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Personlized English reading sequencing based on learning portfolio analysis

Ting-Ting Wu [a], Yueh-Min Huang [a,*], Han-Chieh Chao [b], Jong Hyuk Park [c]

[a] Department of Engineering Science, National Cheng Kung University, Tainan, Taiwan
[b] Department of Electronic Engineering, National Ilan University, Ilan, Taiwan
[c] Department of Computer Science and Engineering, Seoul National University of Technology, Seoul, Republic of Korea

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ABSTRACT

Situated learning can enable learners to interact with real world objects, deepen their impression of learning material, and establish a connection between those objects and the material. For the practice of English reading, a proper integration of learner portfolios and local environments, along with a sound reading strategy, not only strengthens the students' understanding of language and reading comprehension, but also improves the effectiveness of language learning. Extended from the methodology of situational language, this study developed a ubiquitous English reading learning system based on RFID-based location-aware technology and a portfolio-centric article reading guide. Through RFID technology, the learning system can detect a learner's location; it then sends the learner highly situational and relevant English articles to read and study. Linking to the local environment, the English content becomes more perceivable, helping students achieve situational learning: "what is seen is read." Concurrent with the mechanism for situated reading articles, this work conducted an analysis of learner study portfolios incorporating the average learner ability to obtain parameters of standing point. Using the genetic algorithm approach, the system evaluates the difficulty of articles and their relationships. Through multiple evolutionary sequences, the system eventually provides the learner with appropriate and progressive articles for personalized study. The experiment conducted in both quantitative and qualitative evaluations revealed that this learning system can effectively assist learners as they immerse themselves in the study.

1. Introduction

Language is the most essential medium of interpersonal communication. Among all languages, English has become a major communication tool in global society [56]. In many non-native English speaking countries, improving the English ability of the public has become a vital policy to enhance national competitiveness. The development of informational technology has changed the way people obtain, use, and spread information; regarding educational purposes, substantial changes and improvements have occurred [33,34,39]. Particularly, the increasing popularity of wireless technology [16] and mobile devices has propelled mobile learning [1,37,55]. Therefore, to facilitate language study, implementing a teaching support system integrating information and technology has become a crucial research and development issue [18,54,25]. Recently, abundant learning methods have been proposed to promote ubiquitous learning [14,48,49]. Most research in this field has focused on the support for learning English vocabulary [35,50,51]. However, students skilled in vocabulary retention may not be able to construct relationships between vocabulary words and may lack the ability to deduce, analyze, gauge,

* Corresponding author.
E-mail address: huang@mail.ncku.edu.tw (Y.-M. Huang).

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organize, or apply vocabulary. Such students may understand the surface meaning of individual vocabulary words in a sentence but lack the ability to comprehend the overall meaning of the sentence. Such problems have indirectly influenced the English reading, speaking, and writing ability of learners; however, these conditions can be improved by implementing English articles in reading activities.

Reading involves a highly complex cognitive process [47]. Reading English means learning English through reading materials to acquire English vocabulary, sentence structure, and language skills for context inference [31]. During the language learning process, reading material helps learners interpret the meaning in articles, understand vocabulary, form sentences, and apply grammatical awareness; these are keys to learning a second language [20,28]. In addition, some studies have indicated that the appropriate scientific and technological environment supports effective reading strategy instruction, reinforces student language and reading comprehension [22,26], and improves reading learning effectiveness [42,46,58]. By contrast, situated learning theory [38] emphasizes a learning situation that stimulates intrinsic and extrinsic learner motivation, encouraging learners to introduce abstract ideas into concrete thinking, perception, knowledge, and cognition; the learners interact with their environment [17] and, in doing so, obtain knowledge through context [4]. Palmer & Hornby and other language scholars have proposed situational language teaching theories, stressing that language learning is natural to learners. For practical vocabulary, language should be taught in a context and applied to a particular situation [32].

Based on the aforementioned situational learning type, this study explored an English text reading-oriented approach to learning. This method provides learners with the words, phrases, quotations, paragraphs, and even the full text of reading material for situational language learning. The proposed method is based on a combination of RFID, which uses location-aware technology for a ubiquitous English reading learning system, as well as learner-location as context information to provide personnel with the location of surface features of the situation. In reading the study materials, learners further improve their English skills.

When a learning system provides a non-linear and highly autonomous learning model, learners can follow their personal wishes and preferences to determine learning content [23]. During the initial stage, academic or more passive learners are susceptible to learning disorientation and cognitive overload [40], which affect learning organization and the internalization of knowledge [45,57]. Meanwhile, the learning system supports guiding mechanisms [5,6,15] that can reduce the penalty of this problem [30,44]. To provide personal guidance, most studies have focused on mere personal characteristics [7,10], academics [11,41], online behavior [53,9], or learning ability [12,13]. Furthermore, established parameters have been based on such criteria, mainly through questionnaires and other assessment methods without adequately exploring learner portfolios. This auditing approach burdens learners with extra work, including questionnaires or additional assessments. Without comprehensively considering the overall average characteristics and capabilities of learners, the auditing approach results in a high and low achievement gap among learners, even when they are provided with a personal guide.

The cognitive psychologist Ausubel proposed meaningful learning [3], emphasizing that new learning must have a cognitive structure. This is especially pertinent to the study, allowing learning guidance mechanisms to achieve their targets. Old and new knowledge guides process aid in understanding, allowing learners to organize concepts [2,8], theories, and beliefs, as well as ensure concrete learning [29,43]. The second focus of the study adds intelligent tutoring systems to further the concept of personal technology that provide appropriate support in English reading guidance assistance mechanisms. Based on the mean learner ability, the system examines the relevance and difficulty levels of the article, and makes full use of portfolio data analysis. After systems evaluation, a genetic algorithm provides the best and the most appropriate sequence for learners to read articles. Genetic algorithms have been applied by numerous studies to solve optimization problems or answer multi-objective questions [36,59,60]. In this study, we used the advantage of the genetic algorithm to propose a personalized and adaptive guidance mechanism. Thus, learners can participate in an effective learning activity using this personalized guidance mechanism. Moreover, learners can realize their cognitive traits to find ways to learn English more effectively.

The remainder of this paper is organized as follows. Section 2 describes the framework of the proposed learning system and detailed learning process. Section 3 presents three guidance parameters that are further used in the genetic algorithm. The personalized reading guidance is proposed in Section 4. Section 5 introduces the research design, and analysis results are reported in Section 6. Section 7 draws conclusions and offers recommendations for future works.

2. Learning system for English reading

2.1. System structure

This system for English reading assumes a dispersed learner environment, with users at different locations on campus, providing an appropriate reading sequence for English articles based on the learner's location.

Fig. 1 displays the basic learning system structure. The system was constructed in an IEEE 802.11 wireless network campus environment, and the state of the eight school sites (restaurants shops, dormitories, softball field, library, computer lab, sports, academic buildings, and parking lots) were prepackaged with active RFID tags. Learners carry a built-in wireless networking and additional installation of an RFID Reader PDA or Smartphone as a learning device. This device conducts wireless transmission of information, reached via an RFID location detection functionality. Once the action learning set with RFID devices is sensitive to the learner location, the information is sent to the U-Reading Server. The server reads the article in accordance with the proposed guidance system through the derivation, calculation, and assessment of genetic algorithms; hence,