Hindawi
Mobile Information Systems
Volume 2022, Article ID 7993728, 12 pages
https://doi.org/10.1155/2022/7993728

Research Article

Effectiveness of Interactive Reading Mode Based on Multisensor Information Fusion in English Teaching

Xiaoqiang Yu[1] and Liang Zhang[2]

[1]*Jiaxing University, Jiaxing 314200, Zhejiang, China*
[2]*Zhejiang Pharmaceutical College, Ningbo 315000, Zhejiang, China*

Correspondence should be addressed to Liang Zhang; zhangliang@zjpu.edu.cn

Received 24 March 2022; Accepted 16 May 2022; Published 9 June 2022

Academic Editor: Muhammad Muzammal

With the development of the data era, information is available in complex and diverse forms, and the information obtained by a single sensor is always incomplete and cannot grasp the global content. Multisensors, on the other hand, can obtain more dimensional information about the target and fuse the multidimensional information, thus changing the shortcomings of a single sensor. For students, reading is an essential means of communicating ideas and acquiring information, yet many teachers focus too much on decoding language and teaching literal meaning. In general, students only passively acquire knowledge, which does not effectively improve their analytical and reasoning skills. Under the guidance of an efficient reading mode, it is crucial to develop good reading habits and use correct reading strategies. To enhance the effectiveness of interaction between students and teachers, this paper proposes an interactive reading model based on multisensor information fusion to help students' acquisition of background knowledge and language skills, including teacher-student interaction before reading, during reading, and after reading, which ensures the completeness and accuracy of the interactive information and helps decision-making judgments. In this paper, by introducing the theoretical knowledge of multisensor information fusion and interactive reading mode, and by evaluating the English teaching in two parallel classes with the traditional English teaching mode and using the interactive reading mode, we found that the students in the experimental class B believed that their English level in all aspects had improved significantly, and the number of students who performed the 30–60 minutes English reading time period had increased substantially compared with that before the experiment, which could improve the students' reading level of interest in reading, so English teaching using the interactive reading model is effective.

1. Introduction

In recent years, global economic growth has led to the vigorous development of artificial intelligence technology, and technologies such as drones, autonomous robot movements, autonomous driving, and virtual reality have become popular areas. In order to adapt to different working environments, information fusion technology has achieved new developments by combining advanced technologies such as neural networks, image processing, and machine learning. New information fusion algorithms such as active perception algorithms and compensation-based learning fusion algorithms have also been developed. Generally speaking, information fusion technology tends to information integration, people-oriented information retrieval, and joint optimization processing. At present, the teaching methods of English reading in China are still relatively simple. Reading teaching is mainly based on the traditional bottom-up model, and teachers pay more attention to words, grammar, and knowledge points in the classroom. It pays too much attention to the teaching at the level of words and sentences and ignores the teaching of the whole text. In computer vocabulary, interaction often refers to the interaction and invocation of data between computer programs. As people gain a deeper understanding of the concept of interaction, interaction is gradually introduced into teaching.

Due to the complexity of the indoor environment, it is difficult to rely on a single sensor to achieve the target, and the application of multiple sensors is the key. Using information fusion technology, various environmental information is synthesized and processed to create a coherent picture about the surrounding areas, and the corresponding motion strategies are adopted by the machine. The main goal of multisensor information fusion technology is to optimize the processing of multisensor information in a cooperative manner, eliminate redundant information, integrate the effective information of each sensor, and generate complementary and more comprehensive information to better characterize the environmental state. The purpose of this paper is to explore the application of multisensor message convergence in the interaction process to make the interaction better.

The objective of that research is to investigate the effectiveness of the interactive reading model in teaching English reading and to analyze the effective role of the interactive reading model by selecting an evaluation of the interactive reading model based on a weighted average data fusion algorithm. It not only enables students to understand the background knowledge of the chapter from a macro perspective, grasp the main idea but also allows students to master language knowledge from a micro perspective.

2. Related Work

The common objective of the designers of every e-learning teaching content is the way to grab attention of learners and increase the learning effect in the era of information explosion. Therefore, Chen et al. researched the design elements to be used in the instructional film. On the basis of 8 factors, including color application, anthropomorphism, and audiovisual complementarity, he used a sophisticated Kano model of learner expectations for the purpose to discover the classified demands of learners for each factor [1]. New media platforms have the characteristics of wide information dissemination channels, fast release frequency, and efficient interaction methods. According to the characteristics of new media, Qiao et al. expounded the current situation of public weather services. Through the questionnaire survey, he analyzed the actual needs of the public from three aspects: the public's reading habits, the characteristics of sharing and communication, and the defects of information release. It promotes the public service effect of new meteorological media by considering the needs, applying new technologies and rationally using the platform [2]. Modern web technologies enable authors to create various forms of textual visual integration for storytelling. Zhi et al. attempts to understand two forms of textual visualization integration. Linking refers to a two-way interactive mode that explicitly emphasizes explanatory visual elements when selecting narrative text, and vice versa. He explored user reading behavior under different conditions. The study found that participants performed significantly better on the slide layout comprehension task. But it's not very useful [3]. Rahman and Pandian review the major issues related to English language teaching in Bangladesh that hinder the implementation of the new CLT (communicative teaching method) curriculum from the perspective of teachers. He finally made suggestions for more effective English teaching curriculum reform [4]. Kristjansson aims to promote an appreciation for the presence and implementation of faith in Christianity in ELT in the light of the dynamics of connected places and the globe. This suggests a broad dimension in which the dimensions of faith-based recognition alongside the space of the consciousness have an impact on the spatial construction of local pedagogical dynamics [5]. Recently, studies have shown how the link of culture and language emerges as a significant element of language teaching. Toprakc and Zaydnl study aimed to investigate the content of culture in teaching textbooks used for the 9th grade English language according to the World Standards for Language Learning (WRSLL) and from teachers' opinions. The findings show that books with a local perspective are considered insufficient in terms of cultural content [6]. Liu et al. proposed a new method of fault diagnosis based on BPNN and D-S evidence theory for multisensor message fusion. In DS evidence theory, a complete set of mutually incompatible basic propositions (hypotheses) is called a recognition frame, which represents all possible answers to a question, but only one of them is correct. The method is applied to diagnose a fault in the hydraulic servo system (HDSS) of a missile launcher. It can identify and diagnose the key components of the hydraulic servo system and effectively improve the reliability of the system [7]. Lu et al. intended to utilize multisensor message fusion and computer training to identify human jumping phases, which are crucial for the development of a jump-assisted exoskeleton. Using a comparison of the performance of the most advanced method of machine training categorizers, he selected a subset of signatures of sEMG, IMU, and pedal switch signals from a set of time-domain characteristics as window parameters for analysis. sEMG and IMU had an accuracy of 91.76% on average for recognition [8]. Zhu et al. performed a hybrid computational fluid dynamics (CFD) and building energy simulation (BES) modeling of a variable air volume (VAV) air conditioning in an office tower in Shanghai. The objective is to simulate the architecture, the VAV containment, and the indoor heat conditions concurrently. Using the resulting coupled simulation platform, he further proposed a new approach for VAV control by fusing multiple sensor information [9]. Mosalanejad and Arefi describe a sophisticated flexible sensor used for a system of highly nonlinear continuously stirred tank reactors (CSTR). He used multiple sensors for observation using various kinds of sensors at various sampling ratios, assuming the existence of varying kinds of nonrealities in the sensor data acquisition. He proposed the problem of simultaneous state and parameter estimation based on data fusion techniques and the unscented Kalman filter (UKF) and investigated the feasibility of the suggested approach [10]. To address the problems of existing indoor localization algorithms such as low precision, costly installation and upkeep, lack of rigidity, and poor utilization of sensors, Xiangyu et al. proposed a parton filter algorithm that was developed by a multisensor fusion. Results of

experiments show that the multi-sensor-based operator improves the positional accuracy and ruggedness compared to the Wi-Fi-based localization algorithm [11]. The security monitoring is an efficacious approach to predict such a hazard before the establishment of the mine. Wang et al. developed a multisensor real-time online monitoring and early detection system with computer skills and stress monitoring technology. He mapped three-dimensional stress isograms to make more visual and accurate stress evolution. More seriously, it can give short-term warning messages of stability, which can be used as a basis of science for forecasting geological hazards in Yangjiaotuo [12]. The research has carried out a detailed analysis of the application of multisensor information fusion technology and interaction mode. It is undeniable that these studies have greatly promoted the development of the corresponding fields. We can learn a lot from methodology and data analysis. However, there are relatively few studies on English teaching in the field of multisensor information fusion, and it is necessary to fully apply these technologies to the research in this field.

2.1. Multisensor Information Fusion and Design

2.1.1. Multisensor Information Fusion. As an important means of acquiring information and exchanging ideas, reading is a complex cognitive process. Among them, the written word is connected with the cognitive schema, and it is also the interactive process of the individual, the word, and the society [13]. Interactive reading mode is a combination of "top-down" and "bottom-up" reading modes. It focuses on the acquisition of cultural knowledge as well as basic linguistic knowledge, using the reader's existing knowledge to help absorb the information in the reading text. The ultimate goal is to improve the knowledge level of readers [14].

The bottom-up reading mode involves the following processes: fixation—letter and character recognition—word formation—meaning acquisition—sentence processing—sentence processing. From low-level to high-level, processing information at higher levels is emphasized by the bottom-up model. Bottom-up reading mode ignores the role of context and background knowledge. It underestimates the positive initiative of students in the process of reading comprehension, that is, it emphasizes the teaching of language knowledge rather than the cultivation of reading skills. The bottom-up model divides the entire reading process into five levels [15]:

(1) Portrait features, the features of the letters seen by the eyes when reading.

(2) Letter recognition, letters enter the feature's register in portrait representation within 10–20 ms.

(3) Word Recognition: Words enter a mental dictionary containing semantic, grammatical, and lexical phonetic representations from feature registers. Words reach the corresponding entries in the mental dictionary through phonetic representations, which can be quickly recognized.

(4) Process the words into sentences and perceive them from left to right.

(5) Primary memory, phonological, and semantic information about words is transferred to long-term memory through primary memory. This reading mode focuses on the identification and recognition of words and grammar in chapters, and reading teaching focuses too much on superficial structures such as words and sentences.

The top-down reading model assumes that reading is a continuous process of mental guesswork and confirmation. Effective reading involves not only identifying words, phrases, and sentences accurately but also drawing inferences from reading. The top-down reading model emphasizes the use of various cognitive strategies, such as targeting, prediction, selection, and inference, requiring readers to make predictions about a chapter using their own knowledge and relevant experience. It then verifies and confirms or refutes. The top-down reading mode overemphasizes the role of students' existing knowledge and experience, exaggerates students' predictive and reasoning abilities, ignores the importance of forming learners' basic knowledge, and reduces students' reading efficiency and reading ability. Effective reading is not a single process, but an interacting bottom-up and top-down process, as shown in Figure 1, this demonstrates the link that exists among bottom-up as well as top-down.

Both bottom-up and top-down models have certain limitations. Reading should be the result of the action of both. The interactive reading mode can effectively combine the advantages of the two and can fully explain various phenomena in the reading process. Reading comprehension is the process of interaction between the information that the eyes watch and the knowledge the reader already has. The process of this model is word form input $\longrightarrow$ visual information storage $\longrightarrow$ feature extraction device $\longrightarrow$ model synthesizer $\longrightarrow$ most likely explanation. The interaction of information occurs in the most important part of this model: the model synthesizer, which includes visual information as well as various nonvisual information, such as orthographic, word formation, semantic, and syntactic knowledge. This knowledge affects reading at different levels and interacts to help readers understand the information in the text. During the reading process, the glyph information first enters the visual information storage, and then the feature extraction device works on the visual information to extract key features. At the same time, the model synthesizer receives information about syntactic, semantic, orthographic, and lexical knowledge. This information, together with information on the main features, provides the most likely explanation for the lexical input, as shown in Figure 2.

There are many limitations in the use of interactive teaching in the English teaching model, such as the difficulty of achieving teacher-student equality and the difficulty of ensuring student-led teaching. Reading is one of the essential skills for English language learning, and its importance is reflected in practical implementation and written assessment. However, many English teachers

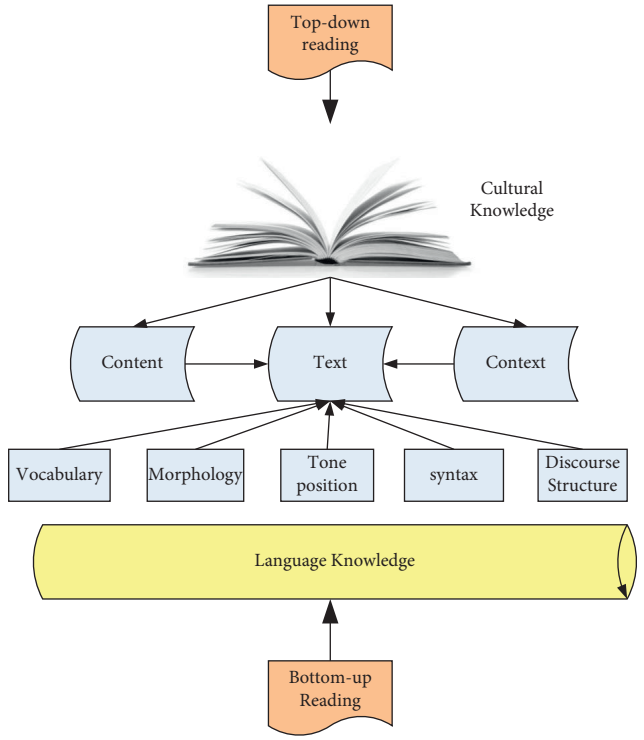

Figure 1: Top-down and bottom-up relationships.

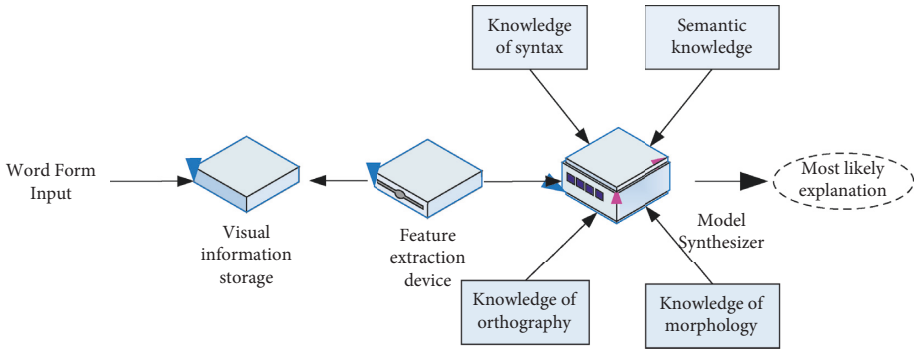

Figure 2: Interactive teaching mode.

still use traditional teaching methods to teach English reading. It is purely centered on English teachers, only pays attention to spoken English, ignores the influence of students' acceptance and autonomous learning, and easily disrupts students' enthusiasm and initiative, resulting in poor reading ability and slow reading speed. Therefore, the interactive reading method can be integrated into English reading teaching practice and fulfill the instructional needs of new teaching materials, encourage joint development of teachers with students, and change teaching methods. Teaching has a key role in the teacher. The role of organizer and facilitator is an important one. Putting students first, improving their independent learning skills, keeping them in mind, and adapting to the interactive reading approach to learning. The main body of learning is the student; the motivation for learning is internal rather than external. Language teaching is based on the correct use of language; language learning penetrates another culture, and students learn to interact with and live in that culture harmoniously. Tests help with learning. The characteristics of the interactive teaching mode are as follows:

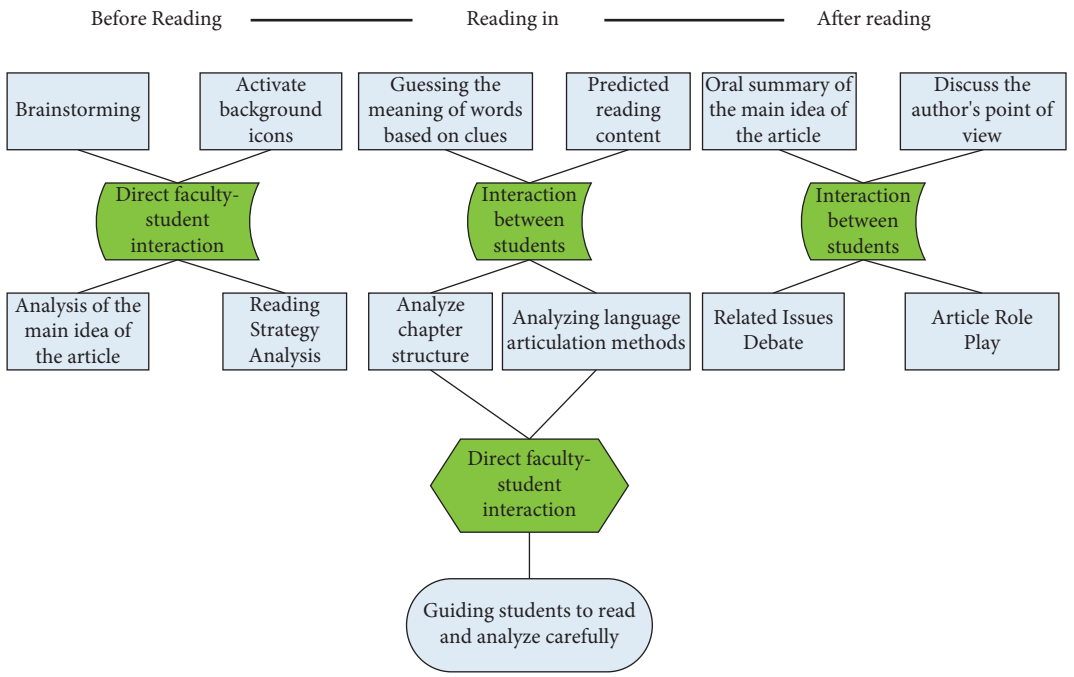

Figure 3: Experiment operation procedure diagram of interactive reading teaching mode based on teacher-student role assignment.

(1) Positivity and initiative. Interactive teaching gives students more freedom and allows them to participate in the learning process, thereby cultivating students' self-learning spirit and improving their enthusiasm and initiative in learning. The focus is on learners as protagonists and teachers as leaders. In interactive reading teaching, teachers, as instructors and classroom moderators, it should constantly stimulate students to think about problems, so that they can not only recall the initial knowledge but it can also build new cognitive models, so that new knowledge can be formed by absorbing and mastering original knowledge and newer knowledge through interaction.

(2) Innovation and practicality. This model allows learners to participate in learning activities as real subjects, be physically and mentally active, and actively participate in the learning process. It explores new knowledge and contributes to the development of innovative spirit and practical ability in language learning.

(3) Instructive. In interactive learning, teachers are not the masters of the classroom, but the organizers, servers, and supervisors of teaching. Students are not recipients of knowledge, but masters of learning, which helps to create a democratic and harmonious learning environment and improve teacher-student relationships.

(4) Teaching students in accordance with their aptitude. This model allows teachers to have a broad dialogue with students: specific explanations for students with learning difficulties, extended learning for students with high learning ability, and so on. This approach is conducive to teaching and learning according to the needs of the students, maximizing their learning abilities and promoting the development of their learning potential.

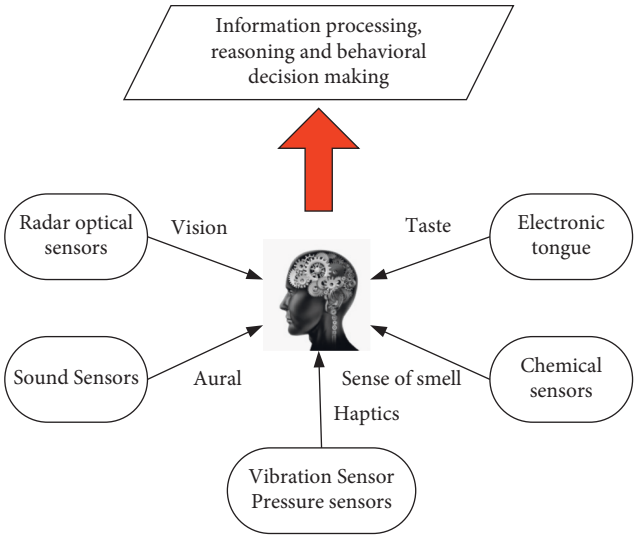

Figure 4: Illustrations of multisensor information fusion.

(5) Inspirational and collaborative. This model allows students to study in small groups, which enhances the exchange of information between students and promotes the development of mutual inspiration and solidarity among group members.

Figure 3 depicts the experimental process of an interactive reading instruction model based on the teacher-student sharing of labor. This model is based on a scientifically sound sharing of

tasks among teachers and students in the construction of knowledge. In this case, students explore the knowledge schema provided by English reading materials and follow the schema to explore the semantics of each level step by step. It allows for a deeper understanding of the overall idea and meaning of the discourse and the entire text. The interactive teaching mode needs to promote a lot of interaction and communication and requires a lot of time and energy to prepare and implement. In addition, the interactive teaching mode has no clear links and steps, and the lack of teaching adaptation mode makes it impossible for teachers to use it.

The general process of human understanding objective things is to use various senses such as sight, hearing, touch, smell, and taste to perceive things from different directions, thereby obtaining multidimensional messages about them. Then this paper analyzes and processes the information based on prior knowledge and logical reasoning and finally obtains the judgment and understanding of objective things. Multisensor information fusion is using machines to mimic human cognitive processes. Information of various dimensions obtained from different sensors is fused and synthesized and analyzed according to certain criteria in this paper to obtain a more correct judgment of the observed target or situation. The diagram of multisensor message fusion is shown in Figure 4.

According to the theory of information, the multidimensional message formed from the convergence with multiple individual dimensions will be greater than the information content of any individual information. It is also the theoretical basis of multisensor message fusion. In the following, giving a certificate from the perspective of Shannon's entropy.

According to the definition of information entropy, let the Shannon entropy $H(X)$ for the stochastic covariate S be a product as a result of the gravity profile $P_1, P_2, \ldots, P_n$.

$$H(S) = H(P_1, P_2, \ldots, P_n) = -\sum_{i=1}^{n} P_i \log P_i. \tag{1}$$

Amont them, $0 \le P_i \le 1$, it is easily available.

$$H(P_1, P_2, \ldots, P_n) \ge 0. \tag{2}$$

The equality sign of formula (2) holds if and only if each term in $-\sum_{i=1}^{n} P_i \log P_i$ is equal to zero, that is, the equality sign is only taken when $P_i = 1$ or $P_i = 0$.

And:

$$\sum_{i=1}^{n} P_i = 1. \tag{3}$$

Combining formulas (2) and (3) can be obtained, when $P_i = 1$ and $P_c = 0\,(i \ne c, c = 1, 2, \ldots, n)$, formula (2) is taking the equivalent symbol.

Supposing the Shannon entropy of stochastic invariables X and Y are $H(X)$ and $H(Y)$, while with their combined Shannon entropy as $H(XY)$. By the additivity of Shannon entropy, on the basis of Shannon entropy, it can be obtained.

$$H(\mathrm{XY}) = H(X) + H(Y|X). \tag{4}$$

Supposing the random covariate Y has the Shannon entropy $H(Y)$ as a function of the probability distribution

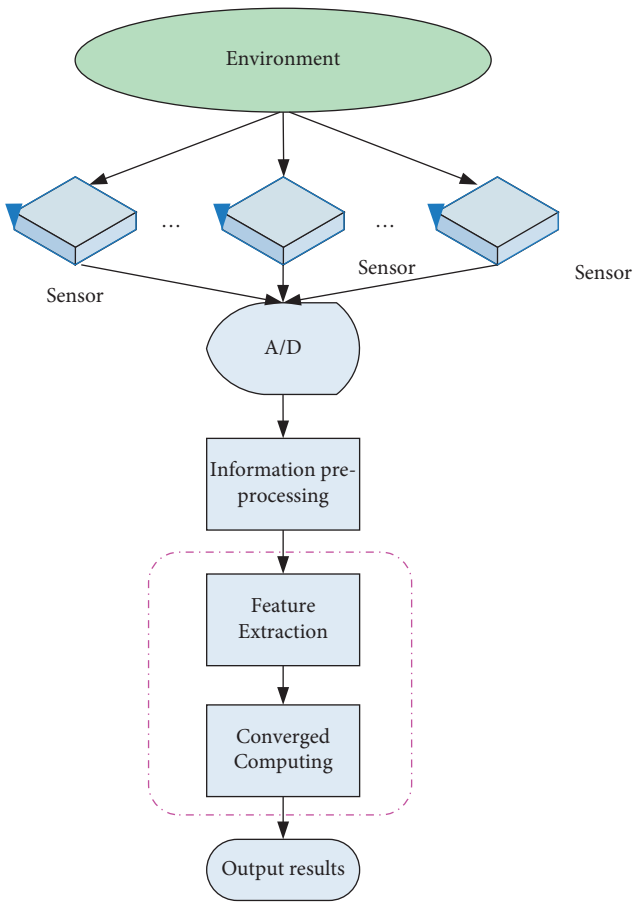

Figure 5: Schematic diagram of the information fusion process.

$P_1, P_2, \ldots, P_m$, and the probability of conditional transmission of X and Y is P_{ij}. Combined with formulas (1) and (4), the Shannon entropy expression for a covariate in two different dimensions can be gained.

$$\begin{aligned} &H(P_1P_{11}, P_1P_{12}, \ldots, P_1P_{1n}, P_2P_{21}, P_2P_{22}, \ldots, P_mP_{mn}) \\ &= H(P_1, P_2, \ldots, P_n) + \sum_{i=1}^{m} P_i H(P_{i1}, \ldots, P_{in}). \end{aligned} \tag{5}$$

From the nonnegativity and $0 \le P_i \le 1$ of Shannon entropy, we get:

$$\begin{aligned} &H(P_1P_{11}, P_1P_{12}, \ldots, P_1P_{1n}, P_2P_{21}, P_2P_{22}, \ldots, P_mP_{mn}) \\ &\ge H(P_1, P_2, \ldots, P_n). \end{aligned} \tag{6}$$

Extending to case of n arbitrary covariates $x_1, x_2, \ldots, x_n$, the scalability of Shannon's entry entropy is

$$\begin{aligned} H(x_1, x_2, \ldots, x_n) &= H(x_1) + H(x_1|x_2) + \cdots \\ &+ H(x_n|x_1x_2 \ldots x_{n-1}). \end{aligned} \tag{7}$$

Taking formulas (6) and (7) together, one can conclude that multidimensional messages are combinations of many multidimensional messages, which contain more messages about a particular objective within them than does any individual one-dimensional message.

In multisensor fusion systems, the information provided by each type of sensor is usually incomplete, even conflicting, and contains many uncertainties. Entropy theory can fill this gap. The entropy theory is characterized by maximizing the use of the information provided by different sensors to make reasonable guesses. It uses the theory of conditional entropy to solve the redundancy and complementation problems of each sensor, so that the fusion system can obtain the most complete information set. According to the relationship between data sources, general information fusion is divided into the following types.

(1) Complementary fusion: aggregating information collected from multiangle, multidirectional, and multiobservation methods to obtain richer data than a single method or multiangle.

(2) Redundancy fusion: in order to obtain the same type of data from different sensors, it is necessary to remove redundant information and synthesize valid information.

(3) Collaborative fusion: data collected from multiple sensors is integrated, analyzed, and processed to obtain more accurate data.

In the multisensor fusion system, the information provided by various sensors is generally not comprehensive, even opposite, and contains great uncertainty. Shannon's entropy theory can just make up for this deficiency. The characteristic of entropy theory is to make reasonable speculation by using the information provided by various sensors to the maximum extent. By using the theory of conditional entropy to solve the problems of redundancy and complementarity of each sensor, it enables the fusion system to obtain the most comprehensive amount of information. The information fusion process is usually divided into the following five steps:

(1) Signal acquisition: using multiple sensors for signal acquisition, these signals include both electromagnetic signals and nonelectrical signals.

(2) A/D conversion: it first converts nonelectrical signals (such as temperature, pressure and chemical information, and others) into electrical signals. The electromagnetic signals and the converted nonelectrical signals are then converted into digital signals by an A/D converter.

(3) Information preprocessing: it includes operations such as filtering noise, removing wild points, and filling missing data.

(4) Feature extraction: extracting the feature vector of the target, that is, extracts the feature attributes that can accurately express the target information according to certain rules.

(5) Fusion calculation: according to different actual scenarios, the corresponding algorithm is used to fuse the information, and the result is judged according to the established judgment rules.

Table 1: Matching algorithm renderings.

Matching degree	Exact match	Semi-match	Complete mismatch
Intersection coefficient	1	0.5	0
Card parties	0	0.67	2
Bachmann distance	0	0.55	1
Land distance	0	0.5	1
Relevance	1	0.7	−1

Multiple sensors bring information redundancy or even contradiction. Therefore, it is necessary to rationally control and use various sensors and their observation information. By combining the information, it collects according to some optimization criterion, it produces an interpretation and description of the consistency of the observed environment. The information fusion process is shown in Figure 5.

In computer vision, the commonly used histogram matching algorithms mainly include correlation, chi-square coefficient, Babbitt distance, intersection coefficient, land movement distance and others. The main principles of these algorithms are as follows:

(1) Mathematical principle of correlation:

$$r_k(H_1, H_2) = \frac{\sum_i H_1(i) H_2(i)}{\sqrt{\sum_i H_1^2(i) H_2^2(i)}},$$
$$H_c' = H_c(i) - \frac{\sum_j H(j)}{N}. \tag{8}$$

N is the number of bars in the histogram, the larger the corresponding matching value, the higher the similarity. When there is an exact match, the match degree is 1.

(2) Mathematical principle of chi-square coefficient:

$$r(H_1, H_2) = \sum_i \frac{(H_1(i) - H_2(i))^2}{H_1(i) + H_2(i)}. \tag{9}$$

The closer the matching value of the function is to zero, the higher the similarity. When it does not match, its value is infinite.

(3) The principle of the intersection coefficient:

$$r(H_1, H_2) = \sum_i \min(H_1, H_2). \tag{10}$$

The larger the function value is, the more successful the matching is. Otherwise, the matching rate is low. When the matching is the best, the value is 1. When the matching is the worst, the function value is equal to 0.

(4) The principle of the Bavarian distance:

$$r(H_1, H_2) = \sqrt{\sum_i \frac{\sqrt{H_1 \cdot H_2}}{\sum_i H_1 \sum_i H_2}}. \quad (11)$$

Babbitt distance matching, the smaller the function value, the better the matching effect. When it is completely matched, the function value is 0, and when it does not match at all, the value is 1.

(5) Land movement distance:

The meaning of EMD is the minimum cost to convert a histogram distribution into another distribution. The main principles are as follows:

$$\mathrm{EMD}(d_a, d_b) = \min \frac{\sum_{i=1}^{m} \sum_{j=1}^{n} g(i,j) r(i,j)}{\sum_{i=1}^{m} \sum_{j=1}^{n} g(i,j)}. \quad (12)$$

The matching method of the histogram is different, so the effect is also different. The matching effect is shown in Table 1.

The advantage of multisource information fusion technology is that it can be more beneficial to improve the reliability and detection capability of sensor systems by collecting multiple information sensors for multiple confirmations of different sensor systems.

In this paper, the interactive reading mode evaluation based on the weighted average data fusion algorithm is selected, and it is assumed that there are four data items to judge whether the interactive reading mode is practical. Through the analysis and testing of the data, it is found that the weighted average method is available and effective for the system. The mathematical model of the weighted average is as follows:

$$e(x) = e_\alpha(x) = \alpha_0 x_0 + \alpha_1 x_1 + \cdots + \alpha_n x_n, \quad (13)$$

where α is the influence weight of each feature, α_i is the offset, and x_i is the input value.

$$e_\alpha(x) = \sum_{i=0}^{n} \alpha_i x_i = \alpha^T x. \quad (14)$$

Formula (14) is an estimation expression of the degree of practicality, which converts the parameters into the form of a matrix.

Using the difference between the predicted value and the actual value, the loss function can be obtained as follows:

$$W(\alpha) = \frac{1}{2} \sum_{i=1}^{m} \left(h_\alpha(x(i)) - y(i)\right)^2. \quad (15)$$

In formula (15), i represents the ith sample data, y is the actual degree value in the sample, and m is the number of training sets.

The loss model function can be used to describe the various gradient fitting and optimization degrees of the loss model. By progressively fitting and optimizing the loss model function, the gradient fitting optimization degree of the loss model can be further improved. The next goal is to minimize the loss function $\mathrm{Min}\, W(\alpha)$. In order to improve the calculation accuracy, the gradient descent method is used here. First assigning a zero vector to α. Then, by iteratively changing the value of α, it makes $W(\alpha)$ descend in the direction of the gradient. When the loss function is the minimum value, the optimal α value is obtained. Taking the partial derivative of the loss function $W(\alpha)$, we get:

$$\frac{\partial}{\partial \alpha} W(\alpha) = \frac{\partial}{\partial \alpha} \frac{1}{2} \sum_{i=1}^{m} \left(e_\alpha(x) - y\right)^2,$$
$$\frac{\partial}{\partial \alpha} W(\alpha) = \left(e_\alpha(x) - y\right) \cdot x_i. \quad (16)$$

Then update α

$$\alpha_i = \alpha_i - \lambda \frac{\partial}{\partial \alpha} W(\alpha) = \alpha_i - \lambda \left(e_\alpha(x) - y\right) \cdot x_i. \quad (17)$$

In formula (17), where α_i represents the ith current weight, $\lambda(e_\alpha(x) - y) \cdot x_i$ represents the value descending in the direction of the gradient, and λ represents the learning rate. By iteratively updating the value of α_i until $W(\alpha)$ converges, the minimum value of $W(\alpha)$ is obtained. When $W(\alpha)$ is the minimum value, the optimally optimized parameter $\alpha_0, \alpha_1, \ldots, \alpha_n$ is obtained. The calculated parameters are brought into the prediction model with the best fitting degree, and multiple linear regression is used to judge the practical degree $e_\alpha(x)$.

2.2. Interactive Reading Mode English Classroom Experimental Design. English reading requires students not only to understand words but also to interpret entire texts. Therefore, it is necessary to mobilize background knowledge and construct a new schema according to students' life experience and knowledge accumulation. This not only enables students to grasp the main idea of the article from a macro perspective, master the core of the text but also enables students to master language knowledge from a micro perspective. Interactive reading mode emphasizes both background knowledge and language knowledge and advocates student-centered. Students change from passive acceptance to active thinking in the classroom, and the role of English teachers also changes to guide, organizer, and assistant. The reading class can be divided into three stages according to the interactive reading mode. The three stages are before reading, during reading, and after reading, as shown in Table 2.

On the basis of the 3 stages of reading, it is extended to 6 steps: overview and questions before reading; prereading and careful reading during reading; and retelling and review after reading, as shown in Figure 6.

2.3. Teaching Philosophy. Reading lessons are learner-centred. It complements and stimulates students' relevant background knowledge and plans, creating context closely related to the subject. By carefully exploring and analyzing discourse, it guides students to use appropriate reading strategies: skip reading, speed reading, and others. It

Table 2: Three stages of reading.

Stage	Specific arrangements	Classroom utility	Significance (%)
Reading before	Introduce inspiration and guide predictions	Clarify the purpose of reading and activate background knowledge	20
Reading in	Presenting new knowledge	Constructing schemas effectively and developing reading strategies	20
After reading	Consolidate the schema and export the language	Guiding creative summaries and developing divergent thinking	60

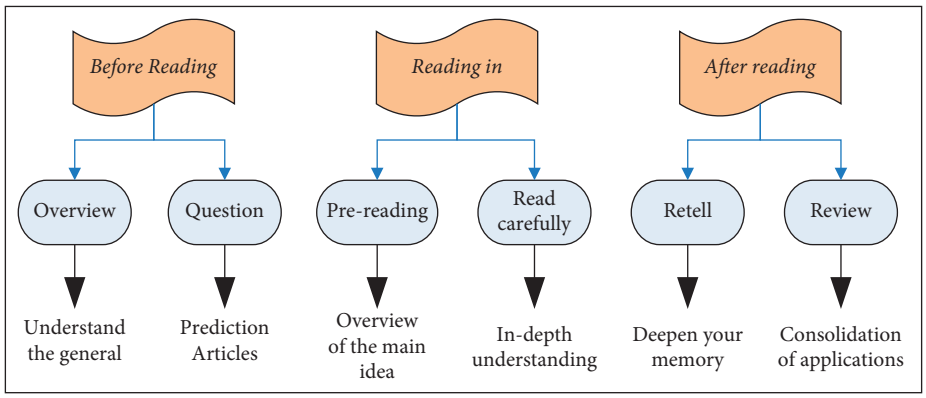

Figure 6: Three-stage six-step interactive reading model.

combines language learning, language skills development, cultural awareness development, and the use of learning strategies to create new programs that implement the goal of developing students' basic literacy skills.

3. Experimental

A combination of quantitative and qualitative research methods was used in this study to investigate the effectiveness of an interactive reading model at the secondary school level. The study used an experimental approach, with reading tests conducted both before and after the study. Questionnaires were conducted before and after the study, and two parallel classes were selected to compare the learning status of traditional English teaching methods and interactive reading methods in one semester. The purpose is to understand students' English reading status and their attitudes towards interactive reading and the effectiveness of interactive reading in English teaching. After the experimental study, the data from the English reading test and questionnaire were analyzed and discussed, as shown in Table 3.

Before the research experiment, a questionnaire was made, and the experimental object was a high school student's English reading status. In this paper, two classes with similar grades were randomly selected, the control class A and the experimental class B. Before the experiment, in order to check whether the control class A and the experimental class B are parallel classes, the English reading scores of the two classes were tested, and the scores were entered into SPSS21.0 for comparative analysis. Figure 7 shows the comparison of the group statistics of reading scores before

Table 3: Student performance in the survey class.

Survey subjects	Class A	Class B
Scores of 85–100	5	5
Scores of 70–84	44	45
Scores of 60–69	28	27
Below 60	23	23
Total number of people	100	100

and after the test. The questionnaire has three dimensions: reading attitude, reading habit, reading self-assessment, and descriptive statistics of the survey data. Figure 8 is a comparison of the results of reading self-assessment before and after the experiment in class B. Figure 9 shows the time spent reading in English outside of class by students in two classes every day.

As can be seen from Figure 7, before the experiment, the average reading score of control class A was 40.23, and the average reading score of test class B was 41.01. The difference between the average scores of the two classes was 0.22, indicating that there was no significant difference between the average scores of the control class and the test class before the experiment. After one semester of interactive English reading teaching, the average reading score of experimental class B was 43.74, and the average reading score of control class A was 40.85. The difference between the average scores of the two classes is large.

It can be seen from Figure 8 that after a semester of English teaching improvement combined with the interactive reading mode, the proportion of students in Class B who think they have both "disagree" and "strongly disagree" has decreased in "Reading English is easy," "Reading scores

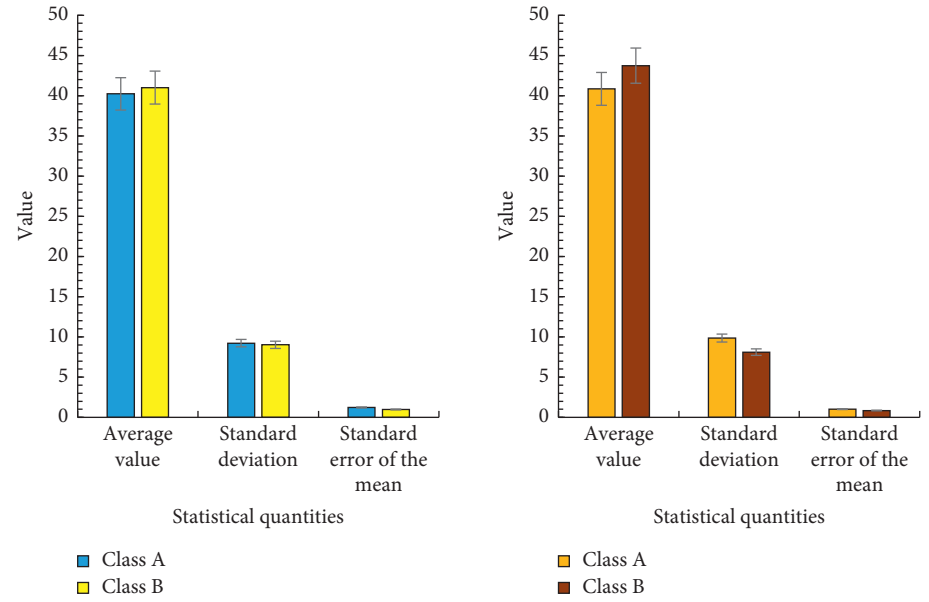

Figure 7: Comparison of group statistics of reading scores before and after the test.

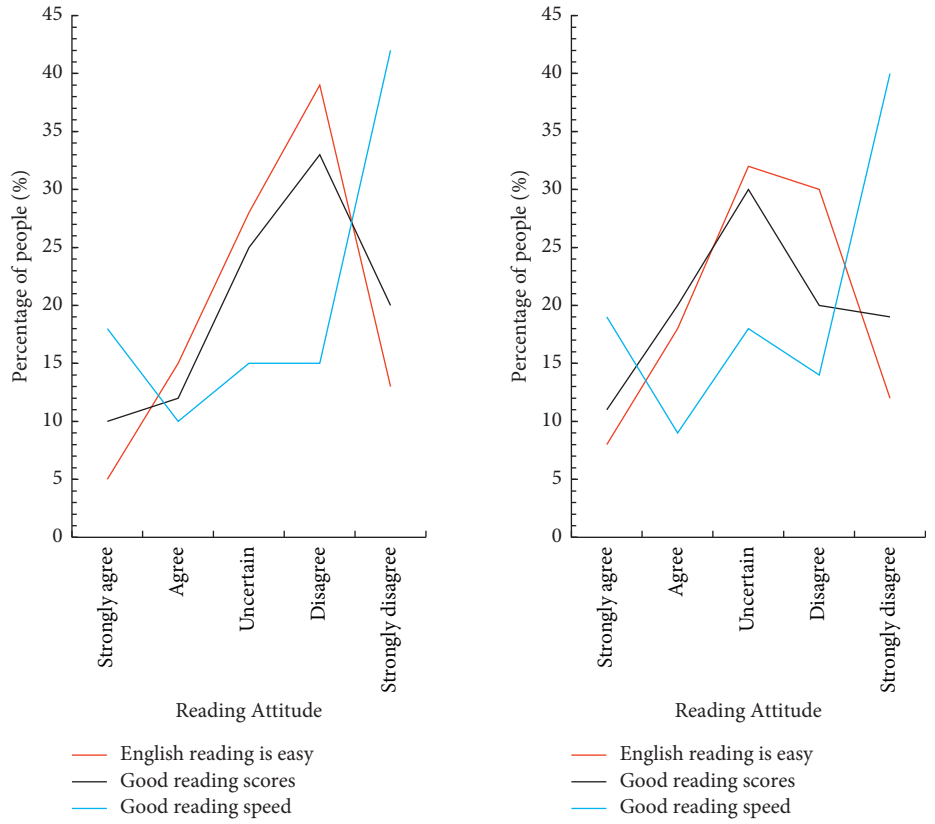

Figure 8: Comparison of reading self-assessment results before and after class B experiment.

are good," and "Reading speed is good." This reflects that after learning the teaching course combined with the interactive reading mode, students believe that their English level has been greatly improved in all aspects, and their self-confidence in learning has improved.

As can be seen from Figure 9, before the experiment, there was little difference in the time spent reading in English between class A and class B, but after one semester, the time spent in English reading in the two classes was quite different. The number of students in class B increased

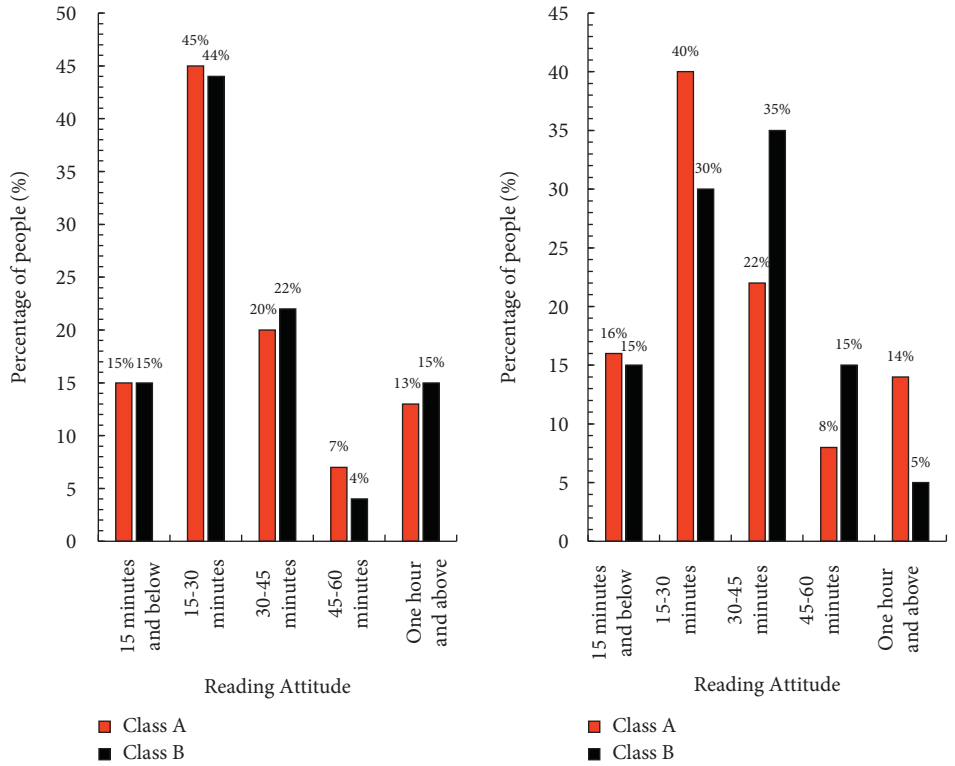

Figure 9: Students in two classes spend time reading in English outside of class every day.

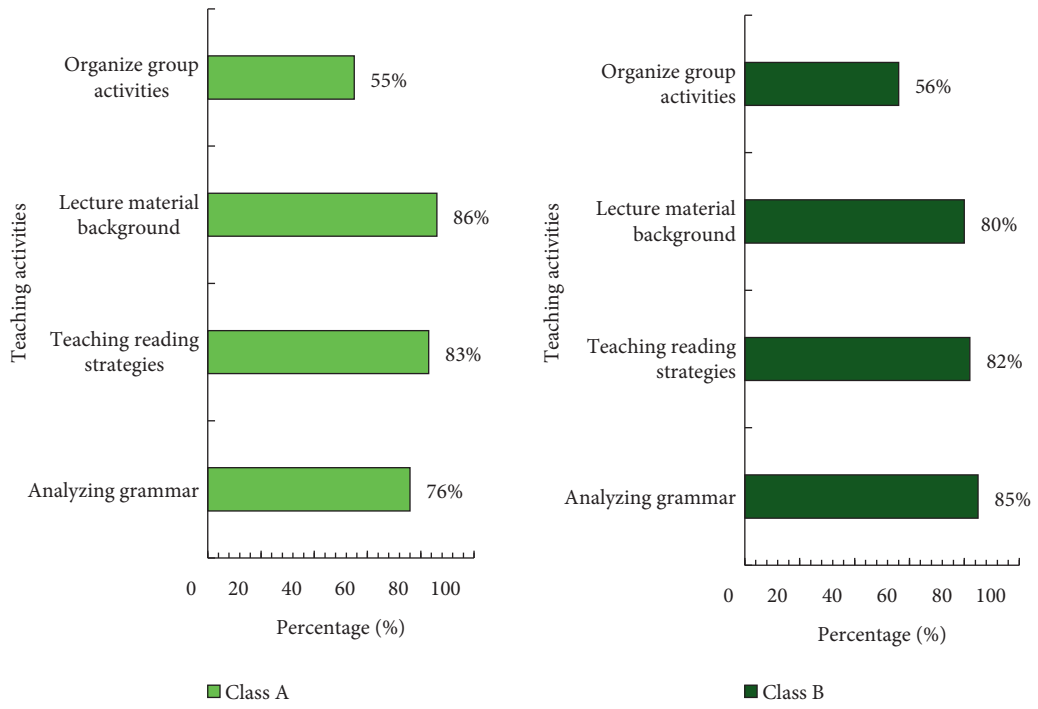

Figure 10: Survey results on what kind of reading classroom activities the two classes would like teachers to carry out.

significantly during the 30–60 minute period compared with before the experiment. Figure 10 shows the results of a survey on what reading classroom activities the two classes would like their teachers to carry out. The figure shows that more than 75% of the students in both classes want the teacher to analyze difficult words and sentences and explain grammar knowledge points in class. The second is to hope that teachers can teach more relevant reading skills and

strategies, and the teaching of relevant background knowledge is also an activity that students want teachers to carry out in the classroom. It is worth noting that more than half of the students in both classes hope that teachers will organize more group activities in the reading class and group members can discuss and cooperate to complete reading tasks and cultivate the spirit of cooperation. In this regard, students are clearly aware of the importance of teaching similar basic knowledge, reading strategies, and background knowledge in the reading class and hope that teachers can carry out more related activities in the reading class to improve their interest and confidence in reading.

After the English interactive reading mode, Class B has changed a lot from before the experiment. The English interactive reading mode guides students to properly interpret the text, judge the author's tone and implication, and distinguish between facts and opinions, all of which help to cultivate students' ability to analyze problems. It helps students to establish a complete logical chain, exercise English thinking, form a sense of English language, and promote students' in-depth thinking and analysis of the article. Students' reading comprehension scores are improved, thus improving students' reading ability.

4. Conclusion

English is one of the major international languages spoken in the world today and the most widely used language in the world. In the process of teaching English, reading is both a key and difficult teaching point. In order to help students use the interactive reading mode to read English effectively, this paper investigates the interactive reading mode based on multisensor information fusion and in testing the learning status of two parallel classes comparing the traditional English teaching method and the interactive reading method of English teaching within one semester, it is obvious that the interactive reading mode does play a positive role in students' English learning, effectively helping them to mastering vocabulary, grammar, and other language skills and performing reading comprehension reasoning and analysis levels. It can be found that the interactive reading mode is more conducive to improving students' English reading performance and teachers' English teaching effectiveness than the traditional teaching mode and the ability to enhance students' motivation and interest in English reading.

Data Availability

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

Conflicts of Interest

The authors declare no conflicts of interest.

References

[1] W. K. Chen, J. Chang, L. Chen, and R. Hsu, "Using refined kano model and decision trees to discover learners' needs for teaching videos," *Multimedia Tools and Applications*, vol. 81, no. 6, pp. 8317–8347, 2022.

[2] Y. Qiao, Z. Yin, L. Yan, G. Yingxin, and W. Ting, "Current development situation and trend analysis of meteorological new media based on public's demand," *Meteorological and Environmental Research*, vol. 8, no. 5, pp. 65–69+72, 2017.

[3] Q. Zhi, A. Ottley, and R. Metoyer, "Linking and layout: exploring the integration of text and visualization in storytelling," *Computer Graphics Forum*, vol. 38, no. 3, pp. 675–685, 2019.

[4] M. M. Rahman and A. Pandian, "A critical investigation of English language teaching in Bangladesh," *English Today*, vol. 34, no. 3, pp. 43–49, 2018.

[5] C. Kristjansson, "English language teaching: locating faith in the context of local and global dynamics," *International Journal of Christianity and English Language Teaching*, vol. 6, no. 1, p. 5, 2019.

[6] N. Toprakc and B. Zaydnl, "Textbooks IN English language teaching IN view OF globalisation, localisation and glocalisation," *International Journal of Teaching & Education*, vol. 8, no. 2, pp. 853–883, 2021.

[7] B. J. Liu, Q. W. Yang, and W. U. Xiang, "Application of multisensor information fusion in the fault diagnosis of hydraulic system," *International Journal of Plant Engineering and Management*, vol. 22, no. 1, pp. 12–20, 2017.

[8] Y. Lu, H. Wang, F. Hu, B. Zhou, and H. Xi, "Effective recognition of human lower limb jump locomotion phases based on multi-sensor information fusion and machine learning," *Medical, & Biological Engineering & Computing*, vol. 59, no. 4, pp. 883–899, 2021.

[9] X. Zhu, T. Shi, X. Jin, and Z. Du, "Multi-sensor information fusion based control for VAV systems using thermal comfort constraints," *Building Simulation*, vol. 14, no. 4, pp. 1047–1062, 2021.

[10] M. Mosalanejad and M. M. Arefi, "UKF-based soft sensor design for joint estimation of chemical processes with multisensor information fusion and infrequent measurements," *IET Science, Measurement & Technology*, vol. 12, no. 6, pp. 755–763, 2018.

[11] X Xiangyu, M. Wang, L. Luo, Z. Meng, and E. Wang, "An indoor pedestrian localization algorithm based on multisensor information fusion," *Journal of Computer and Communications*, vol. 5, no. 3, pp. 102–115, 2017.

[12] Y. Wang, G. Zheng, and X. Wang, "Development and application of a goaf-safety monitoring system using multisensor information fusion," *Tunnelling and Underground Space Technology*, vol. 94, 2019.

[13] W. X. Gu, "Application of learning by design into the cultivation of multiliteracies: a case study of college English teaching practice at Soochow university," *Language & Semiotic Studies*, vol. 4, no. 1, pp. 129–147, 2018.

[14] C. Y. Wong, "The use of L1 in English reading lessons of Hong Kong Chinese-medium secondary schools," *International Journal of Instruction*, vol. 13, no. 2, pp. 863–880, 2020.

[15] D. Stephana, N. Smit, and W. Lowie, "Influences of early English language teaching on oral fluency," *ELT Journal*, vol. 71, no. 3, pp. 341–353, 2017.