Effects of Listening-to-and-looking-at Picture Storybook Activities: In Terms of Matching Sound and Spelling

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Abstract

This study explores the effects of listening-to-and-looking-at picture storybook activities in terms of the accuracy of matching sound and spelling, along with the reaction time of words accessed successfully in the time periods of two different activities: a single activity and several continuous activities. Participants were 5th and 6th graders at an elementary school. The results showed that continuous listening-to-and-looking-at picture storybook activities increased the number of participants who answered correctly with a high score. It was also found that other factors are considered to have more influence on matching sound and spelling than frequency. As for the comparison of reaction time with correct answers, continuous activities caused faster accession of sounds and spellings. In other words, continuous activities accelerate word storage in the lexicon with sounds and their spellings connected.

1. Introduction

Fifth and sixth graders at all elementary schools in Japan will start learning English from 2011. They are supposed to learn English through activities focusing on (1) experiencing intercultural communication, (2) trying to both listen to and speak English positively, and (3) becoming aware of the importance of communication by using English (MEXT, 2010). Therefore, English is mainly introduced orally through enjoyable activities in classes. One of the most important features of these policies is that pupils are expected not to be put under too much pressure to learn English for fear of producing English haters among them in the future. For this reason, reading and writing is not supposed to be introduced at elementary schools. In terms of the mental aspects such as understanding cross cultures and fostering a positive attitude toward communicating with each other, the activities have thus far succeeded according to the author’s personal observation. However, especially for upper graders who start to become interested in
English spelling and want to read English by themselves (Ikari, 2008), activities with only entertainment and pleasure are not enough to satisfy them. Their linguistic abilities and motivations to learn English might be far more than we can imagine.

Considering this situation, I would suggest that picture storybooks are suitable materials for developing their ability to read English in an inductive manner, satisfying their desire to read English, and also motivating them for the same. Many researchers (Brewster, Ellis, & Girard, 1991; Hsiu-Chih, 2008; Miyake, 2009; Mantani, 2009; Hall, 2009; Yamazaki, 2009; Komatsu & Nishigaki, 2007) have already reported the effects of picture storybooks. For example, Brewster, Ellis, & Girard (1991) reported that listening-to-and-looking-at picture storybooks help develop children’s own creative powers, as well as help build up confidence and encourage social and emotional development. Furthermore, they could introduce or revise vocabulary and structures, help children become aware of the rhythm, intonation and pronunciation of language, provide ideal opportunities for presenting cultural information and encouraging cross-cultural comparison, and so on. And Sheu Hsiu-Chih (2008) clarified the effectiveness of listening-to-and-looking-at picture storybooks in elementary schools in Taiwan in three aspects: linguistics, contents, and the existence of pictures. The effects of listening-to-and-looking-at picture storybooks are widely accepted, even by researchers whose views differ somewhat from each other.

In this study, the effects of listening-to-and-looking-at storybook activities in terms of matching sound and spelling are examined. Specifically, this study explored (1) the accuracy of matching sounds with their spellings, and (2) the reaction time of words accessed successfully in the time periods of two different activities: a single activity and several continuous activities.

In this study, accuracy is defined as the percentage of correct answers which the participants successfully matched sounds and spellings of target words. It is said that percentage of correct answers is an indicator to measure the accuracy of decision in matching meaning and spelling (Kadota, p. 65, 2003). In this study, matching sound and spelling is used to measure the accuracy instead of matching meaning and spelling. It shows how information (mainly orthographic, phonological, and semantic) in the mental lexicon is utilized in lexical processing. Kadota (2002) mentioned that reaction time is an effective and sensitive indicator for detecting the differences in participants’ word processing (p. 94). In this study, reaction time is defined as the time required for clicking on target words just after listening to their sounds. If the reaction time is shortened, it could be considered that the words were stocked in the mental lexicon and accessed faster than before.

2. Method

2.1 Participants

The participants in the present study were twenty-eight 5th and 6th graders at an elementary school, Hiroshima, in Japan. They have English activities once a week. All participants have no
experience in learning how to read English through phonics or engaging in listening-to-and-looking-at picture storybook activities. In addition, it was confirmed through questionnaires that none of them learn English outside the school. As for computer operation, they have already learned it and are competent.

In this study, a control group of pupils who do not have listening-to-and-looking-at picture storybook activities was not organized because of ethical issues. All students in the same class and school have equal rights to have the activities.

2.2 Experiment design

Figure 1 shows the flowchart of the overall experiments. The overall experiments are divided into three sections: July experiment, four-month listening-to-and-looking-at activities, and December experiment. We call the first and the last section the experiments because each of them have pre- and post-test respectively and one activity between the tests. In July and December experiments, the participants took the pre- and post-vocabulary tests; both tests were identical. Between the pre- and post-vocabulary tests, they had one listening-to-and-looking-at picture storybook activity. The four-month listening-to-and-looking-at picture storybook activities were conducted between July and December. Twelve picture storybooks were used in the four months.

![Flowchart of the experiments](image)

Figure 1: The flowchart of the experiments

All picture storybooks and vocabulary tests were shown on a sixty-inch display using a projector in the classroom.

2.3 Preparations for the experiments
2.3.1 Selection of picture storybooks and schedule of four-month activities

As one of the preparations for the experiments, 13 books were selected including 12 picture storybooks for four-month activities and one book for one activity. The points for the selection
were as follows: (1) Picture storybooks are serials. Serial books are easy for pupils to understand because the stories’ characters and backgrounds are the same all through the books. (2) The books should be age-appropriate. The contents should not be too childish or too long. They prefer enjoyable and simple story lines (Miyake et al., 2010). (3) CD-ROMs with books are desirable. They are very helpful for elementary school teachers who are not specialists in English. In sum, we chose 13 books from the Oxford Reading Tree series, stage 4 to 9 (see References). According to the publisher, the books from stage 4 to 6 are for 5–6 year olds, and books from stage 7–9 are for 6–7 year old native speakers. The books from stage 1 to 3 are not used in the activities because their target age is 4–5 year olds and the contents are too childish for the participants in this study. Figure 2 is an example page of stage 5 used in the activity.

Table 1 shows the selected 12 books and the schedule of four-month activities. In September, 4 books from stage 4 were used in the activities. The books from stage 4 were mainly introduction of the story’s families and their friends, including their pet. In October, 2 books from stage 4 and 2 books from stage 5 were used in the activities. The “Magic key,” which plays an important role of the whole stories, appeared at the end of stage 4. In November, 2 books, one of which is from stage 6 and the other one is from stage 7, were used in the activities. And in December, each book from stages 8 and 9 was used in the activities. Various adventure stories were developed after stage 5. All six books from stage 4 were used in the activities according to the recommendation of the publisher. The one book for one activity used in July and December was one of the books from stage 5.

![Figure 2](imageurl)  
**Figure 2:** An example page from stage 5

Chip picked up a pencil.  
"Look at this big pencil," he said.

Biff picked up a pin.  
"Look at this big pin," she said.
Table 1: Schedule of activities, the selected 12 books, and their contents

<table>
<thead>
<tr>
<th>month</th>
<th>Stage</th>
<th>Numbers</th>
<th>Contents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sept.</td>
<td>4</td>
<td>4 books</td>
<td>Introduction of families and their friends</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>2 books</td>
<td>Adventure 1</td>
</tr>
<tr>
<td>Nov.</td>
<td>6</td>
<td>1 book</td>
<td>Adventure 2</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>1 book</td>
<td>Adventure 3</td>
</tr>
<tr>
<td>Dec.</td>
<td>8</td>
<td>1 book</td>
<td>Adventure 4</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>1 book</td>
<td>Adventure 5</td>
</tr>
</tbody>
</table>

2.3.2 Selection of target and distracter words for pre- and post-vocabulary tests

As another preparation for the experiments, 20 target and 3 distracter words for each target word were selected for the pre- and post-vocabulary tests in July and December. Table 2 shows a list of partial excerpts from out of 20 target and 3 distracter words for each target word of the vocabulary test. Important points for word selection are the following: (1) content words, (2) their frequency, (3) the length of the words, (4) the regularity in the relation between spelling and sound, (4) concreteness, and (5) familiarity. Words completely unlike the target words were selected as distracters to prevent pupil’s taking time to decide about spellings. An important thing about this test is that participants can match the sounds and their spellings soon after they recognize the spelling, rather than the test intending to confuse the spellings themselves.

Figure 3 is one of the screens of the vocabulary test. Pre- and post-vocabulary tests were conducted on the PC. A question comprised of 4 words, including 1 target word and 3 distracters, is presented. Just after the participant heard the target word, they chose and clicked on (on the PC screen) 1 out of 4 words displayed matching the sound they heard. The results of the questions were sent to a control computer as a log data. Figure 4 is partial log-transformed data. Number 1 refers to correct answers and zero refers to wrong answers.
Table 2: Target words and distracter words (partial excerpt out of 20 target words)

<table>
<thead>
<tr>
<th>Target Words</th>
<th>Distracter 1</th>
<th>Distracter 2</th>
<th>Distracter 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>says</td>
<td>idea</td>
<td>last</td>
<td>story</td>
</tr>
<tr>
<td>children</td>
<td>come</td>
<td>father</td>
<td>glow</td>
</tr>
<tr>
<td>people</td>
<td>heard</td>
<td>bears</td>
<td>mouse</td>
</tr>
<tr>
<td>looked</td>
<td>some</td>
<td>outside</td>
<td>laughed</td>
</tr>
<tr>
<td>cooked</td>
<td>jungle</td>
<td>nobody</td>
<td>stay</td>
</tr>
<tr>
<td>little</td>
<td>never</td>
<td>storm</td>
<td>wind</td>
</tr>
</tbody>
</table>

Figure 3: A vocabulary test screen

Figure 4: Partial log-transformed data

2.3.3 Four-month activities

The continuous activities were conducted for four months, from September to December. The 12 books were used in the activities. A Philippine assistant teacher took charge of the activities in September, and a Japanese homeroom teacher did from October to December. At the
end of each page, teachers initiated a few interactions in English by quizzing the pupils with questions, such as "Where is the Floppy?" and "Is this pen short or long?" to promote understanding of the story and enjoy it.

In the activities, the teachers neither instructed nor focused on the words in particular. They concentrated on having pupils enjoy the activities.

2.3.4 Procedure of the one activity experiments

The procedure of the one activity experiments in July and in December was as followed:
1. All participants were informed about the procedure of the experiments in the same room.
2. Each participant moved to an experiment room.
3. The participant took the pre-vocabulary test on a PC (2 min).
4. The participant listened-to-and-looked-at a picture storybook (5 min).
5. The participant took a post-vocabulary test on a PC (which is identical to the pre-vocabulary test).

Each participant took about 10 min.

3. Results

3.1 Method of the analysis

Number 1 of the vocabulary test was excluded in each experiment, because the test was started abruptly, and so many participants missed hearing the sounds or were puzzled by answering, according to the observations of the researchers and teachers present at the experiments. In all, 19 words out of 20 in the vocabulary test were analyzed to raise the reliability of the analysis.

Analysis points are as follows:
(1) Comparison of the number of correct and wrong answers in each post-vocabulary test in July and December experiments

The numbers of correct and wrong answers were compared for the results of post-vocabulary tests in July and December to examine the ability to match spellings and their sounds. The test of normality (Shapiro-Wilk) showed that the numbers of correct answers for both July and December do not have normality (July: W = .884, df = 28, p < .01, Dec.: W = .842, df = 28, p < .01). Therefore, the Wilcoxon signed-ranks test is conducted to determine whether the significant difference between the number of correct answers in July and December is recognized. When the significant difference is confirmed, what causes the difference is determined from the histogram. Similarly, the comparison of the number of wrong answers is conducted. As one of the critical factors, the words' frequencies in the books are compared with the number of correct answers.
(2) Comparison of the reaction time for correct answers in each post-vocabulary test in July and December experiments

The words that were answered correctly in both pre- and post-vocabulary tests were analyzed. In other words, the words with which the participants already matched the sounds and spellings were analyzed to explore how the ability of accessing sounds and their spellings developed after the activities.

The test of normality (Shapiro-Wilk) showed that the reaction times in July and December do not have normality (July: \( W = .806, df= 341, p< .01 \), Dec.: \( W = .842, df= 396, p< .01 \)). Therefore, the Mann-Whitney test was conducted to confirm the significant difference between them. When a significant difference was confirmed, factors which caused the difference were examined from the line graph for the number of correct answers and their reaction time.

3.2 Comparison of the number of correct and wrong answers

Table 3 shows the descriptive statistic of post-vocabulary tests in July and December. The number of correct words in July was 398 and 429 in December. Means of the correct answers per person were 14.32 words in July and 15.32 words in December. The result of Wilcoxon signed-ranks test showed a significant difference between them (\( Z = -2.054, p< .05 \)). That is, the number of words answered correctly increased in December after the continuous activities.

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Num. words</th>
<th>Ave.</th>
<th>SD</th>
<th>Mdn</th>
<th>Var.</th>
</tr>
</thead>
<tbody>
<tr>
<td>July</td>
<td>28</td>
<td>398</td>
<td>14.32</td>
<td>3.907</td>
<td>14.00</td>
<td>15.263</td>
</tr>
<tr>
<td>December</td>
<td>28</td>
<td>429</td>
<td>15.32</td>
<td>4.000</td>
<td>17.00</td>
<td>16.004</td>
</tr>
</tbody>
</table>

Figures 5 and 6 are the histograms of correct answers in July and December. The number of participants who answered correctly with full marks (19 words) in December (Figure 6) increased compared to those in July (Figure 5). Concretely speaking, the most number of participants' correct answers was 14 words in July, whereas it was 19 words in December. The position of the longest bars in the graphs moved from left (in July) to right (in December). That is, the number of pupils with high correct answer scores increased after the continuous activities of listen-to-and-look-at picture storybooks.
To support the statistical results for correct answers, the number of wrong answers was analyzed. Table 4 shows the descriptive statistic of wrong answers in July and December. The numbers of wrong answers in July and December were 134 and 103, respectively. Means for the wrong answers in July and December were 4.79 and 3.68 words per one participant, respectively. Wilcoxon signed-ranks test showed a significant difference between them ($Z = -2.054, p < 0.05$). Figures 7 and 8 are the histograms of wrong answers in July and December. The position of the longest bars in the graphs moved from right (in July) to left (in December). This movement suggests that continuous activities lowered the participants who answered wrongly.

Table 4: Descriptive statistics for wrong answers in post voc. tests in July & Dec.

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Num. words</th>
<th>Ave.</th>
<th>SD</th>
<th>Mdn</th>
<th>var.</th>
</tr>
</thead>
<tbody>
<tr>
<td>July</td>
<td>28</td>
<td>134</td>
<td>4.79</td>
<td>3.843</td>
<td>5.00</td>
<td>14.767</td>
</tr>
<tr>
<td>December</td>
<td>28</td>
<td>103</td>
<td>3.68</td>
<td>4.000</td>
<td>2.00</td>
<td>16.004</td>
</tr>
</tbody>
</table>
The frequency of the words was explored to clarify what caused the difference between the number of correct answers in July and December. Table 5 shows 7 words that were answered correctly by 25 out of 28 participants in post-vocabulary tests in July and December experiments. Although 5 words out of 7 in July did not appear (frequency was zero) in the book, they showed a high correct answer rate. And 6 out of 7 words from July were also included in December (highlighted in gray in Table 5). Furthermore, the frequency of 4 words out of 7 in December was only one for all 13 books used in the activities. This suggests that factors other than frequency might have more influence on matching the sounds with their spellings in this study.
Table 5: Accuracy and frequency in July and December

<table>
<thead>
<tr>
<th>Target W.</th>
<th>July Num.</th>
<th>FQ</th>
<th>Target W.</th>
<th>December Num.</th>
<th>FQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>magic</td>
<td>27</td>
<td>5</td>
<td>fox</td>
<td>27</td>
<td>28</td>
</tr>
<tr>
<td>middle</td>
<td>26</td>
<td>0</td>
<td>key</td>
<td>27</td>
<td>34</td>
</tr>
<tr>
<td>house</td>
<td>26</td>
<td>1</td>
<td>woke</td>
<td>27</td>
<td>1</td>
</tr>
<tr>
<td>woke</td>
<td>26</td>
<td>0</td>
<td>mirror</td>
<td>26</td>
<td>1</td>
</tr>
<tr>
<td>mirror</td>
<td>25</td>
<td>0</td>
<td>middle</td>
<td>26</td>
<td>1</td>
</tr>
<tr>
<td>shout</td>
<td>25</td>
<td>0</td>
<td>house</td>
<td>25</td>
<td>45</td>
</tr>
<tr>
<td>fox</td>
<td>25</td>
<td>0</td>
<td>shout</td>
<td>25</td>
<td>1</td>
</tr>
</tbody>
</table>

Target W. = target words
Num. = the number of participant who answered correctly out of 28
FQ = frequency of the words in 1 book in July and in 13 books in December

3.3 Comparison of the reaction time of correct answers

Table 6 shows the descriptive statistic of reaction time of the post tests in July and December. The number of words that were answered correctly in both pre- and post vocabulary test in July was 341, and 396 in December. The average reaction time of the post test per one word in July was 3.08 seconds, and 2.41 seconds in December. As the data did not have normality (July W= .806, df= 341, p< .01; Dec. W= .842, df= 396, p< .01), the Mann-Whitney test was conducted for analysis. As a result, a significant difference was recognized between them (Z= -4.559, p< .01). That is, the reaction time per one word was shortened in December after the continuous activities.

Table 6: Descriptive statistics for reaction time of the post tests in July & December

<table>
<thead>
<tr>
<th></th>
<th>Num</th>
<th>Ave.</th>
<th>SD</th>
<th>Mdn</th>
<th>Var.</th>
</tr>
</thead>
<tbody>
<tr>
<td>July</td>
<td>341</td>
<td>3.07543</td>
<td>2.161108</td>
<td>2.436</td>
<td>4.676</td>
</tr>
<tr>
<td>December</td>
<td>396</td>
<td>2.41596</td>
<td>1.431201</td>
<td>1.937</td>
<td>2.048</td>
</tr>
</tbody>
</table>
To clarify these differences in results, a line graph of the number of correct words and reaction times is shown in Figure 9. The gray and black lines show the reaction times for July and December, respectively. The number of correct answers with 1–2 seconds reaction times increased in December (176) compared with those in July (98). In contrast, the number of correct answers with 5–7 seconds was decreased in December (12) compared with those in July (36). These movements of the line support the result of the statistics for the test. Namely, the words for which participants already matched spelling and sound were matched more speedily after the continuous activities.

![Figure 9: Num. of correct words and their reaction time](image)

Time= reaction time of the post test per one word  
July= the number of correct answers in July  
December= the number of correct answers in Dec.  
N= the number of correct answers

4. **Conclusion and Discussion**

This study aimed to explore the effects of continuous listening-to-and-looking-at picture storybook activities for 5th and 6th graders at the elementary school in Japan, focusing on matching sound and spelling. As for the comparison of the number of correct answers, this study found that continuous listening-to-and-looking-at picture storybook activities effectively increased the number of participants with high correct answer scores. Although it might be natural that continuous...
activities have the effects on matching sound and spell, this study has the value of giving proof of
the effects empirically. This study did not consider all factors pertaining to why correct answers
increased. It is often said that frequency is one of the most influential factors to access to the
mental lexicon (Kadota, p.79-80, 2002). But in this study, it was found that other factors do have
more influence on accessing sound and spelling than frequency. For example, the influence of
romaji rules might be considered. It is said that the grapheme-phoneme conversion (GPC) rules, in
which the spellings and sounds regularly correspond, influence adults' word reading (Kadota, p.
154, 2002). However, elementary school pupils do not know GPC rules. Instead, they know
romaji rules, which are commonly taught in the 4th grade and they can read and write to some
extent. Thus, it is possible that the participants in this study got used to the alphabet through the
continuous activities and acquired romaji rules to match sound and spelling more efficiently in
December. Further investigation of this is necessary.

As for the comparison of reaction time for correct answers, continuous activities caused
faster accession of sounds and their spellings. In view of the word recognition study, the words
which were stocked in the lexicon were accessed faster through a lexical route than the words that
were not stocked in the lexicon and accessed through an analytical route (Kadota, p. 156, 2002).
Then, shortening the reaction time in this study means that the words were stocked in the lexicon
and accessed through a lexical route after the continuous activities. Consequently, continuous
listening-to-and-looking-at picture storybook activities can accelerate the word storage in the
lexicon with sound and spelling connected.

The current study analyzed the pupils' performance focusing on matching sound and
spelling. They gave us various information of the necessity of a certain amount of continuous
activities to enhance the ability of connecting sound with spelling inductively. However, the
current study did not deal with meaning of words or comprehension of the storybooks. To better
understand the effects of the activities comprehensively, meaning of words or comprehension of
the storybooks as well as sound and spelling should be dealt with in future research.

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Notes

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