

Culturally Responsive AI-Based English Learning Recommendation System for Students

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Abstract

This project aims to find out whether an AI-based culturally responsive English learning recommendation system can improve students' English learning efficiency. Many English learning materials are designed for general learners without considering students from different cultural backgrounds, which may disconnect the learning process from students' life experiences, cultural backgrounds and local knowledge. As a result, students may need to spend extra time understanding unfamiliar topics and contexts, which causes the learning process to be inconvenient and inefficient. Thus, this study proposes using AI to connect students' English learning with their cultural background. To determine the effect of use of AI in helping students learn English through materials connected to their personal cultural backgrounds, there will be two groups. One group uses the normal English learning materials that are designed for general learners. Another group firstly provides their cultural backgrounds to the AI system, and then the AI system generates the English learning materials that corresponds to their backgrounds for them studying. The effectiveness of both ways will be evaluated by measuring vocabulary retentions, reading comprehension accuracy and students' interest in studying.

Introduction

Since English is one of the most widely used communicative languages around the world, learning English is important for students in school. However, although there are already many English materials for students to study, some of them still find out that it is difficult to learn English vocabulary and understand English passages efficiently. One possible reason is that the materials students use these days are too general to fit all the students from various cultural backgrounds. For instance, students from Tibet may be more familiar with cultural contexts related to Tibetan Buddhism, plateau life, pastoral traditions, local festivals, yaks, barley, monasteries, mountains, and grasslands. Therefore, English reading materials that include these familiar cultural elements may help them understand the context more quickly and focus more on vocabulary and reading comprehension. In contrast, students from eastern China like Shanghai may be more familiar with cultural contexts related to urban life, coastal trade, Confucian educational values, Jiangnan water-town culture, technology, transportation, and modern commercial life. Then, English reading materials about subway systems, high-speed trains, school competition, e-commerce, tea culture, gardens, rivers, or coastal cities may be easier for them to understand than materials

based on unfamiliar rural or plateau contexts. However, both students in different regions are using the same English learning materials. While students are reading materials with unfamiliar topics, they need to spend extra time to understand the context before they can focus on the language. This may reduce their efficiency in learning English.

To improve the situation that students are unfamiliar with the context of English learning materials, this study proposes to use AI with related cultural background to provide more suitable English materials for students. Moreover, previous studies also suggest that background knowledge like daily life and personal experience can affect reading comprehension. Thus, it is important to consider whether the content is meaningful or familiar to different students.

According to these reasons, AI based personalized learning system will become more common in future education, since it can not only provide precise materials match to students' level but also relate to students' background. So, this research intends to design a culturally responsive AI-based English learning recommendation system for students learning English. The system will not only recommend and generate materials based on the students' test scores, mistakes, learning progress, or difficulty levels, but also based on their personal cultural backgrounds, like local knowledge, cultural experiences, and daily life topics.

The research question of this study is: Can AI improve students' English learning efficiency by recommending instructional and practice materials related to students' self-reported cultural backgrounds and familiar life contexts?

Research objectives are:

1. To examine how familiar and cultural backgrounds affect students' learning efficiency in English.
2. To design a small frame of AI-based culturally responsive English learning recommendation system.
3. To evaluate the effects of the system through vocabulary retention, reading comprehension and students' engagement.

Literature Review

Previous research suggests that English learning is not only influenced by vocabulary but also influenced by culture backgrounds and context. Carrell and Eisterhold (1983) explain that ESL reading comprehension is associated with the text and the reader's prior background knowledge, like knowledge, experiences, and cultural assumptions. It means that students do not only simply receive meaning from passages but also understand the meaning through what they already know. In some cases, if students do not get the content schemata provided in the passage, they may feel confused while reading the text. For instance, Carrell and Eisterhold depict that some ESL students could not understand why highways were described as "the world's most expensive parking lots," because they did not share the American cultural schema in which private cars, highway congestion, and public transportation are connected. The authors call this a "culture-specific schema of the cars mass transportation opposition," which directly supports the claim that reading comprehension depends on culturally based background knowledge. A passage that feels familiar to one student may be difficult for another student if the topic or context is far from their lived experience.

Culturally relevant pedagogy also supports the idea that students' cultural backgrounds and lived experiences can be used as learning resources. Ladson-Billings (1995) shows that successful teachers did not separate students' cultural identities from academic teaching. On the other hand, teachers connected students' backgrounds and life experiences to the teaching materials. This not only helps students learn in convenience context but also attracts students' interest in learning.

AI systems have also been increasingly used in education. Zhang and Aslan (2021) found that AI has already been applied in tutoring system for personalized learning and adaptive learning support. Furthermore, the AI system can be used to tutor primary students learning science and help students interact with the context. They also discuss examples in which AI systems predicted students' text comprehension and learning styles to generate learner profiles, and an emotion-aware mobile English learning app provided different content when students seemed distracted or tired. These examples suggest that AI can support learning not only by adjusting difficulty level, but also by responding to students' learning needs, interests, and engagement. This is relevant to the present study because a culturally responsive AI recommendation system could use similar personalization ideas to recommend English materials that match both students' language levels and their familiar life

contexts.

Wei et al. (2021) mentioned a recommendation system based on artificial intelligence. The system analyzed learning behaviors such as video completion, rewinding behavior, and quiz correctness to estimate students' learning ability. It also classified learning resources by features such as difficulty level and recommended suitable resources to different students. Their results showed that the AI-based recommendation system performed better than general popularity-based and collaborative filtering methods. This suggests that AI can recommend learning materials according to students' learning status rather than giving all learners the same resources. In the present study, this idea is extended to English learning by considering both students' English levels and their self-reported cultural backgrounds and familiar life contexts.

However, although there are many previous studies talking about the links between cultural backgrounds of students, students' learning process, and AI recommendation system, there are few studies studying that can AI improve the efficiency of learning English through connecting the learning materials with students' cultural backgrounds. Therefore, this study will design a test to figure out this problem.

Methods

This study will use a small-scale comparative research design to examine whether an AI-based culturally responsive English learning recommendation system may contribute to students' English learning efficiency. A hundred participants will be separated into two groups. One is control group that participants will learn English through general learning materials. The other is experimental group that participants will learn English through English materials that recommended by AI-Based English Learning Recommendation System according to their backgrounds and life experiences.

The study will invite students who are currently learning English as a second language. Since participants may begin with different English levels, all of them need to finish a pre-test, which contains vocabulary questions and reading comprehension questions. Vocabulary questions will be measured by a 20-question vocabulary test, including word meaning, word usage, and sentence completion. Reading comprehension will be

measured by 10 multiple-choice questions and 5 short-answer questions. The purpose of the test is to measure student's English level of vocabulary and reading comprehension. Based on the result of the test, participants will be separated into two groups with similar English levels, so there are no confounding variables caused by different initial English level.

There are several types of data that will be collected in this study. First, pre-test data will be collected to measure the vocabulary level and reading comprehension level of students. Second, the cultural backgrounds and life experiences of students, like traditions, festivals, familiar family styles and community life, will also be collected for material recommendation.

An English learning data set will be created, which includes instructional and practice materials, vocabulary and reading comprehension questions. Each material will be labeled according to the difficulty, vocabulary, and topics. There are roughly two types of topics that one type of material is generally fit for every student without specific cultural things like festivals and traditions, and another type of material is based on specific backgrounds, which is more familiar to a student's local life. Furthermore, to ensure fairness, both types will have similar levels of vocabulary and difficulty. For example, if a student is familiar with plateau life, the passage may include topics such as yaks, mountains, or local festivals, while maintaining the same English difficulty level as the control group materials.

The AI based recommendation system will consist of three main components. The first component is the learning diagnosis module, which is used to analyze the pre-test results for identifying weak areas such as vocabulary meaning, vocabulary use, understanding of details, main idea comprehension, and inference. The second component is the content targeting module, which can classify materials based on vocabulary, difficulties, and topics. The third component is the recommendation module. This module can be used to recommend English learning materials according to the labels provided. For example, the control group will be recommended based on the vocabulary level and difficulties, and the experimental group will be recommended further based on cultural backgrounds than control group. Then, the recommendation system will recommend matched label materials to each student.

In conclusion, the research procedure contains six steps. First, students will complete the English pre-test. Second, students need to fill out a theme survey about their backgrounds. Third, they will be assigned to either control group or experimental group according to their pre-test results. Fourth, students in control group will receive learning materials recommended only based on English level, and students in experimental group will receive learning materials with corresponding topics to their life experience. The learning process will last two weeks. Each day, both groups will study English using corresponding materials, which contains 30 vocabulary words and 2 passages, for exactly two hours. Fifth, both groups are required to finish practice. Sixth, students need to complete the post-test, which has similar difficulties as the pre-test, and a short feedback survey.

The English learning efficiency will be evaluated through academic outcomes and engagement outcomes. Academic outcomes include vocabulary retention, reading comprehension accuracy, and improvement from pre-test to post-test. Engagement outcomes include students' self-reported interests and concentration duration in learning process.

Expected results

It is expected that students in experimental group will show better English learning efficiency than students in control group, since the learning materials used by experimental group are connected to their cultural backgrounds and life experiences. Students in the experimental group may find these learning content easier to understand. Instead of spending time on understanding unfamiliar topics, they can focus more on vocabulary and reading comprehension.

To be more specific, for academic performance, the experimental group may remember vocabulary more effectively when new words appear in familiar contexts, and may perform better on reading comprehension, especially when questions require understanding on situations and interpreting meanings beyond one sentence. For engagement performance, although some students in the control group may show interest in general materials since they are not that familiar with these passages and may feel curious, the experimental group is expected to show stronger interest in relevant materials because the materials are more closely related to their cultural backgrounds and familiar life contexts.

Discussion

The expected result of the study shows that culturally responsive AI system may help students to have more efficiency in learning English. If students in the experimental group show better vocabulary retention and reading comprehension accuracy, it may reflect that familiar cultural backgrounds and life contexts can help students connect English materials with their prior knowledge. In this case, the efficiency can come from learning English with more relevant and meaningful materials.

This result shows that English learning should not only focus on difficulty levels. Although vocabulary and text level are important for English learning, they do not fully represent the best way in learning English. Instead, the cultural backgrounds and the relation between the text and the learner are also vital for English learning efficiency.

However, this study still has some limitations. The sample size is not that large, and the time duration of learning process is short-term. Therefore, the results may not be generalized to larger population and cannot be used to prove long-term learning efficiency. Therefore, future studies could include more students from more variety backgrounds and longer learning periods.

Conclusion

This study proposes a culturally responsive AI-based English learning recommendation system for students. The purpose is to explore whether learning efficiency can be improved through AI recommendation system by providing learning materials related to students.

The study adopted a comparative design, which contains control group and experimental group. The control group uses general learning materials, and the experimental group uses materials that are related to their common life and cultural backgrounds. The evaluation of the learning efficiency will be based on the improvement of vocabulary and reading comprehension, and engagement during learning process.

It could be suggested that when learning materials are connected to students' life contexts, students may feel less difficulty on understanding topics and become more engaged in learning, which shows that culturally relevant learning materials may make the learning process more efficient and engaging. Although there are some limitations in this study, the potential benefits of using culturally responsive AI-based recommendation system are shown.

References

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