Individual differences in lexical learning and use of a pronunciation feature in REAP, an intelligent tutoring system that teaches ESL vocabulary through reading new words in context

INTRODUCTION

This study tests the incorporation of text-to-speech (TTS) generated audio in REAP, an intelligent tutoring system for reading new words, and investigates student and word characteristics which affect learning, in an attempt to enhance the student model and improve personalization of the system.

In REAP, students read authentic texts from the web and answer questions about targeted vocabulary words. Topics of interest and focus words determined by a pre-test initialize a student model. As students read, they have access to built-in dictionary definitions and post-reading practice questions, for which they receive immediate feedback. All student actions are logged by the system and incorporated into the dynamic student knowledge model.

EXPERIMENT

Subjects

The subjects in this study were the 56 adult students enrolled in the intermediate and advanced level reading classes at the English Language Institute (ELI) of the University of Pittsburgh. The table below shows the native languages of the subjects.

<table>
<thead>
<tr>
<th>Native Language</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arabic</td>
<td>10</td>
</tr>
<tr>
<td>Chinese</td>
<td>7</td>
</tr>
<tr>
<td>Japanese</td>
<td>8</td>
</tr>
<tr>
<td>Korean</td>
<td>20</td>
</tr>
<tr>
<td>Other</td>
<td>11</td>
</tr>
<tr>
<td>Total</td>
<td>56</td>
</tr>
</tbody>
</table>

Materials

The target word list consisted of 30 multi-sense words from the Academic Word List (Coxhead, 2000). The words were deliberately chosen to be hard or easy cluster words.

The students began the semester reading at the seventh or eighth grade level. Documents were selected from the pre-crawled corpus based on reading level, test quality, presence ofTTS words and the document length. The length of a document was about 1000 words.

The audio consisted of pre-recorded TTS mp3, generated by the TTS engine built by the Festival speech engine (http://festival.sourceforge.net/) using unit selection concatenation synthesis. The use of TTS made it easy to generate pronunciations of all 30 words and the 79 in-group words, which were also highlighted in the documents. This allowed us to investigate the adequacy of current word-level TTS in foreign language CALL applications.

Method

The within-subjects variable was the availability and use of the audio feature for each subject, audio was available for half of the L1 script. The class division was determined by the day of the week.

On the last day of the semester, students were given a post-test. Our results are based on responses to 38 cloze questions which were written and reviewed by several ELI reading teachers and the researchers. To supplement the post-test of slower readers, who saw fewer words over the course of the semester, some post-test questions were added for unpracticed or unseen words or sentences were added to total 38 questions per student. In the analysis of the data we divide between practiced and unpracticed responses.

HYPOTHESES

Hypothesis 1 - Students with an alphabetic L1 background, who rely heavily on phonological processing in reading, will make use of the audio feature more often than students with a nonalphabetic L1 background, who rely more on visual processing.

Hypothesis 2 - The audio feature will be used more on hard cluster words than on easy cluster words. All of the principal L1s have more difficulty with hard cluster words than will those from L1s that have already developed important skills, that are effective and efficient in their L1s.

Hypothesis 3 - Writing systems differ in terms of how phonologically the phonological representation of a word can be accessed based on its orthographic representation. When the mapping is strong and reliable, the orthographies of languages where this mapping is very regular are said to have high phonological recoverability (Koda, 1998). The effect of L1 writing systems on second language (L2) word processing strategies is well documented. Until recently, reading researchers believed that phonological information was accessed pre-lexically by native readers of all languages. However, in the last few years, many studies on word recognition have shown that transfer from pre-lexical to lexical levels of phonological processing is possible for words that violate L1 orthographic rules. The results are large and conclusively consistent with our hypothesis.

Hypothesis 4 - The Korean group shows no difference in performance based on part of speech to be supplied in the cloze questions. Distracters for the five core parts of speech were based on the L1 scripts. The alphabetic L1 groups with high phonological recoverability do appear to rely more heavily on phonological processing when reading in English than the nonalphabetic groups. This difference is probably due to the greater amount of orthography to phonology mapping in L1 orthographies. The Japanese group showed more evidence of phonological processing than expected in the comparison of overall performance on hard vs. easy cluster words. The use of different types of scripts in Japanese makes it more difficult to classify the processes used in reading.

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