# An Empirical Study on the Effect of Underlined and Bold Text Enhancement on Children's Second Language Vocabulary Learning

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**Abstract: In order to examine the impact of two text enhancement methods, underlining and bolding, on the second language vocabulary learning effect of 6-7-year-old children and their acceptance, this study used experimental methods combined with interviews and observations to conduct empirical research. 45 children with no significant difference in initial English proficiency (average 75.47 points) were randomly divided into underlined experimental group 1, bolded experimental group 2 and no text enhancement control group for four weeks of intervention teaching. Through vocabulary tests and interview observations, the experimental results showed that both text enhancement methods can effectively improve children's vocabulary recognition speed and memory retention rate (the average score of the underline group in the post-test was 90.13, and the bold group's score was 88.27, both higher than the control group's 82.93 points). The significant effect was still maintained after one week, and the average score of the underline group was still the highest. Children are most receptive to underlined materials (4.1 stars). The conclusion shows that both methods have a promoting effect, and the underlying method has a better promoting effect and children's acceptance than the bolding method. The results of this study provide empirical reference for the design of children's second language learning materials and the optimization of classroom teaching.**

**Keywords: Text Enhancement; Second Language Vocabulary Acquisition; Underlining; Bolding; Attention Hypothesis**

## 1. Introduction

In the context of the era of globalization, the importance of mastering a second language has become increasingly prominent. English is one of the most widely used languages in the world. As of 2023, more than 1.5 billion people will use it as a second language, accounting for approximately 20% of the total global population. In second language learning, vocabulary acquisition is considered to be the central task [1]. At the same time, Zhang Ping further pointed out that most of the language input for second language learners comes from classroom teaching [2], and acquisition in a second language classroom environment begins with the input of second language vocabulary. Therefore, it is particularly important to improve the effect of second language vocabulary acquisition in classroom teaching, but in actual learning, most learners will face problems such as low vocabulary learning efficiency, difficulty in memory, and easy forgetfulness. This phenomenon is particularly prominent among children. Teachers or parents often rely on repeated dictation and other methods to strengthen memory. This will not only increase the learning burden, but may also weaken learning interest. How to effectively promote second language vocabulary acquisition has become a key issue in current learning and teaching practice.

Existing research has discussed this from multiple angles. For example, the visual saliency theory states that stimuli that are different from the surrounding environment in dimensions such as form will automatically capture attention [3]. Its core is consistent with the attention hypothesis [4]. This hypothesis believes that the input of language knowledge must be absorbed with sufficient attention to complete the learning process from input to output. Therefore, it is crucial to guide learners to pay attention to key information. Judging from existing research, an effective method is

 

text enhancement, which uses specific processing of text to highlight key information to enhance readers' perception, understanding, and memory of the text. Foreign scholar Bouzeraa studied the role of print-enhanced text in improving students' ability to reduce errors in paragraphs [5]; Yuho Cha and Younghoon Lee explored text enhancement methods with adjustable operation intensity based on contextual learning [6]; in China, research mostly focused on the data field, and Feng Ran et al. provided effective technical support for related fields by sorting out enhancement methods in the field of text data [7].

In terms of text enhancement methods, existing research mostly uses underline and bold text enhancement methods. For example, Ge Liezhong took undergraduates and graduate students from Zhejiang University as a group of subjects and found that underlining significantly promoted the visual search performance of subjects [8]; Tiantian Guo introduced methods such as bolding and underlining into the field of language learning [9], and systematically examined their multi-dimensional effects in vocabulary and grammar learning, second language speaking, etc. His research targets include intermediate college English grammar learners, high school students and so on; in addition, Shonenkov et al. also started from the technical implementation level and discussed the enhancement technology of simulated underlined text [10]. Although existing research has initially verified the effectiveness of underlined and bolded text enhancement methods, and has expanded its application scenarios, most of the research involves adults, and there is obviously insufficient attention to children.

There are significant differences between children and adults in cognitive characteristics, attention mechanisms and information processing methods. In this regard, Liu Jing and Wang Xinru pointed out that second language vocabulary acquisition should develop a personalized learning plan based on the learner's knowledge level and characteristics [11], rather than simply applying adult learning methods. Individual differences among learners will affect second language acquisition [12]. Different learners have differences in learning styles, cognitive abilities, etc., which will have an important impact on their learning results. Based on the above research, it is speculated that children may respond differently to text enhancement than adults. In theory, text enhancement methods such as underlining and bolding that are suitable for adults can also help children learn. However, current research has not systematically explored whether this text enhancement method can promote children's learning effects, and its actual impact has yet to be verified.

Based on the above research background, this article is based on a second language vocabulary acquisition experiment and combines interviews, observations and other methods to examine the second language vocabulary learning effects of 6-7-year-old children under underlined and bold text enhancement intervention measures, and examines the following issues:

Will the underlined text enhancement method improve children's second language vocabulary learning?

Will the bold text enhancement method improve children's second language vocabulary learning?

Which text enhancement method will produce better results in children's second language vocabulary learning?

Which text enhancement method is better accepted by children?

## 2. Research Design

### 2.1 Method

This study adopts experimental methods and combines interviews and observation methods for qualitative and quantitative analysis.

### 2.2 Sample

The experimental subjects were 45 children aged 6-7 years (M = 6.58 years old, SD = 0.49, 22 boys and 23 girls) from two ordinary primary schools. All children's mother tongue was Chinese and their second language was English. They passed the pre-test (100-point system, 26 English letter test questions (75 points), experiment Target vocabulary test questions (25 points), select children with scores between 70 and 80 to participate in the experiment to ensure that there is no significant difference in their initial English levels (M = 75.47; SD = 2.19), and all children are unfamiliar with the experimental target vocabulary, which will not affect subsequent vocabulary learning and experimental accuracy. Three English teachers from the same school (with similar teaching experience and teaching levels) participated in

 

the experiment to conduct teaching activities. The teachers were trained before the experiment started to ensure that they used similar teaching models and methods to conduct teaching activities. This experiment used random grouping, and 45 children were randomly divided into three groups, namely experimental group 1 (underlined text enhancement), experimental group 2 (bold text enhancement), and control group (no text enhancement), with 15 children in each group. All parents signed an informed consent form allowing their children to participate in the experiment.

**2.3 Experimental Materials**

2.3.1 Learning materials

8 texts were selected from the first-grade English textbook (People's Education Press Edition), and 50 words that the children did not know and had not yet learned were selected as the experimental target vocabulary. Text learning materials were produced according to the grouping situation. The experimental group 1 underlined the target vocabulary with solid black lines; experimental group 2 used bold fonts for the target vocabulary; the texts in the control group were all in ordinary fonts without any enhancement.

2.3.2 Test materials

Make target vocabulary cards, the words on the cards are in ordinary fonts; make target vocabulary translation test questions, which are matching connection questions, that is, the vocabulary is provided on the left, and its Chinese definition is provided on the right and shuffled in order. There are 10 words in one group, a total of five groups (2 points for each word, a total of 100 points); the vocabulary cards and vocabulary translation test questions are used to test the word recognition speed and memory retention rate of each group of children in the post-test and delayed test after the teaching.

2.3.3 Interview materials

Interview outlines were designed for children and teachers based on three different groups of text processing, and expression cards needed for interviewing children were produced. Each group had 8 questions. The questions were designed to ensure that the interview time was within half an hour, and were used to understand the acceptance, preference, and feelings of children in each group for the corresponding text enhancements.

**2.4 Experimental Process**

The experiment lasted for 5 weeks. In the first 4 weeks, trained teachers conducted teaching activities according to the teaching plan. In the fifth week, the test was conducted. The experimental location was three classrooms on the same floor of a school (not the school where the experimental subjects were selected). Teaching activities were conducted four times a week (Monday, Wednesday, Friday, and Sunday). The teaching activities of each group were at the same time, starting at 10 a.m. and lasting 30 minutes to ensure that there was little difference in children's learning status. The specific experimental process is as follows.

2.4.1 Preparation stage

Before the start of the experiment, three teachers received unified training and were familiar with the teaching materials. The teachers conducted trial lectures and listened to each other's lectures to ensure that the teaching mode was consistent; 15 observers were selected to familiarize them with the experimental process and observation points in advance. Each observer was responsible for observing the attention span and classroom status of the three children, and making written records.

2.4.2 Teaching implementation stage

First, organize each group of children to enter the corresponding classroom half an hour in advance of the planned time, and distribute text learning materials and stationery. At the same time, 15 observers enter three classrooms in groups of five and sit nearby in the corner of the classroom where the children need to be observed, so as to facilitate the observation of children without affecting teaching activities. Subsequently, the three teachers entered their respective classrooms and officially started teaching activities at 10 o'clock. The teachers taught according to the teaching plan. The content and teaching progress of each class were exactly the same. The teaching activities ended at 10.30.

2.4.3 Test phase

The test is conducted immediately after the last class. First, the teacher conducts a word recognition speed test on each group of children. That is, the teacher randomly shows five vocabulary cards to each child in turn, and the observer records the time from the teacher showing the vocabulary card to the child correctly saying the word definition and the

 

number of correct answers; then the teacher issues target vocabulary translation test questions to each group of children, and the children's answers are uniformly marked by the teacher. A week later (Sunday of the fifth week), children were given a delayed test, that is, children were given target word translation test questions again to test their memory retention rate. After the delayed testing was completed, each child and corresponding teacher were interviewed one-on-one according to the interview outline.

## 3. Data Analysis Results

This study conducted a descriptive statistical analysis of children's test scores and reaction test times, aiming to compare the vocabulary acquisition effects of the three groups under experimental intervention. The data came from 45 children, divided into three groups (15 in each group), and the mean, standard deviation, maximum and minimum values of each group were calculated.

**Table 1. Children's Vocabulary Test Scores**

| Group | Test Type | Mean | Standard Deviation | Minimum | Maximum |
|---|---|---|---|---|---|
| **Experimental Group 1** | Pre-test | 75.10 | 2.05 | 72.0 | 78.0 |
| | Post-test | 90.13 | 4.03 | 82 | 96 |
| | Delayed test | 85.20 | 5.28 | 78 | 96 |
| **Experimental Group 2** | Pre-test | 75.80 | 2.40 | 72.0 | 79.0 |
| | Post-test | 88.27 | 4.33 | 80 | 94 |
| | Delayed test | 82.00 | 4.90 | 72 | 90 |
| **Control Group** | Pre-test | 75.37 | 2.31 | 71.0 | 79.0 |
| | Post-test | 82.93 | 5.28 | 74 | 92 |
| | Delayed test | 79.60 | 6.33 | 70 | 90 |

As shown in Table 1, the pre-test scores of the three groups were very close (experimental group 1: 75.10, experimental group 2: 75.80, control group: 75.37), and the standard deviations were small and similar (2.05-2.40), indicating that the basic levels of the children screened to participate in the experiment were equivalent, and subsequent differences were due to experimental intervention. Analyzing the post-test scores of the three groups, compared with the scores of the control group (M=82.93, SD=5.28), experimental group 1 had the highest average score (M=90.13, SD=4.03), followed by experimental group 2 (M=88.27, SD=4.33), the post-test scores of experimental group 1 and experimental group 2 were both higher than those of the control group, indicating that both text enhancement interventions have a promoting effect on vocabulary acquisition. The delayed test scores showed a similar trend, but the score gap between the three groups was reduced (experimental group 1: 85.20, experimental group 2: 82.00, control group: 79.60). The delayed test scores of all groups were lower than the post-test scores, indicating that the scores declined over time, but the experimental group 1 maintained the best effect.

**Table 2. Children's Response Test Time (Seconds)**

| Group | Test Type | Mean | Standard Deviation | Minimum | Maximum |
|---|---|---|---|---|---|
| **Experimental Group 1** | Post-test | 3.21 | 0.76 | 2.2 | 4.7 |
| | Delayed test | 3.57 | 0.80 | 2.2 | 5.1 |
| **Experimental Group 2** | Post-test | 3.59 | 0.67 | 2.5 | 4.8 |
| | Delayed test | 4.19 | 0.74 | 2.7 | 5.3 |
| **Control Group** | Post-test | 4.03 | 0.67 | 2.8 | 5.0 |
| | Delayed test | 4.61 | 0.68 | 3.6 | 5.6 |

In terms of reaction test time, as shown in Table 2, experimental group 1 had the shortest post-test reaction time (M=3.21s, SD=0.76), followed by experimental group 2 (M=3.59s, SD=0.67), although the standard deviation of experimental group 1 is relatively large, indicating that the reaction time difference within the group is large, the overall performance is the best; in the delayed test one week later, the reaction time of the three groups increased compared with the post-test, indicating that the reaction speed was generally slower, and experimental group 2 (M=4.19s), the control group (M=4.61s) responded the slowest. In contrast, the average time of experimental group 1 remained the shortest

 

(M=3.57s) and the time increase was the smallest (0.36s). This result shows that the experimental intervention improved children's vocabulary acquisition and retention abilities.

By comparing the performance of the two experimental groups and the control group on children's test scores and reaction times, the immediate and sustained effects of the two methods on children's vocabulary acquisition were examined. The results showed that both experimental intervention methods could significantly improve children's vocabulary acquisition in the short term, and the intervention effect of Experimental Group 1 was better than that of Experimental Group 2. Over time, although the scores and reaction speeds of each group declined, in comparison, the intervention effect of Experimental Group 1 was able to maintain its advantage. This shows that the intervention method used by Experimental Group 1 is more effective in promoting the long-term maintenance of children's vocabulary acquisition.

## 4. Interview and Observation Results

### 4.1 Child Interviews

In the question of material selection and recommendation, more than 86% of the children in the underlined group expressed their willingness to recommend underlined books to their friends; the final average rating of children in the experimental group 1 for the underlined text materials was 4.1 stars (on a 5-star scale), with typical comments such as "The underlined words feel like they are waving to me, and I can always see them at a glance." About 66% of the children in experimental group 2 expressed that they like bold words and wanted to own books with bold fonts. About 26% of the children reported that "the thick words are a bit dark and not good-looking" and "the dark words are a bit tiring after reading for a long time." The average rating was 3.3 stars. After viewing the three materials, according to statistics, the proportion of children in the control group who chose underlined materials as the books they most wanted to study with (53.3%) was significantly higher than those who chose bolded materials (26.7%) and ordinary materials (20%). Regarding memory, children in the underlined group showed more evidence that they were more likely to remember the underlined words and were able to take the initiative to give examples during the interview.

### 4.2 Teacher Interviews and Observation Results

Teachers and classroom observers in experimental group 1 generally believed that underlining can effectively and clearly guide children's eyes, children can quickly locate the target to learn vocabulary, and classroom interaction is relatively active. Teachers rated the underlying materials as 9 points (on a 10-point scale), and observers scored an average of 8.6 points. Teachers in Experimental Group 2 believed that bolding could attract children's attention to a certain extent. Observers said that children were initially curious about the bold words, and the children would discuss the target words with each other. However, later the teacher said that the children's feedback was "a bit confusing." The observers noticed that some children blinked more frequently. The teacher scored the bolded materials 8.5 points, and the observers gave an average score of 7.6 points.

## 5. Discussion

The results of this study show that both underlining and bolding text enhancement methods can promote the second language vocabulary acquisition of 6-7-year-old children. This result supports the attention hypothesis of Schmidt (1990). Only the noticed language forms can be effectively processed and internalized by learners. The target words are highlighted through visual means, which successfully guides children's attention and enables them to input key information more effectively, thus promoting the effective processing and internalization of target words by children. This is ultimately reflected in children's faster recognition speed and higher memory retention rate.

Regarding the core finding that the learning effect of the underlined text enhancement method is better than that of the bold text enhancement method, first of all, John From the perspective of visual cognitive load proposed by Sweller in 1988, underlining is a relatively mild way of highlighting. It does not significantly change the shape of the words and the overall grayscale of the page, but underlines the words below to guide children's attention; in contrast, bolding will make the words' body strokes are thicker, the overall color of the page is darker, and it is more visually abrupt. This may cause

 

potential visual pressure for children who are in the language development stage, and is not conducive to the extraction and absorption of information. This is also consistent with children's reports that it is "unsightly and a bit messy" and observers' reports that children blink frequently. Secondly, children's higher acceptance of underlined materials is also an influencing factor in their vocabulary learning effects. Higher love and acceptance can be transformed into motivation for learning, improving children's learning interest and learning emotions. As a result, children's learning investment will be higher and learning results will be better.

This study provides ideas for the compilation and teaching of second language textbooks for children. As a low-cost, easy-to-implement and effective enhancement method, underlining can attract children's attention and improve learning efficiency. Textbook writers can underline core vocabulary and content, and teachers can use this method in the process of teaching writing on the blackboard, thereby improving the quality and efficiency of teaching.

Although this study has achieved certain empirical results, there are still some limitations. First of all, the samples and scenarios of this study have limitations. The sample size is small, geographically concentrated, and insufficient in generalizability. The sample size can be expanded in the future to improve the applicability of the conclusions. Secondly, although this study combines quantitative tests and qualitative interviews, it lacks objective indicators such as eye movements. Future studies can enrich the design and add equipment such as eye trackers and electroencephalograms to explore the intrinsic mechanism of text enhancement in guiding children's attention from a scientific perspective.

## 6. Conclusion

This study verified the positive effect of text enhancement on second language vocabulary acquisition of 6-7-year-old children through a second language vocabulary acquisition experiment combined with interviews, observations and other methods, and reached the following conclusions:

Both underline and bold text enhancement methods can effectively improve the second language vocabulary learning effect of 6-7-year-old children.

The underlined text enhancement method has a better promotion effect on children's second language vocabulary acquisition than the bold text enhancement method.

Children prefer and accept underlined text materials more than bolded text materials.

Therefore, in the practice of children's second language vocabulary acquisition and teaching, it is recommended to give priority to underlining rather than bolding as a text enhancement method to improve vocabulary learning and teaching effects in a way that is more in line with children's cognitive characteristics.

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