Hindawi
Mathematical Problems in Engineering
Volume 2022, Article ID 5014131, 10 pages
https://doi.org/10.1155/2022/5014131

Research Article

Construction and Application of College English Multiple Intelligence Teaching Model Based on Internet of Things

Ying Zhou

Wuhan College, Wuhan, Hubei 430212, China

Correspondence should be addressed to Ying Zhou; 8649@whxy.edu.cn

Received 29 January 2022; Revised 22 February 2022; Accepted 26 February 2022; Published 18 March 2022

Academic Editor: Gengxin Sun

Copyright © 2022 Ying Zhou. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

An RFID sensor is installed above the classroom door, and the scanning distance is set to 8 m to identify the composite campus cards of incoming and outgoing teachers and students, so as to realize automatic statistics of teachers' theoretical teaching workload and automatic attendance of students' theoretical class hours. The system automatically starts the multimedia equipment just 5 minutes before class and conducts self-checks on all devices in advance, reducing teachers' preclass operation steps. The multimedia management system of all classrooms is connected to the campus network and is centrally controlled by the cloud system. When the multimedia equipment in a classroom fails, it can directly instruct teachers to change to an idle classroom. Using the relevant theories of educational psychology and teaching theory, the WPBL teaching model based on the theory of multiple intelligences is expounded and demonstrated. It focuses on expounding theories and ideas; relationships and structures; and environment and resources and conducts in-depth discussions on relevant design rationales and architectural levels. Research has found that students are more interested in reading English than before. The reason is that in the English reading class of the experimental class, basically every student can have their own teaching activities, and more students like to participate in these activities. Applying the theory of multiple intelligences to English reading teaching has played a positive role in stimulating students' interest in reading. Multiple intelligence English reading activities play an important role in improving students' English reading performance. Through various teaching activities, the students in the experimental class are more interested and confident in the English reading class. Applying the theory of multiple intelligences to the English reading class can improve the students' English reading performance and reading ability. In order to apply the theory of multiple intelligences to actual English reading teaching, when designing personalized English reading activities, teachers should learn to combine the theory with the purpose and content of English reading teaching.

1. Introduction

In recent years, China's Internet of Things industry has developed strongly [1]. With the joint efforts of scientific research institutes at all levels in the country, enterprises, and universities, a relatively complete IoT industry chain has been formed, including sensor chips, application equipment, networks, software and applications, system integration, and IoT services [2]. The Wuxi National Sensor Network Innovation Demonstration Zone leads the world's development in the narrowband Internet of Things and continuously improves dominance in international discourse. Under the background that governments around the world are promoting the development of the Internet of Things industry, the Internet of Things has carried out a lot of research and practice in smart logistics, smart homes, smart cities, e-health, smart grids, etc., and plans to develop in a new round of dominate [3]. Other fields such as public safety, government work, transportation, industrial monitoring, agricultural monitoring, telemedicine, and environmental monitoring will also have a far-reaching impact. It is believed that the application space of the Internet of Things will become more and more broad.

In the past few years, the teaching concept of attaching importance to students and taking students as the main body has gradually been recognized by the society and parents, and the school's educational concept has also been quietly changing [4]. This is consistent with the requirements of the

new curriculum reform, which requires teachers to pay attention to the development of students' multiple intelligences. In the new curriculum reform, the limitations of the traditional teaching model have become increasingly prominent, and the main role of students has not been fully demonstrated. Students only passively listen to teachers who impart knowledge and do not participate in the learning process in person. In order to give each student the opportunity to fully demonstrate their advantages, teachers to understand students more comprehensively, and to promote the all-round development of ordinary county high school students, the author tries to apply the theory of multiple intelligences used in college English teaching in high schools and uses modern teaching technology to cultivate students' multiple intelligences, thereby changing the way students learn college English and teachers' teaching methods, in order to improve students' performance and develop students' multiple intelligences [5].

So far, the theory of multiple intelligences has been applied for many years [6]. As this theory has gradually been paid attention to by the educational circles of various countries, my country already has some experience in the research of the theory of multiple intelligences, but on the basis of implementing hierarchical teaching, how to make better use of the theory of multiple intelligences to develop the potential of each student, how to change the teaching methods of teachers and improve the learning effect of students still needs to be further considered and explored. The use of multiple intelligences theory plays a very important role for teachers in college English teaching. This theory allows teachers to evaluate the information obtained by students in their daily learning of college English from multiple levels and angles. Using the theory of multiple intelligences can make college English teaching achieve the teaching effect of teaching students in accordance with their aptitude, and the use of hierarchical teaching methods can meet the different types of actual needs of students in learning college English courses [7]. In the teaching of actual college English courses, different teaching modes can be used according to different groups of students to set up different learning and training plans for college English courses and the main goals that can help them achieve. However, the most important thing in practical teaching is to use a variety of means to promote students to develop in various aspects of college English learning, so that each student can give full play to his own advantages and make continuous progress in college English learning [8].

This article designs the overall design diagram of the "project teaching method" management system based on the three-tier architecture of the Internet of Things and will use the "life cycle method" of software engineering to complete the development of the entire project from top to bottom. The perception technology of the Internet of Things is mainly RFID, and the advantages of HF and UHF RFID cards will be combined as much as possible in the follow-up research. In order to ensure that the cloud of the IoT architecture has better computing power, a cloud computing architecture with a simple structure and good scalability is designed. Four kinds of servers will be configured in the cloud: website server, communication server, data server, and computing server. The WPBL teaching based on the theory of multiple intelligences has factors such as an open learning environment, different levels of learners' knowledge and experience, and flexible and diverse learning methods. It is necessary to support effective learning activities through a learning service support system. WPBL teaching is carried out in an open network environment. It needs to collect, organize, and analyze a large amount of information. It needs the intervention of the learning service support system to guide and help learners to use information acquisition and retrieval tools and reasonably collect and utilize information resources. Students in WPBL teaching have different intelligent structures and different learning methods. Without individual tutoring, it is difficult to ensure the smooth progress of learning. Self-directed learning and group collaborative learning in WPBL teaching are relatively independent. If learning support services are not provided, students' learning is easy to stray from the topic. In this 4-month personalized English reading teaching experimental study, researchers designed a variety of English reading teaching activities to combine students' multiple intelligence development level with English reading ability. We use controlled experiments, questionnaires, and interviews to conduct research and use SPSS20.0 and other research tools to analyze the results to understand whether the application of multiple intelligences theory to English reading teaching can achieve good results. In a 4-month study of personalized English reading teaching, researchers applied multiple intelligences theory to English reading teaching classrooms. The researchers concluded that personalized English reading instruction guided by multiple intelligences theory can stimulate students' motivation and interest in English reading learning. According to the analysis results of SPSS 20.0, it can also significantly improve their English reading ability and grades. All the data and results show that the English reading teaching model, teaching strategy, and teaching plan adopted by the researchers are effective. The results of classroom observation show that students' interest and motivation in English reading learning have been significantly improved.

1.1. Related Work. With the continuous development and updating of computer technology, big data, cloud computing, and artificial intelligence will be widely used in various fields of social life. For example, using big data to predict the occurrence of crimes, enterprises can analyze the sales status of products based on customer reviews on shopping websites; the National Center for Disease Control and Prevention can analyze the spread of diseases based on the search records of netizens, and so on. For the massively generated data, through the integration and analysis of the data, people can discover new knowledge and create new value.

Western developed countries have applied sensor technology to the teaching of science courses, but this is not the Internet of Things in the true sense [9]. Since then, modern handheld technology has been widely used in many

countries. It can measure the required data at any time and transmit data with the computer, and it has become a very popular teaching tool. The K-12 Ubiquitous Educational Network System (OssaBEST) has received extensive attention as a precedent for educational applications based on IoT technology in the United States. The system is different from other general information technology education systems, mainly including two parts, sensor network and field guide, which can provide students and teachers with a lot of vivid and interesting learning experiences. From physical sensor operation to multimedia database operation, information technology is integrated into ongoing fieldwork, and according to feedback, students' learning effect has been significantly improved [10].

Relevant scholars discussed distance education and Internet of Things computing technology [11]. On this basis, it was proposed that the application of Internet of Things technology in the field of distance education is mainly reflected in real-time recording of the teaching process, adjustment of the classroom environment, and networking of teaching materials. In addition, related research also pointed out that the Internet of Things can also effectively support mobile learning, ubiquitous learning, and inquiry learning [12]. Based on the combination of mobile learning and resource push, researchers designed a mobile learning resource push system based on RFID [13]. The system can sense learning equipment in teaching buildings and laboratories and push learning resources, effectively improving and expanding the mobile learning mode. Relevant scholars believe that digital learning in the Internet of Things environment has the characteristics of ubiquity, mobility, and diversity, which can promote the optimization of teaching technology [14]. After careful analysis of exploratory learning methods, objects, and regional differences, relevant scholars built a new exploratory learning platform based on Internet of Things technology and discussed the construction concept, technical implementation, and functional modules in detail [15]. The platform has not been put into use; only theoretical research is being conducted.

Traditional intelligence only pays attention to three aspects, namely language intelligence, mathematical logic ability, and partial spatial intelligence. Only these three aspects of intelligence cannot fully measure a person's intelligence. Scholars pointed out that human intelligence should be diversified, and each person has at least nine kinds of intelligence in his life [16]. With the deepening of research, there may be more intelligences. People's multiple intelligences are both independent and cooperative to a certain extent, that is, a person may be strong in one area and weak in other areas [17].

With the increase in IoT business volume, the storage and computing volume of data will bring the demand for "computing" capability to cloud computing. Cloud computing will provide corresponding services in infrastructure, platform, and software. Artificial intelligence is a branch of computer science, and it is also a new technical science that combines computer and other disciplines. It mainly studies some theories, methods, and technologies to simulate, extend, and expand human intelligence. The purpose of studying artificial intelligence is to develop a machine to simulate or replace humans to perform similar work, because computers have the characteristics of large storage capacity, fast computing speed, and high computing accuracy. Therefore, in some heavy disciplines and engineering calculations, intelligent robots have advantages over humans.

Related scholars believe that there are differences in human intelligence [18]. The theory of multiple intelligences points out that each person possesses nine relatively independent intelligences, and these intelligences are presented in a combined form in each individual. Individual intelligence is different, just like everyone's left hand and right hand, it is impossible to completely overlap, because there are no two identical leaves in this world, each person's intelligence structure is different, and their strengths and weaknesses are different [19, 20].

2. Method

2.1. Teaching IoT Architecture. The Internet of Things technology is to solve the mutual perception, mutual communication, and mutual control between things and things. Therefore, the Internet of Things technology meets the two major requirements of the fourth-generation management system for data collection and instruction execution. In addition, IoT technology usually adopts a thin client architecture design, thereby reducing the processor cost on the physical side. IoT technology moves complex computing work to the cloud for processing, and the physical side only provides basic data to the cloud and executes cloud instructions. In order to perceive the behavior of teachers and students in the Internet of Things system, it is necessary to wear the identification methods available for the Internet of Things technology on teachers or students. The identification methods of IoT technology are as follows:

(1) Two-dimensional barcode: a two-dimensional barcode is attached to the person or object to be identified. The two-dimensional code scanner usually uses a camera to identify the two-dimensional code, which can store a large amount of information. The identity number can also store hundreds of words, and the identity name of a person or thing can also be known without the support of a database. The advantages of 2D barcodes are that they are cheap and have a certain antifouling ability. In the case of damage to 1/4, they can also guarantee successful reading. If the QR code is made of cloth material and embroidered on clothes, a better identity perception effect can be obtained. However, young college students will not accept that every garment is embroidered with a conspicuous QR code logo, so it is difficult to promote QR code as an identification technology in colleges and universities. Moreover, good visual conditions are required for QR code recognition. When the light is insufficient and the QR code is blocked, the QR code cannot be successfully recognized.

(2) RFID card: there are many kinds of RFID cards, which can be divided into low frequency, high frequency, ultra-high frequency, and microwave frequency. Among them, high frequency (HF) band and ultra-high frequency (UHF) are most widely used in identification The frequency used in the HF band is 13.56 MHz, which is mainly used for micropayments at a distance of 10 cm, with excellent security. The frequency used in the UHF band is 915 MHz, which is mainly used for identification at a distance of 10 m to 20 m. Compared with the two-dimensional barcode, it can work without visual conditions. In the dark, under certain shielding, the RFID card can be recognized by the card reader. Moreover, RFID cards can use anticollision technology, and the UHF frequency band has a long recognition distance. One card reader can identify hundreds to thousands of RFID cards at the same time. It can improve the efficiency when applied to the attendance of batches of people, and avoid the problem of one-by-one attendance. Entrance and exit were congested, and accidental stampede occurred. The cost of RFID is relatively high, and the retail price of an RFID card is less than 1 yuan. RFID technology is also suitable for the identification of equipment and books, so that the one-card system extends from the identification of people to the identification of objects. Therefore, in this topic, the identification technology of people and things chooses RFID technology and combines the advantages of HF and UHF RFID cards as much as possible.

Based on the basic idea of IoT technology, the IoT system is usually divided into a three-tier architecture or a four-tier architecture. The three-layer architecture is divided into a perception layer, a network layer, and an application layer. The four-layer architecture strengthens the hardware facilities of the perception layer and is divided into sensors, sensor networks, network layers, and application layers. In this design, each sensor does not form a sensor network, but directly sends data to the cloud application layer, so a three-layer architecture of the Internet of Things system is selected.

In this design, the perception layer perceives the basic behavior data of people or things, the network layer transmits the data to the application layer, the application layer processes the data after receiving the data to form various instructions, and the network layer sends the application layer instructions to the perception layer. The hardware system of the layer executes the application layer instructions. Therefore, in the three-layer architecture of the Internet of Things, the application layer is regarded as the cloud above, reflecting the intelligence of the entire system. Excellent cloud computing capabilities will make IoT systems more intelligent.

The Internet of Things technology has spawned cloud computing technology. Under the Internet of Things system, the computing power of the cloud will be infinitely expandable. In this design, in order to expand the cloud computing capacity infinitely, a relatively simple method is adopted. Strictly speaking, this method is not a cloud computing technology, but a cloud computing architecture with low cost, simple structure, and good scalability, as shown in Figure 1.

The cloud computing architecture of this design has good scalability. When the system is just put into operation, due to the small amount of data, two computing servers can be installed to meet the management needs of the "project teaching method." As the amount of data continues to increase, the teaching, experiment, and training data can be separated, and three data servers can be set up. If the school develops rapidly and can build multiple clouds based on multiple campuses, the architecture will remain unchanged. Therefore, the designed cloud architecture has good potential for computing expansion and data expansion.

2.2. Multiple Intelligence Learning Community. The theory of multiple intelligences recognizes and respects students' different intelligence structures and advocates individualized teaching ideas, so that teachers can teach the same learning content through different lesson plans or provide different intellectual types of learning support and can serve different educational goals. The educational purpose of the theory of multiple intelligences is not to give priority to the development of art education such as music-rhythm intelligence and body-kinematic intelligence; in fact, people can use the theory of multiple intelligences as a tool to achieve traditional teaching purposes. The key factor is to abandon the established, single-value presupposition; to understand the intelligent structure of students; and to determine the curriculum arrangement, teaching form, and assessment method.

The WPBL teaching mode based on the theoretical perspective of multiple intelligences has the following three notable characteristics: (1) it fully reflects the educational connotation of multiple intelligences. Students' multiple intelligence structure is not only the foundation and starting point of education, but also the content and goal of education. At the same time, the profound personality nature of multiple intelligences theory not only challenges the educational process, but also provides theoretical guidance for teaching design and implementation. (2) It fully reflects the respect and inheritance of the traditional classic PBL teaching method. As a relatively mature and complete teaching model, PBL already has its unique and classic form and steps. When exploring the PBL teaching model in the new environment, it should not completely abandon the traditional classic model of PBL and start anew but should be fully absorbed. On the basis of the reasonable core of the classic PBL teaching mode, it focuses on exploring the new characteristics and new challenges of PBL in the new environment. (3) The participation effect of network technology on learning activities has been highlighted. The contribution of network technology in the new era to education and teaching is no longer limited to the transmission and presentation of information, but is widely involved in every step of education and teaching as an important teaching element, such as

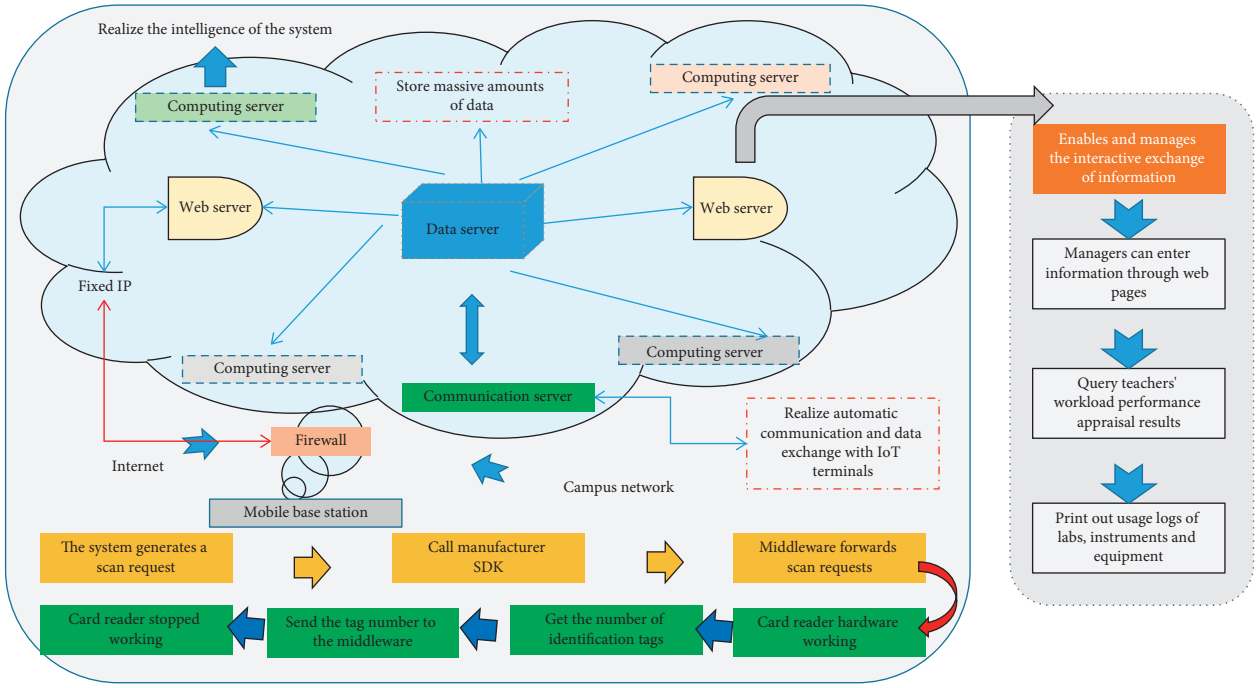

Figure 1: Scalable cloud technology architecture.

learning situation creation, learning content representation, and learning cognitive process. The interaction between teachers and students, the creation and presentation of learning results, and the evaluation of learning are all inseparable from the software and hardware support of network technology. It can be said that the educational technology with network technology as the core has changed from a marginal element of education to an integral part of students, teachers, and teaching content.

In this section, from the dimension of "synchronicity," combined with the idea of distributed cognitive theory, the relationship between the teaching elements in the WPBL teaching model based on the theory of multiple intelligences is initially constructed, as shown in Figure 2.

This model diagram is mainly constructed based on the idea of distributed cognition theory. Students, as cognitive subjects (problem-solving subjects), carry out multiple intelligence learning around problems (including "learning for multiple intelligences" and "learning with multiple intelligences"). As another important human resource, teachers play the role of activity instructors and cognitive coaches in the community. As a medium, information technology plays a role in creating a situation and cultural atmosphere for problem inquiry; supporting teachers and students in teaching and learning; and providing resources (including learning materials, hardware equipment, software, support platforms, etc.). Teaching activities provide comprehensive and strong learning support services.

The distributed teaching mode allows teachers, learners, and learning content to be distributed in different noncentral locations, so that teaching and learning can occur independently of time and space. In this community, students, teachers, and learning content (multiple intelligence learning) are distributed in different noncentral locations. The three are developed around problems. The problem-solving process is the link that closely links the three. Information technology is the synchronous and asynchronous between teachers and students.

Teachers and students' multiple intelligence learning around problems is the core part of this model. Teachers design and manage learning activities. Students choose their preferred learning methods and expressions to participate in learning activities according to the characteristics of their own intelligence structure. Teachers and students participate in teaching and learning. Activities are mostly dependent on the support of information technology. With the support of synchronous and asynchronous information transmission technology, teachers and students can achieve comprehensive and profound interaction.

2.3. Implementation Methods of Multiple Intelligence Teaching in College English. Drawing on the concepts of "input variables," "output variables," and "intervention variables" in Carroll's school learning model, combined with the research ideas of explanatory structural model research, the implementation process of WPBL teaching based on the theory of multiple intelligences is analyzed.

The improved model diagram added the intervention variable "group participation," and the students' existing knowledge background and cognitive characteristics directly affected "group participation." The influencing factors of "group participation" have been deeply explored. The ambiguity of their questions and the relevant knowledge background of students are the key factors affecting the group's in-depth learning (this is confirmed in the

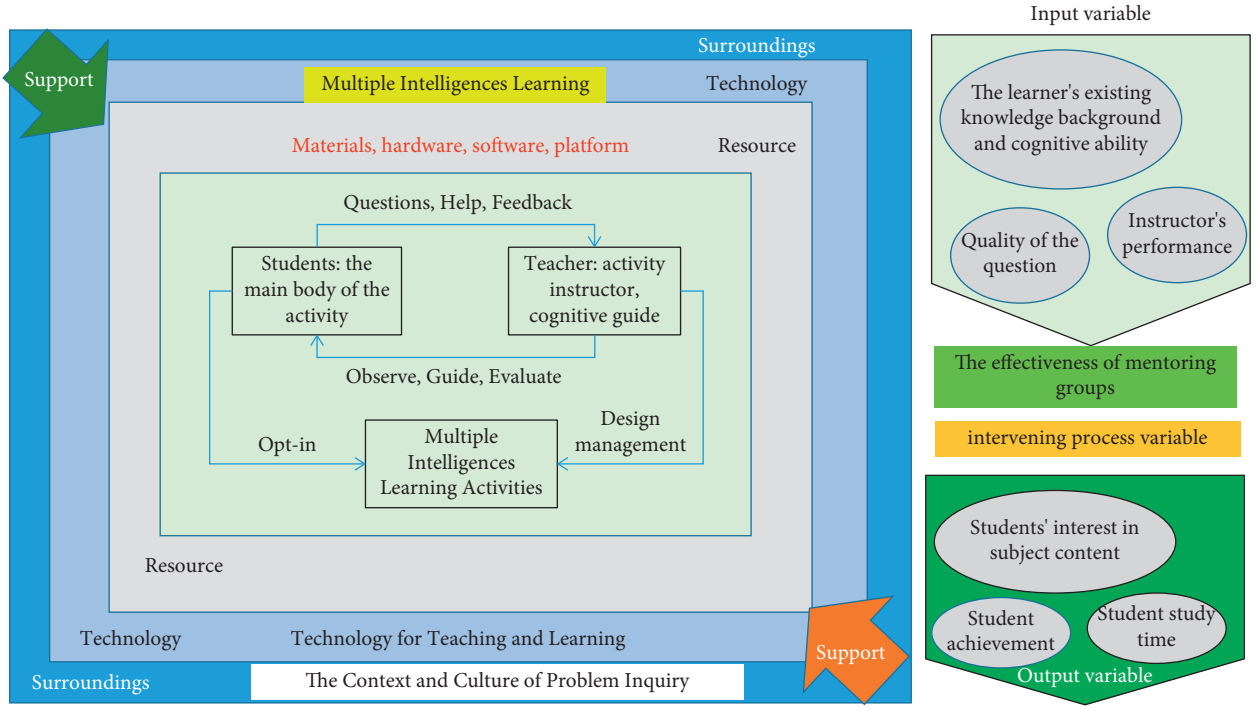

Figure 2: Learning community of the WPBL teaching model based on multiple intelligences theory.

experimental research part of this study). In addition, through the connection of subject knowledge between tutors and students, the "cognitive harmony" and "role harmony" between teachers and students are the influencing factors that affect "the effectiveness of the tutoring group." In addition to improving academic achievement and interest in learning, PBL learning can improve learners' problem-solving skills, teamwork skills, and critical thinking skills.

The problem (theme) is the center of learning, and the learning activities are integrated by the theme (question); the student's multiple intelligence structure is in the position closest to the center, which is the basis of learning and the purpose of learning, the purpose of learning and the means of learning. The design of activities should fully reflect and invoke the various intelligences of human beings; students' problem-solving activities are the core layer of this model and the key to the success of PBL learning. It can be said that other elements in the model diagram are provided for students' learning.

Although it seems that teacher-student activities are task-driven and unfold in sequence in the pattern diagram, the learning steps are circular and generative, not linear and fixed. According to the idea of scaffolding teaching, teachers' behavior is selected and adjusted according to students' behavior; and according to the theory of cognitive flexibility, learners' learning activities are not linear, but may be random and accessible.

Not only that, but the solution (or unresolved) and reflection of a single problem is not the end of PBL, but the beginning of solving a new and deeper problem (or original problem). Students' problem-solving skills and higher order thinking skills are continuously enhanced and deepened in the process of solving problems one by one.

2.4. From Conditional Knowledge Graph to Search Algorithm. This section describes a conditional knowledge graph-based search algorithm that will retrieve relevant documents from a database and rank them according to their respective conditional knowledge graph K_d relevancy to the conditional knowledge graph K_q corresponding to query q. This section mainly examines the specific correlation calculation algorithm. First, the common path form in the graph was considered, which is defined as the ordered sequence of nodes and edges in the graph:

$$\begin{aligned}\varphi_f &= \left[a_1 e_1 E_{\text{attr}}(e_1, a_1) E_{\text{obj}}(e_1, a_1)\right],\\ \varphi_c &= \left[a_3 \;\; e_3 \;\; E_{\text{subj}}(e_3, a_3) \;\; E_{\text{obj}}(e_3, a_3)\right].\end{aligned} \tag{1}$$

The correlation between the query graph K_q and the literature graph K_d is evaluated using standard precision and recall in information retrieval systems: high precision indicates that the knowledge-carrying paths in the literature are highly similar to those in the query. The knowledge carrying path is completely covered by the literature content, and the factual correlation between the query graph and the literature graph is defined as the harmonic mean of the accuracy and recall of the fact knowledge-carrying path:

$$\text{precision}_{f,K_qK_d} = \frac{\prod_{i=1}^{N} \text{Max}_{j=1,2,\ldots,M} \varphi_{i,f}}{(N-1)}, \tag{2}$$

$$\text{recall}_{f,K_qK_d} = \frac{\prod_{i=1}^{M} \text{Max}_{j=1,2,\ldots,M} \varphi_{i,f}}{(M-1)}, \tag{3}$$

$$\text{relevance}_{f,K_qK_d} = (1-\beta)\frac{\beta\text{recall}}{\text{recall} - \text{precision}}, \tag{4}$$

where N and M represent the number of fact knowledge-carrying paths detected in the query and literature, respectively. β is an important hyperparameter for balancing precision and recall.

The relevance of the final query graph and the literature graph is defined as the weighted average of the relevance of factual knowledge and conditional knowledge:

$$\text{relevance}_{K_qK_d} = (1-\lambda)\text{precision} - \lambda^2\text{relevance}_{f,K_qK_d}, \quad (5)$$

where λ is a hyperparameter used to balance the contribution of factual and conditional knowledge to relevance.

sim_w computes the similarity of attribute and relation nodes:

$$\text{sim}_w\left(u_i, u_j\right) = 1 - \cos\left(u_i\right)\bullet\ \cos\left(u_j\right), \quad (6)$$

where u_i and u_j are the vector representations of the corresponding text i and j.

3. Analysis of Results

3.1. Results of the Multiple Intelligence Questionnaire. In order to understand the intelligence characteristics of students, the multiple intelligence self-assessment scale was used to measure the intelligence of 30 students in the experimental class, so that the design of personalized English reading based on multiple intelligences is more scientific and reliable. There are 15 test questions for each intelligence with a total score of 75 points. Intelligences that score above 45 are considered relatively developed, while intelligences that score below 44 are relatively underdeveloped. The characteristics of multiple intelligences of the experimental class students are shown in Figure 3.

The students' intelligence disadvantage is mainly concentrated in physical-kinesthetic intelligence, internal intelligence, and natural intelligence. Therefore, traditional English reading teaching cannot effectively promote the development of students' multiple intelligences.

3.2. Questionnaire Data and Result Analysis on Students' Attitude towards English Reading. The purpose of the questionnaire on students' attitude towards English reading is to investigate students' interest and motivation in English reading, so as to find out the difficulties in reading teaching and further design curriculum activities and arrange teaching procedures. Students in the experimental class were asked to fill out the questionnaire anonymously and complete the questionnaire within 5 minutes. The data for student answers are shown in Figure 4.

More than half (65%) of the students in the experimental class think English reading is very important, 20% think English reading is not very important, and 15% think English reading is not important. These data suggest that most students in the experimental class have realized the importance of English reading, and they may be very cooperative in subsequent experiments. When asked if they were interested in reading in English, 12% of the students showed great interest in reading, 24% showed some interest in reading, and the rest showed little interest. The data show that the number of students in the experimental class who are interested in English reading has not yet reached half. As we all know, interest is the best teacher. If teachers can stimulate students' interest in reading, cultivating students' reading ability can achieve twice the result with half the effort. The results show that different students have different reading preferences, and teachers should choose different types of articles as reading materials.

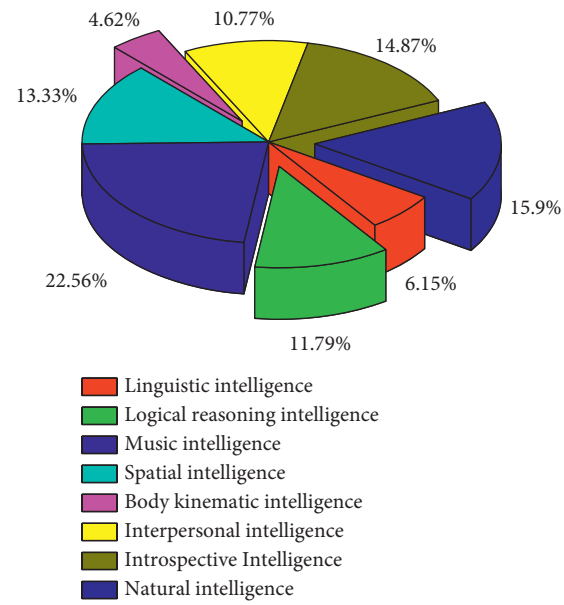

Figure 3: Overview of multiple intelligences of students in experimental class.

When asked about the main barriers for students to read, more than half of the students chose insufficient vocabulary, and the remaining three options were similar in proportion, indicating that in the eyes of students, insufficient vocabulary is still the main problem in their reading. When asked about the impact of English reading teaching methods on learning motivation, 51% of the students believed that reading teaching methods had a greater impact on their learning motivation, which indicated that the role of English reading teaching methods was very important. When encountering difficult English reading materials, more than half of the students simply choose to give up, and 12% of the students will skip the parts that they feel are more difficult, and selectively read the parts that they can understand. Some of the students choose to skim, and some choose to read by looking up a dictionary. Fast and very slow students were a minority, with the majority reading a 200-word text in 9 minutes. When asked where students felt they needed to improve their reading ability the most, 58% of students felt they needed to improve their vocabulary and grammar the most. Most students have not mastered any English reading skills in their studies and will follow their feelings when reading text materials. More than 70% of students believe that they need teachers to guide their English reading methods. And all students want to improve their English reading scores.

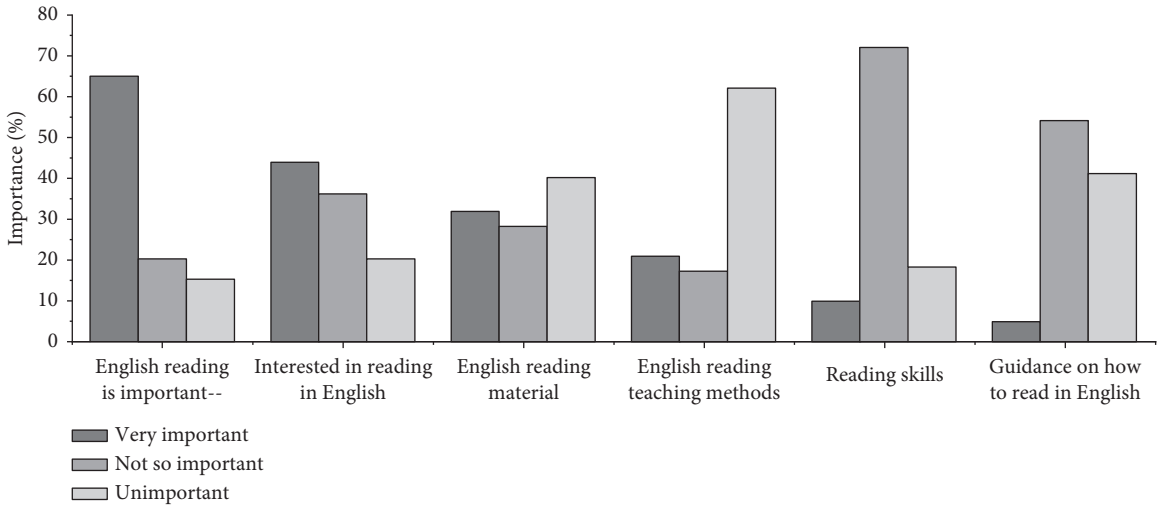

Figure 4: The attitude of students in the experimental class towards English reading.

The data from this questionnaire indicate that students' interest in English reading plays an important role in improving students' reading proficiency, as students' reading preferences have a great impact on reading efficiency and ultimately reading ability. Therefore, how to effectively stimulate students' interest in reading and improve their English reading skills is imminent, which is the main concern of every English teacher.

3.3. Analysis of Control Experiment Results. The effect evaluation of the teaching experiment in this article is based on the monthly test paper organized by the school, and at the same time, the English results of the first monthly test are used as the pretest data. The statistical indicators of English performance show that (3) and (4) are very close in terms of mean, standard error, standard deviation, etc. The P values of these two classes are both greater than 0.05, indicating that (3) and (4) class English scores and the average level of grade English scores are not significantly different. To further verify that classes (3) and (4) are parallel classes with teaching, an independent sample t-test was conducted. The results show that the significance probability of the homogeneity of variance test is 0.759, which is greater than 0.05, so the assumption that the grades are at the level of homogeneity of variance is accepted; and the two-tailed significance probability of the equal means test is 0.9618, which is greater than 0.05, indicating that there is indeed no significant difference in the English scores of the two classes.

Classes (3) and (4) are taught by the same English teacher. Class (3) is an experimental class that uses MI theory to teach, class (4) is a control class with traditional English teaching, and other ordinary classes are teaching evaluation classes. In addition to daily lesson preparation and teaching, we often communicate with her the connotation of MI theory and the cases of its teaching application, and at the same time guide her to develop teaching design based on multiple intelligences. In addition, the English textbooks, weekly class hours, daily tests, teaching progress, monthly test papers, etc. used in each class are arranged by the Academic Affairs Office. This ensures that the influence of irrelevant factors on this experiment is equal.

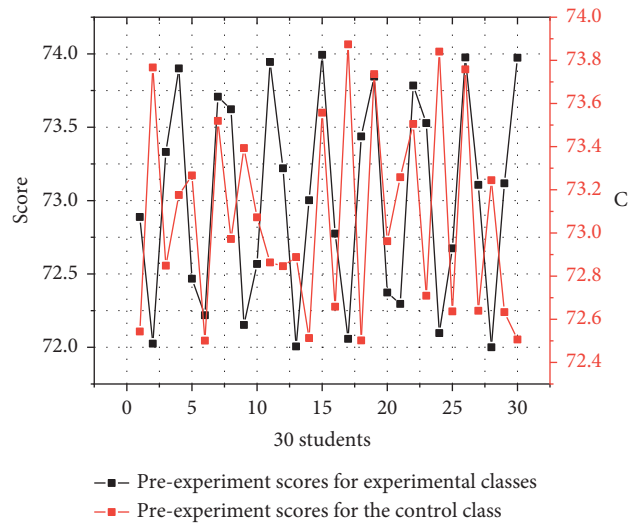

Figure 5: Comparison of scores between the experimental class and the control class before the experiment.

Before the experiment, in order to check whether there is a significant difference between the English reading levels of the two classes, the experimental class and the control class were pretested, and the following are the descriptive statistics of the performance of the two classes.

In this article, an independent sample t-test analysis was performed on the pretest scores of the experimental class and the control class. First, it can be seen from Figure 5 that the test scores of the experimental class and the students of the control class are basically the same. To further test whether the pretest results of the two classes were significantly different, the researchers then performed independent sample mean standard error tests on the scores of the English reading comprehension sections of the two classes, as shown in Figure 6.

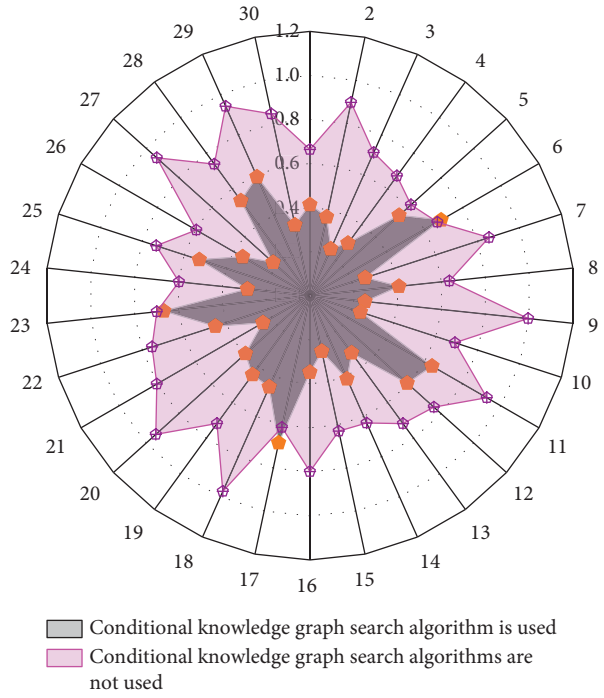

Figure 6: The mean standard error of the experimental class and the control class before the experiment.

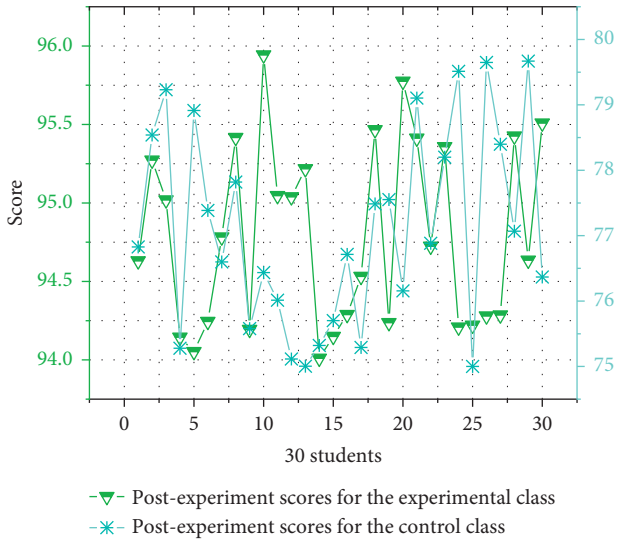

Figure 7: The score comparison between the experimental class and the control class after the experiment.

In order to effectively prove whether the application of multiple intelligences theory in English reading can effectively improve students' reading performance, the researchers compared the reading level of the experimental class and the control class through posttest. The results are shown in Figures 7 and 8. An independent sample t-test analysis was performed on the posttest scores of the experimental and control classes. First, it can be seen from Figure 7 that the test scores of the experimental class are higher than those of the students in the control class.

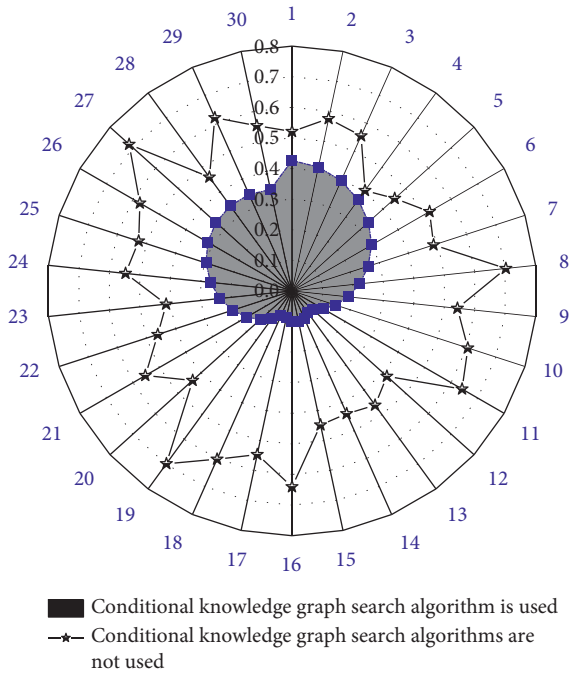

Figure 8: The mean standard error of the experimental class and the control class after the experiment.

To further test whether the posttest results of the two classes were significantly different, the researchers then performed a standard error of the mean test on the scores of the English reading comprehension section of the two classes. As shown in Figure 8, it can be seen that the reading score of the experimental class is significantly higher than that of the control class.

4. Conclusion

The learning community model and implementation flowchart of WPBL teaching based on the theory of multiple intelligences constructed in this study can provide a new perspective for the organic integration of the theory of multiple intelligences and PBL in the new environment. The process and results of the experimental research can provide reference for the development of multiple intelligence education and teaching practice in the modern information technology environment. The design and development of the PBL learning platform supported by technology reflects the integrity, diversity, and exploration of functional modules and provides a "hardware" basis for the development of research network PBL learning activities. This study confirms that it is feasible to deal with educational challenges from three aspects: educational concept, teaching method, and technical support. The problem-solving teaching mode based on the theory of multiple intelligences in the network environment is an effective teaching mode, which can effectively improve students' general ability. Academic performance and innovation and critical thinking skills can enhance students' interest in learning and self-efficacy. Personalized English reading teaching activities are designed, taking into account the differences in the development level of multiple intelligences and English reading

ability of different students. For different teaching objects, researchers adopt different teaching methods to design personalized English reading teaching activities, which stimulates the atmosphere of English reading teaching classroom, stimulates students' interest and motivation in English reading learning, and improves their English reading ability. In the process of English reading, students can learn how to make full use of their strong intelligence and learn how to combine some reading strategies and skills to solve reading difficulties in reading materials. The main findings and research results can be used to help teachers and students learn more about the theory of multiple intelligences, and can also be used in English reading teaching classrooms to stimulate students' motivation and interest in English and improve students' English reading ability and achievement. An evaluation model must be established in the multiple intelligence English reading teaching classroom. Teachers will only consider how the teaching practice of cultivating students' ability is carried out when they attach importance to the development of students' ability. Therefore, in the multiple intelligence English reading classroom, teachers should use multiple assessment models to evaluate students' English reading learning ability. This assessment includes not only test scores, but also other assessments such as classroom observations, student self-assessments, and more. Multi-assessment can develop students' cognitive ability, which makes them know that the improvement and development of learning ability is also an important and necessary part of English reading learning process.

Data Availability

The data used to support the findings of this study are available from the author upon request.

Conflicts of Interest

The author declares no conflicts of interest.

Acknowledgments

This study was supported by 2021 National Research Project on Foreign Language Teaching in Universities, "A Study on Blended Teaching of College English in Applied Universities under Smart Education Environment," under no. 2021HB0455.

References

[1] S. Alrabah, S.-h. Wu, and A. M. Alotaibi, "The learning styles and multiple intelligences of EFL college students in Kuwait," *International Education Studies*, vol. 11, no. 3, pp. 38–47, 2018.

[2] Y. Bouzembrak, M. Klüche, A. Gavai, and H. J. P. Marvin, "Internet of Things in food safety: literature review and a bibliometric analysis," *Trends in Food Science & Technology*, vol. 94, pp. 54–64, 2019.

[3] M. Alamri, N. Z. Jhanjhi, and M. Humayun, "Blockchain for Internet of Things (IoT) research issues challenges & future directions: a review," *Int. J. Comput. Sci. Netw. Secur*, vol. 19, pp. 244–258, 2019.

[4] F.-Y. Lo and N. Campos, "Blending Internet-of-Things (IoT) solutions into relationship marketing strategies," *Technological Forecasting and Social Change*, vol. 137, pp. 10–18, 2018.

[5] B. B. Sinha and R. Dhanalakshmi, "Recent advancements and challenges of Internet of Things in smart agriculture: a survey," *Future Generation Computer Systems*, vol. 126, pp. 169–184, 2022.

[6] X. Hu, L. Sun, Y. Zhou, and J. Ruan, "Review of operational management in intelligent agriculture based on the Internet of Things," *Frontiers of Engineering Management*, vol. 7, no. 3, pp. 309–322, 2020.

[7] S. Hajiheidari, K. Wakil, M. Badri, and N. J. Navimipour, "Intrusion detection systems in the Internet of things: a comprehensive investigation," *Computer Networks*, vol. 160, pp. 165–191, 2019.

[8] O. Bello and S. Zeadally, "Toward efficient smartification of the Internet of Things (IoT) services," *Future Generation Computer Systems*, vol. 92, pp. 663–673, 2019.

[9] M. S. Mahdavinejad, M. Rezvan, M. Barekatain, P. Adibi, P. Barnaghi, and A. P. Sheth, "Machine learning for Internet of Things data analysis: a survey," *Digital Communications and Networks*, vol. 4, no. 3, pp. 161–175, 2018.

[10] P. Matta and B. Pant, "Internet of things: genesis, challenges and applications," *Journal of Engineering Science & Technology*, vol. 14, no. 3, pp. 1717–1750, 2019.

[11] R. Vinayakumar, M. Alazab, S. Srinivasan, Q.-V. Pham, S. K. Padannayil, and K. Simran, "A visualized botnet detection system based deep learning for the Internet of Things networks of smart cities," *IEEE Transactions on Industry Applications*, vol. 56, no. 4, pp. 4436–4456, 2020.

[12] Y. Lu, S. Papagiannidis, and E. Alamanos, "Internet of Things: a systematic review of the business literature from the user and organisational perspectives," *Technological Forecasting and Social Change*, vol. 136, pp. 285–297, 2018.

[13] Y. Liao, E. de Freitas Rocha Loures, and F. Deschamps, "Industrial Internet of Things: a systematic literature review and insights," *IEEE Internet of Things Journal*, vol. 5, no. 6, pp. 4515–4525, 2018.

[14] H. Ma and X. Pang, "Research and analysis of sport medical data processing algorithms based on deep learning and Internet of Things," *IEEE Access*, vol. 7, pp. 118839–118849, 2019.

[15] H. Elazhary, "Internet of Things (IoT), mobile cloud, cloudlet, mobile IoT, IoT cloud, fog, mobile edge, and edge emerging computing paradigms: disambiguation and research directions," *Journal of Network and Computer Applications*, vol. 128, pp. 105–140, 2019.

[16] B. Pourghebleh, V. Hayyolalam, and A. Aghaei Anvigh, "Service discovery in the Internet of Things: review of current trends and research challenges," *Wireless Networks*, vol. 26, no. 7, pp. 5371–5391, 2020.

[17] B. Pourghebleh, K. Wakil, and N. J. Navimipour, "A comprehensive study on the trust management techniques in the internet of things," *IEEE Internet of Things Journal*, vol. 6, no. 6, pp. 9326–9337, 2019.

[18] X. Yue and Y. Chen, "Strategy optimization of supply chain enterprises based on fuzzy decision making model in Internet of Things," *IEEE Access*, vol. 6, pp. 70378–70387, 2018.

[19] T. Wei, W. Feng, Y. Chen, C.-X. Wang, N. Ge, and J. Lu, "Hybrid satellite-terrestrial communication networks for the maritime Internet of Things: key technologies, opportunities, and challenges," *IEEE Internet of Things Journal*, vol. 8, no. 11, pp. 8910–8934, 2021.

[20] T. Eli, "Students` perspectives on the use of innovative and interactive teaching methods at the university of nouakchott Al a, Mauritania: English department as a case study," *International Journal of Technology, Innovation and Management (IJTIM)*, vol. 1, no. 2, pp. 90–104, 2021.