Journal of Cases on Information Technology
Volume 26 • Issue 1

Study of the Effectiveness of 5G Mobile Internet Technology to Promote the Reform of English Teaching in the Universities and Colleges

Jie Yu, Changde College, China*

ABSTRACT

With the continuous progress of information technology, distance English teaching is becoming a practical choice. The introduction of 5G technology has improved the English classroom experience and provided innovation for modern teaching. With the help of wireless communication technology, teachers can effectively impart cognitive skills. Compared with traditional English teaching methods, it obviously enhances the two-way communication between students and professors. Teaching students in accordance with their aptitude uses the reformed Best Available Technology Optimization Algorithm (RBOA) to optimize the transmission process and evaluate students' cognitive ability. This study shows that the proposed method seems to be more effective than the traditional college English course and can significantly improve students' language ability. This optimization scheme has a potential wide application prospect in teaching practice, which has injected new vitality and possibility into English education.

KEYWORDS

5G Network, Colleges, English Teaching, RBOA, Universities, Wireless Communication

With the continuous development of science and technology, mobile Internet technology has gradually become an indispensable part of college English teaching. However, traditional teaching methods are no longer able to meet the needs of modern students for learning experiences and educational resources. Therefore, how to promote English teaching reform through emerging technologies has become an urgent problem that needs to be solved.

This article aims to explore the effectiveness of 5G mobile Internet technology in college English teaching reform and uses the improved Bat optimization algorithm (RBOA) for research and analysis, hoping to put forward specific plans and suggestions for its implementation through this study. This article first introduces the English teaching reform, the relevant background, and characteristics of 5G mobile Internet technology, and explains its relationship with English teaching reform. Second, based on the characteristics of 5G technology, this article explores its application scenarios and advantages in English teaching. Subsequently, using experimental data, it shows that the implementation of 5G

DOI: 10.4018/JCIT.342114 *Corresponding Author

methods has a positive impact on demonstrating the reform of English teaching. A specific framework for transmitting teaching data in self-study rooms is then formulated. Finally, this article summarizes the effectiveness of 5G mobile Internet technology in college English teaching reform and offers suggestions for further research.

This research provides a deeper understanding of the application status and advantages of 5G mobile Internet technology in college English teaching reform. It provides feasible technical and methodological support for educational institutions, giving a valuable reference for research and development in related fields.

LITERATURE REVIEW

The fifth generation of mobile communications, or 5G, promises to enhance previous generations by delivering greater data transfer rates, a broader service area, and more reliable connections. Development of 5G, the next generation of mobile communication technology, is a major focus as it will play a crucial role in the next generation of information technology and telecommunication networks. The technical characteristics of 5G, including ultra-high speed, ultra-low latency, and ultra-large connection capacity, will not only improve the user experience on the network but also increase the speed of data transmission to mobile devices, satisfy the needs of various applications, and make virtually everything internet-enabled (Chen et al., 2021). As the popularity and availability of online video and audio content continue to rise, the globe is increasingly shifting to mobile devices and consuming more bandwidth. Now that more individuals are attempting to use the same online mobile services simultaneously, disruptions in service due to increased strain on bandwidth is inevitable (Teixeira & Rexford, 2006).

The range of devices that can benefit from 5G's enhanced capabilities is extensive, including smartphones, sensors, cameras, and smart streetlights. Some argue that smart classroom technology should be used in schools and lecture halls. Group projects and online multimedia presentations may be permitted in more advanced educational settings (English & Ongole, 2020). SMART refers to a group of interrelated activities: storing, making available, interacting in real time, presenting, managing, and analyzing data. The educational environment has evolved with the advent of new kinds of information and communication technology (ICT), and the number of students signing up for online courses has surged. With the rise of online education, the standard college experience has been transformed.

To satisfy the rising demand for management training, more institutions are creating their own online education platforms. In this age of big data, we have access to vast quantities of data that can be swiftly analyzed for use in the classroom, allowing us to improve and fine-tune the quality of education and instruction. The objective of this study is to explain how machine learning technology can be used to improve the system for evaluating the quality of education and conducting ongoing reviews of the curriculum.

The SMART standards of today are applicable to all facets of the modern classroom (Borge, 2016). The arrival of 5G technology gives educators an opportunity to attempt something novel in the classroom, which may pique students' interest and result in improved English proficiency (Haupin, 2016). Schools of higher learning may deploy 5G wireless networks and artificial intelligence (AI) to replace their antiquated communication infrastructure. There are a number of cutting-edge technologies that might be used to create state-of-the-art educational systems, including machine learning, convolutional neural networks, and reinforcement learning. There has also been much research on the motivations of English as a second language (ESL) students (Nhongo et al., 2017).

5G networks are becoming more commonplace, leading to a rise in enrollment in online English language courses across a variety of socioeconomic levels (Ziegler, 2014). However, online second language learners have had fewer opportunities to benefit from incentives compared to their face-to-face counterparts (Qammourah et al., 2018). Translating findings from studies on motivation in

traditional language classes to online English language study is challenging, with limited insights into changeable mechanisms impacting motivation concepts. Online English course dissatisfaction is a major concern in second language acquisition (Muhammad, 2014). To address this, a 5G wireless distance English learning system based on mobile edge computing is required to seamless connectivity and collaboration among students and instructors across time zones and geographical boundaries (Yufeia et al., 2020).

The reform movement in education, which began several decades ago, has profoundly impacted students' critical thinking, information retention, social skills, and self-evaluation (Zhu, 2017). With the advent of mobile computing-enabled, 5G-based educational platforms, there is optimism among today's students regarding enhanced educational opportunities.

Although test results do not always align, there is valuable insight to be gained from understanding how online education works. However, studies with small sample sizes may lack credibility. In this study, a unique grading system for higher education is presented using a 5G questionnaire survey technique and computational analytical approach. The structured and well-delivered lecture content make the content accessible to listeners. The Bat algorithm is used for optimal data transfer (BOA), potentially enabling the rough calculation of students' intelligence levels.

This study not only highlights challenges faced by English teachers in the classroom but also provides potential solutions to improve instruction in both physical and virtual spheres. To enhance the monitoring of teaching quality, schools must implement a system for objective, fair, and scientific evaluations of instructors' performance (Zou, 2017). The primary goal of this system is to assess the quality of education for students unable to take part in traditional classroom settings.

The current study has developed many components of mobile learning, leveraging improvements in technique and technology to facilitate learning on-the-go using a mobile device (Yu, 2021a). As global Internet use continues to rise, new methods of teaching languages like English are emerging. The theoretical framework and pedagogical strategies proposed by researchers have substantial bearing in the field of mobile learning (Wali, 2008).

The theoretical groundwork provided by computer-assisted design (CAD) in English instruction is applicable in a wide variety of contexts, which suggests its potential to boost student outcomes and retention. The growth of edge computing and networks has been influenced by several disciplines, including the situational network and cognition framework, as well as ideas of cognitive flexibility and informal learning (Yanhua, 2020).

The "listening, reading, and hearing" method has been lauded as the gold standard for teaching the English language in other countries. Using deep neural networks (a type of machine learning), the author built a model that considered the needs of both students and teachers, as well as two other models: one to identify potentially fraudulent degree upgrades, and another to predict students' and teachers' levels of interest in pursuing a given field of study (Wanwu, 2015).

An overarching system architecture is presented, outlining the functional components and shedding light on their interdependencies. Research by Zhang (2022) showed that providing students with access to 5G-based technologies for practice improves their English writing and communication skills. Ma (2021) proposed a fascinating teaching strategy for mechanical manufacturing within today's computer-rich classroom.

An extensive study was conducted on foundational themes, including how to build a virtual network platform and the principles of virtual reality, before selecting the technologies for a networked classroom. College basketball coaching multimedia courseware on the Internet was evaluated. Educators aiming to incorporate multimedia into their teaching should establish a plan tailored to their position, students' ages and developmental levels, and the available media options (Qin & Xinyue, 2020). The Flash mx2004 plugin was used to complete the basketball fundamentals multimedia classes.

English teachers may use the Internet for various resources, from lesson plans to educational technology updates (Royal, 2017). Academic environments provide a plethora of online resources for

both individual and group assignments throughout students' college education. Physical education instructors can gather materials like videos, songs, and charts for use in class or individual settings.

The project aims to improve communication between educators and students, inspire more individuals to pursue higher education, equip educators with technological expertise, and set the groundwork for academic and professional communities. Yu (2021b) investigated the potential advantages to students and universities of greater access to online resources for English language study, while also exploring how wearable technology may improve tertiary ESL education through a survey of the teaching staff.

Scientists have discovered that students majoring in English are receptive to testing cutting-edge wearable gadgets (Yong, 2020). This study broadens the vibrancy of multimodal discourse analysis, delving into multimodal semiotics and other theories of human education. The task of teaching English to non-native speakers is difficult for educators regardless of their experience level (Gao, 2021). As English becomes standardized, English education and proficiency are becoming increasingly crucial and complex. This research suggests that delivering lectures over 5G mobile internet can increase students' English proficiency and their ability to draw connections across discipline.

RELATED MATERIALS AND METHODS

English Teaching Reform

English teaching is a globally significant educational activity, given the widespread use of English in international trade, culture, technology, and other fields. The main goal of English teaching is to cultivate students' proficiency in listening, speaking, reading, and writing, while also enabling them to master basic grammar knowledge and vocabulary. At the same time, English teaching focuses on cultivating students' comprehensive literacy and cross-cultural communication skills.

Various teaching methods and means, such as lectures, exercises, multimedia tools, and communication activities, are used to improve students' learning effectiveness and interest. Evaluation and examination play vital roles in English education, allowing educators to gauge students' progress, provide feedback, and initiate improvements. Common English exams like TOEFL, IELTS, and SAT serve as benchmarks for students' language proficiency.

The ongoing reform of English teaching is key to improving its quality and effectiveness, including revisions in teaching methods, textbook designs, instruction, and evaluation methods. Current trends in English teaching reform include interdisciplinary integration, technology-assisted teaching, task-based teaching method, and personalized teaching strategies. Furthermore, the training and development of English teachers influence the overall quality of English instruction, highlighting the value of investing in teacher education and professional development.

Currently, English teaching faces some difficulties in practice. Due to the large number of students, it is difficult for teachers to provide personalized guidance and evaluation for each student, potentially affecting the quality and progress of their learning. Moreover, there is often too much emphasis on exam preparation, leading teachers to prioritize teaching grammar knowledge and exam-taking skills while neglecting the cultivation of students' actual language proficiency and cross-cultural communication skills.

In non-English speaking countries, students may lack opportunities for a practical language environment, posing a challenge to the improvement of their listening and speaking abilities. Additionally, there are some problems with the quality of textbooks, with some being oversimplified and boring, failing to stimulate student and motivate learning.

Traditional English exam evaluation methods often prioritize memorization and mechanical application, failing to comprehensively evaluate students' overall language proficiency and practical application abilities.

In response to these challenges, English teaching needs to undergo continuous improvement and innovation. This involves personalized instruction to meet the individualized needs of students and the cultivation of practical language skills. Additionally, efforts should be made to provide more opportunities for students to engage in a real language environment.

Furthermore, strengthening teacher training and professional development ensures that educators are equipped with more effective evaluation methods. The optimization and updating of textbooks can also contribute to more engaging and effective learning experiences.

The widespread application of 5G technology will bring about a series of changes and impacts to English teaching, influencing various aspects like:

1. **Optimization of Online Teaching Experience:** The high-speed transmission and low latency characteristics of 5G will greatly improve the online teaching experience. Students can participate in online English courses more seamlessly, facilitating smoother real-time interactions and video teaching sessions. As a result, the effectiveness of remote teaching is expected to improve markedly.
2. **Application of Augmented Reality (AR) and Virtual Reality (VR) Technology:** With the high-speed transmission and low latency of 5G, students can better experience the application of AR and VR technology in English learning. They can engage in language practice through virtual scenes, thereby enhancing the fun and participation in learning.
3. **Personalized Learning:** 5G technology can support stronger data processing and cloud computing capabilities, providing students with more personalized English learning services. Learning content can be tailored according to students' learning style, interests, and level.
4. **Remote Practice and Communication:** The promotion of 5G technology enables cross-cultural communication and cooperation for English learners across countries and regions. Students can practice their English speaking and written expression skills through high-definition video conferences, remote cooperation projects, and other forms.
5. **Enriching Teaching Resources:** More English-teaching resources will be presented via high-definition videos, interactive textbooks, and other forms due to the popularization of 5G technology. This will allow both teachers and students to more conveniently access and utilize high-quality learning resources.

Overall, the development of 5G technology will bring richer, more efficient, and personalized learning experiences to the teaching of English, while also promoting innovation and development in education.

5G technology plays an important role in promoting reform and development in the field of education by providing faster and more reliable network connections, thereby offering broader digital and distance learning opportunities. However, achieving the long-term sustainability of education reform supported by 5G requires consistency with education policies and standards. This is achieved through:

1. **Policy Support and Investment:** The government needs to formulate relevant policies that outline the support and trajectory of 5G technology within the education field, accompanied by corresponding investment and resource allocation. These policies should be consistent with educational reform goals and overall strategy to ensure sustainable development.
2. **Infrastructure Construction:** To achieve education reform supported by 5G, it is necessary to build a sound network infrastructure. This includes deploying more 5G base stations and coverage areas, providing high-speed and stable network connections. The government and relevant institutions should develop plans to ensure that the network infrastructure aligns with educational needs and is consistent with education policies and standards.

3. **Educational Content and Application Innovation:** 5G technology can provide opportunities for more digital resources and innovative educational applications. However, it needs to align with educational content and standards. Educational institutions and educators should proactively explore and develop content and applications compatible with 5G technology, while ensuring they meet the requirements of educational policies and standards.
4. **Teacher Training and Professional Development:** Supporting educational reform in 5G technology requires equipping education practitioners with relevant technical and teaching abilities. The government and educational institutions should provide corresponding teacher training and professional development opportunities. This ensures that education practitioners can adapt and apply 5G technology consistent with education policies and standards.
5. **Data Security and Privacy Protection:** In the process of promoting education reform supported by 5G, it is necessary to attach importance to data security and privacy protection. Relevant policies and standards should clearly outline the requirements for safeguarding student and educational data, ensuring legal, secure, and private data usage and sharing.

In summary, achieving the long-term sustainability of education reform supported by 5G requires consistency with education policies and standards. Collaboration among the government, educational institutions, and practitioners is crucial to effectively integrate 5G technology in the field of education, ensuring its coordination with policies and standards to promote innovation and development in the field.

5G Mobile Internet Technology

5G technology, the fifth-generation mobile communication technology, has superior features compared to its predecessor, 4G technology. It offers higher data transmission speeds, theoretically reaching speeds of up to tens of Gbps per second, greatly improving network transmission efficiency and user experience. Additionally, 5G technology has lower latency, usually at the millisecond level, which means faster data transmission and more timely responses, particularly suitable for real-time interaction and virtual reality applications. Moreover, 5G technology supports simultaneous connections of more devices, meeting the needs of the Internet of things (IoT) and large-scale device connectivity, providing better support for fields like smart homes and smart cities. Its wider coverage range can support high-speed network connections in more areas, including remote areas and developing countries, thereby improving communication services. Furthermore, 5G technology will promote the digital transformation across various industries, encouraging the development of emerging applications like intelligent transportation, healthcare, and industrial Internet. Ultimately, the development of 5G technology will greatly change people's ways of life and work patterns, propel digital transformation across industries, and bring greater convenience and opportunities to society.

Common types of 5G technologies include the following:

1. **Enhanced Mobile Broadband (eMBB):** eMBB is a main application of 5G, aimed at providing higher data transmission speeds and capacity compared to 4G. This enhancement enables support for high-definition video streaming, VR, AR, and other high-volume data transmission applications.
2. **Ultra Reliable Low Latency Communication (URLLC):** URLLC is another important feature of 5G technology, with a focus aimed at achieving ultra-low latency at the millisecond level and extremely high reliability. This capability is suitable for applications that require rapid response and high reliability, such as industrial automation and intelligent communication.
3. **Massive Machine Type Communications (mMTC):** Large-scale machine type communication is a technology that supports the connection of numerous IoT devices within 5G networks. It achieves low-power, low-cost, and efficient communication between a large number of devices, making it suitable for scenarios in smart homes and smart cities.

4. **Network Slicing:** This key technology in 5G networks divides network resources into multiple independent logical network slices. In turn, these slices are customized for diverse application scenarios, meeting various business needs.

The above are common types of 5G technologies that constitute the core characteristics of 5G networks, providing more flexible and efficient communication solutions for application scenarios. The following challenges may exist when implementing 5G technology:

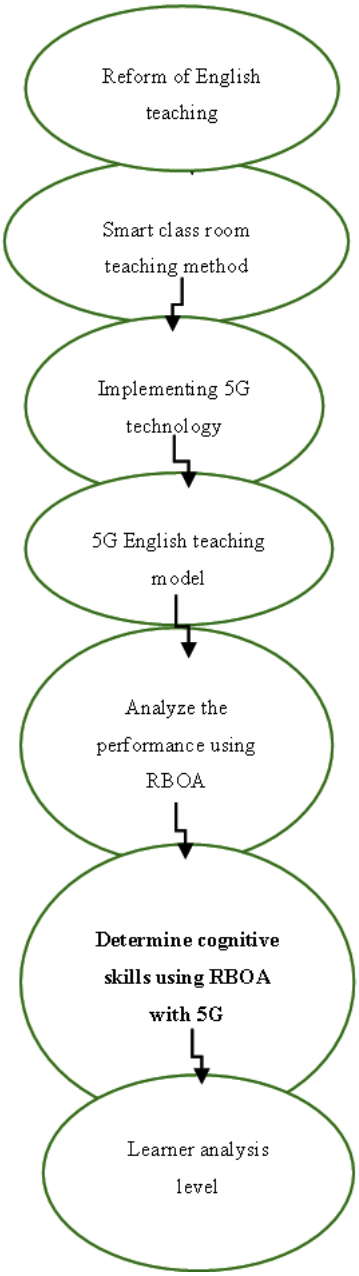
1. **Infrastructure Construction:** 5G requires large-scale deployment of base stations and network equipment, which is costly and time-consuming. These response measures include government backing and financial support, encouraging operators to accelerate infrastructure construction, fostering collaborating and resource sharing with relevant industries, and improving efficiency throughout the deployment process.
2. **Spectrum Resources:** 5G requires spectrum resources to support high-speed data transmission. However, the spectrum resources are limited, and allocation and management issues must be addressed. Response measures include optimizing spectrum management policies to ensure efficient allocation, promoting innovative methods like spectrum sharing and dynamic allocation, and improving spectrum utilization efficiency through advanced technologies.
3. **Network Security:** The complexity and connection density of 5G networks increase network security risks like data leakage and network attacks. Response measures include strengthening the construction of network security laws and regulations, promoting the development of security standards and mechanisms specific to 5G technology, and enhancing network security monitoring and emergency response capabilities.
4. **Privacy Protection:** 5G applications involve the collection and processing of a large amount of personal data, placing high demands on privacy protection. Response measures include strengthening the protection of privacy laws and regulations, establishing standards for data use and sharing, providing users with data control and selection rights, and strengthening the research and development of data security and privacy protection technologies.
5. **Application Innovation:** The widespread application of 5G technology requires deep integration with various industries. However, there are challenges related to application scenarios, business models, and other aspects. Response measures include supporting innovation and entrepreneurship, fostering cross-border cooperation, stimulating the vitality of application innovation, and promoting the integration and development of 5G, AI, IoT, and other technologies.
6. **Digital Divide:** The popularization of 5G may exacerbate the digital divide, making it difficult for some regions or groups to enjoy its benefits. Response measures include increasing investment, promoting wider 5G network coverage, providing subsidy policies, strengthening digital infrastructure construction, and narrowing the digital divide.

These are some of the challenges and corresponding measures that may be faced during the implementation of 5G technology. Through the joint efforts of the government, enterprises, and society, these challenges can be overcome, leading to the stable development and widespread application of 5G technology.

Figure 1 provides a glimpse into the potential of leveraging 5G network connectivity in the management of future English lecture halls. To provide students with an interesting and engaging learning environment, it is necessary to conduct research on building a well-structured, innovative English curriculum within the classroom. With an expectation of more virtual classrooms in the coming years, the next section presents a high-level overview of the system's requirements analysis, performance assessment, and practical design. Figure 1 presents the flow chart of the proposed method.

This study analyzes a proposed design for 5G wireless networks, wherein sensor nodes (SNs) and gateways are randomly distributed and remain in their current locations. If the contact range

Figure 1. Flowchart of Proposed Model



between the gateways is smaller than that of the SNs, the SNs will be divided among the gateways. Consequently, SNs may be given to prefixed gateways. In some cases, certain gateways may be hidden under the surface between SNs. Each SN corresponds to a specific set of gates. Every so often, the distributed sensor network (DSN) project conducts a round of data collection. Once a cycle concludes, the SNs combine their local data and transmit it to the appropriate gateway. Thus, the data gateways process the signal and deliver just the essential data to the base station (Werner-Allen et al., 2005). Following two cycles of radio hibernation to save power, the two nodes may disconnect from the

network. The 5G Wi-Fi network will provide ubiquitous Internet access. Despite their proximity, the nodes may still communicate wirelessly with one another.

RBOA

In the quest for food, bats go outside their natural habitat and hunt whatever animals they encounter. As they fly, bats produce pheromones that help mask their location (Chaverri et al., 2018). Pheromones play a crucial role in guiding bats along a certain route, with their pheromone grouping decreasing over time due to diffusion processes. This dynamic skill is essential for effective navigation.

The proposed steering mechanism is carefully investigated in light of bats' food-seeking behavior after the formation of groups. The process involves two phases: selecting a trustworthy hub and identifying the best route. Initially, the algorithm chooses the most secure route based on prior assessments of trust by other bats.

In the wireless environment with 15 hubs, each hub's trust score is based on criteria like consistency and accessibility. Most hubs consist of individuals who can legally identify packages received from neighbors by tracing their origin. To calculate the trust score, a number of guiding criteria or steering metrics are employed, including ask for, reaction, and mistake, among other factors like transmission capacity and cost. When many shipments are delivered simultaneously, the hub is downgraded to Gathering 2.

Once the feedback energy levels of all hubs have been determined, the rate of true affirmation may be assessed using the following equation:

$$SR_{(1,j)} = \frac{\left[C_1 \times \left(\left(ACK \;/\; NP\right) \times 100\right) + C_2 \times Temp_{score} C_3 \times Spatial_{score}\right]}{\left[C_1 + C_2 + C_3\right]} \tag{1}$$

where NP stands for the number of bundles received from neighbor hubs, C1, C2, and C3 address the loads applied to a few energy values, TR(1,j) denotes the underlying energy proportion for the jth hub, and TR(1,j) is the jth hub's energy proportion. ACK stands for the number of affirmations sent from neighbor hosts. Equation (2) is used to calculate the delivered bundle's size. The result is utilized to calculate the neighboring hubs' trust score:

$$SR_{(2,j)} = 100 - \left(\left(\frac{SRP}{TSRP}\right) \times 100\right) t1 < t < t2 \tag{2}$$

$$SR_{fitnessvalue} = \frac{\left(SR_{(1,j)} + SR_{(2,j)}\right)}{2} + FS \tag{3}$$

The underlying trust score is denoted by SR(1,j), the subsequent trust incentive for hub j is denoted by SR(2,j), and the wellness score is denoted by FS. The overall nodal trust score is referred to as wellness esteem.

Where SR(2,j) denotes the neighbor trust esteem proportion for the jth hub, SR denotes the overall number of packages delivered in the universities, TSRP denotes all parcel numbers delivered, and t denotes the urgent requirement to check time limits t1 and t2 for the least and most significant delay limits, respectively. Finally, the equation is used to determine the course-specific hub j's absolute trust worth.

The route may be chosen once the hub has been located. Therefore, dynamic features are favored over static ones in terms of prefixes. Equation (4) describes the distance between the two hubs, and the cargo weight is used to determine how much energy is needed to transport k items. Therefore, distinguishing characteristics are preferable to static ones in prefixes. The recommended method allows us to group the leading occurrences like bats:

$$En_{tx}\left(k,d\right)=k\times En_{elec}+k\times\varepsilon\times d^{m} \tag{4}$$

where the energy lost by the telecom circuit denoted by Enelec is the amount of energy used by the BATS. Due to multipath blurring, m is given a value of 2 or 4. Energy is referred to as what is anticipated for electrical intensification.

For each BAT hub that is accessible inside the company, the usual benefits of the overall trust values are handled as:

$$RBAT_{route}=\sum_{j=1}^{m}\frac{TR_{j}}{m} \tag{5}$$

TRj is the trust score variety, RBAT is the normal course trust esteem, and m is the amount of bats. Once the information is retained, it is transferred across the confided-in course. CH collects the data through a series of courses created for the SNs. Finally, data from the sink hub may be accessed.

In Equation (6), γ is the number of outputs of the English teaching under the guidance of wireless communication networks and δ_{h} is the gradient of the errors for the neurons. DS denotes the students' interest in reforming English education.

$$\Delta U_{ij}=\Delta U_{ij}+DS_{i}\delta_{h} \tag{6}$$

The gradient of the weights between the i^{th} input layer neuron and the j^{th} hidden layer of the English teaching under wireless communication networks and DS_{i} is the input of the i^{th} neuron is represented. The weights of all the connections will be updated based on the gradients of the weight is represented in Equation (7):

$$U_{ij}=U_{ij}+\xi\Delta U_{ij} \tag{7}$$

where ξ is the learning rate.

By using the momentum method, we add the new term to adjust weight by η" $We_{hi}\left(k-1\right)$, as shown in Equation (8).

$$\Delta Reforme_{hi}\left(k\right)=\Delta We_{hi}+\eta\Delta We_{hi}\left(k-1\right) \tag{8}$$

Using the parameters u and v and their dependency on the successive sign of the gradients, Equation (9) is obtained:

$$\xi_{ij}\left(k\right)=\begin{cases} u.\xi_{ij}\left(k-1\right),\ \mathrm{sgn}(\Delta U_{ij}\left(k\right)=\mathrm{sgn}\left(\Delta U_{ij}\left(k-1\right)\right) \\ v.\xi_{ij}\left(k-1\right),\ \mathrm{sgn}(\Delta U_{ij}\left(k\right)=-\mathrm{sgn}\left(\Delta U_{ij}\left(k-1\right)\right) \end{cases} \tag{9}$$

$\xi_{ij}\left(k\right)$ – learning rate and also defined by using the method of variable learning rate.

The algorithm yields half the square of the Euclidean norm of the output of English teaching under the guidance of wireless networks and 5G vectors, as shown in Equation (10).

$$E\left(DS,U,Reforme,output\right)=\frac{1}{2}\left|\overline{e_{output}}\right|^{2} \tag{10}$$

RESULTS AND ANALYSIS

Analysis of Experimental Results

This section assesses the proposed method, anticipating that discussions on 5G firms and the 5G-based educational system would center on developing a comprehensive English-language education system. Establishing an efficient schooling data transmission framework is essential for the English data framework to function effectively within the 5G-training organization. The dataset of this study includes the actual application of 5G mobile Internet technology in the English curriculum for freshmen in a university in 2023, aimed at evaluating its effectiveness in English teaching reform. The statistical data includes information on students' creative thinking, basic English proficiency, English learning ability, speaking skills, learning attitude, English listening comprehension, and more. Figure 2 shows the extent to which students in six classrooms were able to express their creativity after using 5G communication frameworks.

Figure 2. Creative Ability vs. Parameter Value

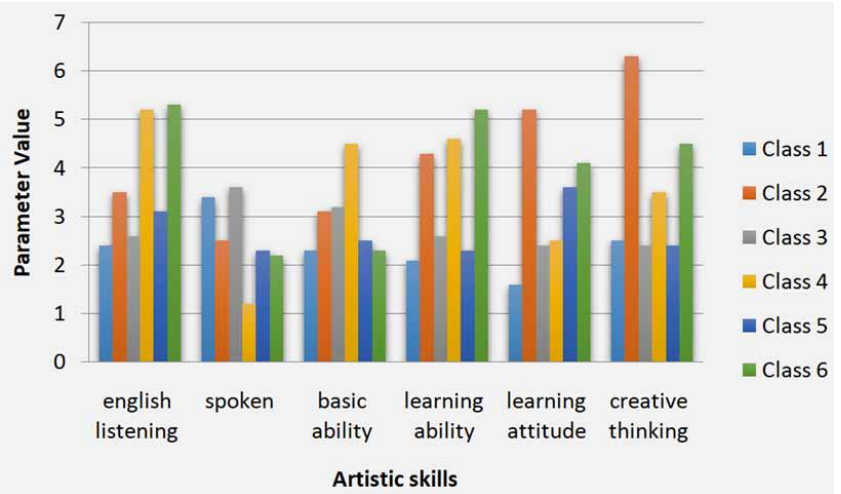


Figure 2 illustrates the improvement in members' English competency in learning, speaking, listening, and creative thinking, as evidenced by breaking down the findings. The impact of education delivered by 5G Internet is significantly larger than that of conventional face-to-face learning. Remote learning based on 5G registration is 50% more effective and has double the impact of traditional presenting methods.

In Figure 3, the remarkable improvement in students' English language proficiency is evident, indicating that online preparation using 5G technology may be more efficient than conventional in-person learning. It was demonstrated that the improvement noted in real-world classes was less evident than the overall improvement in student performance following 5G-based training.

Figure 4 shows that the students' proficiency across various linguistic abilities was inadequate before 5G preparation, contrasting with their current competency levels.

Figure 3. Type and Value of the Argument

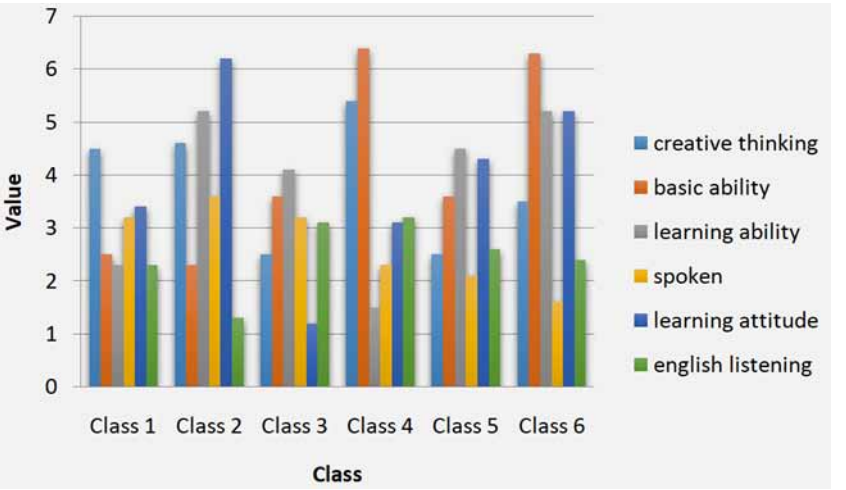


Figure 4. Class vs. Parameter Values Prior to Preparing

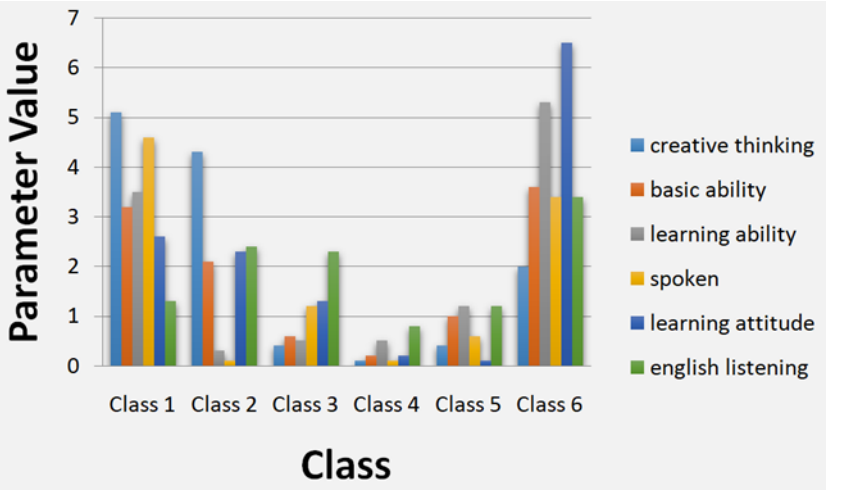


Figure 5. Prepared Class and Parameter Values

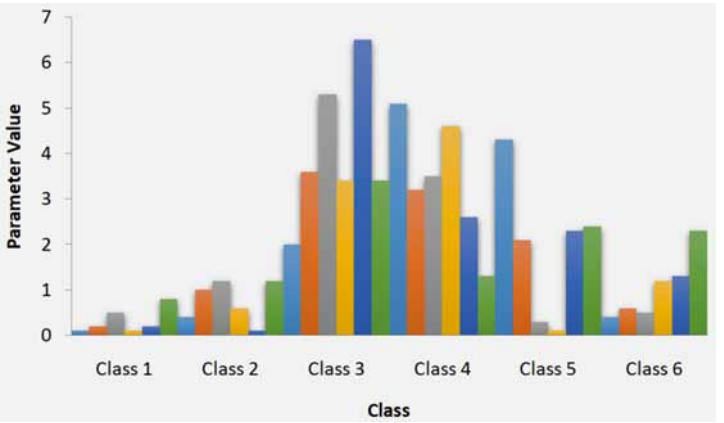


Figure 5 demonstrates the substantial improvement in students' skills across a variety of tasks after 5G training, with their scholarly presentation outpacing expectations.

Figure 6 shows the correlation between exam grades of the two groups. The average appraisal score and self-reported understudy satisfaction were used to record the usual understudy outcomes, which included covariate-changed relapse for each condition.

Figure 7 highlights that while 5G-enabled English homeroom sessions may be advantageous, most students prefer the conventional audio transmission technique in classroom settings. The survey assesses students' perspectives on topics like fun, knowledge, social associations, educational viability, and overall value of educational development in English-speaking homerooms. Interview replies are evaluated on a scale ranging from Unmistakably Agree, Agree but Unsure, Deviate, and Clearly Conflict.

The instructional methodology used by 5G Internet differs from conventional e-learning platforms, leveraging developments in communication and computers to deliver interactive, multimedia-rich courses. Given the innovative nature of 5G online training simulators, they are popular among

Figure 6. Score Level Analysis

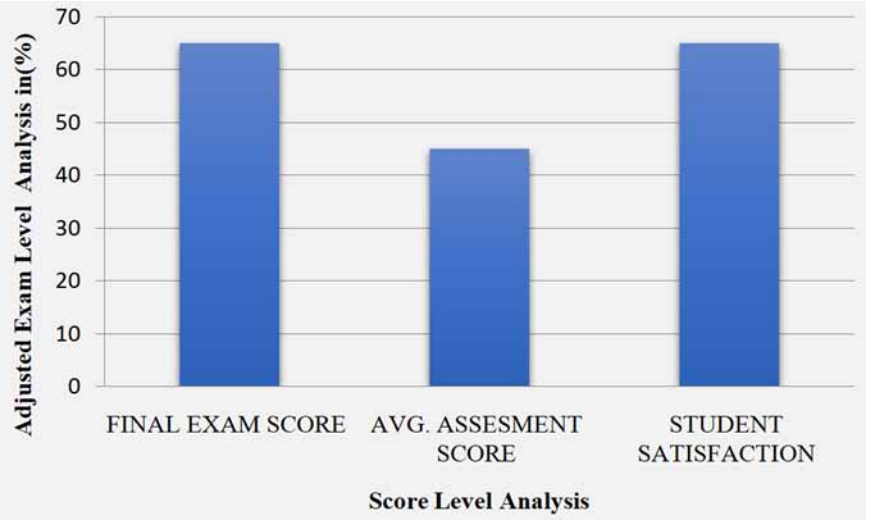
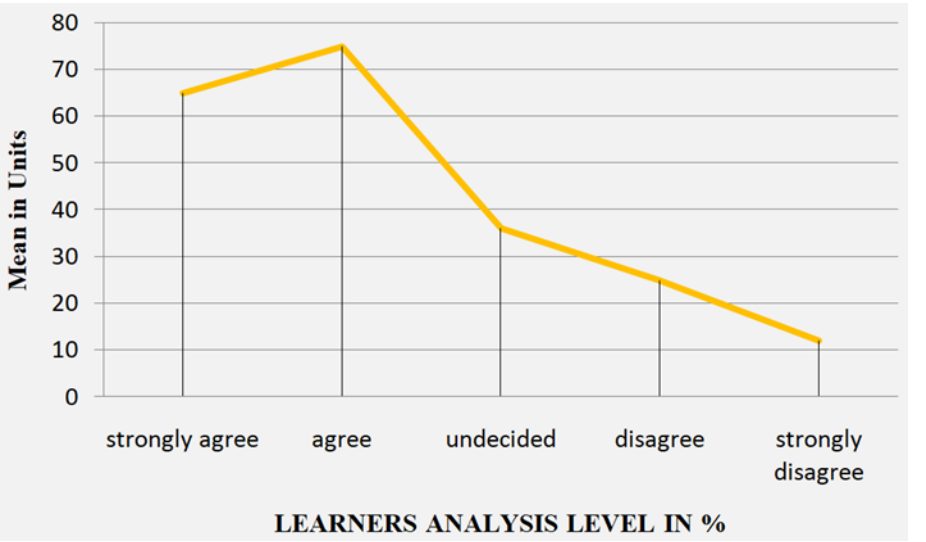


Figure 7. Students' Level Examination



contemporary students. Mathematical and statistical methods were used to evaluate the known costs associated with these various pedagogical approaches, leading to a conclusion. While results might vary, overall, the relative performance disparities across approaches should not be substantial. Hence, the study results state that the implementation of the 5G method helps in demonstrating the reform of English teaching.

Analysis of Practical Applications

With the continuous development of science and technology, 5G mobile Internet technology, as an eye-catching innovation, is gradually penetrating into various fields. In the field of education, 5G technology is considered to have enormous potential, especially for the reform of English teaching in universities. However, in the process of exploring and applying 5G technology, we must be aware that there are also some limitations in this study, which need to be further studied and overcome.

1. **Technical Limitations:** 5G mobile Internet technology is still in the continuous development stage, and it may have insufficient coverage, unstable network and other problems in some regions or under specific conditions, which may affect the actual application effect. It is recommended to combine the characteristics of 5G technology in practical applications, choose areas with wider coverage and higher network stability for experimentation, and strengthen cooperation with communication operators to solve problems such as network instability.
2. **Limitations of Experimental Scope:** This study only used the improved RBOA for analysis, and did not fully consider other potential influencing factors, so the conclusion may be limited by the experimental scope. Future research can consider introducing more influencing factors, such as teaching content, student characteristics, etc., to construct a more complete research framework and explore the role of 5G technology in English teaching from multiple perspectives.
3. **Limitations of Effectiveness Evaluation:** When evaluating the promoting effect of the implementation of 5G methods on English teaching reform, this study may not have fully considered the impact of other factors on teaching reform, such as the interactive effects of teaching content, teaching methods, and other factors. When evaluating the promoting effect of 5G technology on English teaching reform, other factors should be comprehensively considered

and more comprehensive evaluation methods such as questionnaire surveys and field observations should be adopted to obtain more accurate data support.

4. **Limitations of Operability:** Due to the relatively new application of 5G technology in university teaching, practical problems like technical training and teacher acceptance may be encountered in actual operation, warranting further research and exploration. To enhance the acceptance of 5G technology among teachers and students, it is recommended to carry out relevant technical training and promotional activities to stimulate their engagement. Simultaneously, optimizing the technology application interface and improving user experience can contribute to this goal.
5. **Persistent Limitations:** This study did not fully consider the sustainability, stability, and safety issues of long-term 5G technology use, which are important aspects in practical applications. When advocating for the continuous application of 5G technology in the field of education, it is necessary to prioritize the stability and security of the technology. This entails establishing sound monitoring mechanisms and safeguard systems to ensure the reliability of long-term use.

In summary, by comprehensively considering the aforementioned limitations and implementing corresponding targeted measures, the application effect of 5G technology in the reform of English teaching in universities can be further optimized. This will promote the integration and development of educational informatization and English teaching, achieving better teaching effects and user experience. The research results of this article can be applied in practical education fields, specifically in the following aspects:

1. **Teaching Practice:** Educational institutions can develop online courses and platforms for sharing teaching resources in English instruction. By leveraging this technology, institutions can create more intelligent and personalized teaching content and services to meet students' \ learning needs.
2. **Remote Teaching:** Through high-definition videos, VR, and other teaching methods supported by 5G technology, teachers can engage in more vivid and intuitive remote teaching sessions. This transcends geographical limitations, providing students in remote areas access to better educational resources.
3. **Collaborative Learning:** Combining 5G technology, students can engage in more diverse learning activities through multimedia interaction, remote collaboration, and other means. This fosters collaborative learning environments and enhances communication among students.
4. **Experimental Teaching:** With the support of 5G technology for remote control and data transmission, teachers can conduct more convenient and efficient experimental teaching. This enhancement improves the quality and efficiency of experimental teaching.
5. **Education Management:** Through the utilization of big data analysis and remote monitoring supported by 5G technology, schools can achieve intelligent allocation of teaching resources, real-time monitoring of teaching processes, and improve the scientific level of education management.

In summary, the research findings of this article can promote the practical application of 5G technology within university English teaching. By promoting the deep integration of educational informatization and English teaching, teachers and students can benefit from more convenient teaching experiences. This integration not only provides greater convenience but also encourages continuous innovation and development in education and teaching. The following development directions can be considered in the future:

1. **In-Depth Research:** Further in-depth research can be conducted on specific application scenarios and effects of 5G technology in English teaching, exploring innovative teaching modes and tools to improve the effectiveness and efficiency of English teaching.

2. **Interdisciplinary Cooperation:** Future developments can strengthen interdisciplinary cooperation across fields like computer science and AI, combining technological development trends, promoting the deep integration of 5G technology and English teaching, and achieving innovative applications in more fields.
3. **Education Ecosystem Construction:** Attention should be paid to the entire education ecosystem, including teachers, students, parents, and management departments within the field of education. This effort will build a comprehensive education information system based on 5G technology, thereby promoting the modernization of education development.
4. **Data Security and Privacy Protection:** As 5G technology becomes more pervasive, it is necessary to focus on priorities like data security and personal privacy protection. This entails the establishment of sound laws, regulations, and technical mechanisms to protect educational information from breaches and unauthorized access.
5. **International Exchange and Cooperation:** Strengthening academic exchange and cooperation between countries is essential for leveraging the experiences and best practices of other nations in the field of 5G technology and education. By fostering international cooperation, countries can jointly promote the modernization of education on a global scale.
6. **Continuous Evaluation and Optimization:** Continuously evaluating and adjusting the application effect of 5G technology in English teaching is crucial. By gathering feedback and analyzing data, educators can optimize teaching strategies and curriculum plans, ultimately improving the quality of English education.

Through the efforts and practices in the future development directions, we can further promote the application innovation of 5G technology in English teaching, thereby advancing the transformation and enhancement of education and instructional models. By doing so, we can significantly contribute to the cultivation of a larger pool of talent equipped with more international competitiveness.

CONCLUSION

At present, traditional teaching methods are no longer able to meet the diverse learning needs of students. With the continuous development and application of 5G mobile Internet technology, its potential role in the field of education has gradually attracted attention. This article studies the effectiveness of 5G mobile Internet technology in reforming college English teaching.

First, 5G mobile Internet technology plays an important role in promoting college English teaching reform. Its implementation enables more efficient and rapid data transmission and resource sharing, providing more diverse and personalized teaching methods and resource support for English instruction. This addresses the various learning requirements of students and improves the flexibility and precision of English teaching.

Second, the experimental data in this article underscores the positive impact of 5G methodologies on demonstrating the reform of English teaching. Through 5G technology, teachers and students can more conveniently access and share English learning resources, thereby enriching teaching content, improving instructional effectiveness, and enhancing the learning experience.

However, it is important to be aware of the limitations of 5G mobile Internet technology in college English teaching reform. For example, some regions may not be able to fully utilize 5G technology due to infrastructure deficiencies. In addition, concerns like network security risks may arise during use.

In response to these limitations, it is recommended to strengthen the construction of 5G network infrastructure in the future and augment the research and application of network security technology. This ensures the sustainable and stable operation of the technology. In addition, integrating other traditional teaching methods with responses tailored to different online environments can be combined to comprehensively utilize various resources and improve the comprehensiveness and quality of English teaching.

DATA AVAILABILITY

The figures and tables used to support the findings of this study are included in the article.

CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest.

FUNDING STATEMENT

This work was supported by Hunan Social Science Achievement Evaluation Committee's study on the training path of agricultural products cross-border e-commerce talents in local applied universities under the background of Humei rural areas (Project No XSP24YBC003).

ACKNOWLEDGMENT

The authors would like to show sincere thanks to those techniques who have contributed to this research.

REFERENCES

Borge, N. (2016). Artificial intelligence to improve education/learning challenges. [IJAEIT]. *International Journal of Advanced Engineering & Innovative Technology*, *2*(6), 10–13.

Chaverri, G., Ancillotto, L., & Russo, D. (2018). Social communication in bats. *Biological Reviews of the Cambridge Philosophical Society*, *93*(4), 1938–1954. doi:10.1111/brv.12427 PMID:29766650

Chen, G., Wei, H., Zhang, Y., Guo, C., Shi, S., Wang, Z., Yan, T., & Ma, S. (2021, June). Application of 5G communication technology in power communication and research on key technologies. []. IOP Publishing.]. *IOP Conference Series. Earth and Environmental Science*, *791*(1), 012151. doi:10.1088/1755-1315/791/1/012151

English, O., & Ongole, A. P. (2020). Artificial intelligence applications to teach/learn English to the secondary level students. *Artificial Intelligence*, *7*(05).

Gao, H. (2021, February). Reform of college English teaching model under the background of artificial intelligence. []. IOP Publishing.]. *Journal of Physics: Conference Series*, *1744*(4), 042161. doi:10.1088/1742-6596/1744/4/042161

Haupin, R. (2016). Improving receptive oral language skills of English language learners to enhance achievement in reading recovery. Doctor of Education, Widener University.

Ma, Q. (2021). Development of English classroom teaching innovation under the background of artificial intelligence. In *Application of Intelligent Systems in Multi-modal Information Analytics: 2021 International Conference on Multi-modal Information Analytics (MMIA 2021)* (volume 2, pp. 539–546). Springer International Publishing. doi:10.1007/978-3-030-74814-2_76

Muhammad, E. (2014). *Motivation applications in artificial intelligence.* Unpublished MA thesis. Al-Neelain University, Khartoum.

Nhongo, R., Cekiso, M., Tshotsho, B., & Zhou, S. (2017). Exploring the second language teaching strategies of Ndebele English teachers in selected secondary schools in Zimbabwe. *Gender & Behaviour*, *15*(2), 8619–8629.

Qammourah, S. S., Muhammad, B., & Krosh, H. (2018). Artificial intelligence between reality and the expected: A technical field study. In Artificial intelligence: A new challenge for the law. (pp. 1–27).

Qin, Z., & Xinyue, W. (2020). The practical form of AI+ teachers collaborative teaching in the intelligent era. *Journal of Distance Education*, *2*, 37–45.

Royal, K. (2017). A guide for making valid interpretations of student evaluation of teaching (SET) results. *Journal of Veterinary Medical Education*, *44*(2), 316–322. doi:10.3138/jvme.1215-201R PMID:27487112

Teixeira, R., & Rexford, J. (2006). Managing routing disruptions in internet service provider networks. *IEEE Communications Magazine*, *44*(3), 160–165. doi:10.1109/MCOM.2006.1607880

Wali, E. A. (2008). *Reinterpreting mobile learning: an activity theoretic analysis of the use of portable devices in higher education.* Doctoral dissertation, Institute of Education, University of London.

Wanwu, H. (2015). Construction of English learning assistant platform based on artificial intelligence. *Revista Ibérica de Sistemas e Tecnologias de Informação*, (16B), 260.

Werner-Allen, G., Johnson, J., Ruiz, M., Lees, J., & Welsh, M. (2005, February). Monitoring volcanic eruptions with a wireless sensor network. In *Proceedings of the Second European Workshop on Wireless Sensor Networks* (pp. 108–120). IEEE. doi:10.1109/EWSN.2005.1462003

Yanhua, Z. (2020, June). The application of artificial intelligence in foreign language teaching. In *2020 International Conference on Artificial Intelligence and Education (ICAIE)* (pp. 40–42). IEEE. doi:10.1109/ICAIE50891.2020.00017

Yong, Q. (2020, April). Application of artificial intelligence to higher vocational English teaching in the information environment. []. IOP Publishing.]. *Journal of Physics: Conference Series*, *1533*(3), 032030. doi:10.1088/1742-6596/1533/3/032030

Yu, B. (2021b, October). Research on artificial intelligence technology in English teaching. In *Proceedings of the 2021 5th International Conference on Electronic Information Technology and Computer Engineering* (pp. 967-971). doi:10.1145/3501409.3501583

Yu, J. (2021a). Academic performance prediction method of online education using random forest algorithm and artificial intelligence methods. *International Journal of Emerging Technologies in Learning*, *15*(5), 45. doi:10.3991/ijet.v16i05.20297

Yufeia, L., Salehb, S., Jiahuic, H., & Syed, S. M. (2020). Review of the application of artificial intelligence in education. *Integration (Amsterdam)*, *12*(8), 1–15.

Zhang, Y. (2022). Construction of English language autonomous learning center system based on artificial intelligence technology. *Mathematical Problems in Engineering*, *2022*, 1–12. doi:10.1155/2022/7900493

Zhu, D. (2017, June). Analysis of the application of artificial intelligence in college English teaching. In *2017 2nd International Conference on Control, Automation and Artificial Intelligence (CAAI 2017)* (pp. 235–237). Atlantis Press. doi:10.2991/caai-17.2017.52

Ziegler, N. E. (2014). *English language learners' epistemic beliefs about vocabulary knowledge*. The University of Toledo.

Zou, S. (2017). Designing and practice of a college English teaching platform based on artificial intelligence. *Journal of Computational and Theoretical Nanoscience*, *14*(1), 104–108. doi:10.1166/jctn.2017.6133

APPENDIX

Table 1. Creative Ability Versus Parameter Value

	English Listening	Spoken	Basic Ability	Learning Ability	Learning Attitude	Creative Thinking
Class 1	2.4	3.4	2.3	2.1	1.6	**2.5**
Class 2	3.5	2.5	3.1	4.3	5.2	6.3
Class 3	2.6	3.6	3.2	2.6	2.4	2.4
Class 4	5.2	1.2	4.5	4.6	2.5	3.5
Class 5	3.1	2.3	2.5	2.3	3.6	2.4
Class 6	5.3	2.2	2.3	5.2	4.1	4.5

Table 2. Type and Value of the Argument

	C 1	C 2	C 3	C 4	C 5	C 6
Creative Thinking	4.5	4.6	2.5	5.4	2.5	3.5
Basic Ability	2.5	2.3	3.6	6.4	3.6	6.3
Learning Ability	2.3	5.2	4.1	1.5	4.5	5.2
Spoken	3.2	3.6	3.2	2.3	2.1	1.6
Learning Attitude	3.4	6.2	1.2	3.1	4.3	5.2
English Listening	2.3	1.3	3.1	3.2	2.6	2.4

Table 3. Class vs. Parameter Values Prior to Preparing

	C 1	C 2	C 3	C 4	C 5	C 6
Creative Thinking	5.1	4.3	0.4	0.1	0.4	2
Basic Ability	3.2	2.1	0.6	0.2	1	3.6
Learning Ability	3.5	0.3	0.5	0.5	1.2	5.3
Spoken	4.6	0.1	1.2	0.1	0.6	3.4
Learning Attitude	2.6	2.3	1.3	0.2	0.1	6.5
English Listening	1.3	2.4	2.3	0.8	1.2	3.4

Table 4. Values of the Class vs. Parameters Before Preparing

	C 1	C2	C 3	C 4	C 5	C 6
Creative Thinking	0.1	0.4	2	5.1	4.3	0.4
Basic Ability	0.2	1	3.6	3.2	2.1	0.6
Learning Ability	0.5	1.2	5.3	3.5	0.3	0.5
Spoken	0.1	0.6	3.4	4.6	0.1	1.2
Learning Attitude	0.2	0.1	6.5	2.6	2.3	1.3
English Listening	0.8	1.2	3.4	1.3	2.4	2.3

Yu Jie was born in Changde, Hunan, PR China, in 1976. She received the master's degree from Hunan Normal University, PR China. Now, she works in Faculty of Humanities and Arts, Changde College. Her main research area is college English education.