Research Article

Improving College English Reading Teaching Efficiency Based on Student Behavior Data Mining and Mobile Edge Computing

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Received 16 January 2022; Revised 17 February 2022; Accepted 18 February 2022; Published 4 April 2022

Academic Editor: Xin Ning

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The reading scope of university English reading is constantly expanding, and the teaching content is gradually increasing. Students are unable to grasp the article’s ideas while reading, resulting in an incorrect understanding of the article and the selection of incorrect topics. In English reading, teachers should begin by broadening students’ knowledge, increasing their amount of new words, gradually building reading experience, and improving reading efficiency. Data mining (abbreviated as DM) is a method of extracting hidden, unknown, but potentially useful information and knowledge from a large amount of incomplete, noisy, fuzzy, and random practical application data. Based on student behavior DM and mobile edge computing, this paper investigates strategies to improve the efficiency of university English reading instruction. Teachers and students can interact more easily with the help of university English reading teaching based on student behavior DM, and good interpersonal interaction can help students better understand and master the language. It is also beneficial for teachers to provide more tailored guidance for students’ individual university English reading teaching levels and learning abilities, as well as to assist them in developing personalized efficiency improvement strategies. The goal of DM student behavior is to discover knowledge, mine information, and apply rules without making any assumptions, with unknown, useful, and effective results.

1. Introduction

Reading is not only an important way for people to obtain information, but also an important form of human social and cultural communication. The general university English curriculum standard also lists improving students’ extracurricular reading ability as one of the curriculum standards, requiring college students to read more than 360000 words after class [1]. The teaching content of university English reading is gradually increasing and the reading scope is constantly expanding. Students cannot grasp the ideas of the article in reading, resulting in an incorrect understanding of the article and wrong topics [2]. Therefore, when arranging reading exercises after class, teachers should pay attention to the composition, difficulty, and ease of exercise questions, take arousing students’ interest as the starting point, exercise students’ reading speed and accuracy, and gradually improve students’ reading ability [3]. In English reading, teachers should start with broadening students’ knowledge, constantly increase students’ amount of new words, gradually accumulate reading experience, and improve reading efficiency. At present, DM technology [4, 5] is also widely used. DM technology is used to solve practical problems in various fields such as finance, insurance, economic management, medical treatment, and education. In the current university English reading teaching, although reading teaching has been paid attention to, the teaching effect is not ideal. The main reason is that nonverbal factors have not been paid enough attention [6]. Grammar translation is still widely used in our reading class. The grammar translation method mainly focuses on the explanation of language points, while ignoring the efficiency improvement, cultivation, and development of students’ language and speech ability; The main energy and time of English reading teaching are spent on language knowledge, ignoring the learning and application of various nonverbal factors [7]. Students always read without any new word barriers, and are always in a passive and receptive position, unable to take the initiative. Therefore, when explaining new knowledge points, teachers can further understand the learning status of each student through
timely communication with students, avoid students from memorizing too much, and strengthen the communication between teachers and students, so that students can continuously improve their learning awareness in a harmonious and interesting atmosphere [8, 9].

DM’s job is to categorize the research objects based on the variables that have been chosen. Because the mining structure only reflects the data structure defined by the variables chosen, variable selection is critical in mining. In general, the variables chosen should meet the following criteria [10]. In fact, there is no clear definition of DM from the past to the present, and different descriptions can be found in various application fields and literatures. DM is a process of extracting information from massive, noisy, fuzzy, incomplete, and random data that people cannot see on the surface, do not know in advance, is implicit, but has value [11]. Select relevant algorithms suitable for DM based on the nature of the knowledge representation target data, use intelligent methods to extract data patterns and build models, and mine potential laws and knowledge from the data [12, 13]. This new data processing technology can explore and analyze a large number of university English reading teaching data in accordance with established business objectives, reveal hidden, unknown, or verified regularity, and improve efficiency strategies.

DM can help decision-makers, help them analyze historical data and current data, and find out the hidden relationship among them, so as to provide the basis for students’ behavior and predict the possible behaviors in university English reading teaching [14]. Student behavior DM is to discover knowledge and mine information and rules without any assumptions, and the results are unknown, useful, and effective. Student behavior DM is often considered knowledge discovery, knowledge extraction, information acquisition, data archeology, pattern recognition, etc., which can best show its essence, so it is widely used in many academic circles and industries. With the support of university English reading teaching based on students’ behavior DM, teachers, students and students can interact more conveniently [15]. Good interpersonal interaction can help students better understand and master the language, and it is also beneficial for teachers to provide more targeted guidance for students’ individual university English reading teaching level and learning ability, and assist them to formulate personalized efficiency improvement strategies.

2. Related Work

Literature [16] points out that in the current university English reading teaching, although reading teaching has been paid attention to all the time, the teaching effect is not satisfactory, and the main reason is that nonlinguistic factors have not been paid enough attention. Literature [17] through the method of big data analysis, in actual teaching, the biggest problem facing reading teaching is that both teachers and students focus on completing exam questions, ignoring students’ understanding and understanding of reading materials. Literature [18] shows that grammar translation mainly focuses on the explanation of language points, while neglecting the cultivation and development of students’ language and speech ability. The main energy and time of teaching are spent on language knowledge, while ignoring the study and application of various nonlanguage factors. However, students always read without any obstacles to new words, and they are always in a passive and receptive position, unable to take the initiative. Literature [6] points out that similar students’ insufficient reading after class, lagging reading materials obviously cannot arouse students’ interest, and overemphasizing the accumulation of students’ vocabulary are all obstacles to the development of English reading teaching. Literature [19] in improving classroom teaching efficiency through big data analysis is an important direction to improve English reading teaching. Through a series of investigations and practices, it has been proved that “student-centered,” “integrating teaching methods,” and “improving classroom vitality” are the most effective ways, among which “student-centered” is the starting point of all aspects of work. Literature [20] shows that emotional factors play a key role in second language acquisition, and all unsuccessful readers can be attributed to various emotional obstacles. Here, students’ emotional factors should include psychological needs, reading motivation, emotional interest, and so on. In the process of improving the efficiency of university English reading teaching strategy, all of the above are satisfied, and students will gain a sense of reading happiness in reading, and the reading effect will far exceed passive and coping reading. With the help of psycholinguistics, literature [21] proposes a brand-new reading theory. Reading, he believes, is a complex psycholinguistic activity that is the result of the author’s interaction with language information and readers. Literature [22] broadens students’ knowledge and builds on their English background knowledge over time through big data analysis and more reading, making inference of the plot of reading materials easier. Because language and culture are inextricably linked, increasing students’ knowledge reserves entails not only the acquisition of vocabulary but also the comprehension of background knowledge in English-speaking countries. It is possible that cultural differences will cause some confusion among students. Reading is a human activity, according to literature [23], and one’s perception of human nature determines one’s perception of efficiency improvement strategies for the initiative of university English reading teaching activities. In the end, everything a person does is motivated by his or her own needs. It is inhumane to practice that does not meet the needs of people. Practical activities cannot begin without meeting human needs, and practice cannot be sustained without meeting people’s needs. According to the literature [24], students can effectively learn a foreign language only if they are given enough comprehensible input and have a positive attitude toward receiving it. All of these theories demonstrate that affective factors play roles in reading such as support, regulation, coordination, and innovation.

Based on the DM of students’ behavior, this paper studies the strategies to improve the efficiency of university English reading teaching. Any learning process is a gradual process, and teachers should have enough patience and confidence in students’ progress. In reading practice, we should gradually increase the content of deep reading and improve
the difficulty of reading training. Using DM to evaluate and analyze the strategies of improving the efficiency of university English reading teaching of students' behavior, it is difficult to evaluate students' learning ability, such as problem-solving ability and innovation ability, in the traditional way, while DM can further quantify these evaluation indexes, thus forming students' data and making teaching evaluation more accurate, comprehensive, and specific. However, it should be noted that teachers should grasp this degree well, which can not only defeat students' self-confidence in completing reading tasks, but also appropriately exceed students' knowledge scope, so that students can think more deeply. After teaching practice, it will be found that through the training of high-level reading materials, students are more comfortable in dealing with exam questions, and their reading ability is also improved subtly.

3. Principle and Algorithm of DM

DM can help decision-makers analyze historical data and current data, find hidden relationships, and then provide basis for business decision-making, financial prediction, and market planning, and predict possible future behaviors. Let DM be implemented in all aspects of education and teaching, such as goal setting, content selection, activity design, classroom teaching organization, homework arrangement, and after-school summary and reflection, so as to create an atmosphere of teaching and learning driven by big data among teachers and students. DM is also an interdisciplinary subject involving a wide range of disciplines, including artificial intelligence, machine learning, mathematical statistics, database, and visualization. The process of DM is actually one of the most important steps of KDD, as shown in Figure 1.

The process of DM mainly includes:

① Data acquisition
Through the analysis of the research content and related data, determine the required target data, and extract the data needed for research from the data source.

② Data cleaning
Due to the complexity of the original data, it may contain some unnecessary or wrong data, which will have an impact on the results of DM, so it is necessary to clean the data, eliminate noise, and delete unnecessary data.

Wrong data.

③ Data integration
In the process of DM, the required data may come from different data sources, and multisource data can be combined together to facilitate data management and operation in the future.

④ Data conversion
Data transformation is a process of transforming the present data form into the form needed in mining research, in order to better use and mine the data. Commonly used methods of data transformation include data normalization, aggregation, attribute, construction, and generalization.

⑤ DM

According to the nature of the target data of knowledge representation, select the relevant algorithms suitable for DM, use intelligent methods to extract data patterns and build models, and mine potential laws and knowledge from the data. At present, DM technology is also widely used. DM technology is used to solve practical problems in various fields such as finance, insurance, economic management, medical treatment, and education. Let DM be implemented in all aspects of education and teaching, such as goal setting, content selection, activity design, classroom teaching organization, homework arrangement, and after-school summary and reflection, so as to create an atmosphere of teaching and learning driven by big data among teachers and students. DM is to classify the research objects according to the selected variables. The mining structure only reflects the data structure defined by the selected variables, so the selection of variables is very important in mining. In general, the selected variables should meet the following requirements.

① Closely related to the purpose of DM
② To reflect the general characteristics of classified objects
③ There are obvious differences in the values of different research objects
④ Variables should not be highly correlated

With the continuous development of information technology, people gradually realize the convenience provided by Internet technology to all walks of life. Performance is not only driven by teaching environment, teaching methods, and students' inherent ability, but also related to students' dynamic behavior to a great extent. The regularity of daily behavior reflects the self-discipline of individuals and has a positive impact on the learning state. First of all, promote the integration of big data and daily English teaching, encourage teachers to make full use of big data in classroom teaching, fully understand the specific learning situation of students based on the analysis and integration of DM, pay attention to the individual differences of different students in English language knowledge and ability, design teaching activities according to students' learning situation, and organize students to carry out self-learning according to their own development. In this environment, people are no longer just passive information acquirers, but active information providers and creators. DM system is composed of various databases, processing modules before mining, operation modules during mining, mode evaluation modules, and knowledge input modules. The organic components of these modules constitute the architecture of DM, as shown in Figure 2.

In reality, some complex problems can be broken down into a set of independent and similar subtasks. The majority of machine learning algorithms use a single-task learning strategy, in which they learn one subtask at a time and then combine them. Multitask learning, as opposed to learning each task independently, uses shared representation to learn multiple related tasks in parallel, which improves a single learner's and the group's generalization performance. More data prediction and data management tools emerge as the total amount of data grows, improving the efficiency and
decision-making function of data applications. At the same time, big data represents a shift in traditional thinking and encourages the development of new ways of thinking.

Simply, taking the linear model \( Y^i = X^i W^i \) as an example, for \( M \) tasks, the general framework of multitask learning is

\[
\min_W \sum_i \text{Loss}(W, X^i + Y^i) + \lambda \text{Re}(W).
\]  

(1)

The types of correlation between tasks mainly include the following aspects.

It is assumed that the model parameters of all tasks are similar, that is, the deviation between the model parameters and the mean is punished

\[
\min_W \text{Loss}(W) + \lambda \sum_i \left| W^i - \frac{1}{m} \sum_{i=1}^M W^i \right|.
\]  

(2)

Let all tasks share the same substructure, that is, the same feature set

\[
\min W \text{Loss}(W) + \|W\|_{q^1}.
\]  

(3)
The regularization term is sparse by using normal form, such as $l_2,1$-normal form

$$\|W\|_{2,1} = \sum_{i=1}^{d} (w_i).$$

(4)

While correctly classifying the training data, maximize the distance between classes as much as possible, that is, solve

$$\min_{w,k} -\frac{1}{2} \|w\|^2.$$ 

(5)

It is equivalent to row thinning of the parameter matrix, which is used to filter the shared feature dimensions.

It is assumed that all tasks share the same low-rank subspace

$$\min_{W} \text{Loss}(W) + \lambda \cdot \text{rank}(W).$$

(6)

In the work of text, multitask learning based on feature sharing is mainly used for automatic feature filtering.

4. Research on Strategies to Improve the Efficiency of University English Reading Teaching

4.1. Strategies for Improving the Efficiency of University English Reading Teaching Based on Student Behavior DM.

University English reading teaching based on student behavior DM should take students’ reading situation as the starting point, focus on explaining general problems, deal with personal problems alone, and avoid the waste of classroom time. University English reading teaching methods: we should connect the text understanding with the whole text layout, grasp the central idea, and constantly improve the details; instead of the teacher’s “full house” way, students’ questions can effectively use time, seize the blind spot of students’ knowledge, and explain effectively; classroom teaching and after-school practice should be combined to consolidate learning knowledge in time and effectively accumulate vocabulary. In the actual process of university English reading teaching, we should pay attention to the improvement of teaching from these three aspects, pay attention to the scientific cooperation of teaching methods, and improve the quality of reading teaching. Using the methods of DM and data learning analysis, a prediction model of university English reading teaching is trained from many students’ information. When inputting new student information, the system will determine whether students have learning crisis and whether they can improve efficiency strategies according to the university English reading teaching model. However, the reading needs of students’ behavior learners are not accidental and temporary. They need to cultivate good reading motivation and emotional maintenance subjectively. Reading is a long-term and gradual process, which requires the use of various emotional strategies to constantly convert reading interest into continuous reading behavior. For weak readers, we should fully grasp the reading motivation caused by occasional interests, preferences, or self-realization consciousness, establish correct goal expectations, get rid of the fear and anxiety of reading, get more happiness and happiness from reading, and enter the virtuous cycle of reading as soon as possible. Therefore, in the process of English reading teaching, we must let students experience more success and try our best to create opportunities for students to succeed. It can guide students to comprehensively analyze their achievements and focus on longitudinal comparison of whether they have made progress and how much progress they have made. For example, students can read some simple articles first, and then gradually increase the difficulty. In this way, in the step-by-step process, students can often experience the feeling of success and feel happy. They feel that learning and reading are the way to make them happy, so they are more willing to read and gradually form a virtuous circle. In the university English reading teaching of student behavior DM, teachers should arrange the preview task of reading materials in advance. This preview is not to browse the reading materials to be learned, but to let students read a lot of topic articles related to the reading materials. On the one hand, it can help students expand the content of the text based on the original reading materials. On the other hand, expanding background knowledge can also effectively increase and enrich students’ content schemata and language schemata, and then drive the development of rhetorical schemata. Adopt teaching methods such as teacher-student interaction to improve the vitality of classroom teaching.

To begin, teachers must first comprehend students’ interests, arrange reading materials according to students’ interests, adopt scientific teaching methods for DM of students’ behaviors, increase interaction links between teachers and students, narrow the distance between teachers and students, explain according to students’ reading situation, add students’ answers, improve students’ subjective initiative, and enliven classroom atmosphere. Of course, we have two options for reading materials: teacher selection or student selection. Teachers, on the other hand, cannot become a mere formality for the preview before class. Instead, students must extract or comprehend what they have read in order for teachers to inspect them. We need students to write a story outline of what they have read, as well as some of their own ideas, so that they can give speeches in class and discuss their thoughts on the reading materials. Students can build a large number of language and content schemas with such pre-class DM of their behavior. When reading materials are in line with the learners’ situation in all aspects, reading will bring them great satisfaction and happiness; on the other hand, when the materials are out of line with the learners’ situation in all aspects, they will not only fail to stimulate their interest in reading, but will also bore them and cause them to have an undue aversion to it. “Student-centered” means “student-oriented,” which is the new curriculum standard’s requirement for developing students’ abilities. We should first eliminate students’ fear of reading and make them enjoy reading when teaching university English reading based on DM of students’ behavior. Then,
centering on students’ interests, expanding students’ reading range. Finally, through teachers’ targeted explanations, students’ teaching efficiency can be effectively improved. In the innovative teaching strategy of “student-oriented,” the following aspects are worth noting. English teachers should directly teach students the culture related to reading materials, supplement the cultural background knowledge, and purposefully inject some background knowledge that students lack but are closely related to reading articles, so as to help students increase the content schema and fill the lack of information. For weak readers, we should fully grasp the reading motivation caused by occasional interests, preferences, or self-realization consciousness, set up correct target expectations, get rid of the fear and anxiety of reading, get more happiness and happiness from reading, and enter the virtuous circle of students’ behavior reading as soon as possible.

4.2. Experimental Results and Analysis. We conducted an independent sample t-test on the vocabulary score, reading score, post-test vocabulary score, and reading score of the experimental class, the control class, and the standard class. Then, the scores of the experimental class and the control class in the vocabulary level, reading performance, and reading situation were tested by paired sample t-test. Five experiments were carried out, respectively, and the results are shown in Figures 3–7.

It can be seen from Figure 3 that there is no significant difference in the scores of vocabulary level test between the experimental class, the control class, and the standard class.
Therefore, it can be considered that there is little difference in the vocabulary level of students in the three classes before teaching intervention.

In the post-test, there is no significant difference between the experimental class and the control class in the vocabulary level test.

In the difference test of the vocabulary level of the experimental class, the control class, and the standard class, there is a significant difference in the post-test vocabulary level of the experimental class, but there is no significant difference in the post-test vocabulary level of the control class.

As can be seen from the above figure, in the pre-test, there is no significant difference in reading scores between the experimental class, the control class, and the standard class.

In the post-test, there is significant difference between the experimental class and the control class and the standard class. The reading performance of the experimental class is significantly higher than that of the control class and the standard class.

The experimental results show that the experimental class’s vocabulary differs significantly between pre- and post-test scores, but there is no significant difference in the post-test vocabulary level between the experimental class, the control class, and the standard class, so we cannot conclude that schema theory teaching can effectively improve the vocabulary level of primary school students. The above findings could be explained in two ways. First, the schema theory is thought to be effective in increasing vocabulary levels, and it can assist students in the experimental class in receiving more vocabulary at the same time than students in the standard class, but it has not yet reached a statistically significant level. Second, it is assumed that the schema theory cannot improve students’ vocabulary levels, and that the post-test results contain sampling error, i.e., the experimental class’s performance in the vocabulary level test is
higher than the control and standard classes’ because the post-test questions only correspond to the experimental class’s content. It is also crucial for teachers and students to interact and communicate with one another. Only by maintaining constant communication with students can teachers gain a better understanding of their learning levels, enable students to recognize their own shortcomings, and assist students in improving their English reading ability. From short to long, English reading improves not only one’s command of the language, but also one’s willpower. Teachers should actively encourage and provide timely help when students are transitioning from short to long materials. In terms of methodology, students are encouraged to read in groups or free pairs, complete material analysis together, encourage each other in the reading process, and exchange reading feelings in a timely manner in order to achieve common goals. In order to implement the strategy of improving efficiency in the teaching of university English reading, DM is required. We can monitor students’ learning situations in real time, help teachers fully understand the learning needs of different students, and then prepare lessons for the second time, adjust teaching design, and improve classroom efficiency using DM of college students’ behavior. At the same time, we can promote the practice of collective lesson preparation, which will improve lesson preparation accuracy and efficiency. Big data technology’s role in classroom teaching reflection helps teachers optimize classroom teaching while also diversifying after-school tutoring, which has made significant contributions to the strategy of improving the efficiency of university English reading teaching.

5. Conclusions

The purpose of DM is to sort the research objects into categories based on the variables that have been chosen. Only the data structure defined by the selected variables is reflected in the mining structure, so variable selection is critical in mining. The most important index for determining a school’s teaching level is DM based on student behavior, and it has long been a source of concern in educational and academic circles. Effective and timely learning performance prediction is beneficial not only to the school’s learning and work departments in improving supervision efficiency, but also to students in maintaining good learning habits. When new student data is entered, the system will determine if students are experiencing a learning crisis and whether they can improve their efficiency strategies using the university English reading teaching model. The low teaching effectiveness is closely related to students’ low interest in university English reading teaching based on student behavior DM. Teachers should recognize the importance of interest to students in order to strengthen the stimulation and cultivation of students’ interest in reading and cultivate students’ reading interest. First and foremost, teachers must change their teaching ideas in order to optimize the efficiency of reading teaching and improve the effect of strategies. Students can improve their English reading ability and complete the practice questions better and faster by combining free reading after class with practice questions, efficiency improvement strategies, and scientifically addressing the differences between the two.

Data Availability

The data used to support the findings of this study are included within the article.

Conflicts of Interest

The author does not have any possible conflicts of interest.

Acknowledgments

This study was supported by the Education and Teaching Reform Project of Chongqing Metropolitan College of Science and Technology. Research on Interpretation Course
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