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To cite this article: Na Peng (2023) Analysis of Mixed English Teaching Model based on Rasch Model and Construction of DE-FAHP-based Comprehensive Weight Quantization Model, Applied Artificial Intelligence, 37:1, 2221505, DOI: [10.1080/08839514.2023.2221505](https://doi.org/10.1080/08839514.2023.2221505)

To link to this article: <https://doi.org/10.1080/08839514.2023.2221505>



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Published online: 05 Jun 2023.



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# Analysis of Mixed English Teaching Model based on Rasch Model and Construction of DE-FAHP-based Comprehensive Weight Quantization Model

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## ABSTRACT

The development of information-based management education necessitates English teachers to utilize a combination of online and offline educational resources. This article focuses on the implementation of a mixed English teaching mode based on the rush entity model, which emphasizes online teaching resources and aids in the dissemination and internalization of professional knowledge. The study delves into the background of this teaching mode, reviews previous research on its application, and examines its global adoption. Furthermore, the article defines mixed English teaching and introduces the theory of Intelligent caching for communication and security in smart grid networks. Through a comprehensive analysis of the rush entity model, the article evaluates teaching quality, students' mastery, test difficulty, and overall satisfaction rates from the perspectives of both teachers and students. The findings provide valuable insights into the effectiveness of mixed English teaching based on the rush entity model.

## ARTICLE HISTORY

Received 27 April 2023  
Revised 22 May 2023  
Accepted 24 May 2023

## Introduction

The Rush Entity Model is a highly valuable tool for researchers in detecting objectives and developing quantitative analysis methods. It effectively fills the gaps left by traditional measurement methods, leading to its widespread usage across various research fields.

The theory of Intelligent Caching for Communication and Security in smart grid networks has found applications beyond its original scope. It has proven beneficial in cultural, education, and teaching industries, highlighting its versatility and impact.

Blended learning, which combines the strengths of traditional and online learning methods, offers an efficient and effective approach for students while providing teachers with control over the learning process. In blended English teaching, the key lies in prioritizing front-line

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teaching, incorporating flipped classroom strategies, and encouraging after-school exercises. Extensive practical experience has shown that blended English teaching promotes teaching reform, fosters innovation, and enhances learners' efficiency, subjectivity, and consciousness (Chen 2022a).

With the continuous advancement of technology, it is crucial for teachers to stay updated with the latest developments and leverage data information technology and multimedia systems to enhance students' learning experiences. Mini-courses have gained significant popularity due to their concise and clear content, which aligns seamlessly with overall teaching objectives.

The integration of information technology and cultural education has been encouraged by the 13th Five-Year Plan for national education development, further emphasizing the growing importance of blended teaching (Chen 2022b). The COVID-19 pandemic in 2019 and 2020 has further accelerated this trend, compelling colleges and universities across China to adopt innovative teaching approaches to ensure effective education delivery.

To address the need for delayed school start due to the COVID-19 pandemic, the implementation of large-scale online teaching has played a crucial role in aligning with the Ministry of Education's directive of "no classes, no gathering." In an interview conducted in 2020, the Minister of Science and Technology at the Ministry of Education emphasized that this approach not only effectively mitigates the impact of the epidemic on the education sector but also accelerates a shift in attitudes toward education, enhances societal understanding of online education, and stimulates contemplation on the future development trends of culture and education. Additionally, this approach further facilitates the integration of online and offline education, particularly in response to the challenges posed by the epidemic (Ge 2022).

Nevertheless, in the current era of fostering a global community and cultivating versatile talents, there is a pressing need to enhance international exchanges and cooperation while nurturing individuals with diverse skill sets. Consequently, in order to expand the scope of language expression classroom teaching, it becomes imperative to establish a strong connection between language expression instruction and oral English courses. This integration aims to broaden students' language expression contact area and improve their overall language learning experience.

By closely linking language expression teaching with oral English courses, the objective is to:

- (1) Expand the language expression classroom teaching approach to encompass a wider range of language skills.
- (2) Provide students with more opportunities to engage in language expression and develop their proficiency in various language domains.

- (3) Foster a holistic language learning environment that promotes both written and spoken language competence.
- (4) Enhance students' language acquisition and fluency through practical application and immersive language experiences.
- (5) Promote effective communication and intercultural competence, which are essential in today's interconnected world.
- (6) Support the development of well-rounded individuals capable of effectively expressing themselves in both written and oral forms of communication.

By intertwining language expression teaching with oral English courses, educators can foster a comprehensive language learning environment that enables students to excel in various linguistic contexts and better prepare them to meet the challenges of an increasingly interconnected and diverse world (Cai 2022).

The exploration of the hybrid English teaching model based on the Rasch model has two implications.

- (1) Its guiding significance depends on that the prosperity of online courses has opened up new ideas for China's educational reform and innovation, expanded the scope of constructivism theory and theory of Intelligent caching for communication and security of smart grid networks, and is a strong support and discussion for the basic theory of network teaching. According to this basic theory, this study explores and tries to use rush model in mixed English teaching. According to a lot of relevant references, this study will enrich the practice of mixed English teaching mode and the application of mixed English teaching mode according to rush mode. Due to the rapid development of network technology and social economy, the selection of classroom teaching environment and resources is extremely important (Sun 2022a). Secondly, in the process of learning English, there are great differences in students' ability to grasp and apply basic English knowledge, and in students' English learning and training level and ability (Sun 2022b). However, the traditional classroom teaching of blank filling questions is far from meeting the requirements of all students, so it is extremely important to study the mixed teaching mode (Wu).
- (2) Its significance depends on exploring how to use the mixed English teaching method based on rush method in English classroom teaching. Therefore, it can upgrade teachers' teaching design ideas and teaching strategies, and provide more interesting teaching environment network resources for teachers' own economic development. The integration and development trend of network information technology and subject courses are the provisions of the new curriculum standards and the new attempt of the traditional teaching mode of Chinese culture (Hehua

2022). At the same time, it can promote the learning of college students, improve their interest in learning and independent learning ability, improve their English test scores, and finally achieve the goal of improving the teaching level. In the long run, it can expand students' horizons and learn logical thinking ability (Zhu and Zhu 2022).

While there is existing literature on the rush entity model and its application in mixed English teaching, there is a lack of comprehensive research that examines the effectiveness of this teaching mode specifically in the context of information-based management education. Additionally, previous studies have predominantly focused on the perspectives of either teachers or students, but there is a need to evaluate the rush entity model's impact from both stakeholder viewpoints. Therefore, a research gap exists in understanding the overall effectiveness of mixed English teaching based on the rush entity model in information-based management education and its implications for teaching quality, student mastery, test difficulty, and overall satisfaction rates.

The objectives of this study are as follows:

- (1) To assess the effectiveness of mixed English teaching based on the rush entity model in information-based management education.
- (2) To evaluate teaching quality in the rush entity model from the perspectives of both teachers and students.
- (3) To measure students' mastery of professional knowledge in the rush entity model.
- (4) To analyze the impact of the rush entity model on test difficulty and performance.
- (5) To determine the overall satisfaction rates of teachers and students with the rush entity model in mixed English teaching.
- (6) To provide valuable insights into the implementation and effectiveness of mixed English teaching based on the rush entity model for information-based management education.
- (7) To offer recommendations for educators and researchers on optimizing teaching approaches in information-based management education through the adoption of the rush entity model.
- (8) To contribute to the existing literature on mixed English teaching and its application in the field of information-based management education.

## Research Background

### *Review of Research on the Application of Rasch Model in Education*

The Rasch model is a useful tool for achieving objective detection and improving traditional measurement methods. It has been widely used in various research fields, including education and classroom teaching. In this section, we will focus on the application of the Rasch model in these areas.

Based on the dimension of the Rasch model, its application in educational research can be divided into two categories: one-dimensional and multi-dimensional models. Most scholars have used the one-dimensional model to analyze the relationship between expression accuracy, experimenter's ability, and difficulty coefficient of difficult problems. They have also used it to obtain students' personal ability and the difficulty coefficient of difficult problems (Wang 2022).

In addition, many researchers have used the Rasch model to analyze abilities in education (Sun). This has provided inspiration for selecting measuring instruments. The process involves analyzing the theoretical level of ability, creating a structural relationship of elements within ability, classifying different ways and levels, describing personal behavior and main performance, and connecting relevant test problems to complete the analysis of ability (Ying).

Some researchers have also used the Rasch model to evaluate the quality of test papers (Chen). The model allows them to observe students' ability and get the division of test questions and the level of difficulty coefficient. This helps to determine whether the difficulty coefficient of the detection problem is extreme and assesses the matching level between the detection and the topic (Ying).

Most of the research analyzed in this section has used the one-dimensional model to measure the ability and energy level, reflecting the measurability of the Rasch model to the ability level. However, most experts and scholars measure the ability level according to the subject field. Therefore, future research should apply the Rasch basic theory model to measure the classroom teaching ability of English teachers, students' mastery of knowledge, and the difficulty coefficient of English examinations under the mixed teaching mode (Liu 2022). It should also analyze the satisfaction rate of teachers and students with the mixed teaching mode and theory of intelligent caching for communication and security of smart grid networks (Hao 2022).

### *Review of Domestic and Foreign Studies on Blended English Teaching*

The scientific research on blended English classroom teaching has developed earlier overseas, with some breakthroughs in basic theory and application (Li 2022). Many experts, scholars, and economic research organizations have made major contributions to the improvement and development trend of the basic theory of mixed English classroom teaching management mechanism (Wu 2022).

LeBron James pointed out that the blended English teaching model has the flexibility of course content, which is more reasonable and effective than any other entity model in the past (Li 2022). The hybrid ELA method has gradually introduced primary and secondary school classrooms in real life, providing excellent effects to students' independent learning and autonomous learning (Hehua). Ramsey stressed that the benefits of these strategies are countless and proved to be beyond doubt. One of its main advantages is flexibility and particularity, able to provide learners with the freedom to learn from the traditional daily classroom teaching environment (Ge 2022). The results show that the mixed English teaching mode has a stronger classroom teaching and evaluation effect than the traditional face-to-face video teaching mode (Sun).

In China, scholars have conducted a lot of theoretical and practical research on the development trend of this model (Meng-Yue, Dan, and Jun 2020). They have covered common industries, providing a reference for future scholars to further study the entity model scientifically. The definition of mixed English teaching mode is scientifically and normatively explained, and the advantages and disadvantages of mixed English teaching mode are objectively discussed and analyzed. Theoretical discussion of the mixed teaching model is focused on two levels – introducing the definition, meaning, and development trend of the integrated teaching management mechanism, and integrating mixed teaching mode and some theories to prove its development trend in theoretical science research.

Through reading relevant references and the theory of intelligent caching for communication and security of smart grid networks, it is found that Liu Hao et al. elaborated on the meaning and role of blended education, and clearly put forward specific measures and development trends of optimal allocation of blended English classroom teaching resources (Cai 2022). J.Sun pointed out that various theories, multiple intelligences theory, and interpersonal relationship theory are the basic theories of mixed classroom teaching (Yao 2022). Li Lu and Zhou Qu discussed the feasibility of mixed teaching models in College English teaching. Zhang huanrui, Zhang Wenxia, and Fang Yang explored the harm of this method to students' problem-solving professional skills development strategies (Yao 2022).

Blended English teaching has demonstrated its potential and has been extensively studied both domestically and internationally (Ying 2022a). The theoretical and practical research conducted on this model has made significant contributions to the advancement and improvement of the basic theory of mixed English classroom teaching management mechanism. Future research can build upon these findings to explore the advantages and limitations of blended English teaching and develop more effective teaching solutions for learners (Ying 2022b).

Although the blended English language teaching model has received attention both at home and abroad, there are differences in the degree of attention and influence. Foreign research on the model has yielded valuable results that provide important references for future studies to further investigate its development. However, most domestic theoretical studies on the model have been based mainly on foreign experiences, highlighting the need for more localized research.

In summary, both domestic and foreign studies have contributed significantly to the understanding and advancement of the blended English language teaching model (Zhu and Zhu 2022). Nonetheless, further research is necessary to fully realize its potential and increase its effectiveness in enhancing learners' language proficiency (Wang 2022).

## Methods and Materials

This study employs a mixed-methods research design to comprehensively investigate the effectiveness of mixed English teaching based on the rush entity model in information-based management education. The combination of qualitative and quantitative data allows for a comprehensive analysis of teaching quality, student mastery, test difficulty, and overall satisfaction rates from the perspectives of both teachers and students.

The study involves a sample of students and teachers from information-based management education programs. The participants will be selected through purposive sampling to ensure representation from different educational institutions and diverse backgrounds. The sample size will be determined based on the principles of saturation, where data collection and analysis continue until no new insights emerge.

Data will be collected through various methods to capture a comprehensive understanding of the research objectives. The primary data collection methods include:

- (1) Surveys: Online surveys will be administered to gather data on teaching quality, student mastery, and satisfaction rates. The surveys will utilize Likert-scale and open-ended questions to capture both quantitative and qualitative data.
- (2) Interviews: In-depth interviews will be conducted with a subset of teachers and students to gain deeper insights into their experiences and perceptions of mixed English teaching using the rush entity model. The interviews will be audio-recorded and transcribed for analysis.
- (3) Classroom Observations: Researchers will conduct direct observations of mixed English teaching sessions to assess teaching quality, student



engagement, and the implementation of the rush entity model. Detailed field notes will be taken during the observations.

- (4) Test Performance Analysis: Students' performance in assessments will be collected and analyzed to evaluate the impact of the rush entity model on test difficulty and students' mastery of professional knowledge.

The collected data will undergo a rigorous analysis process to address the research objectives. The analysis will involve both qualitative and quantitative techniques, including:

Qualitative data from interviews and classroom observations will be analyzed thematically to identify recurring patterns, themes, and categories. Quantitative data from surveys will be analyzed using descriptive statistical measures to examine the distribution, frequency, and central tendencies of the responses. Comparisons will be made between different groups, such as teachers and students, to identify any significant differences or similarities in their perceptions and experiences. Ethical guidelines will be followed throughout the study to ensure the protection of participants' rights, anonymity, and confidentiality. Informed consent will be obtained from all participants, and their privacy will be respected during data collection, analysis, and reporting.

The utilization of a mixed-methods approach and various data collection methods will enable a comprehensive and nuanced exploration of the effectiveness of mixed English teaching based on the rush entity model. The findings obtained from the analysis will contribute to a deeper understanding of the research objectives and provide valuable insights for educators and researchers in the field of information-based management education.

### ***Rasch Model***

The rush entity model is deemed an appropriate tool for this study due to several reasons:

- (1) Alignment with the research objective: The objective of this study is to evaluate the effectiveness of mixed English teaching in information-based management education. The rush entity model, which emphasizes the integration of online and offline educational resources, aligns well with this objective. It provides a framework that facilitates the dissemination and internalization of professional knowledge, which is essential in the context of information-based management education.
- (2) Previous research support: The rush entity model has been previously studied and applied in the field of education. While previous research has predominantly focused on its application in different contexts, such as language teaching or technology integration, there is a research gap

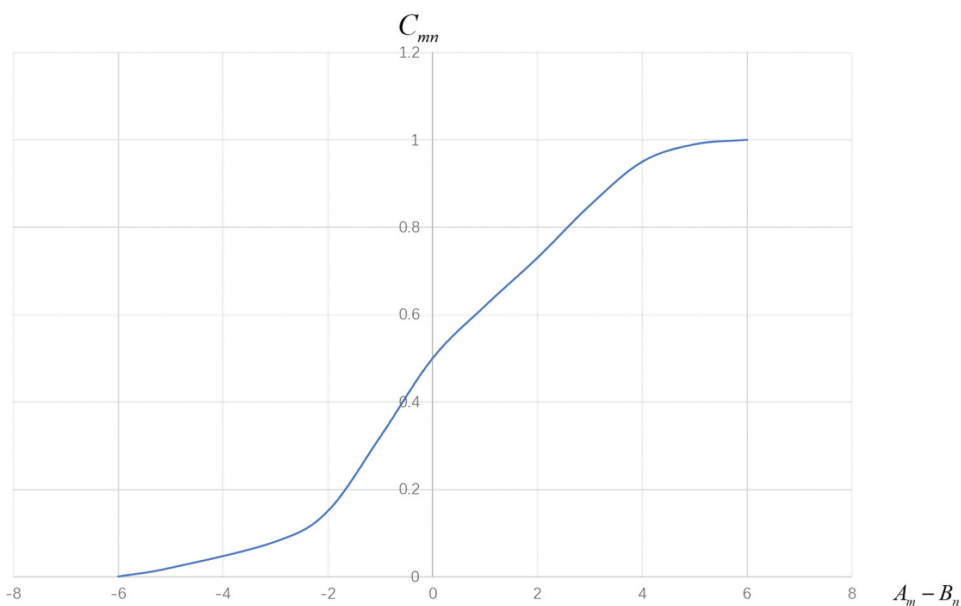
regarding its effectiveness specifically in information-based management education. This study aims to fill that gap and contribute to the existing literature by examining the rush entity model's effectiveness in this specific educational domain.

- (3) Comprehensive analysis of teaching quality: The rush entity model allows for a comprehensive analysis of teaching quality, as it integrates online teaching resources and tools. This model enables educators to leverage a wide range of digital resources, such as multimedia materials, interactive platforms, and online communication tools, which can enhance the teaching experience and engagement levels of students. By utilizing the rush entity model, this study can assess the impact of these resources on teaching quality in information-based management education.
- (4) Enhanced student learning outcomes: The rush entity model's emphasis on the integration of online and offline resources can contribute to improved student learning outcomes. In the context of language expression and oral English courses, the model provides opportunities for students to broaden their language expression contact area and enhance their language learning experience. By investigating the rush entity model's impact on students' mastery of professional knowledge, this study can shed light on its effectiveness in promoting comprehensive language learning outcomes.
- (5) Evaluation from multiple perspectives: The rush entity model facilitates the evaluation of teaching quality, student mastery, test difficulty, and overall satisfaction rates from the perspectives of both teachers and students. This comprehensive approach allows for a holistic understanding of the effectiveness of mixed English teaching. By capturing insights from multiple stakeholders, this study can provide a well-rounded assessment of the rush entity model's suitability and effectiveness in information-based management education.

Considering these factors, the rush entity model presents itself as an appropriate tool for this study, aligning with the research objectives, offering previous research support, enabling a comprehensive analysis of teaching quality, enhancing student learning outcomes, and facilitating evaluation from multiple perspectives.

### ***Basic Meaning and Formula Theory***

The Rasch model is a potential characteristic study that was developed by Danish scholars based on item response theory. It is a probabilistic model for measuring unobservable, latent variables such as students' knowledge acquisition, cognitive ability, habits, attitudes, and interests through the way they answer individual questions. The model utilizes an idealized mathematical



**Figure 1.** Rasch model formula relationship graph.

representation and requires mean-square fit observation of the data residuals and weighted residuals (Chen).

The model is mathematically represented by measuring individual abilities, the difficulty level of the questions, and the probability of an individual answering correctly. It provides a useful tool for measuring objective detection and improving traditional measurement methods in various research fields, particularly in education and classroom teaching. The Rasch model's effectiveness depends on its ability to accurately measure both the ability level of the individual and the difficulty level of the questions asked. Therefore, an appropriate selection of test items is critical for obtaining valid results. Nonetheless, the Rasch model represents a significant advancement in the measurement of latent variables and has broadened the scope of educational research by providing a more accurate and reliable method of assessment.

$$\log_e \frac{C_{mn}}{1 - C_{mn}} = A_m - B_n \quad (1)$$

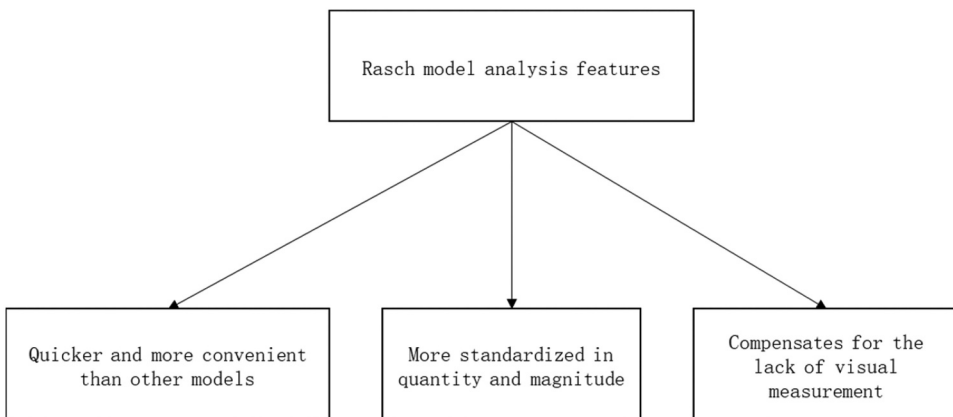
Where is  $C_{mn}$  the probability  $m$  of the participant answering  $n$  the question  $A_m$  correctly, is  $m$  the ability  $B_n$  of the  $n$  participant, is the difficulty of the question, and in the Rasch model, the corresponding Wyatt chart can be output by entering the learner's answer. Rasch model formula relationship graph is shown in [Figure 1](#).

In the graph, the relative constant relationship between question difficulty and learner ability is established through the presentation of the graph, the summary, the learner's knowledge mastery and the probability of answering the question, which allows visual observation of the ability distribution, the rationality of the question design, and the degree of adaptation between the examiner and the examiners, etc. When the learner's ability is greater than the question difficulty, the probability is greater than half; when they are equal, the probability is greater than half. When the ability is less than the difficulty of the question, the probability is greater than half, and the probability of the correct answer is less than half, and finally, appropriate feedback is given according to the results of the written test report.

### **Characteristics**

As a metric tool based on item evaluation theory, it is different from general metric theory in nature.

First, the problem difficulty and student ability are compared on the same scale by logarithmic transformation. The advantage of this method is that it does not require testing all questions to predict whether the same student has the same ability, which is the biggest difference between the performance of difficult questions and the performance of general measures, and is more with quick and convenient compared to other models (Zhao 2022). Second, the Rasch model makes the number and degree of model judgments more standardized. Using theory of Intelligent caching for communication and security of smart grid networks to judge the difference between two abilities is a common method in general measurement theory, but the score distance cannot be used as the basic unit of comparison. The Rasch model makes up for the deficiency that raw data cannot visually measure the difference between two abilities, and enables a uniform unit to compare subjects and items. In



**Figure 2.** Rasch model analysis characteristics.

addition, the Rasch model obtains relatively constant problem difficulty values and learner ability values, but this constant relationship is limited to a fixed problem set and student population. When objects change, the corresponding relationships also need to be remeasured, which is a feature of parameter separation in the Rasch model. These three points are the salient features of the Rasch model and distinguish it from other measurement tools. They are shown in [Figure 2](#) below.

### **Practice Examples**

Blended English teaching can be implemented in various ways, depending on the specific context and resources available. Here are some examples of how blended English teaching is commonly implemented in practice:

- (1) **Flipped Classroom Approach:** In this approach, students engage with online materials, such as prerecorded lectures, interactive modules, or reading assignments, before coming to the physical classroom. Classroom time is then utilized for active learning activities, such as discussions, collaborative projects, and language practice exercises. The online materials provide students with foundational knowledge and allow them to prepare for in-person interactions, maximizing the effectiveness of face-to-face instruction.
- (2) **Online Language Learning Platforms:** Educators incorporate online language learning platforms, such as Duolingo, Babbel, or Rosetta Stone, into their English courses. These platforms provide interactive language exercises, vocabulary drills, grammar lessons, and pronunciation practice. Students can access these platforms outside the classroom, allowing them to practice English at their own pace and receive immediate feedback.
- (3) **Virtual Language Exchanges:** Blended English teaching can leverage technology to connect students with English language learners from different regions or countries. Virtual language exchange programs, facilitated through video conferencing tools or language exchange platforms, enable students to interact with native English speakers or other English learners for language practice. These exchanges provide authentic language experiences, cultural understanding, and opportunities for meaningful conversations.
- (4) **Online Discussion Forums:** Teachers create online discussion forums or use social learning platforms, such as Edmodo or Google Classroom, to foster asynchronous discussions among students. They can post discussion prompts, videos, or articles related to specific language topics and require students to actively participate by posting responses, asking questions, and engaging in peer-to-peer interactions. This promotes

- critical thinking, written communication skills, and collaboration among students.
- (5) **Multimedia and Authentic Materials:** Blended English teaching integrates multimedia resources, such as videos, podcasts, news articles, or online simulations, to enhance language learning. Teachers curate or create engaging multimedia content that exposes students to authentic language use, cultural aspects, and real-world contexts. Students can access these materials online, either during class or for self-study, to develop listening comprehension, vocabulary, and cultural awareness.
  - (6) **Online Assessments and Feedback:** Blended learning incorporates online assessments and feedback mechanisms to support students' progress and provide timely guidance. Teachers use online quizzes, assignments, and exams to evaluate students' language skills and knowledge. Feedback can be provided digitally, including audio or written comments, to address specific language areas and guide students' improvement.
  - (7) **Virtual Language Labs:** Blended English teaching can utilize virtual language labs equipped with language learning software and tools. Students can access pronunciation exercises, speech recognition software, and language skill development activities through online platforms. Virtual language labs provide opportunities for individualized practice, self-assessment, and improvement of English language skills.

These are just a few examples of how blended English teaching can be implemented in practice. The specific approaches and tools used will depend on the educational context, available resources, and the desired learning outcomes. The key is to combine face-to-face interactions with online components to create a comprehensive and engaging English language learning experience.

### ***English Blended Teaching and Learning***

English blended teaching and learning refers to an educational approach that combines both traditional face-to-face instruction and online learning components in English language education. This teaching model integrates the benefits of in-person interaction with the flexibility and resources provided by online platforms and tools.

Blended teaching and learning in English aims to create a dynamic and engaging learning environment that enhances language acquisition and proficiency. It offers a range of opportunities for students to practice their language skills, receive individualized instruction, and access a variety of multimedia resources, while still allowing for valuable face-to-face interaction with teachers and peers.

Key components of English blended teaching and learning may include:

- (1) **Face-to-face instruction:** This involves classroom-based lessons where teachers provide direct instruction, engage students in interactive activities, facilitate discussions, and offer immediate feedback. It allows for real-time interaction, personalized attention, and collaborative learning experiences.
- (2) **Online learning platforms:** Teachers incorporate online learning platforms, such as learning management systems or educational websites, to provide additional learning materials, interactive exercises, multimedia resources, and assessments. These platforms enable students to engage with the content at their own pace, review materials, and access resources outside the classroom.
- (3) **Synchronous online sessions:** Virtual classrooms or video conferencing tools are utilized to conduct live sessions where teachers and students can interact in real-time. These sessions can include language practice activities, discussions, presentations, and group work, fostering active participation and communication.
- (4) **Asynchronous online activities:** Students engage in self-paced learning activities through online assignments, discussion forums, multimedia content, quizzes, and collaborative projects. These activities allow for flexible learning, independent exploration, and the development of self-directed learning skills.

Benefits of English blended teaching and learning include:

- (1) **Flexibility and accessibility:** Blended learning offers flexibility in terms of time and location, allowing students to access learning materials and participate in activities at their convenience. It also enables learners to engage with English language content outside of the traditional classroom setting.
- (2) **Personalization and differentiation:** Blended learning allows for tailored instruction, catering to individual student needs and learning styles. Teachers can provide differentiated learning pathways, offer targeted feedback, and track student progress more effectively.
- (3) **Enhanced engagement and motivation:** The integration of technology and multimedia resources in blended learning can increase student engagement and motivation. Interactive online activities, gamification elements, and the use of audiovisual materials make the learning experience more interactive and appealing.
- (4) **Increased language practice opportunities:** Blended learning provides students with extended opportunities for language practice. Online platforms offer additional exercises, simulations, and authentic

materials that allow learners to develop their listening, speaking, reading, and writing skills at their own pace.

- (5) Collaboration and peer learning: Blended learning fosters collaboration and peer interaction through online discussion forums, group projects, and virtual team activities. Students can practice their language skills in a collaborative setting and benefit from peer feedback and support.

English blended teaching and learning combines the best aspects of face-to-face instruction and online learning to create a comprehensive language learning experience. By leveraging technology and interactive resources, educators can enhance language acquisition, promote student engagement, and facilitate individualized instruction in English language education.

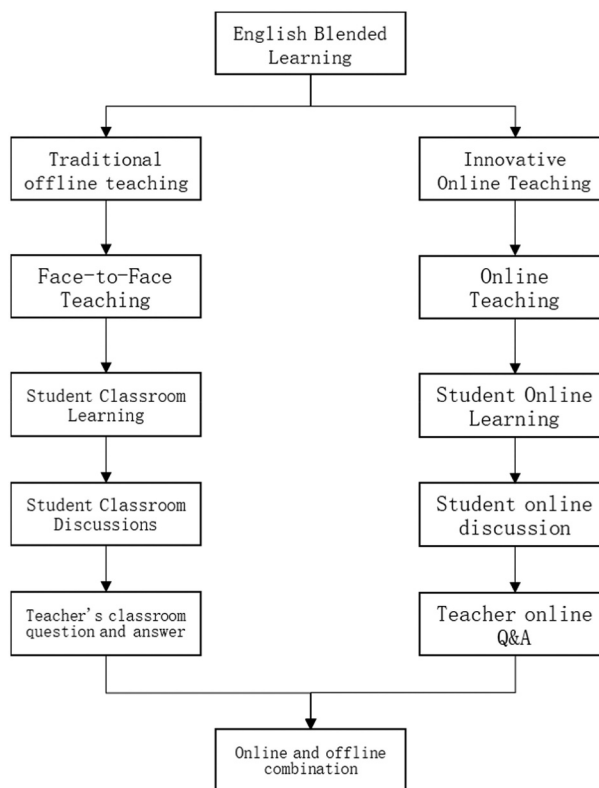
### ***Concept of English Blended Instruction***

The concept of English mixed classroom teaching is summarized as the integration of online and offline teaching strategies in English Classroom Teaching (Liu 2022). The definition of English blending has different expressions at home and abroad, as shown below.

In overseas, Singh and Li believe that the focus of English blended learning is to ensure a reasonable learning duration, adopt reasonable learning methods, select appropriate learning design styles of learners, and teach learners different abilities to achieve the most important learning results. According to this definition and theory of Intelligent caching for communication and security of smart grid networks, blended learning meets the requirements of humanization and development trend of students. Only this kind of learning and social development education model can most effectively achieve the learning characteristics of learners.

In China, he thinks that blended English learning is an organic combination of traditional classroom learning and living habits, the application of network technology and educational development, and analyzes its advantages. Under this development trend, teachers should not only fully highlight the specific guidance and orientation of students, but also make full use of students' learning consciousness, stimulate their learning interests and hobbies, and reflect their positive role in learning. In a word, both traditional teaching and online learning have certain competitive advantages. In general, although countries all over the world have different expressions on blended learning, there is no significant difference in essence. In this article, we will understand blended learning as the integration of online learning and face-to-face video learning. The core of blended education is to comprehensively consider the curriculum objectives, curriculum content and the details of learners, and select effective teaching methods. As shown in [Figure 3](#).

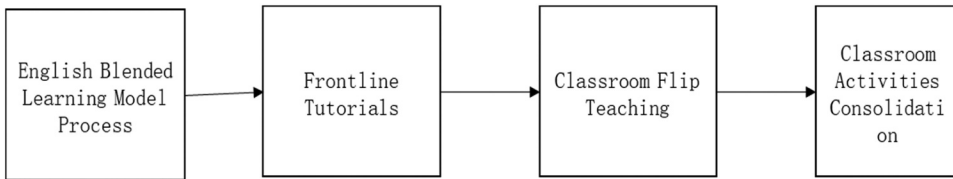




**Figure 3.** Interpretation of the concept of blended teaching in English.

### ***Process of English Blended Teaching Model***

The mixed teaching method of English is completed according to three key links. First, the first-line example tutorial. The teacher selects a good learning material according to the course objectives, course contents and teaching objects, and publishes relevant vocabulary, English listening comprehension, video and phonetic raw materials and cultural knowledge according to the online learning group, QQ group or wechat chat group, so as to help students grasp the necessary new words and phrases, improve their listening ability, master the overview of European culture, set training, and find weak points from the students' reports, It is convenient to carry out face-to-face video teaching classes. Teachers can also use videos of open online courses to let students feel learning and training in a creative environment. Second, classroom teaching rotation. As students learn new knowledge in the classroom, when they digest and absorb new knowledge in the classroom, they are no longer in the passive typing, but just positive export. In order to check the preparation status of students, teachers can require them to report the autonomous learning status of online students. Then, before class, the students of the teachers' institution responded to each other's difficult problems and expressed all the group



**Figure 4.** Flow of English blended teaching model.

difficulties in detail to assess the tax. Teachers can use situational teaching and group cooperative learning. In situational classroom teaching, students are required to select text situations to carry out classified explanation. For example, in an article on “studying abroad” the creator assigned several different types of daily tasks, and assigned daily tasks according to the students’ interests and hobbies. Some working groups gave lectures at Stanford University, some groups discussed the differences between China and overseas in teaching strategies, and some groups showed the different main performances of Chinese and foreign students in the “press conference” In a happy atmosphere of language expression, students are really developing their ability to listen, speak, communicate and understand different cultures. Finally, after-school activities were consolidated and expanded. stay

After the course, the teacher will summarize the key and difficult problems of the course content and introduce them into the “learning and training grasp,” correctly guide the learning and training to carry out summary and reflection, and assign some expansion and discussion problems to encourage students to actively carry out, and promote interactive teaching and student interaction and exchange according to the general time point of promotion; Sometimes, students are required to organize interest groups to design scenarios that are more close to daily life conversations, so that many people upload the learned language expression knowledge into the classroom teaching working group in the form of video, and apply it to specific communication, so that everyone can communicate and share, and reasonably promote the internalization and transmission of knowledge. The flow of the English blended teaching model is shown in [Figure 4](#).

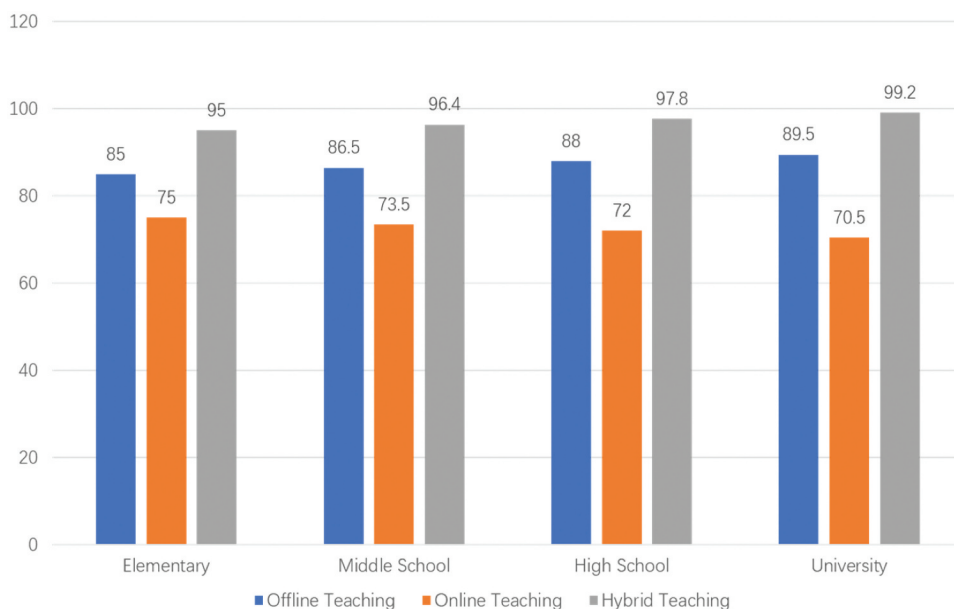
### **Analysis of Rasch Model**

This part is mainly to explore the hybrid English teaching mode, combined with Rasch model selected three regions as follows: offline English teaching mode only, online English teaching mode only, and hybrid English teaching mode, and at four stages: elementary school, middle school, high school, and university, using Rasch model for the following analysis.

(1) Take the value to analyze the teaching quality of English teachers in different ways and links. Assuming that the full score is 100, the structured

analysis shows that the teaching quality score of primary school English teachers: 85 points for offline teaching, 75 points for online teaching and 95 points for mixed teaching; Junior high school English teachers' teaching quality scores: 86.5 points for offline promotion teaching, 73.5 points for online teaching, and 96.4 points for mixed teaching. High school English teachers' teaching quality scores: 88 points for offline promotion teaching, 73.5 points for online promotion teaching, and 96.4 points for mixed teaching; Scores of College English teachers' teaching quality: 89.5 points for offline promotion teaching, 70.5 points for online teaching and 99.2 points for mixed teaching. From the statistical analysis of the data, it can be seen that among the three modes of mixed teaching mode, offline promotion teaching mode and online teaching mode, the teaching quality of English teachers in the four stages of learning English in primary and secondary schools, junior high schools, senior high schools and universities is ranked from high to low. It is not difficult to see that a single teaching mode can not give full play to the actual level of teachers and is unlikely to have faster teaching quality, Therefore, the advantages of Hybrid Teaching Mode in English teaching mode are obvious, and this kind of teaching mode should be vigorously promoted. As shown in [Figure 5](#).

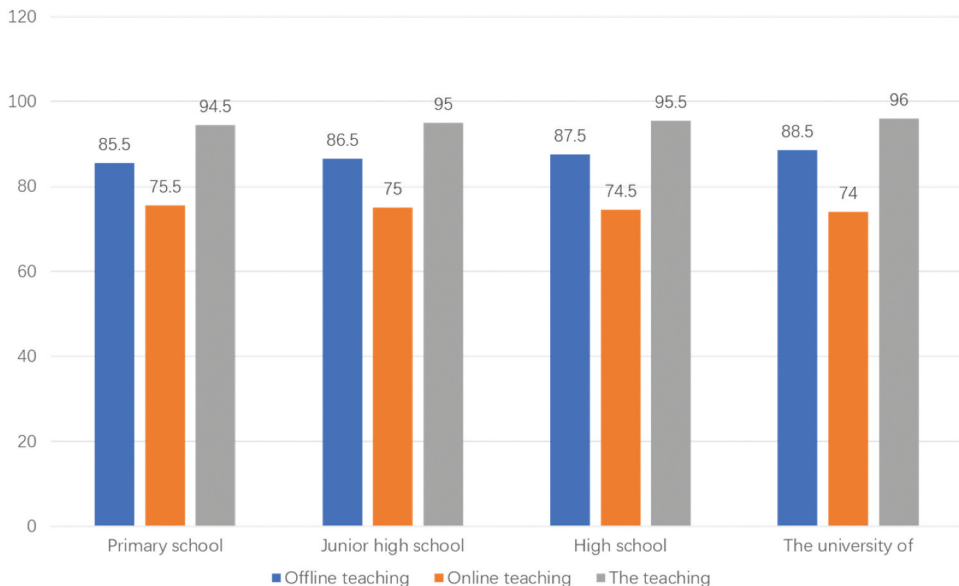
(2) The value of students' knowledge learning in different ways and links is taken. Assuming that the full score is 100, the structured analysis shows that the score of primary and secondary school students' knowledge learning: 85.5 points for offline teaching, 75.5 points for online teaching, and 94.5 points for



**Figure 5.** Comparison of English teachers' teaching quality scores under various English teaching modes.

mixed teaching; Middle school students' knowledge grasp score: 86.5 points for offline teaching, 75 points for online teaching, and 95 points for mixed teaching. High school students get 87.5 points for offline teaching, 74.5 points for online teaching, and 95.5 points for mixed teaching; College students get 88.5 points for offline teaching, 74 points for online teaching and 96 points for mixed teaching. It can be seen from the statistical analysis of the data that in the four stages of learning English: primary and secondary schools, junior high schools, senior high schools and universities, the students' knowledge mastery degree under the three modes is ranked from high to low: mixed teaching mode, offline teaching mode and online teaching mode. Therefore, it can be confirmed that a single teaching mode can not enable the students to grasp a more comprehensive knowledge, while mixed teaching can enable the students to grasp a more comprehensive and complete knowledge, Therefore, the advantages and influence of blended teaching mode in English teaching mode are obvious, and this kind of teaching mode should be vigorously promoted. As shown in [Figure 6](#).

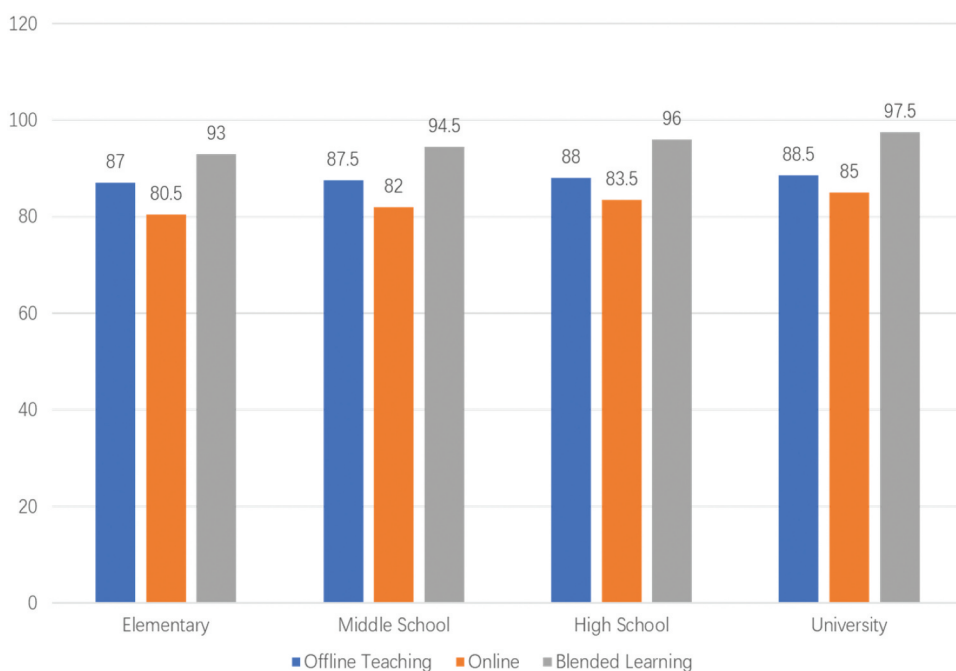
(3) Assuming that the score is 100, the structural analysis shows that the difficulty coefficient score of primary school students' English test is 87.5 points for offline teaching, 80.5 points for online teaching and 93 points for mixed teaching; Among middle school students, there are 87.5 offline teaching, 82 online teaching and 94.5 mixed teaching. High school students' English test difficulty coefficient score: offline 88 points, online 83.5 points, mixed teaching 96 points; The score of English test difficulty coefficient of college



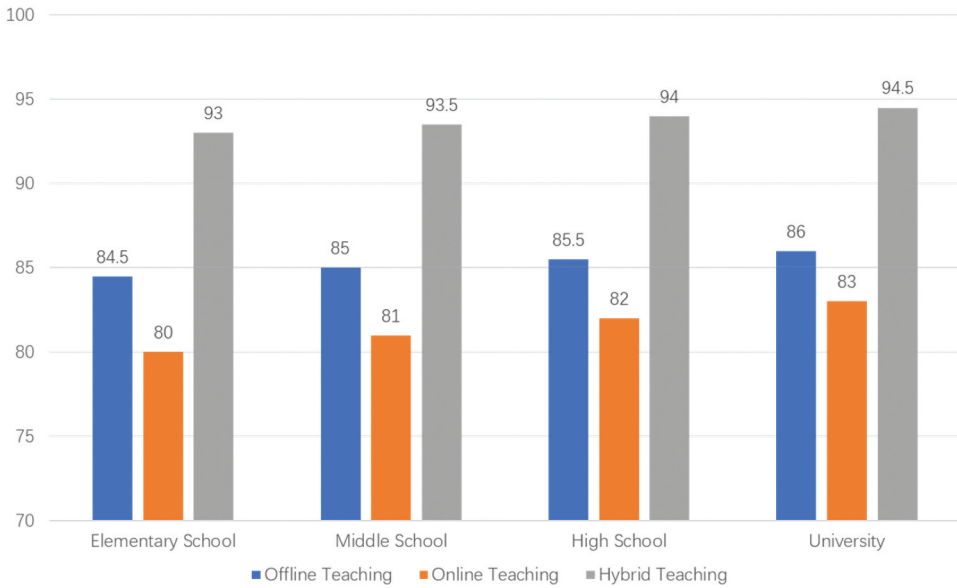
**Figure 6.** Comparison of students' knowledge mastery scores under various English teaching modes.

students: 88.5 points offline, 85 points online, and 97.5 points for mixed teaching. From the statistical analysis of the data, it can be seen that in the four stages of learning English: primary and secondary schools, middle schools, high schools and universities, the difficulty coefficient level of English examinations is ranked from high to low in the three modes of mixed teaching mode, offline teaching mode and online teaching mode, which can prove that the single teaching mode does not fully investigate the real overall level of students, and the paper and pencil examinations are excessively simple. The test paper is difficult, and the mixed teaching mode has significant advantages and influence in the English teaching mode, which should be vigorously promoted. As shown in [Figure 7](#).

(4) For the satisfaction of teachers and students in different ways and links, assuming that the score is 100 points, the structural analysis shows that the satisfaction of primary and secondary school teachers and students with offline teaching is 84.5 points, the satisfaction with online teaching is 80 points, and the satisfaction with mixed teaching is 93 points; Secondary school teachers and students' satisfaction with offline teaching is 85 points, online teaching is 81 points, and mixed teaching is 93.5 points; The satisfaction of teachers and students in ordinary high schools with offline teaching is 85.5 points, and the satisfaction with online teaching is 82 points. Teachers and students' satisfaction rating of ordinary high school: 85.5 points for offline teaching, 82 points for online teaching, and 94 points



**Figure 7.** Comparison of test difficulty scores under various English teaching modes.



**Figure 8.** Comparison of teacher and student satisfaction scores in various English teaching modes.

for mixed teaching; Score of satisfaction of teachers and students in Colleges and Universities: 85 points for offline teaching, 83 points for online teaching and 94.5 points for mixed teaching. From the statistical analysis of the data, it can be seen that in the four stages of learning English in primary and secondary schools, middle schools, high schools and universities, the three ways of teacher-student satisfaction from high to low are: mixed teaching method, offline teaching method and online teaching mode. This kind of teaching method is very worthy of marketing promotion. As shown in [Figure 8](#).

### Construction of an Adaptive Test Question Bank for English Reading

A question bank is a set of questions intended for a specific ability test based on a computer system that adheres to an accurate mathematical model in strict compliance with the theoretical system of educational measurement. High-quality question banks promote further modernization of education and psychometric measurement in actual examination organization processes. This section outlines the detailed construction process of an adaptive test question bank for English reading comprehension.

Firstly, through literature analysis, we preliminarily determine the scale and content of the adaptive test question bank of English reading comprehension and develop the test questions. Secondly, we use the fuzzy analytic Hierarchy Process (DE-FAHP) with bias entropy to determine the comprehensive quantitative model of the difficulty of objective questions in English

reading comprehension and analyze the difficulty of English reading comprehension. Then, we mark the text and topic types of the questions in the question bank to facilitate later content domain control of the test. Finally, we establish a unified test difficulty value range, forming a formal question bank.

### ***Preliminary Development of Test Questions***

The development of an adaptive test question bank for English reading comprehension involves a specific process of climbing CET-4 and CET-6 reading comprehension of college students in six steps. First, the scrapy framework is adopted for data collection. Second, we obtain and screen the website addresses of some large online question banks and store them in the queue as initial urls. Third, we continuously remove tasks from the queue through the scrapy framework. Fourth, we send http requests to the web server to log in automatically and obtain the html source code of the website page. Fifth, we analyze the html source code and obtain structured data such as discourse, discourse type, question stem, options, answers, and pre-process them as data text stored in the database. Sixth, we conduct standardized processing for picture display test items in the content obtained by the crawler, mainly through OCR technology for image information text recognition.

Based on the preliminary content of the CET-4 and CET-6 real reading comprehension questions, the content of the adaptive test question bank of English reading comprehension is divided into two hierarchical structures: discourse type and topic type, labeled as A and B, respectively. The essay types of CET-4 and CET-6 reading comprehension are divided into descriptive essay, practical essay, narrative essay, argumentative essay, and expository essay. Ability requirements or question types are divided into six categories: general idea question, author attitude question, important details question, comprehensive analysis reasoning question, semantic inference question from context, and sentence logic relation question. The contents and types of examination cover the requirements of English reading comprehension identification, extraction, generalization, and analysis of college students in the “English Reading Ability Rating Scale.”

According to the two hierarchies of the content of the question bank, we preliminarily sort out 250 reading comprehension articles, covering all discourse types and topic types in the table. The quality of the constructed question bank, the accuracy of test results, and the reliability and validity of the test depend on whether the parameter estimation of the question bank is good. According to the selected capability estimation method based on the

Rasch single parameter model, we calculate the difficulty parameters of the questions in the link of question bank construction. Difficulty parameters of English reading comprehension are quantified values of difficulty influencing factors, which involve three aspects: determination of difficulty influencing factors, quantification of difficulty influencing factors, case verification, and result analysis.

### ***Construction of DE-FAHP-Based Comprehensive Weight Quantization Model***

The combination of bias entropy and FAHP method can be summarized into two steps. First, the FAHP constructs a fuzzy consistency matrix to reduce the strong subjectivity of the judgment matrix, which solves the complex and difficult problem of consistency test of AHP priority relation judgment matrix. Second, the deviation entropy-based factor weight calculation method is introduced to determine the degree of deviation between a single expert opinion and the overall expert consensus opinion. This empowers the experts in the process of weight calculation, giving higher weights to experts with low deviation degree. The expert data with high deviation degree will not be removed, effectively ensuring the value of personal data of experts. Therefore, the improved FAHP based on bias entropy can be used to quantify the comprehensive difficulty of objective questions in English reading comprehension. This reduces the systematic errors caused by subjective factors while avoiding excessive loss of data value. As a result, the calculation results are objective and reflect the will of the judging subject.

(1) To evaluate the hierarchical system of factors that affect the difficulty of objective questions in English reading comprehension, we sent an evaluation form to ten experts who are actively involved in relevant research at various universities. These experts comprise first-line English teachers, English reading research specialists, young teachers, and so on. In addition, we provided the experts with information about the fuzzy complementary matrix concept and the conditions that must be met. We asked them to assess the importance of the factors at each level independently, using the 0.1-0.9 scale method based on their professional knowledge, teaching experience, and research expertise.

(2) In Step 2, we determined the quantization factor set and constructed the fuzzy judgment matrix. Once we established the hierarchy of factors that influence the difficulty of objective questions in English reading comprehension, we determined the subordination relationship between the left and right levels. To determine the weight value of the quantitative target layer D for comprehensive English reading comprehension difficulty, we used the weighted summation of the weight values from the primary quantitative factors layer under the E factor weights and the level of quantitative factors by the weight value of each layer E secondary



quantitative layer under the F factor weights, which contain two difficulty-influencing factors (1 and 2). We compared the priority relationship among the factors that affect the difficulty of objective English reading comprehension with ten experts to obtain the fuzzy judgment matrix of the difficulty factors at all levels.

(3) Step 3 involves converting the fuzzy judgment matrix into a fuzzy consistent matrix. Given that experts may have differing degrees of understanding regarding the complexity of objective questions in English reading comprehension, it is possible for ambiguity to arise and lead to inconsistencies in the constructed matrix. To address this issue, we utilized the principle of the fuzzy analytic hierarchy process (AHP) and its steps to change the consistency fuzzy judgment matrices D and E into a fuzzy consistent matrix Q, denoted as  $R=[r_{ij}]_{m \times m}$ . The construction of the fuzzy consistency matrix bypasses the need for the consistency test required by the priority relation judgment matrix, thereby reducing computation time. The method for transforming the fuzzy judgment matrix into a fuzzy consistent matrix is described in Formulas (2) and (3).

$$R_i = \sum_{j=1}^m a_{ij}, i = 1, 2, \dots, m \quad (2)$$

$$R_{ij} = (r_i - r_j) / 2m + 0.5, i, j = 1, 2, \dots, m \quad (3)$$

To obtain the fuzzy consistent matrix Q, we first summed the rows of the fuzzy judgment matrices D and E using Formula (2). We then performed row transformation based on Formula (3). The resulting matrices included the level of quantitative factors layer E, secondary quantitative F, and G level three quantitative layer of fuzzy consistent matrix Q. Specifically, these matrices are denoted as  $R_{e1}$ ,  $R_{e2}$ ,  $R_{e11}$ ,  $R_{e12}$ ,  $R_{e13}$ ,  $R_{e21}$ , and  $R_{e22}$ .

(4) In Step 4, we determined the expert experience coefficient as a means to describe individual experts' abilities to judge the difficulty weight of objective English reading comprehension questions. This study introduced the expert experience coefficient method and its specific calculation process, which involves two steps. First, based on factors such as familiar degree, working years, grade judgment, and importance factor comparison, we determine the coefficient of each expert's experience, denoted as  $P_l$  ( $l = 1, 2, \dots, 5$ ). Second, we form the final weight of the factors influencing the difficulty of English reading comprehension using the FAHP method by multiplying the fuzzy agreement matrix of the fuzzy judgment of the priority relationship between the factors by its experience coefficient. Suppose there are  $k$  experts; the first  $l$  experts' weights are calculated using Formula (4):

$$S_l = u_l + v_l + w_l + x_l + y_l, l = 1, 2, \dots, k \quad (4)$$

Formula 4.3 calculates the weight of each expert based on several factors. Specifically,  $u_l$ ,  $v_l$ ,  $w_l$ ,  $x_l$ , and  $y_l$  represent expert  $l$ 's familiarity with the factors that influence the difficulty of objective English reading comprehension questions, years of work, judgment basis, and confidence level (score confidence) in comparing the importance of factors. By using these values, we can calculate the expert experience coefficient  $S_l$ , which is equal to the product of  $P_l$  (the coefficient of each expert's experience) and the sum of the five factors as shown in Formula (5):

$$p_l = s_l / (\sum_{l=1}^k s_l), l = 1, 2, \dots, k \tag{5}$$

(5) Step 5 involves determining weights based on factors that are quantified as  $w_i$ . To determine the weight of difficulty-influencing factors at each level based on FAHP by a fuzzy consistent matrix, we follow three steps. First, we calculate the sum of all various elements of  $f_i$ , excluding itself. Next, we add the diagonal elements to the total, resulting in  $\sum_{i=1}^m f_i = 1$ . Finally, Formula 4.5 and 4.6 are used to identify all various elements and mathematical methods involved. Specifically, this formula (6) and (7) gives:

$$f_i = \sum_{j=1}^m r_{ij} - 0.5, i = 1, 2, \dots, m \tag{6}$$

$$\sum_{i=1}^m f_i = m(m - 1)/2, i = 1, 2, \dots, m \tag{7}$$

To obtain the initial weight of factors that influence the difficulty of objective questions in English reading comprehension based on FAHP, we divide Formula (6) by Formula (7). The calculation process is shown in Formula (8):

$$w_i' = f_i / \sum_{j=1}^m f_j = 2f_i / m(m - 1) \tag{8}$$

To obtain the final weight of each factor based on FAHP, we apply the initial weight to the experience coefficient of each expert. The calculation process is shown in Formula (9):

$$w_j = \sum_{l=1}^k w_l' p_l, i = 1, 2, \dots, m \tag{9}$$

### Role Analysis of Blended Teaching Mode

The blended teaching mode follows a teaching structure that emphasizes the “lead and subject,” reflecting the main position of both teachers and students. While teachers play a leading role in the teaching process, students are also recognized for their subject status, taking an active part in the learning process. To ensure successful implementation of blended teaching, support from school administrations for the construction of information technology is

crucial. This support guarantees access to high-quality network resources, construction of infrastructure for smart classrooms and other facilities, and the development of user-friendly learning software and educational resources for institutional teachers.

#### (1) Teacher's role in blended teaching

In the blended teaching mode, teachers play a central role in combining information technology and English curriculum content (Hao 2022). While the controlling influence of college foreign language teachers has changed, they remain responsible for designing preschool education and learning resources, planning and guiding classroom teaching, and evaluating the actual effect of after-school learning.

Teachers must take a holistic approach to classroom, Chinese class, and after-school practice, actively participating in seeking knowledge and adjusting according to different student conditions. They need to provide guidance to students in navigating the vast ocean of knowledge found online, ensuring the quality and effectiveness of independent learning materials (Zhao 2022). Classroom teaching is still important, but teachers should organize various theme activities to enable students to acquire professional knowledge actively.

Teachers must also guide students in using the advantages of the Internet to adjust their learning objectives, formulate and continuously adjust learning plans, restrict their specific implementation plans, and evaluate their own learning methods and results. Teachers should frequently log in to service platforms applied by students to master their learning performance and immediately give feedback, resist lazy behavior, and encourage good learning habits.

With the support of the multi-purpose Internet, teaching reform can complete individual evaluations of students through interactive evaluation subjects, diverse evaluation content, and dynamic evaluation processes. This includes online main performance, general online testing, classroom teaching group cooperative learning, offline promotion of examination scores, self-evaluation, mutual evaluation, teacher evaluation, formative evaluation, and concluding evaluation. These measures make evaluations fair and just, help students correct deficiencies, and promote development.

#### (2) Role of students in blended teaching

In the blended teaching mode, students play a crucial role in two aspects. Firstly, they can use information network resources to identify and solve problems independently, only seeking assistance from tutors when necessary. They become information solvers and builders of professional knowledge. Secondly, students can choose appropriate learning methods based on their level, interests, and hobbies. They can formulate learning plans, adjust their learning rhythm, understand their own learning process, and develop their subjective initiative and consciousness. Additionally, students have a responsibility to improve their ability to solve information problems and filter out poor quality information. Applying the theory of Intelligent

caching for communication and security of smart grid networks, students must attempt to participate in classroom teaching and social practice activities such as English speech competitions and College English competitions nationwide. This process helps to enhance their motivation and ability to learn independently in real-world scenarios. Overall, students do not play a passive role in the blended teaching mode but instead actively engage with the learning process to improve their abilities and increase their knowledge.

### (3) Role of information technology support in blended teaching

To enhance the integration of information technology and foreign language curriculum content, colleges and universities nationwide have invested significantly in capital construction, hardware configuration infrastructure, and the opening of smart classrooms, autonomous learning classrooms, radio broadcasting, cultural experience learning and training classrooms. Some institutions even include browsing IP TV information as part of their student evaluation criteria.

However, some institutions face challenges due to outdated network resources. This results in students experiencing technical difficulties, which leads to time wasted on tracking their main performance, indicating a need for improved network resources. The advantages of blended language teaching rely on the sharing of high-quality foreign language network resources, which is crucial to implement the blended language expression teaching mode effectively. Therefore, it's essential to develop convenient and user-friendly learning software and educational resources for institutional teachers to create virtual and simulated natural environments for student's foreign language interpersonal communication. This approach ensures efficient and successful English language learning for students. Blended foreign language classroom teaching combines online and offline teaching modes, emphasizing the dominant position of teachers and the main role of students. It aligns with the development of the information age, promotes educational reform in colleges and universities, improves students' learning outcomes, enhances students' subjectivity and consciousness, promotes emotional communication between teachers and students, develops flexible social skills, and shapes high-quality complex talents (Wang 2022).

## Conclusion

This article provides an in-depth exploration of mixed English teaching mode based on rush mode and its application in teaching. By reviewing scientific research on mixed English classroom teaching in various countries worldwide, we have defined the mode and analyzed its advantages from three perspectives: teachers' teaching level, students' grasp degree, and examination difficulty.

The analysis shows that for effective mixed teaching, teachers must change their teaching consciousness from being masters of classroom teaching to becoming guides and helpers for students. They should actively improve their teaching skills, learn online teaching platforms and choose new information technology to meet future teaching requirements. Diversified learning methods and formative assessments can ensure student participation, and personalized learning tasks are crucial to meet student needs, working abilities, and interests.

Moreover, teacher participation and interaction with students play a critical role in mixed learning. Teachers should not merely assign daily tasks as “online” extracurricular homework but should participate actively in the class stage. Interactive learning is vital in the teacher-student interaction phase, enabling students to better participate in classroom discussions and deal with problems like “Chinglish.”

Overall, this study recommends encouraging mixed learning through proper evaluation and incentives to improve the effectiveness of “offline promotion” teaching. The blended English teaching mode based on rush mode and intelligent caching theory can benefit both teachers and students by promoting teaching reform, innovation, and improving learners’ efficiency, subjectivity, and consciousness.

Limitations of the study:

- (1) Sample size and representativeness: The study’s findings may be limited by the size and representativeness of the participant sample. The sample used in the study may not fully capture the diverse range of learners and teachers in information-based management education programs, thus potentially affecting the generalizability of the findings.
- (2) Contextual factors: The study may be influenced by specific contextual factors, such as the particular educational institutions or regions involved. These factors may limit the applicability of the findings to other settings or populations.
- (3) Time constraints: The study’s duration may impose limitations on the depth and breadth of data collected. A longer timeframe would allow for more comprehensive data collection and analysis, providing a more nuanced understanding of the effectiveness of blended English teaching based on the rush entity model.
- (4) Self-reporting bias: The study’s reliance on surveys and interviews for data collection introduces the potential for self-reporting bias. Participants may provide responses that align with social desirability or may not accurately reflect their actual experiences or perceptions.

Areas for future research:

- (1) Long-term impact: Future research could explore the long-term effects of blended English teaching based on the rush entity model. Assessing the sustainability of the model and examining its impact on language proficiency, academic performance, and career outcomes would provide valuable insights into its effectiveness over time.
- (2) Comparative studies: Conducting comparative studies between blended English teaching and traditional face-to-face instruction could provide further insights into the advantages and disadvantages of each approach. Comparative research can help identify specific areas where blended learning outperforms traditional methods and vice versa.
- (3) Pedagogical strategies: Further investigation into specific pedagogical strategies within blended English teaching would be valuable. Exploring the effectiveness of different instructional approaches, such as flipped classrooms, online language labs, or virtual reality simulations, can contribute to refining the implementation of blended learning in English language education.
- (4) Teacher training and support: Research focusing on the training and support needs of teachers in implementing blended English teaching would be beneficial. Investigating the impact of professional development programs, the challenges faced by educators, and effective strategies for supporting teachers in adopting and adapting the rush entity model can contribute to successful implementation.
- (5) Student engagement and motivation: Future research could delve deeper into understanding student engagement and motivation in blended English teaching. Exploring factors that enhance student motivation, such as gamification, peer collaboration, or personalized learning pathways, can inform the design and implementation of blended learning environments.

By addressing these limitations and pursuing further research in these areas, the field of blended English teaching based on the rush entity model can continue to evolve, improve, and contribute to effective language education.

### **Data availability statement**

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

### **Disclosure statement**

No potential conflict of interest was reported by the author.

## Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

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