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Enhancing Mobile Learning App for Revamped Blended Learning Class in Beginner's Chinese Course

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Abstract: The authors have been conducting Chinese language classes for first-year university students that combine face-to-face instruction and e-learning for review. They have also been developing a mobile application for review. Beginning this year, the curriculum has been modified so that one of the two linked weekly classes will be conducted as an on-demand class, and the app will be utilized to consolidate the learning content. The mobile application was also substantially modified accordingly. This paper describes the design.

Keywords: Smartphone learning app, blended learning, Chinese, speech recognition

1. Introduction

The authors have been implementing blended-learning for beginner Chinese language classes that combine face-to-face teaching and e-learning review. Since 2018, we have been using KoToToMo Plus, a mobile app with microlearning that allows students to review the content of those classes (Ohkawa et al., 2018). In addition, to encourage students to use the app, a My Page to track their learning status was introduced in 2022 (Nakagawa et al., 2022).

New students at our university are required to take a second foreign language class twice per week. In the previous curriculum, the two weekly classes were taught by different instructors and used different textbooks. However, there are issues with learning effectiveness and quality assurance when conducting parallel classes that are not coordinated. Hence, beginning in 2023, the two classes were converted into a cooperative class using the same textbook. The video-based on-demand class is one of the two weekly classes. After the class, students use a mobile app to learn vocabulary, grammar, and conversation. The other class is an in-person meeting.

Due to the change in curriculum, the mobile app's purpose has shifted from reviewing face-to-face classes to practicing for retention in on-demand classes, necessitating a modification. This paper describes the design of the resulting modified app and the issues for the speech recognition-based learning content included in it, as well as the methodology for addressing these issues. This paper constitutes part of a study to determine whether students can learn without difficulty after the curriculum change compared with the previous app and whether the learning motivation designed for the previous year's curriculum is effective.

2. Design of Learning App Modifications

2.1 Problems of the Existing App

The existing apps were insufficient for the new curriculum in terms of types of learning and the amount of learning per class (Gui et al., 2023). Since the total number of classes per year, including the on-demand type, would double, the number of learning chapters in the app was increased from 18 to 23 chapters. In addition, when students used the My Page function to check the chapters that needed to be studied based on the class's progress, they were required to locate the chapters with upcoming deadlines on the calendar screen, which was not fully utilized.

2.2 Design of the Modified App

The second, fourth, and fifth authors, who are also class instructors, proposed the addition of the following learning types.

- **Vocabulary Practice 1:** Students first listen to an audio example of the word, then read it aloud. Their voice is then converted to text using speech recognition, and their pronunciation is determined.
- **Vocabulary Practice 2** and **Grammar Practice 2:** Students evaluate their comprehension of a word's four tones, pinyin, or grammar through multiple-choice questions.
- **Conversation Practice:** Role-playing conversations containing four to five sentences from the textbook allows students to practice listening and speaking with others.

In Vocabulary Practice 1, in acquiring word pronunciation using speech recognition, students must check the model voice and perform recognition numerous times. As a result, we designed it as depicted in Figure 1(a).

As shown in Figure 1(b), the Conversation Practice screen was designed to resemble a chat screen, alluding to the SNS screens that are popular among Japanese university students and with which they are familiar, so that users can practice while reviewing the conversation's content before and after the conversation. However, these forms using speech recognition were required to modify the questions to resolve issues with the speech recognition function of the operating system (OS), as described in the following section.

For the My Page, the design of the existing screen was modified so that the user can directly view which chapter is closest to the deadline and the number of unlearned questions, as shown in Figure 1(c).

(a) Vocabulary Practice 1 (b) Conversation Practice (c) My Page

Figure 1. Screen Design of the Modified Learning App.

3. Speech Recognition Issues and Solutions

The speech recognition capabilities of mobile OSs are designed for native speakers and do not account for the pronunciation errors of nonnative speakers. However, obtaining a corpus

of Chinese speech utterances by Japanese speakers is difficult, and preparing a specialized recognition system is incapable. Therefore, we decided to use a standard OS function for speech recognition to determine pronunciations, allowing for certain problems.

In speech recognition, results are obtained by taking into account not only the similarity of pronunciation but also the frequency with which a word occurs as a sentence. Therefore, even if a single word is attempted to be recognized, if it is likely to be used in a sentence, the recognition result may contain an unspoken subject word. Proper nouns that do not frequently appear in the conversation of native speakers are likely to be misidentified. Moreover, monosyllable-only short words and differences in tone of voice are also strongly affected by the probability of occurrence as a sentence, making correct recognition challenging for even native speakers.

Therefore, in the Vocabulary Practice 1 learning form, we asked native speakers to use a prototype of the modified app and replaced difficult-to-recognize words with words and expressions that could be recognized, even if they differed from those in the textbook. Most of the replaced words were short words consisting of single vowels and were made recognizable by adding Chinese adjectives equivalent to “very” or “one.” Conversely, the example sentences in the Conversation Practice format contain a significant number of proper nouns. It is challenging to eliminate proper nouns and reconstruct conversational sentences. Therefore, even if the recognition result is incorrect, the system is designed to prompt recurrence up to four times, depending on the edit distance from the correct answer, before permitting the user to continue the conversation. This is because we placed greater emphasis on oral practice than on obtaining accurate pronunciation.

4. Conclusions

This paper describes the design of a mobile learning application that has been modified to meet the requirements of the new blended Chinese classes that will be implemented in Tohoku University’s beginner’s Chinese courses beginning in the academic year 2023. It also described the changes made to the learning questions’ content and the learning method’s design due to the challenges of speech recognition. The app based on the above design has been in use since April 2023, with 27 classes and more than 900 new students.

Currently, we are preparing to analyze the log data obtained from the app’s use, the learning effects compared to the previous years’ curriculum, motivational effects, and other learning factors.

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