

A Study on Constructing a Theoretical Model of Adaptive Learning System for English Reading

Tingli Xue¹, Shuheng Li¹ and Zhoujing Lin^{1,*}

¹Liaoning Normal University, China

Abstract

This study aimed to design an adaptive learning system for English learners to provide personalized English extracurricular reading services. The system adapts to learners' characteristics and goals, enhancing traditional online teaching for extensive English reading. Drawing on the concept of English reading literacy (RL), the system uses a six-dimensional framework to assess learners' English RL levels and select suitable picture books. It utilizes a multifaceted approach, including tests, questionnaires, and dynamic learning diagnoses, to generate personalized spiderweb diagrams for learners. The system aims to enhance English RL by offering tailored reading materials and fostering a vibrant reading culture.

Keywords: Adaptive learning system, English reading literacy, English extracurricular reading support

Introduction

In recent years, the rapid development of modern information technology, social sciences, and distance education has shown a trend characterized by an emphasis on individualized learning, rapid feedback, and open lifelong education. This trend has prompted the transformation of the distance education system to adapt to the learning needs of students under the guidance of educational objectives, so adaptive learning systems have attracted particular attention from researchers in related fields.

This study aimed to design an adaptive learning system, with junior high school students as the intended user base, in pursuit of providing personalized

*Corresponding Author E-mail: linzhoujing2013@163.com

English extracurricular reading requests and services for a wide range of English learners.

The adaptive learning system in this study includes customized English reading materials and learning processes suitable for learners in accordance with their different characteristics and goals. It will make traditional online teaching systems more conducive to individual learners carrying out extensive English reading without the guidance of a human teacher alongside.

At present, English extracurricular reading, with picture books as the mainstream supplementary materials, has been widely promoted and used in primary and secondary schools across various provinces and cities in China. However, there are some issues. First, because of the limitations of class time, it is not possible for teachers to provide sufficient direction for independent reading after class, which result in significantly different reading effects. Second, the limited amount of directions from the teacher cannot be fully implemented because of the students' different reading habits, levels, and even differences in personalized reading styles. If this newly designed adaptive learning system can be developed and put into the market, it is believed that English extracurricular reading will enter a new stage of personalized "teaching" supported by new technology.

Theoretical Foundation

The notion of "reading literacy" (RL) emerged as a pivotal concept within academic discourse in the 1990s, emphasizing that reading ability extends beyond merely an ability for decoding and comprehension to encompass a broader view of literacy that supports the holistic development of reading skills. This inclusive perspective acknowledges the significance of factors such as motivation for reading, attitudes, preferences, and other intrinsic elements in fostering RL (Mullis et al., 2009; OECD, 2013). To address the needs of Chinese English learners, Wang's team (Wan & Ao, 2015; Wang & Chen, 2016) has formulated a theoretical framework that integrates six dimensions, as shown in Figure 1, outlining developmental goals tailored to enhance English RL among this population.

To offer more opportunities for children to develop their English RL, this article introduces the Adaptive Learning System for English Extensive Reading (ALS-EER), addressing social concerns regarding the lack of equality in education. The ALS-EER (hereafter referred to as "the system") uses a multifaceted approach to recognize and accommodate learners' individual learning characteristics.

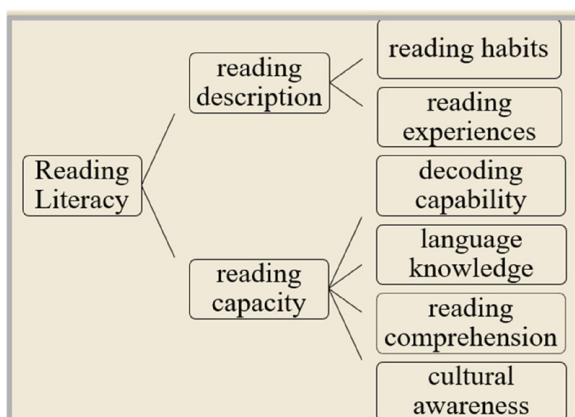


Figure 1. Theoretical framework of the development of goals English reading literacy for English learners in China.

Research Questions

To cater to the individualized needs of students, the system recognizes learners' current levels of English RL and indicates their developmental requirements. This can be achieved through pre- and post-learning diagnoses, as well as formative prompts during learning, which enable the system to generate a six-dimensional spiderweb diagram of the learners' existing English RL (hereafter referred to as SWD1).

Based on the six dimensions of the English RL framework, this study used the "Description Table of Picture Books" (Wang & Chen, 2016) to describe the typical characteristics of picture books in terms of the vocabulary, phrases, chapters, forms of presentation, and so forth. This facilitates the creation of a spiderweb diagram (hereafter referred to as SWD1') that represents the English RL required for students to understand the given text.

Subsequently, during the system's pilot operation phase, a number of users engaged in reading activities and underwent dynamic learning diagnoses. The resulting SWD1 with individual differences served as a basis for further refining SWD1', ensuring that the recommended texts aligned more closely with the learners' personalized needs.

Therefore, the following two research questions were proposed:

- Q1: How does the system recognize learners' individual learning characteristics?
 Q2: How does the system choose a suitable picture book for a particular learner?

Research Process

To answer Q1, this ALS-EER uses a multifaceted approach to recognize the learners' dynamic English RL. It incorporates both traditional tests for assessing their reading ability and a comprehensive questionnaire for learning about their reading habits and experiences. The reading abilities that the system aims to assess include language knowledge and diverse skills such as phoneme manipulation, guessing words, sequencing of images, comprehension of details, and summarization. Using the data from 572 participants, the questionnaire was analyzed with SPSS 23.0 to verify its reliability, validity, and discrimination, ensuring the robustness of the collected data.

As the learners start the system, they complete both the tests and the questionnaire. The system then diagnoses their performance across the six critical dimensions of English RL, enabling it to tailor its interventions and learning resources to each learner's unique strengths, weaknesses, and preferences, thereby fostering a more personalized and effective pathway towards the enhancement of their English RL.

Regarding Q2, Wang & Chen (2016, pp. 35–36) meticulously outlined the distinctive features of books' levels in terms of vocabulary, phrases, chapters, forms of presentation, and illustrative samples in the Picture Book Description Framework, offering teachers and parents a visual guide for selecting appropriate reading materials.

Building upon the *Chinese English Curriculum Standards for Compulsory Education* (revised in 2022) (Ministry of Education of the People's Republic of China, 2022), we have expanded the original Picture Book Description Framework and developed a series of description tables for picture books, particularly at the discourse level, to better accommodate the specific content of individual picture books. First, further guidance has been provided on categorizing picture books into thematic clusters and sub-themes and a more nuanced categorization of types of discourse has been offered in terms of points of view and comprehension difficulty of words and phrases. Second, the tables summarize character traits in each individual picture book based on their psychological impact on readers, generalize the overarching ideas and writing cues for both narrative and other texts, and utilize typical sentences to illustrate specific textual techniques. Third, a new dimension named cultural knowledge has been incorporated into the description tables, mirroring the emphasis on cultural awareness within English RL, to enhance the understanding and appreciation of the cultures represented in picture books.

Based on the six-dimensional descriptive tables of picture books, the system generates corresponding six-dimensional spiderweb diagrams, namely SWD1' for each text, and compares them with SWD1, so that texts which are in line with the learner's zone of proximal development can be given to the learner.

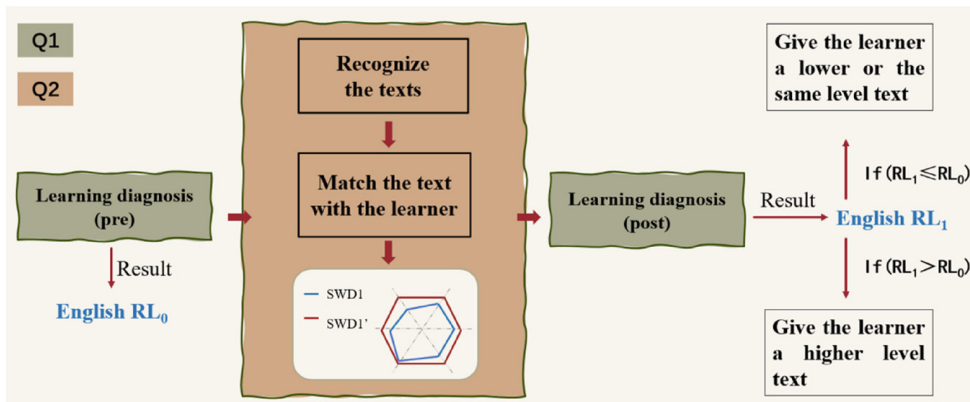


Figure 2. Theoretical Model of adaptive learning system for English extracurricular reading.

Conclusion

This study developed a theoretical model of ALS-EER (Figure 2) tailored for meeting the personalized English extracurricular reading needs of learners. By recognizing learners' individual English RL and giving them specific texts that require the corresponding English RL for them to understand, the system aims to enhance their English RL through extracurricular reading without the guidance of teachers. It holds promise for revolutionizing English extracurricular reading through technology-supported personalized learning.

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