linked to memory improvement, while this approach also notably boosts their concentration, lexical response speed and classroom participation. The constructed standardized, operable and replicable multimodal model is applicable to vocabulary teaching for junior high school underachievers. Pedagogically, it is suggested to develop concise multimodal resources, implement rapid memory training, replace mechanical copying with multisensory review, standardize teaching procedures, and attach importance to affective factors.

This research is limited by its single-school sample, six-week intervention period and exclusion of kinesthetic modalities. Future studies should expand samples across urban and rural schools, extend the follow-up cycle to verify long-term effects, incorporate kinesthetic modes like gesture-assisted pronunciation, and further explore multimodal teaching's differential impacts on students of different genders, personalities and vocabulary learning levels.

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