

DEVELOPMENT AND EVALUATION OF A FOREIGN-WORD LEARNING SYSTEM BY IPODS

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ABSTRACT

In learning the vocabulary of a foreign language, it is effective to increase the time and frequency of learning the novel words. Hence, in our study, we developed a foreign-word learning system based on a popular mobile device, the iPod, that enables its users to make good use of his/her free time. Compared to other mobile devices, the iPod has a larger storage capacity. Furthermore, the user can easily replay the moving image files. These advantages can be put to good use in language learning. In our system, the users first select the foreign words that they want to learn using their personal computers, then download the corresponding contents into their iPods. The contents that are downloaded into the iPod consist of the pronunciation of each word together with a series of either still or moving images corresponding to these foreign words. In addition, we conducted an evaluation experiment in which we compared the learning method based on our system against the conventional paper-and pencil method. The result indicated that the method based on our system showed as 1.5 times as better ratio of memorization after two weeks, thus verifying the effectiveness of our system.

KEY WORDS

e-learning, mobile learning, iPod, moving images, foreign word

1 Introduction

Recently, e-Learning based on mobile devices such as cellular phones is becoming popular. By employing mobile devices, the user can make use of his/her free time by learning at any time and at any place[2]. Since it is generally claimed that increasing the time and frequency of learning a foreign language is effective, mobile devices are suitable for foreign word learning.

There are many methods to learn foreign words[3, 4, 5]. Prior to this study, we have conducted an experiment that compared the following four methods that are said to be effective in word learning[1]:

- Learning words through games
- Learning words in contexts

- Learning words by listening to their pronunciation
- Learning words by looking at the corresponding images

The latter two approaches, that is, the methods based on pronunciation and images showed better results against others. In this study, we, therefore, combine these two methods in order to draw out the synergy effect.

In Japan, since the cellular phone is the most popular mobile device, it might seem worthwhile to develop a system based on this device. However, if we try to use a cellular phone as a learning device, there are some serious drawbacks: the screen is too small; the storage capacity is limited; the charge rate is high. Hence, in this study, we adopted the iPod as our learning device. Compared to a cellular phone, the iPod has a larger screen and a larger storage capacity (30GB to 80GB). In addition, since the iPod user can easily refer the sound and image files, the iPod is suitable for a system that is based on the combination of sounds and images. Moreover, the shuffling function of the iPod can be employed to change the order that the words appear. By changing the word order, the users can avoid relying too much on their memorization associated with the order of occurrence, an often observed problem in workbook learning.

In the following sections, we present the details of the foreign-word learning system that we have developed along with the result of the evaluation experiment.

2 Our System

The iPod (Figure 1) is a mobile digital music player of Apple Computer, Inc. The iPod is available to refer not only music data but also videos and audiobooks as well. In addition, Podcast offers the function to play games. The iPod has an internal hard disk and data can be transferred from a personal computer into the disk by connecting to the computer. The iTunes shown in Figure 2 is a software on personal computers that is used to download music contents into the iPods. By using the iTunes, the users can transfer the data quickly.

In our system, the users first select the words that they want to learn from a dictionary on their personal computers. Next, the system makes a vocabulary book for them.

Then, the users download them into their iPods and start learning the words. In the process of foreign-word learning, the users can remove the words that they have memorized from the selected word list, making it easier to organize the list, therefore facilitating the learning process. Hence, in this study, the users first make their vocabulary books on their personal computers, then they transfer the books to iTunes to download the contents into the iPods. Moreover, as mentioned above, the content for each word, which we call the 'word file', consists of its pronunciation together with either a still or moving image. The collection of these word files is called a 'vocabulary book'.



Figure 1. iPod overview



Figure 2. iTunes overview

In Figure 3, we illustrate the learning process. First, the user selects the words from the dictionary that he/she wants to learn on the personal computer. Then, the system collects the word files and compiles them into a vocabulary book in the user's personal folder. The user then drag-and-drops the folder onto the iTunes, allowing the vocabulary book to be transferred to the iTunes. Finally, the user connects the iPod to the personal computer, then downloads the contents that need to be learned.

First, we explain the sub system that makes the word list on the personal computer. Figure 4 shows the initial state of the system where the numbers (1) and (2) are not displayed in practice.

The flow of operation in Figure 4 is as follows:

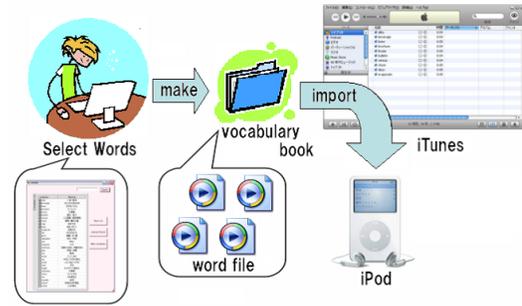


Figure 3. Flow of creation and transfer of the vocabulary-book

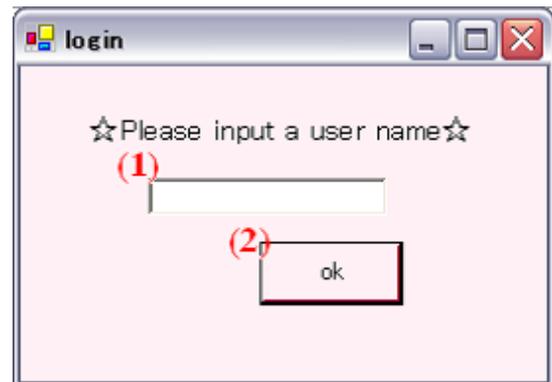


Figure 4. Login session in the initial state of our system

Step 1 (Input user name) The user inputs his/her name into the text box (1), then, determines the name by pressing down the decision button (2)

Step 2 (Create personal folder) If the folder that corresponds to the user name specified in Step 1 exists, the system invokes it, otherwise, the system creates a new folder.

Step 3 (Invocation of main screen) The system invokes the main screen of the dictionary.

Figure 5 shows the main screen where the numbers from (1) to (6) are not displayed in practice. If the user's folder exists (cf. Step 2), the selected words from the previous session will automatically appear ticked. In the case where the user has already mastered the meaning of some of the words, he/she can remove the check mark, and the word will be deleted from the list. This process will encourage the user.

The functions from (1) to (6) are described below:

- (1) Check box list to select words
- (2) Text box to input a word to be searched
- (3) Button to start the search



Figure 5. Main screen

- (4) Button to show the list of selected words
- (5) Button to show the learning history
- (6) Button to create a vocabulary list in the personal folder

The flow of operation is as follows:

Step 1 (Select word) The user selects the words that they want to memorize by clicking the check boxes that appear in front of each word. If the user wants to see the list of checked words, he/she can press the button (4) and the list is shown as in Figure 6.

Step 2 (Search word) The user inputs the word from the text box (2), and presses the button (3). Then the system searches the word from the dictionary (1).

Step 3 (Display learning history) If the user presses the button (5), then the learning history is displayed. Figure 7 shows an example.

Step 4 (Create vocabulary book) The collection of the word files corresponding to the selected words are copied into the personal folder invoked in the session shown in Figure 4, and the personal vocabulary book is created. After the completion of creation, the system displays the place of the personal folder in a message box.

The search function becomes convenient especially when the number of words in the list increases. If the searched word exists, then the corresponding check box is

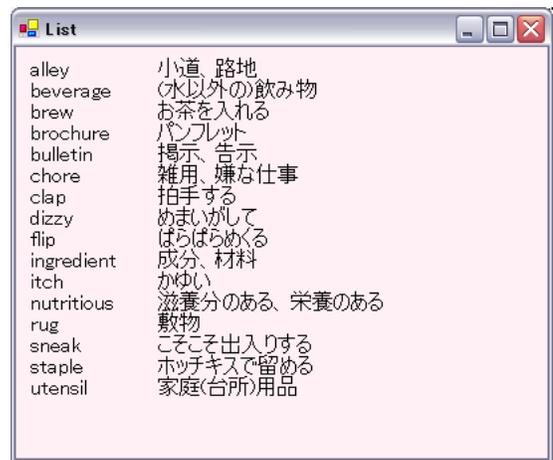


Figure 6. An example of the list of the selected words

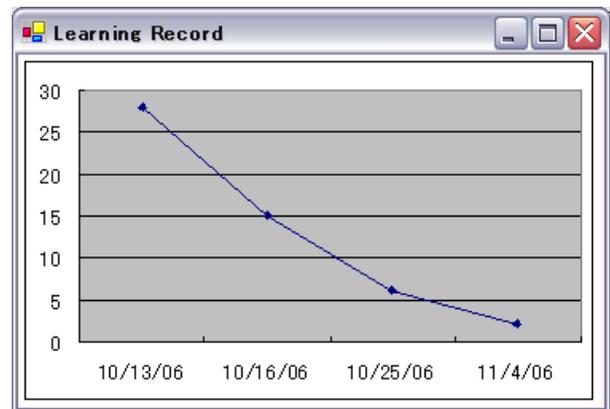


Figure 7. An example of the learning history

automatically set. Otherwise, if there is no such word, the failure is reported in the message box. Learning history is sorted by the updated dates of the vocabulary book and displayed by the line graph (Figure 7). The number of the unremoved words is plotted by the line graph.

Next, we explain the transfer of the vocabulary book to the iPod. The first process is very simple and it is done by just drag-and-dropping the personal folder onto the iTunes. Then the vocabulary book is transferred to the iTunes. The second process is just to plug the iPod in the personal computer. Then the contents are taken into the iPod from iTunes and the user can start to learn the words.

After the vocabulary book is taken into iPod, the user can start studying as he/she likes/pleases. For example:

- The user can memorize the word surely by repeatedly checking its file.
- The user can study skipping the memorized word.

Now, we will explain the creation process of the im-

ages. Both the still and the moving images are provided as contents. The creation process of a moving image is as follows:

Step 1 (Collect image data) The images provided by our system are all original. The moving images were taken by using a video camera.

Step 2 (Superimpose sound onto image data) Superimpose the subtitle and the pronunciation onto the moving image by using the Windows Movie Maker. The subtitle consists of the spelling and the meaning of the word.

Step 3 (Convert file format) Convert the image file constructed in Step 2 from WMV form into M4V form so that the file can be viewed by an iPod.

Our system is not language-dependent. This means that our system enables the user to learn any foreign language. For example, in Figure 8 we depict the image taken from our French word file.



Figure 8. A content example for French word ‘garçon’

Each word file consists of the spelling and the pronunciation of the word together with a still/moving image of about 5 seconds. If the content is too long, it takes too much time for the user to learn one word. Moreover, if much time is spent for each word, it is inconvenient for mobile learning. The word file has the spelling, the meaning, and the pronunciation of the word. In the former two seconds, only the spelling of the word is shown and the meaning appears for the latter three seconds. Figure 9 shows an example of the word file. If the spelling and the meaning are always displayed, then it would be difficult for the user to judge if he/she has already memorized the word or not. Hence, the meaning is not displayed for the former two seconds. Its merit is that the user can skip the content if he/she judges that the meaning of the word has been already acquired. The pronunciation of the word is emitted twice in the five seconds because as mentioned above it has been proved to

be effective to use the pronunciations of the words to learn them. The pronunciation files provided by the goo dictionary is used.



Figure 9. An example of a word file

3 Evaluation of System

3.1 Flow of Experiment

To verify the effectiveness of our system, we conducted an evaluation experiment based on English words. The subjects were ten adults. In this experiment, the subjects are asked to learn the words by our system and by the traditional paper-and-pencil method. After that, we compared the test scores. Furthermore, we prepared an instruction manual of our system and evaluated the usability of the system.

Figure 10 shows the flow of the experiment.

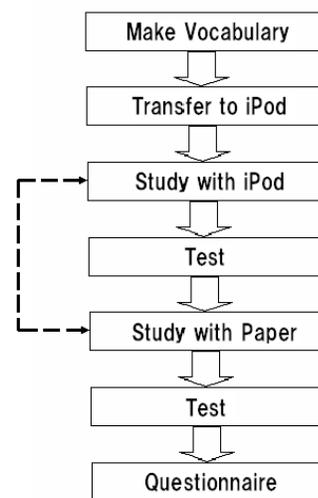


Figure 10. Flow of evaluation experiment

Step 1 (Create vocabulary book) We asked each subject to create his/her personal folder by referring the manual. In the following process, we chose ten words randomly from the folder for our system, and other ten words for the paper-and-pencil method.

Step 2 (Transfer data to iPod) The subjects were asked to transfer the contents to the iPod by referring the manual.

Step 3 (Studying with iPod) We asked each subject to study the ten words for ten minutes (two five-minute sessions with a three-minute interval).

Step 4 (Test 1) We asked each subject to write down the meanings of the words in Japanese just after Step 3. Figure 11 shows the screen example for the test.

Step 5 (Learning by paper-and-pencil method) The spelling and the meaning are printed out on the paper. Each subject is asked to learn the words by using this paper. The learning time is same as Step 3.

Step 6 (Test 2) The same test as Test 1 is conducted just after Step 5.

Step 7 (Test 3) Tests 1 and 2 were conducted once again after two weeks in order to check the memory retention ratio of the words.

The subjects were divided into two groups, each group consisting of five people. In the first group, the subjects first studied the words based on the traditional paper-and-pencil method, then by our method. In the second group, the order was reversed (i.e., the subjects first studied the words based on our system, then by the paper-and-pencil method).



Figure 11. Screen example of the word test

Table 1. Average scores of each test

Method	Just after	After two weeks
iPod	9.6	4.0
Paper-and-pencil	9.3	2.7

3.2 Results of tests

In this section, we report the test results. Table 1 shows the average scores of each test. Figure 12 shows the changes of the average scores. Note that the maximum score is 10.

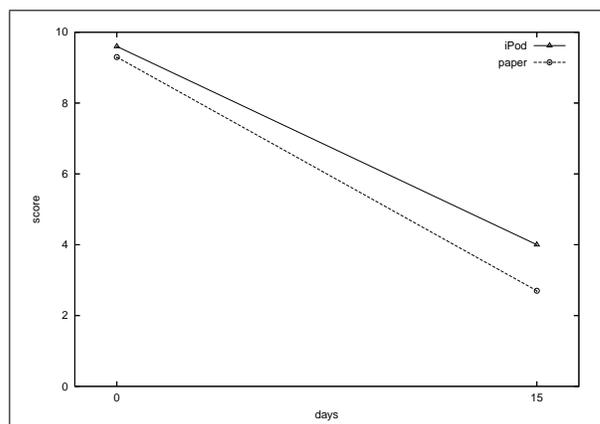


Figure 12. Changes of the average scores

If we compare the scores just after the learning sessions, no difference can be observed between the two methods. However, a significant difference can be seen after two weeks: the retention percentage of the words learned by our system was 40%, while that by the paper-and-pencil method was only 27%. This indicates that our system is more effective in retaining the meaning of the words in the long run.

3.3 Results of usability

We also conducted a subjective questionnaire concerning the usability and ease of operation of our system. The questionnaire and the results are shown in Table 2. The subjects were asked to choose among the following four options:

1. No, not at all
2. Relatively no
3. Relatively yes
4. Absolutely yes

Questions (1)–(3) concern the usability of our system. We found that even though some users seemed to have confusion in transferring the contents to the iPods (cf. question

Table 2. Questionnaire and results

Question	Result
(1)I could create my personal folder without confusion.	3.6
(2)I could transfer the contents to the iPod without confusion.	2.9
(3)I could see the moving images by using the iPod.	3.9
(4)It is effective to learn the foreign words by using the iPod.	3.4
(5)The learning time will increase if I use the iPod.	3.0
(6)I want to learn the foreign word by iPod after this experiment.	2.8

2) our system allowed even novice users to easily handle the system by referring to the manual we provided. Next, the score for Question (4) showed a very high result 3.4. The subjects explained that the iPods made it easier for them to memorize the words because they had access to corresponding images. Moreover, some claimed that the pronunciation of the words remained in their 'ears'. The score for Question (5) was 3.0. The subjects commented as follows: the contents are interesting; they can make use of their free time; the iPod is handier than a book. The score for Question (6) was 2.8, which was not as high as we had expected. Most of the subjects remarked that they would not consider using iPods in foreign language learning because they are too expensive.

4 Conclusion

In this study, we have proposed a foreign-word learning system based on iPods. We also conducted an evaluation experiment on ten subjects. The result was as follows: although no difference could be observed between our system and the paper-and-pencil method right after the learning session, a significant difference was seen after two weeks. While the subjects retained the meaning of 40% of the English words using our system, only 27% was retained by the conventional paper-and-pencil method. Hence, we conclude that our system is effective in learning foreign words.

For future work, we need to take into consideration the property of each word. That is, a certain method may be suitable for some words but not for others depending on properties such as abstract vs. concrete, verb vs. noun, etc. Moreover, it is necessary to check the availability of Web-based distribution by the contents on the database.

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