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AUTHOR(S):

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A Picture-Book Recommender System for Extensive Reading on an E-Book System

Chifumi Nishioka[1, *], Sanae Fujita[2], Takashi Hattori[2], Tessei Kobayashi[2], Futoshi Naya[2], Hiroaki Ogata[1]
[1] Kyoto University, [2] NTT Communication Science Laboratories
[*] nishioka.chifumi.2c@kyoto-u.ac.jp

ABSTRACT: In this paper, we demonstrate a picture-book recommender system to promote extensive reading in English. Extensive reading refers to the independent reading of a large quantity of material for information or pleasure and is known to be effective for acquisition of a second language. The recommender system is implemented on an e-book system that shows digital learning materials (e.g., textbooks and slides) on student's device. Activities on the e-book system are recorded as learning logs. The recommender system suggests picture books in English based on contents of English textbooks. Specifically, we implement two recommendation strategies: (1) term-based recommendation and (2) grammar-based recommendation. In the future, we use learning logs and loan records of picture books to investigate the influence of picture books on acquisition of English and to enable personalized recommendations for each student.

Keywords: recommender system; language learning; e-book; learning analytics; extensive reading

1 INTRODUCTION

In these years, digital books (i.e., e-books) have been introduced to schools in different countries including Europe (Conrads et al., 2017) and Asia (Ogata et al., 2015). Activities on e-book systems are recorded as learning logs that are used for learning analytics. In this paper, we demonstrate a picture book recommender system on an e-book system for students to promote extensive reading in English. Although there are a lot of works of recommender systems for education and learning (Manouselis et al., 2011), to the best of my knowledge, there is no recommender system of resources for extensive reading. Extensive reading is defined as the independent reading of a large quantity of materials for information or pleasure (Renandya et al., 1998) and is reported to be effective for acquisition of a second language. According to Day and Bamford (2015), the primary purpose of extensive reading programs is to get students reading in the second language and liking it. Hafiz and Tudor (1989) reported that students prefer story books as reading materials. In addition, they indicated that shorter books place less strain on learners' concentration and are thus more likely to be picked up. Nishizawa et al. (2010) reported the effectiveness of a long-term extensive reading project, in which picture books were included in reading materials. Motivated by these works, we use picture books in English as reading materials for extensive reading. Although it is important provide a lot of picture books for resources of extensive reading, it is difficult to find a picture book that suits their levels and preferences. The recommender system aims to facilitate students to find picture books that match what they learn (i.e., words and grammar). As an e-book system, we use BookRoll (Ogata et al., 2015). BookRoll is a web application that shows digital

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learning materials (e.g., textbooks and slides) on student's devices (e.g., tablet and laptop). Different activities on BookRoll are recorded as learning logs and will be used to investigate the influence of extensive reading on language learning.

2 PICTURE-BOOK RECOMMENDER SYSTEM

In this section, we describe the overview of the recommender system (Section 2.1) and recommendation strategies (Section 2.2).

2.1 Overview of the Recommender System

The recommender system is implemented on BookRoll (Nishioka & Ogata, 2018) and suggests picture books based on content shown on BookRoll. As shown in Figure 1 (left), we see a recommendation icon at the top-right corner, if there is at least one recommendation for the page. After clicking the recommendation icon, the recommendation panel is shown up at the right as illustrated in Figure 1 (right). It lists recommended picture books with metadata including author, title, and identification number. Each recommended picture book is attached a URL to a corresponding page in Google Books, where students can see the detailed information of the picture book. If a student is interested in a recommended picture book, she or he can find the picture book based on its identification number from the bookshelf of picture books installed in a school and borrow it. Clicks on the recommendation icon as well as recommended picture books are recorded as learning logs. In addition, loan records of picture books are also stored and will be used for learning analytics.

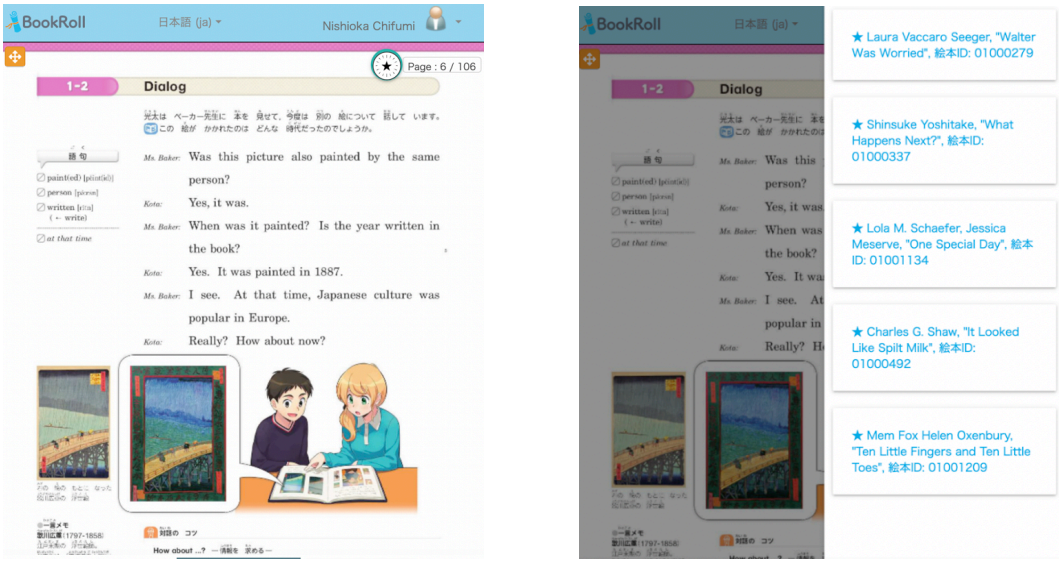

Figure 1: Interface of the recommender system. (Textbook: NEW HORIZON 3, Tokyo Shoseki, 2016)

2.2 Recommendation Strategies

The recommender system implements two recommendation strategies: (1) term-based recommendation and (2) grammar-based recommendation. We automatically extract texts from textbooks as well as picture books and use them for computing recommendations. As term-based recommendation strategy, we employ Term-Frequency Inversed Document Frequency (TF-IDF). As

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grammar-based recommendation, recommendations are calculated along with the following procedures. We first manually assign grammar items to learn for each unit of English textbooks. Grammar items are listed by CEFR-J (2018). In contrast, we automatically detect which grammar items are used in each picture book. Then, we pick up picture books that uses the identical grammar items for each unit. Finally, among them, the recommended picture books are selected by TF-IDF. In the initial deployment, we employ the term-based recommendation strategy for even pages and the grammar-based recommendation strategy for odd pages. We compute term-based recommendations and grammar-based recommendations for each spread and unit, respectively.

3 CONCLUSION AND FUTURE DIRECTIONS

In this paper, we demonstrate a picture book recommender system to promote extensive reading for students. We deploy the recommender system in a junior high school in Japan since December, 2019. In the future, we would like to leverage learning logs recorded on BookRoll including clicks to recommendations as well as loan records of picture books to identify influence of recommendations and picture books on language learning. In addition, we would like to enable personalized recommendations of picture books using learning logs and loan records.

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