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An Experiment on Supporting Children’s English Vocabulary Learning in Multimedia Context*

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ABSTRACT

Learning in context is an important component of second language (L2) vocabulary teaching and learning. However, young children may encounter some difficulties in dealing with the context. Hence learning support should be included to facilitate learning. The present study examined the effects of two types of learning support on Chinese children’s (7 years of age) learning of English words: sentence-level translation (SLT) and target warming-up (TW). The results indicated that learning L2 vocabulary in an animation-based context without any learning support was inefficient for the young beginners. SLT and TW were both effective in facilitating L2 learning in a multimedia context. These findings have important implications for L2 vocabulary teaching and the design of effective multimedia L2 teaching tools.

INTRODUCTION

In the past decade, an increasing number of studies in the field of second language acquisition have addressed vocabulary learning (Kojic-Sabo & Lightbown, 1999), including the effectiveness of various learning approaches. The present study was designed to investigate children’s L2 vocabulary learning in a multimedia context and to explore ways in which productive learning can be facilitated.

Second Language Vocabulary Learning in Context

Learning a second language (L2) vocabulary in context is an important avenue to lexical growth and widely perceived by the teaching profession as more

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desirable compared with learning words out of context (Krashen, 1989; Oxford & Scarcella, 1994). In contextualized learning, students have to make informed guesses as to the meaning of a new word in light of available linguistic cues in the context as well as the relevant knowledge in the learner’s mind, including general knowledge of the world, awareness of the situation, and relevant linguistic knowledge. The alternative approach to L2 vocabulary learning is often mentioned in the literature as decontextualized learning (also termed word lists, or paired associate, translation learning), in which the new words are presented with their translations. This approach requires learners to memorize pair associations directly.

It is argued that inferring the solution to a problem leads one to invest greater mental effort in the task than when being given the solution directly, and that words learned in context may later be recalled and used more successfully than words attained in a “pair associate” condition (see Grace, 1998). According to Prince (1996), assessing the meaning of a word in context encourages learners to develop strategies, such as anticipation and inference, which become increasingly profitable as learning progresses because they instill an attitude of self-reliance that is a hallmark of proficiency. In addition, context provides an indication of the ways in which the words are used. All these factors may contribute to learners’ L2 autonomy and to the facilitation of the transfer of knowledge that accompanies it. Overall, contextualized vocabulary learning is considered to be more effective than learning words in lists.

Although current pedagogical trends emphasize contextualized learning, much of the empirical research in this field has failed to demonstrate any advantage of learning in context over translation learning. Indeed, data reported by Seibert (1930) indicate that learning words in pairs is consistently more effective than learning them in context. Coady (1993) reported that the probability of learning a word in context was only 5%–15%. Results from a number of other studies showed that no significant difference was found between learning words in context and in isolation, or that learning words by pairs was more effective (Qian, 1996).

According to Harley, Howard, and Roberge (1996), the ineffectiveness of L2 learning in context may be attributed to a variety of factors, including insufficient encounters with specific words, contextual clues that are misleading or beyond the learners’ linguistic capacity to use, or, conversely, contextual clues that are so obvious that they do not promote enough attention to a given word. These factors may be particularly important for novice
learners. As Bensoussan and Laufer (1984) reported in their study, L2 learners with low proficiency made little use of contextual cues to guess the meaning of words, and the inference was made more from the learners’ preconceived ideas about the word rather than via the support of cues in the text. Also, Morrison (1996) found that low-proficiency learners use fewer sources than high-proficiency learners in a lexical inference task. The low-proficiency learners relied heavily on the co-text and their knowledge of the world, and they made higher numbers of unsuccessful guesses.

Children’s L2 Vocabulary Learning in Multimedia-Based Contexts

Most studies on L2 vocabulary learning in context have focused on learning with text-based materials presented in a single modality. This is limited in that it relies heavily on learners’ reading comprehension ability. In the case of young children from a Chinese background, therefore, it would neither be very effective nor efficient to learn English vocabulary in text-based contexts. The rapid growth of the multimedia computer as a learning tool brings new possibilities to the design of L2 learning activities. Information presented in audio, video, graphic, animated, and verbal formats can be integrated to create an authentic, vivid, attractive, and multi-sensory language context. For young children, this can be a motivating and effective way to learn a second language, especially when they have very little or no access to L2 input in daily life.

In recent years, several studies have investigated the effects of presenting information using multiple modalities, such as text, audio, still pictures, and dynamic videos, on L2 learning (Al-Seghayer, 2001; Duquette & Painchaud, 1996; Mousavi, Low, & Sweller, 1995). Neuman and Koskinen (1992) compared mean scores on measures of vocabulary learning in groups of immigrants to the United States exposed to different L2 learning conditions: watching television with or without subtitles, reading and listening to the document, and simply listening. The results showed a net advantage in gain and retention of words learned from watching subtitled television. It was suggested, therefore, that written words associated with a visual text played an important role in adult non-native speakers’ retention of vocabulary presented via television.

Baltova (1994) evaluated the impact of video on the L2 comprehension of 8th-grade students, who were presented with the L2 material in two ways – sound only, and video and sound. Although no significant difference was
found between students in the two conditions, it was noted that more students in the sound-only group reported having experienced difficulties in concentrating on the text and disliking the story more than their counterparts in the other group.

Kost, Foss, and Lenzini (1999) compared the effects of pictorial and textual glosses on incidental vocabulary growth for foreign language learners. Participants were asked to read a passage under one of the three glossing conditions: textual gloss alone, pictorial gloss alone, and text combined with pictures. Performance on both production and recognition tests of 14 words was better for those who were allowed to use a combination of text and picture. Mayer and Moreno (1998) also found that performance on a word-list learning task was better when learners were presented with the acoustic and visual information simultaneously.

Most studies of L2 vocabulary learning in context have used samples of adults or adolescents; there have been few studies of children, especially those beginning to learn a second language. Young children may encounter at least three kinds of difficulties when learning L2 vocabulary through a multimedia-based context.

First, language input made up solely of the target language might not be the optimal input for children with low L2 proficiency. They may have difficulties in understanding that kind of input as it is far beyond their "i + 1" level (Krashen, 1994). This may hamper their integration of the context information and lead towards improper inferences about the new words' meanings.

Second, limited L2 knowledge may also cause problems in phonic learning. Learners who are insensitive to the L2 input and have not yet grasped the rules of pronunciation may find it hard to learn the pronunciation of a new word merely by listening to it without knowing exactly how the word is pronounced.

Another problem facing novice learners is that they may not pay adequate attention to critical cues in the context. According to interactionist theory, language input, such as that received through CALL materials, needs to become intake in order to be acquired by the learner. Input is more likely to become intake if it is noticed (Hegelheimer & Chapelle, 2000). As stated by Schmidt (1990), "...that intake is what learners consciously notice. This requirement of notice is meant to apply equally to all aspects of language (lexicon, phonology, grammatical form, pragmatics ...)"). However, learning in context is always considered to be incidental as the words and their meanings are not taught explicitly but attained as a by-product of understanding the whole context. Furthermore, in a multimedia environment, it is
very possible for learners to be attracted by the diversity of the information, which leads to the problem of wandering attention (Acobson, 1996; Dias, 1997). Under the condition of incidental learning, the children who lack L2 experience may be attracted by the superficial scenario in the context, to which they are much more sensitive, rather than by the L2 input. As was proposed by Baltova (1994), the rich clues in the multi-sensory environment might benefit learners with high capability but disturb and distract inefficient learners.

These difficulties may restrain the effectiveness of L2 learning in a multimedia context. Therefore learning support should be offered to help learners cope with the difficulties. These support elements can be embedded into a learning environment by exploiting the advantages of multimedia computers.

**Integrating Learning Support into the L2 Vocabulary Learning Activities**

To promote children’s efficiency in dealing with a multimedia learning context, it is very important to integrate learning support into the L2 vocabulary learning activities. Two types of learning support may be helpful for young children.

The first type of learning support, Sentence-level Translation (hereafter SLT), promotes learners’ understanding of language input by providing translation of L2 sentences. In Grace’s (1998) research, sentence-level translation was used to diminish the risk of incorrect inference from a L2 context and, consequently, of committing the wrong meaning to memory. It was also proposed that sentence-level translations might lead to elaborate, deep, and durable memory encoding. Grace’s study found that sentence-level translations in a pregnant CALL context could help beginning-level learners to achieve greater retention of correct word meanings.

The second type of learning support involves the integration of contextualized and decontextualized learning. These two methods should be compensatory rather than incompatible in L2 vocabulary teaching and learning (Rodriguez & Sadoski, 2000). They can be integrated into the L2 learning activities in various ways (Nation, 1990). Dong (2001) attempted to examine the effect of integrating the decontextualized (such as word-list learning and word exercises) with the contextualized method in college students’ L2 vocabulary learning. She found that the integration strategy increased performance in L2 vocabulary learning among low-proficiency students.
The Present Study
Software to facilitate English vocabulary learning among Chinese children was developed for use in the present study. The learning material used as the context for L2 vocabulary learning was a segment of a popular Disney cartoon that included 29 English sentences.

Two types of learning support were designed. One was Sentence-level Translation (SLT). The English sentences were translated into Chinese, and a computer program presented the translations orally after each English sentence. SLT was used to help children better understand the English sentences in the cartoon, which constituted the context for learning the target words.

The other type of learning support was an integration of a decontextualized learning method with the contextualized learning method. The decontextualized learning support method used in the present study was a 5-min Target Warming-up (hereafter TW) session, which took place before the children viewed the cartoon. In this session the experimenter displayed each target word (printed on a flash card), read the word aloud, and asked the children to read after her. The children could observe how the experimenter pronounced each word and practice the pronunciation with feedback from the experimenter until they could imitate the word’s pronunciation properly. This session was used to familiarize the children with each word’s pronunciation. The children were then asked to watch the cartoon and guess the meanings of the target words. It was hypothesized that the children would behave more actively and intentionally and pay more attention to the English input when they had clear goals while watching the cartoon. It was expected that it would improve the children’s pronunciation of the target words and their ability to infer the meanings of these words from the context.

Three learning conditions were designed to examine the effects of the two types of learning support on Chinese children’s English vocabulary learning, and study participants were divided into three groups based on these conditions. The first learning condition is No Support. The children in this group watched the cartoon without any learning supports or prompts, and they were not told that they should try to learn the target words or that they would be tested on their pronunciation and comprehension after they saw the cartoon. The second learning condition is Sentence-level Translation (SLT). The children in this group watched the cartoon with the translation of each English sentence. As in the No Support condition, the participants in this condition were also not directed to try to learn the target words and not told about the posttests. The third learning condition is a combination of contextualized
learning (Sentence-level Translation) and decontextualized learning (Target Warming-up) – SLT + TW. The children in this group read each of the target words, following the example of the experimenter, before they watched the cartoon, for which the sentence-level translations were provided by the computer program. They were explicitly asked to try their best to guess the meanings of the target words as they watched the cartoon.

Three computer-based posttests were implemented immediately after the children watched the cartoon: the Word Pronunciation Test, the Word Understanding Test, and the Sentence Translation Test. These tests were used to measure children’s achievements in imitating the target words’ pronunciation, in understanding the meaning of the target words, and in understanding the English sentences presented in the cartoon, respectively. The children’s performances on each test were compared among the three conditions.

The hypotheses in the present study were:

(1) SLT would facilitate children’s understanding of the context. Therefore, the children in the last two conditions would score higher on the Sentence Translation Test than their counterparts in the first condition.

(2) SLT itself would not be able to facilitate children to grasp the words’ pronunciation, and it would not be supportive enough to help children infer the meanings of the target words when they had no clear learning goals. Therefore, there would be insignificant differences in the children’s performances on the Word Pronunciation Test and the Word Understanding Test between children in the first two conditions.

(3) The children in the SLT + TW condition would have higher scores on the Word Pronunciation Test and the Word Understanding Test than children in the other two groups.

METHODOLOGY

Participants
Sixty-seven Grade-1 and Grade-2 students (31 girls and 36 boys) from a primary school in urban Beijing participated in this experiment. Their average age was 7 years and 3 months. They could speak Chinese fluently as L1 and had been learning to write Chinese for 1 or 2 years. They had not yet taken English classes in school. A pretest was conducted to assess whether the children knew the meanings of the L2 target words in the cartoon to be used in
this study. During this pretest, the experimenter read aloud each of the target words and an equal number of other words as filling items, and asked the children to point out their meanings. None of the children could correctly identify the meaning of any target word.

Learning Software
The learning software was a 6-min animated segment captured from a Disney cartoon. This cartoon, telling a story about a family of ducks, consisted of 29 sentences involving 19 words (six nouns, two adjectives, four pronouns, two adverbs, two articles, and three auxiliaries). The sentences in this cartoon were read by a native English speaker; corresponding subtitles appeared on the bottom of the screen. As it is very difficult for a young child to learn many L2 words in a limited time, only four words presented in this animation (baby, family, sad, and happy) were chosen as target words in this study. These words are all easy for young children to understand. In the animation, each target word reappeared in various contexts, which could function as cues to help children guess the meanings of the words. Figure 1 shows an exemplar interface captured from the learning software.

Fig. 1. The interface of the learning software.
Design

One-factor experimental design was used in this study. Participants were randomly assigned to one of the three learning conditions. Each participant watched the computer-based animation twice.

(1) The No Support (NS) Condition: The subjects ($N=14$) under this condition merely watched the English-language animation, receiving the L2 language input without any learning support. The instruction to this group of children was:

“*You’re going to watch an interesting cartoon. Please watch carefully.*”

(2) The Sentence-level Translation (SLT) Condition: After each English sentence in the animation, a Chinese translation was provided orally by the computer program. The instruction to these subjects ($N=20$) was:

“*You’re going to watch an interesting cartoon, which includes some English sentences. The translation of each sentence will be provided to help you understand it better. Please watch it carefully.*”

(3) The Sentence-level Translation + Target Warming-up (SLT + TW) Condition: Before watching the cartoon, the experimenter presented the subjects ($N=12$) with the flash cards of the individual target words and asked them to read each word after the experimenter. This session lasted approximately 5 min. Then the subjects were asked to watch the cartoon with SLT. The instruction was:

“*You’re going to watch an interesting cartoon, which includes some English sentences. The translation of each sentence will be provided to help you understand it better. All the words we read earlier will appear in the cartoon. Please watch it carefully, and try to find them and guess their meanings.*”

Immediately after watching the animation, all of the children were asked to complete three successive computer-based posttests. The program was written in such a way that it registered the children’s responses to each item in the tests and created a log-file for each subject.

Measurement

Three posttests were designed to evaluate the L2 learning achievements of the children in the three groups:

(1) The Word Pronunciation Test was used to evaluate how well the children were able to imitate the pronunciation of the four target words.
The pronunciations of the target words were presented randomly by a computer, and the participants were asked to imitate the pronunciations of these words. A score of 0 or 1 was given to a child’s answer to each item depending on whether he or she could imitate the word’s pronunciation correctly or not.

(2) The Word Understanding Test was used to examine how well the children were able to infer and remember the meaning of the target words. The target words, together with their pronunciations captured from the animation, were presented randomly by a computer. The participants were asked to report each word’s meaning. Learners’ response to each item was scored 0, 1 or 2. A score of 0 indicated the child was unable to tell the word’s meaning at all. A score of 1 was given to answers that were relevant but not accurate, for example, if the meaning of “baby” was thought to be “very small”. A score of 2 was given when the child could tell the word’s meaning exactly. Scores on the Word Understanding Test ranged from 0 to 8 points.

(3) The Sentence Translation Test was intended to assess how well the children grasped the meanings of the sentences that involved the target words. Four sentences were randomly presented together with their co-contexts captured from the animation, each of which included one target word. The participants were asked to translate the sentences orally. Their responses to each of the four sentence-translation tasks were scored as 0, 1, or 2. A score of 0 was given when the answer was based on the superficial clues in the story and had nothing to do with the sentence’s meaning. A score of 1 indicated that the child’s translation represented the meaning of the target words but not the accurate meaning of the whole sentence. A score of 2 indicates that the answer was exactly right (see Table 1 for examples). Scores on the Sentence Translation Test ranged from 0 to 8 points.

Table 1. Examples of Evaluation Criteria in the Sentence Translation Test.

<table>
<thead>
<tr>
<th>Item</th>
<th>Score</th>
<th>Example answers</th>
</tr>
</thead>
<tbody>
<tr>
<td>He has a family.</td>
<td>0</td>
<td>(They are swimming.); (Swim).</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>(Family); (They are a family).</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>(He has a family).</td>
</tr>
</tbody>
</table>
RESULTS

**Phonic Learning Outcome Analysis**

Children’s scores on the Word Pronunciation Test were compared among the NS, SLT, and SLT + TW groups. Because equal variance was not assumed, a Non-parametric statistical test (Mann–Whitney U Test) was conducted to examine the effect of learning conditions. Table 2 shows the results of the multiple comparisons for the Word Pronunciation Test.

As shown in Table 2, children in the SLT + TW condition significantly outperformed those in the other two conditions on the Word Pronunciation Test. There was no significant difference between the SLT and NS groups on this test.

**Word Understanding Test Outcome Analysis**

The effects of SLT and TW on children’s Word Understanding Test were examined by comparing the test scores among the NS, SLT, and SLT + TW groups using the Mann–Whitney U Test (see Table 3).

Again, the SLT + TW children significantly surpassed those in NS and SLT groups, who manifested very poor performance on this test. No significant difference was found between the SLT and NS groups.

**Sentence Translation Test Outcome Analysis**

Similarly, Mann–Whitney U Test was conducted to analyze the differences of children’s performance in Sentence Translation Test among NS, SLT, and SLT + TW conditions (see Table 4).

<table>
<thead>
<tr>
<th>Learning condition</th>
<th>N</th>
<th>M</th>
<th>SD</th>
<th>Mean rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>NS</td>
<td>14</td>
<td>1.29</td>
<td>1.14</td>
<td>18.25</td>
</tr>
<tr>
<td>SLT</td>
<td>20</td>
<td>1.15</td>
<td>1.14</td>
<td>16.98</td>
</tr>
<tr>
<td>M-W U</td>
<td></td>
<td></td>
<td></td>
<td>129.500</td>
</tr>
<tr>
<td>NS</td>
<td>14</td>
<td>1.29</td>
<td>1.14</td>
<td>8.54</td>
</tr>
<tr>
<td>SLT + TW</td>
<td>12</td>
<td>3.25</td>
<td>0.62</td>
<td>19.29</td>
</tr>
<tr>
<td>M-W U</td>
<td>20</td>
<td></td>
<td></td>
<td>14.500***</td>
</tr>
<tr>
<td>SLT</td>
<td>20</td>
<td>1.15</td>
<td>1.14</td>
<td>11.35</td>
</tr>
<tr>
<td>SLT + TW</td>
<td>12</td>
<td>3.25</td>
<td>0.62</td>
<td>25.08</td>
</tr>
<tr>
<td>M-W U</td>
<td></td>
<td></td>
<td></td>
<td>17.000***</td>
</tr>
</tbody>
</table>

***p < .001.
As can be seen from Table 4, the pupils in the SLT and SLT + TW groups had significantly higher scores than those in the NS group. Although children in the SLT + TW group got higher scores on the Sentence Translation Test than did their counterparts in SLT group, this difference is not statistically significant.

### DISCUSSION AND CONCLUSION

The findings from this study indicate that learning L2 vocabulary in an animation-based context was too difficult for young beginners when no
learning support was provided. These results are consistent with previous studies on adults’ L2 learning in a text-based context (Qian, 1996). Children who received no learning support tended to be easily attracted by superficial characteristics of the L2, English-language animation, and they paid little attention to the English input that was unfamiliar to them. Most of these children could neither imitate the pronunciation of the target words accurately nor integrate the language input with the context. Their guesses as to the meanings of the targets words and sentences in the animation were based entirely on their preconceived ideas. This finding is congruent with the conclusions of Bensoussan and Laufer (1984). The Sentence-level Translation (SLT) facilitated young children’s understandings of the English input. The children in the SLT group surpassed those in the NS condition on the Sentence Translation Test. This finding indicates that SLT can improve young Chinese children’s understanding of the English sentences that constitute the language context of the words to be learned. Children in the SLT condition, however, performed no better than those in the NS condition on a test of phonic imitation and a test of inferring the meaning of words, even when they had grasped the meaning of the context. Overall, the first two hypotheses of this study were supported by the above results. Various factors may account for these children’s inefficiency in phonic learning and semantic learning. First, children with low English proficiency may lack the awareness to infer the meanings of the new words. They may have difficulties in concentrating on the English input that is unfamiliar to them, and they may have limited cognitive resources to infer the meaning of new words when they receive no learning support. The Word Understanding Test was much more demanding than the Sentence Translation Test. When completing the Word Understanding Test, the children needed to recall the inferred meanings of the words based on their understandings of the contexts. No contextual information was presented in the test to provide cues for their recall, which made the test even more difficult. Vocabulary learning under the NS and SLT conditions was incidental in nature, that is, children in these conditions were not aware of the real purpose of the activity and, consequently, not engaged actively in inferring the new words’ meanings. This may account for their poor performance on the Word Understanding Test. Phonic learning may also have been impaired if learners paid inadequate attention to the cartoon. Another factor that may have contributed to the NS and SLT groups’ inefficiency in phonic and semantic learning was the restricted presentation of
L2 input. The phonic input of English sentences in the animation was presented as an aside read by a narrator who did not appear on the screen. Learners could not observe how the words were pronounced, a situation that may be disadvantageous to novice learners’ imitation of target word pronunciation. Inefficiency in phonic learning may make it more difficult for the children to identify the target words from the context and to infer the words’ meanings; this may have a negative effect on semantic learning. Therefore, SLT alone could not substantially promote L2 learners’ performances on the Word Pronunciation Test and the Word Understanding Test.

Target Warming-up (TW) was designed to help familiarize the young L2 learners with the target words and to direct their attention during the learning process. Test performances of the children in the SLT + TW condition were markedly better than those of the children in the other two learning condition groups, especially on the Word Understanding Test and the Word Pronunciation Test. With TW, children could detect the target words in the animation more easily and infer the meanings of the words more actively and intentionally. The results support the third hypothesis in the present study and converge with Dong’s findings (2001) for adult L2 learners.

In sum, findings from the present study suggest that learning L2 vocabulary in an animation-based, multimedia context was inefficient for young beginners without proper learning support. A combination of contextualized learning support (SLT) and decontextualized learning support (TW) was effective in facilitating children’s L2 vocabulary learning in a multimedia animation-based context. Children tended to perform more actively and efficiently when SLT and TW were both provided than when they received only SLT learning support.

Decontextualized learning of a second language is characterized by intentional rehearsal and practice; contextualized learning entails guessing new words’ meanings from context. In the condition of SLT + TW, children experienced an integrated learning process that incorporated both decontextualized and contextualized learning approaches. SLT could facilitate young L2 learners’ understanding of the English input. With the help of TW, the learners could become familiar with the target words’ pronunciations by practicing the pronunciations demonstrated by the experimenter. Before watching the cartoon, the learners were presented with the explicit goal of guessing the meanings of the target words. All these treatments could help the learners infer the target words’ meanings from a context more effectively. It seems clear, then, that, when designing and using multimedia teaching materials to promote children’s L2 learning in context, it is very important to
integrate different learning approaches and to provide proper learning supports. SLT and TW, used together in a multimedia instructional context, provide effective learning support for English language instruction of young, native-speaking, Chinese children.

**Limitations of the Study and Recommendations for Future Research**

This study was designed to investigate the effects of two types of learning support on English vocabulary learning in a multimedia context. The subjects were young Chinese children at the beginning level of learning English as a second language and having low exposure to the L2 language in their daily lives. Little research has been done on samples of young children in the field of L2 learning. The present study was an exploratory investigation in this area.

The findings in the present investigation suggest that SLT and TW learning supports, when provided together, may promote the learning of word pronunciations and word meanings among young children beginning to learn a second language. In this study, however, only four words were chosen as target words, and the L2 instruction took place in an experimental situation over a short period of time. The findings, therefore, may not be generalized to more extensive L2 vocabulary learning or to L2 instruction over a longer duration. More studies are needed to investigate the characteristics, strategies, and proper multimedia scaffolding methods of L2 instruction directed toward young children in a more natural learning environment, such as in the classroom or at home.

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