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*Research Article*

# Effectiveness of Computer-Aided Technology for Teaching English Courses in the Internet Era

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Computer and Internet technologies have advanced significantly in recent years. They have been incorporated into people's daily lives and workplaces. The traditional English teaching approach has several problems. It includes poor student learning interest and lack of active learning. English teaching courses are set up in colleges and universities for non-English majors. The contradiction between students' needs for foreign language learning and personal interests is increasing day by day. Traditional single classroom teaching has been unable to meet the basic requirements. With the rapid advancement of Internet technology, computer-aided technology is being proposed and applied in English education to investigate the effectiveness of English instruction. This article goes into detail on the idea, classification structure, and courseware design process of computer-aided technology. It employs the AI teaching approach in English instruction, creates a similarity matrix of English learners, and assesses English learners who exhibit similar behavior. Finally, the students are tested by answering the proportion of 1000 words correctly in English teaching to measure the effect of course learning. The results show that the number of words memorized by students increases after using computer-aided technology. This article analyzes students' capacity to compose in English and evaluates the efficacy of students' English teaching. It proclaims that after teachers adopt computer-aided technology, the error rate in English composition is reduced. The total score in English increased from 58.6% to 69.6%.

## 1. Introduction

Education technologists have long lauded computer technology's promise to transform university teaching and learning. Academic journals in educational technology publish research on the capabilities of technologies such as computers and the Internet to speed university students' learning, improve and democratize access to educational opportunities, and promote interactivity, engagement, and collaboration. In short, it is thought that the shift toward computer-based teaching and learning during the last 20 years has changed and reinvigorated the university sector. Thus, education technologists continue to issue stern ultimatums that colleges must either "change or die" in the face of technological innovation.

This unwavering trust in higher education's "technological remedy" is evident in the billions of dollars poured into education each year worldwide. Besides technology-enabled distance education, much of this money is now being spent on on-campus applications. Indeed, institutional spending on computer infrastructure has risen considerably during the previous decade. With the increasing usage of virtual learning environments such as WebCT, Blackboard, and Moodle, the notion of the university campus has shifted from a bricks-and-mortar to a clicks-and-mortar model. Computer technology has become a symbol of early twentieth century higher education provision in developed and developing nations.

Computer-aided technology (CAI) is a type of teaching-aided technology that has emerged because of the fast advancement of computer technology. Its essence is to conduct teaching activities using computers as a teaching medium, and teachers utilize computers to fulfill aided teaching tasks [1]. It thoroughly explains computer-aided technology, covers fundamental principles, and explains categorization of frameworks and courseware design. It serves as a vital

theoretical foundation for researching the efficiency of computer-aided technology in English teaching [2]. The advantage of computer-aided technology lies in its strong interaction, integration, and diversity. Interaction is used to distinguish the teaching methods of the one-way output such as TV, multimedia technology, and film. It combines graphics, animation, sound, and video into the teaching content and exhibits the course information with both voice and emotion so that teachers may better complete English teaching and increase the quality and effectiveness of English teaching.

CAI can exhibit the teaching content flexibly and thoroughly through the computer. It better regulates the teaching process and eventually achieves the teaching goal while effectively improving the teaching quality, efficiency, and level. To evaluate the efficiency of English course teaching, two classes of students are chosen to take a writing test during the first week of school and after the semester, which must be finished in 45 minutes. When analyzing the effect of computer-aided technical English teaching, this paper tests and feeds back 42 words by using the computer and counts the results. The number of words in this test is 42, with wrong and correct answers. The wrong words will be displayed on the computer page, and then, the corresponding Chinese meanings of these words will be listed. According to the experimental results, it is fully demonstrated that the experimental class's total English score and translation ability improved significantly after using computer-aided technology. However, the score of the control group without computer-aided technology did not improve significantly. It demonstrates that the effect of computer-aided technology in English teaching is ideal.

Presently, CAI technology is widely used in college teaching, but various disciplines have significant differences. Most CAI technology is used in the teaching of technical disciplines as well as in English course teaching. It is efficient in both technical and nontechnical disciplines. The traditional English course teaching model lacks flexibility. It slavishly follows the bookish rule of constructing structures as prescribed by the grammarians. The students' classroom environment is not lively, it is difficult to pique kids' interest in learning, and it is difficult to give a better English language setting. Facing these problems, computer-aided technology has been introduced to study the effectiveness of English teaching and improve the quality of English teaching.

The innovations of this paper are as follows:

(1) This research investigates the usefulness of computer-assisted technology in English instruction in the Internet era. Computer-aided technology is applied in English course teaching to study the effectiveness of English teaching.

(2) The AI technology of computer-aided technology to be used in English course teaching is selected, the similarity matrix of English learners is constructed, the English recommendation threshold is set, and the English teaching system of computer-aided technology is established.

After the introduction section, the work related to the study has been discussed. Following that, the computer-aided technology under the background of the Internet has been explained. After that, the application of computer-aided technology using the Internet has been discussed. Lastly, the analysis of English teaching and the conclusion of the research paper have been discussed.

## 2. Related Work

After years of development, computer-aided technology has become increasingly mature. Now it is widely used in the field of teaching, which has attracted the attention and research of scholars at home and abroad. Gao developed computer-aided Chinese teaching, designed, developed, and made full use of teaching resources for evaluation and management in a multimedia environment, compiled and designed multimedia teaching materials, and developed and used multimedia Chinese courseware [3]. Liu and Hungpointed out that the use of computer-aided teaching of Chinese as a foreign language can activate the Chinese classroom form, improve the classroom efficiency, highlight students' comprehensive skills and memory, and has significant advantages compared with the traditional teaching mode [4]. Christel analyzed the impact of computers on media technology in teaching Chinese as a foreign language from the perspective of teaching methods, teaching contents, and teaching organization forms [5]. Mayer proposed that the use of multimedia technology in English teaching provides a new way of teaching, which is convenient to strengthen students' learning intuition, and the learning effect is ideal [6]. Gunawardhana's research points out that CAI can solve the problems of teaching space and time. Students can review and learn the course content anywhere by using the network and can fully popularize the teaching methods [7]. Marlowe and Tsilomelekis proposed that foreign language teaching policies, economic development, teachers' learning experience, and their own abilities all affect the effect of English teaching. After using computer-aided teaching, teachers can analyze teachers teaching behavior in any situation and change teachers' teaching methods [8]. Nagata's research points out that various factors such as classroom, students, and environment will affect teachers' CAI methods. Because teachers need to design courseware and select videos and images when using CAI, teachers' ability directly determines the effect of CAI [9]. Ai et al. pointed out that when studying the effectiveness of computer-aided technology in English teaching, we can judge from many aspects such as teaching objectives, teaching quality, and teaching effect so as to avoid selecting a single direction for evaluation, and the real effective results of English teaching cannot be obtained [10]. Ji believes in the effective framework of CAI and summarized several factors affecting the teaching effect, such as teaching methods, teaching design, and students' interests [11]. Kara studied the skills and CAI attitude of visual art teachers from the perspective of school factors and demographics and comprehensively investigated the personal attitude of students toward the use of CAI. The results showed that the candidates of visual teachers recognized the effect of CAI [12].

## 3. Computer-Aided Technology under the Background of the Internet

Computer-aided technologies are the use of computer technology to aid in the design, analysis, and manufacture of products. The ever-increasing spread of the use of the Internet in intelligence technologies has begun to revolutionize people's life. This section explains the concept of computer-aided technology and the classification framework of the study.

*3.1. Computer-Aided Instruction Concept.* Presently, the most widely used teaching technology is computer-aided technology. Computer-aided teaching uses computers as the teaching medium to complete teaching activities. During teaching, teachers use computers to design teaching courseware, enrich teaching contents by means of numbers, words, and images, and display teaching videos, teaching images, teaching sound, and animation so as to realize multidimensional and three-dimensional communication of educational information and strengthen the expressiveness and authenticity of information [13]. In addition, students use input and output devices to realize human-computer dialogue on the computer. This human-computer interaction is a significant feature of computer media, while other teaching methods such as TV and slide show do not have this function [14].

When using computer-aided technology in teaching, we can stimulate students' senses from many aspects and let students obtain knowledge and information from all aspects. From the perspective of psychology, people can acquire about 15% of their knowledge in hearing and about 25% knowledge in vision. If these two methods are used in teaching to transfer knowledge, at the same time, their acceptance is as high as 65%. The US survey data show that the use of computer-aided technology can improve about 38% compared with ordinary teaching methods and save about 31% of teaching time.

*3.2. Classification Framework of CAI.* The computer-assisted instruction model can be called an information-based teaching model. It studies the teaching model from the values and cognition and formulates the classification framework of computer-assisted instruction. From the perspective of cognitive theory, there are two opposing concepts, namely, constructivism, and objectivism. From the perspective of values, there are also two opposing concepts, namely, collectivism, and individualism. This paper uses the two-dimensional coordinate system to illustrate the differences between various types of education by selecting the four dimensions of collectivism, individualism, constructivism, and objectivism so as to obtain the classification framework of the computer-assisted instruction shown in Figure 1.

CAI is a comprehensive teaching mode formed by using modern teaching theory and modern teaching information technology in teaching. The key to this teaching style is to employ computer-based courseware and to fully utilize multiple technologies such as teaching design, teaching theory, computer-aided technology, and program design to complete courseware design, production, and usage. The CAI's effective framework was used to synthesize numerous factors affecting the teaching effect. The factors affecting the teaching techniques are teaching design and students' interests. The framework is shown in Figure 2.

Formally, CAI uses the computer as a teaching tool, which is more advanced than electrochemical teaching equipment and traditional teaching form. As a brand-new teaching technology, CAI can display the teaching content flexibly and comprehensively through the computer, better control the teaching process, and finally achieve the teaching goal and realize the effective improvement in the teaching quality, efficiency, and level.

## 4. Application of Computer-Aided Technology in English Teaching

Computer-assisted language instruction can significantly improve students' self-learning abilities. Teachers can employ a multimedia curriculum to personalize the standard way of the content to be taught in the context of computer-assisted language education. In this section, the applications of the technology have been discussed.

*4.1. AI English Teaching.* At present, the use of the AI computer-aided teaching method in English teaching can improve the English teaching environment, solve the problem of "deaf-mute English" in the past, and let students experience personalized teaching methods so as to optimize the teaching effect and make full use of English teaching resources. AI technology can be used in the computer to comprehensively analyze various media information technologies such as graphics, text, sound, and images, and an intelligent system is formed based on the data connection logic [15]. The remarkable advantage of this system is that it can provide different English teaching interaction modes, such as text interaction, content interaction, and graphical interface interaction. The three interaction modes are independent of each other and jointly strengthen the teaching effect [16]. AI teaching interaction mode is shown in Figure 3.

*4.2. Constructing the Similarity Matrix of English Learners.* Based on the characteristic vector $T$ of learners' personalized information, assuming that $T_1$ (student number) is different and the number is $n$, this paper forms the characteristic matrix of $TZ_{n\times 30}$ personalized information, which is expressed by the following formula (1). There is a similarity matrix between any learner and learners with similar characteristics, which is represented by $u_{30\times n}$. The formula is as follows:

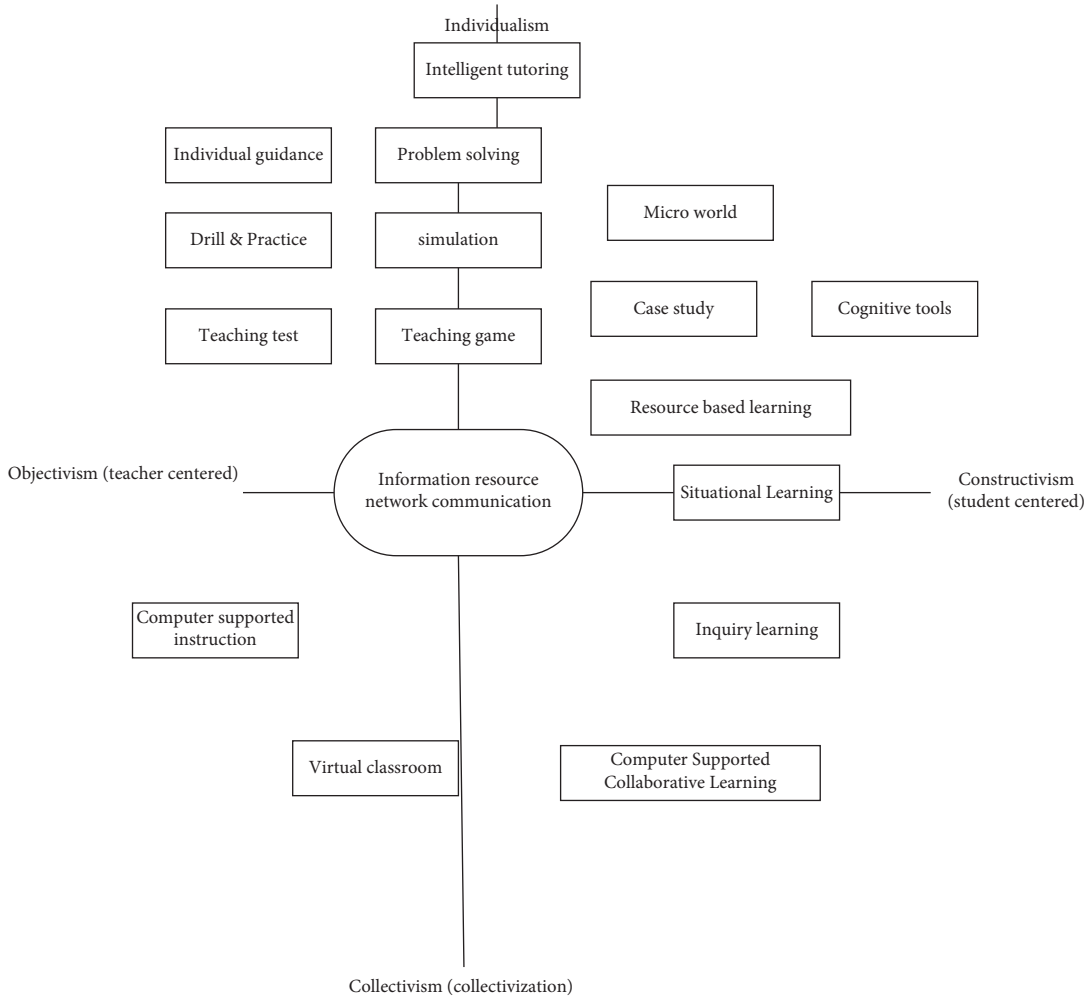


Figure 1: Classification framework of CAI.

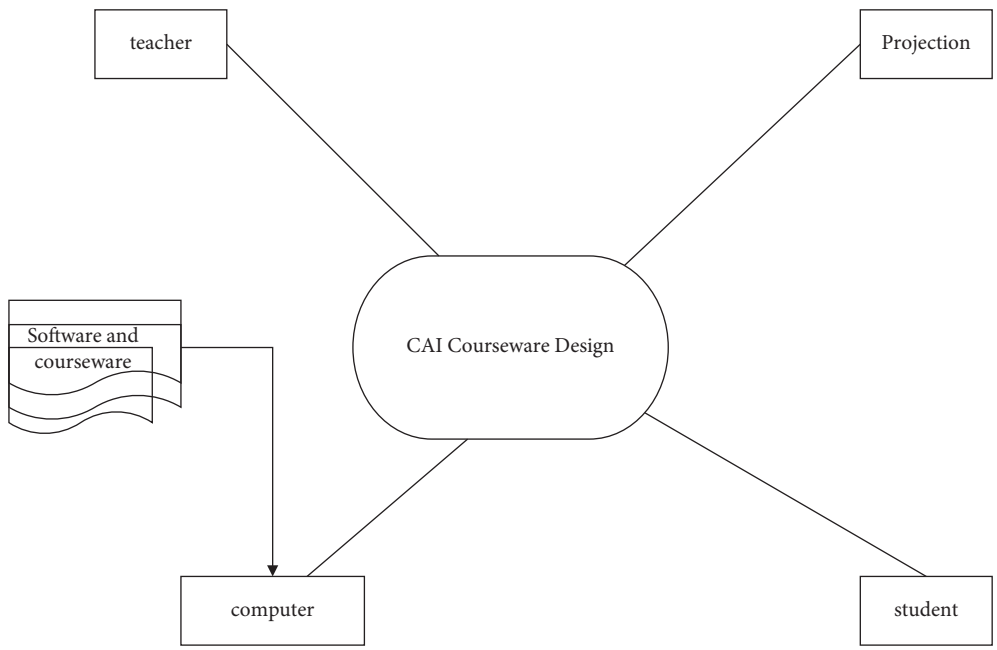


Figure 2: CAI courseware design.

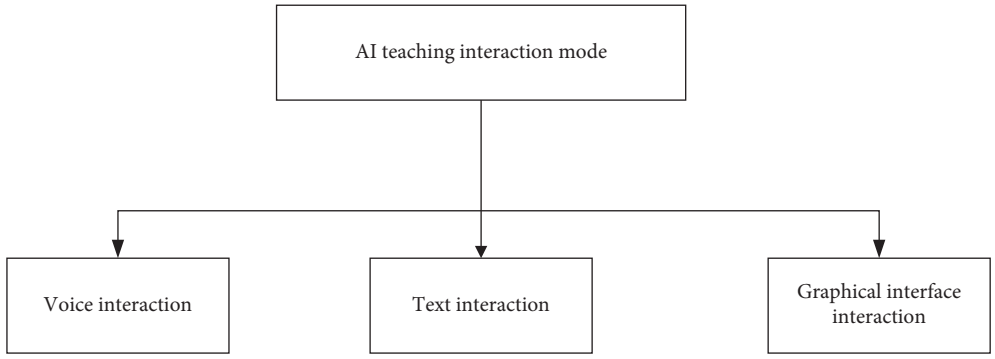


Figure 3: AI teaching interaction mode.

$$TZ_{n\times 30} = \begin{pmatrix} t_{1.1} & t_{1.2} & \cdots & t_{1.30} \\ t_{2.1} & t_{2.2} & \cdots & t_{2.30} \\ \cdots & \cdots & \cdots & \cdots \\ t_{n.1} & t_{n.2} & \cdots & t_{n.30} \end{pmatrix}$$
$$u_{30\times n} = TZ_n = \begin{pmatrix} u_{1.1} & u_{1.2} & \cdots & u_{1.30} \\ u_{2.1} & u_{2.2} & \cdots & u_{2.30} \\ \cdots & \cdots & \cdots & \cdots \\ u_{n.1} & u_{n.2} & \cdots & u_{n.30} \end{pmatrix}. \quad (1)$$

Based on the Euclidean distance formula in the fuzzy concept, the following results are obtained:

$$d_2(x, y) = \left( \sum_{i=1}^{n} |xi - yi|^2 \right)^{1/2}. \quad (2)$$

If $x = (x_1, x_2, ..., x_i), y = (y_1, y_2, ..., y_i) \in Rn$, then the Euclidean distance of any learner's feature code similar to this learner is calculated by the following formula:

$$D(x, y) = \sum_{k=1}^{n} \left| u_x(k_x) - u_y(x_k) \right|. \quad (3)$$

If the small value of $D(x, y)$ indicates that the feature similarity between this learner and other learners is high, another learner session mode is recommended for this learner.

In addition, session clustering can be obtained by clustering user sessions using the FCCRD algorithm. The similarity of access patterns among customers in the same session clustering is high, and the access patterns used by users in each session clustering will be different. When the significance threshold and user session clustering are certain, the user painting clustering is generally calculated by using the $pr_c$ method. The formula is calculated is as follows:

$$pr_c = \{\langle p, weight(p, prc)\rangle | p \in p, weight(p, prc) \geq \mu\}. \quad (4)$$

Among them,

$$weight(p, pr_c) = [1/|c|] * \sum_{t\in s} w(p, t). \quad (5)$$

This user session $s$ is as follows:

$$S = \{S_1, S_2, ..., S_n\}. \quad (6)$$

The following formula represents the characteristic $C$:

$$C = \{w_{1c}, w_{2c}, ..., w_{nc}\}. \quad (7)$$

$W_{ic} = \text{weight}(P_i, C)$ if $P_i \in C, 0$, the cosine similarity function is used to calculate the matching coefficient between $S$ and $CC$, and its formula is as follows:

$$\text{Match}(s, c) = \left[ \sum_k (w^c{}_k * s_k) \right] / \left\{ \left[ \sum (s_k)^2 * \sum_k (w^c{}_k)^2 \right]^{1/2} \right\}. \quad (8)$$

If Recommend$(p, s)$ is used as a measure to determine whether to recommend to learners, it is necessary to set a threshold or set the highest value on the recommendation page and select several larger pages in Recommend$(p, s)$ to recommend to learners. Due to the different ways of recommending pages during customers' visit time, Web mining technology or Web structure mining can be used to calculate the recommendation coefficient of Web pages and judge whether to recommend to learners according to the recommendation coefficient. The calculation formula is as follows:

$$\text{Recommend}(p, s) = [\text{weight}(p, s) * \text{match}(s, c)]^{1/2}. \quad (9)$$

*4.3. English Teaching System Based on Computer-Aided Technology.* The English Teaching of computer-aided technology shows the characteristics of teacher guidance. Teachers guide students from the learning track of students or complete English teaching directly by using computer-aided technology. This technology will determine the learning content according to the students' learning behavior and then will give feedback to the teachers. After receiving the students' learning behavior, the teachers will carry out personalized teaching and heuristic teaching. The components of this English teaching include an expert system, a knowledge base, and the students' cognitive model, which is shown in Figure 4 [17].

*4.3.1. Knowledge Base.* The knowledge base stores the knowledge of various disciplines to be taught, including declarative knowledge, meta knowledge, and process

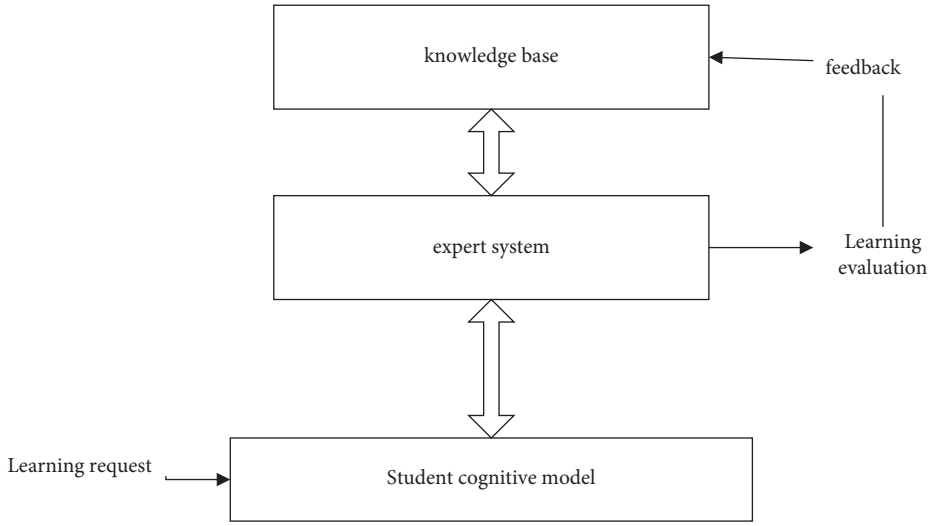


Figure 4: English teaching model.

knowledge. The time is gradually extended, and many knowledge base contents will be accumulated in the next round. In combination with the actual requirements, all kinds of knowledge will be retrieved and queried, questions will be generated, and then, the content of students' answers will be evaluated.

*4.3.2. Expert System.* The expert system makes intelligent teaching decision according to the content of the knowledge base and students' cognition. The learning process directly determines the learning methods and learning contents to be taken in the next step and can formulate modification opinions and strategies for the evaluation of the students' learning effect.

*4.3.3. Student Cognitive Model.* The students' cognitive ability and cognitive level are all preserved in the cognitive model. Starting from the students' real cognitive level, we know the students' learning situation and dynamically adjust the learning situation according to the learning situation. If there is new English teaching content, it can automatically provide students with new learning content suggestions according to their previous learning records. The expert system makes scientific decisions according to the students' cognitive model so that the system can accurately evaluate students' knowledge learning and understanding and formulate corresponding teaching activities in combination with all students' characteristics and differences.

## 5. Analysis of the Effectiveness of English Teaching

This research examines the benefits of internet-based computer-assisted language education in English course instruction, as well as English teaching examples. This section evaluates the analysis of the experimental results concluded and analyzes the effectiveness of the English course teaching.

*5.1. Analysis of the English Teaching Effect.* This paper uses computer-aided technology to study the effectiveness of English teaching and divides English teaching into two processes: first, teaching and learning, as the main body of the teaching process. The second process is English practice and testing, which is used to feed back on the effect of English teaching in the previous stage and find out the weaknesses of students in the English learning stage. To improve and adjust English teaching activities, the students can fully grasp the differences between themselves and English teaching objectives. They can make continuous efforts according to English teaching objectives [18]. The cycle is too long, which leads to students forgetting some of the test contents, and students cannot find their own loopholes and shortcomings, at the same time, resulting in a lack of continuity of teaching. Nowadays, the use of computer-aided technology in English teaching has changed the traditional practice methods. Firstly, the practice is put on the network test system. Secondly, students use the network to select the test questions or exams previously stored in the question bank and then submit the test scores. Teachers can browse students' English teaching practice on the system. After adjusting the test method, the teaching effect can be fed back to the teacher for the first time. The teacher can readjust the teaching content and progress according to the students' learning situation so as to improve the students' classroom teaching efficiency and practice effect. Moreover, students can obtain the feedback results of practice by using computer-aided technology so that they can understand the learning objectives and direction in the later stage [19].

When analyzing the effect of computer-aided technical English teaching, this paper tests and feeds back 42 words by using the computer and counts the results. The number of words in this test is 42, with ## wrong answers and ## correct answers. The wrong words will be displayed on the computer page, and then, the corresponding Chinese meanings of these words will be listed. After completion, a prompt message will be displayed on the page, "Do you want to

Table 1: Proportion of 1000 word answer pairs in the total number of computer-assisted instructions (total number: 607).

| Number of correct English words | Below 50 | 51–99 | 100–199 | 200–299 | 300–399 | 400–499 | 500–599 | 600–699 | 700–799 | 800–899 | 900–999 | Over 1000 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Number of correct answers | 5 | 36 | 24 | 53 | 116 | 68 | 65 | 116 | 18 | 88 | 6 | 11 |
| Percentage% | 0.82 | 5.93 | 3.95 | 8.73 | 19.1 | 11.2 | 10.7 | 19.1 | 2.96 | 14.5 | 9.9 | 1.8 |

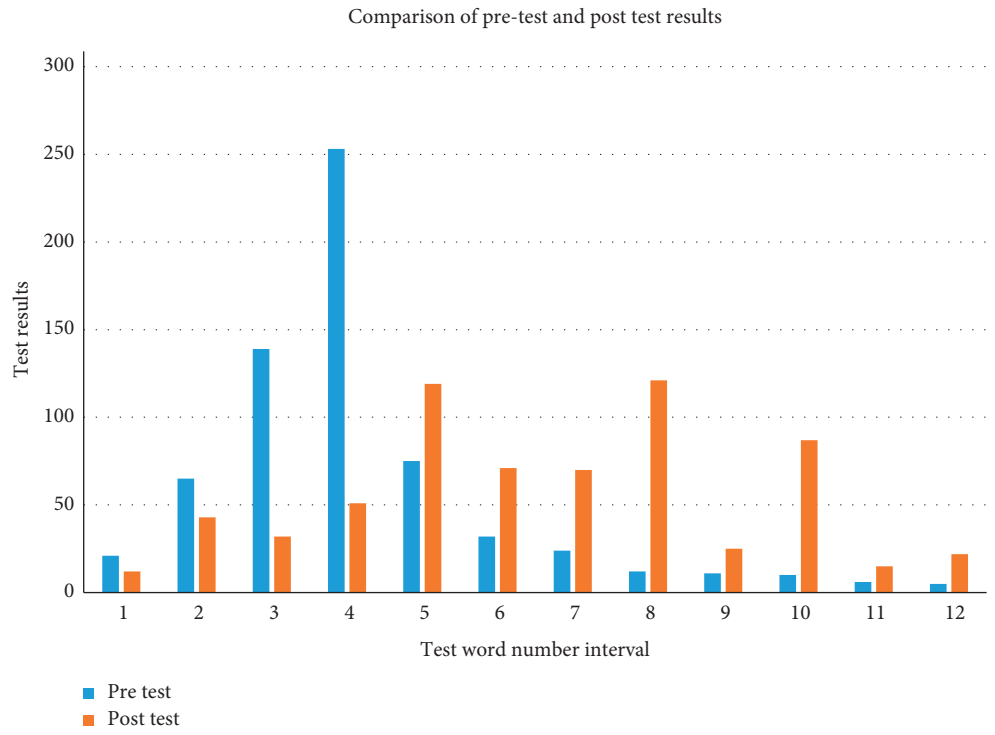


Figure 5: Comparison of the pretest and post test results.

continue learning?" and click start or return. After the students press the return button, they can jump to the learning page and learn the wrong words again. After learning, the computer-aided equipment will test the students' learning situation, recycle the above links, and guide the students to learn all the words in this unit until all the words are clearly remembered and the answers are correct.

When testing the effect of English teaching, three months after the end of learning and an interval of two weeks are chosen. The test paper tested before is used to retest and record the test results, which are shown in Table 1.

There are obvious changes in the data comparison before and after the test. Here, the bar statistical chart is used to display the results of the pretest and post-test for comparison, which is shown in Figure 5.

According to the data in Tables 1 and 2 and Figure 5, the students' scores before and after the test are shown. The results show that in English teaching, the number of English word segments that students have answered correctly based on computer-aided technology is gradually increasing, especially from 0–399 cumulative word segments. The cumulative proportion of people with more than 0–1000 words is as high as 99.8%. The cumulative number of correct English words shown in Figure 5 is fewer than 50, which is represented by 1. The number of 51–99 words is represented by 2. The number of 100–199 words is represented by 3. The number of 200–299 words is represented by 4. The 300–399-word quantity segment is represented by 5. The 400–499-word quantity segment is represented by 6. The number of 500–599 words is represented by 7. The number of 600–699 words is represented by 8. The number of 700–799 words is represented by 9. The 800–899-word quantity segment is represented by 10. The 900–999-word quantity segment is represented by 11. More than 1000 words are represented by 12. After the test, the maximum number of students' cumulative correct English words is 300–399. This result demonstrates that, with the assistance of computer-aided technology, the cumulative number of right English words among students continues to rise, which is beneficial to students' English course learning.

*5.2. Analysis of the Effectiveness of English Course Teaching.* To analyze the effectiveness of English teaching, two classes of students are selected to take a composition test in the first week of school and at the end of the semester, which is required to be completed within 45 minutes. Then, start from word grammar, spelling, sentence pattern collocation,

Table 2: Cumulative number of people in different grades.

| Number of correct English words | Below 50 | 51–99 | 100–199 | 200–299 | 300–399 | 400–499 | 500–599 | 600–699 | 700–799 | 800–899 | 900–999 | Over 1000 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Number of correct answers | 5 | 42 | 65 | 117 | 236 | 301 | 369 | 482 | 503 | 588 | 597 | 606 |
| Percentage% | 0.82 | 6.9 | 10.7 | 19.3 | 38.9 | 49.6 | 60.8 | 79.4 | 82.9 | 96.9 | 98.4 | 99.8 |

Table 3: Frequency of errors in the pretest and post-test results of students in the control class and the experimental class.

| | Pretest | | Post-test | |
|---|---|---|---|---|
| | Experimental class | Control class | Experimental class | Control class |
| Frequency of lexical errors | 98 | 89 | 51 | 58 |
| Frequency of grammatical errors | 35 | 55 | 21 | 32 |
| Frequency of errors in sentence pattern collocation | 40 | 11 | 22 | 20 |
| Frequency of errors in coherence | 21 | 14 | 3 | 6 |
| Cumulative error frequency | 194 | 195 | 97 | 116 |

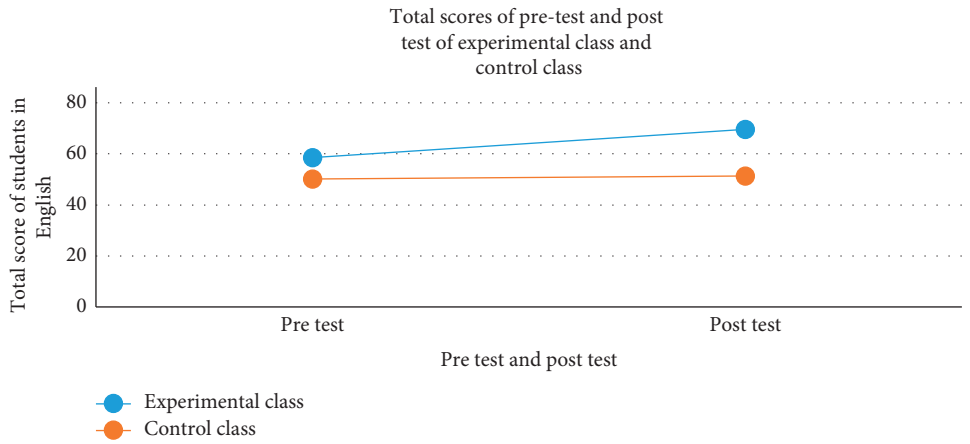


Figure 6: Total scores of the pretest and post-test results of the experimental class and the control class.

and conjunctions, the purpose is to find the number of errors in students' English composition and list the error frequency data of the pre-test and post-test in the control version and the experimental class in Table 3 below.

The analysis of the data in Table 3 shows that at the initial stage of enrollment, the English cooperation level of the experimental class and the control class is basically the same. The cumulative total error frequency of the students in the pretest experimental class in terms of English grammar, vocabulary, sentence pattern collocation, and coherence is 194 words, which is basically the same as that of the students in the control class. Then, the computer-aided instruction technology is used in English teaching for one semester. The test results show that the total error frequency of the experimental class is 97 and that of the control group is 116. Compared with that, the error frequency of the student group decreases more, which shows that the computer-aided technology has a great improvement in English teaching and can help students master more English skills. The pretest and post-test results of the experimental class and the control class are shown in Figure 6.

The experimental results of middle school students are shown in Figure 6, and the average score of students in the experimental class increased from 58.6 to 69.6, while the average score of students in the control class increased from 50.2 to 51.3, with little change. It is fully proved that the total English score and translation ability of the experimental class have greatly improved after using computer-aided technology. However, the control group's score without computer-aided technologies did not increase much. This demonstrates the optimum effect of computer-aided technology in English instruction.

## 6. Conclusions

In the twenty-first century, computer technology has developed rapidly. Computer-aided teaching technology around computers has become the main teaching method at present. The application of computer-assisted instruction can speed up the students' learning progress and improve the students' memory. Presently, computer-aided technology is widely used in physics, art, and other disciplines, while it is less used in English teaching. Computer-aided technology can design teaching methods in combination with teaching, artistry, and teaching objectives. It also recommends appropriate English learning methods for them so as to establish the English course teaching system of computer-aided technology. Teachers can only formulate teaching

plans according to the process. Through in-depth analysis of the classification framework and basic concepts of computer-aided technology, a computer-aided technology English teaching system is established to judge the quality of English teaching. When analyzing the effectiveness of English teaching, the student's English writing ability is tested. The results show that the error rate in English composition has reduced after teachers adopt computer-aided technology, and the total score of English has increased from 58.6% to 69.6%. After using computer-aided technology, the student's English level has improved faster. Based on this study, a lot of new algorithms can be formed to deeply analyze and improve the efficiency of computer-aided technology and AI technology in building new models for students. The theory can help build up and propose new solutions to the present research problems and evaluate them more efficiently involving less manual labor and timesaving.

## Data Availability

The data of this paper are available from the corresponding author upon request.

## Conflicts of Interest

The author declares no conflicts of interest.

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