

Research Article

Innovative Research on Intelligent Classroom Teaching Mode in the “5G” Era

Jing Rong 

Maanshan Technical College, Maanshan 243031, China

Correspondence should be addressed to Jing Rong; rongjing@mastc.edu.cn

Received 19 August 2022; Revised 2 September 2022; Accepted 12 September 2022; Published 21 September 2022

Academic Editor: Imran Khan

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

The integration of “5G + education” has become a consensus and trend. The maturity and application of technologies represented by artificial intelligence, virtual reality, and big data in the 5G era have provided a new and greater impetus for education and teaching reform. Education must adhere to the concept of people-oriented, high-quality talent training is the foundation and core of higher education, and colleges and universities need to quickly adapt to the development trend of education in the new era. Therefore, it is of significance to investigate some innovative strategies to address the existing problems in the intelligent classroom teaching mode in the “5G” Era. This paper discusses the characteristics of high speed and low latency in the 5G era, discusses the development of the intelligent classroom teaching promoted by 5G technology, and creatively puts forward different teaching strategies in combination with the problems existing in an intelligent classroom in colleges and universities. Students interact with the constructed virtual or virtual real scenes in real time. With the help of artificial intelligence technology, can establish artificial intelligence teaching assistants and learning partners, support one-to-one skills training, will also provide teachers with an intelligent learning environment, integrate teaching resources, optimize the teaching path, improve teaching interaction, provide a reference for future teaching activities, explore the application of innovative teaching mode based on 5G communication. Big data will record the learning behavior in the process and use it for the diagnosis and evaluation of dynamic learning results, providing a basis for educators to practice “people-oriented” and help students grow up.

1. Introduction

In 2018, the “Education Informatization 2.0 Action Plan” issued by the Ministry of Education emphasized the comprehensive promotion of educational modernization through informatization, and emphasized the integration of cloud computing, big data, and the Internet, and new technologies such as artificial intelligence. With the transition to smart education, the teaching methods based on classroom teaching are also slowly changing. More importantly, in the teaching environment, at the same time, with the help of virtual reality means and technology, through personalized immersive learning, students’ interest in learning is improved, and the development of smart education is promoted [1]. My country’s three major operators have also responded positively to this action plan and have proposed their own smart education plans. China Mobile released “5G + Smart Education,” covering “5G” dual-

teacher interactive teaching, “5G” holographic projection teaching and “5G” VR/AR immersive teaching, etc. and is committed to creating an immersive smart classroom teaching model; China Unicom It released “5G + Smart Education” and established a Smart Education Demonstration Laboratory dedicated to smart education technology and product research and development; China Telecom focused on “5G” education cooperation with Education Group. In early July 2021, the Ministry of Education proposed in the “Guiding Opinions on Promoting the Construction of New Educational Infrastructure and Building a High-quality Education Support System” that the new educational infrastructure is guided by the new development concept, led by informatization, and oriented towards the education high school. Quality development requires a new infrastructure system focusing on information networks, platform systems, digital resources, smart campuses, innovative applications, trusted security, etc., [2]. Reforming the

existing classroom teaching requires not only “reversing” the information technology environment under the existing classroom teaching structure, but it is also necessary to think deeply about how to realize the transformation from knowledge-based to literacy-based, so as to reconstruct relationships, resources, abilities, processes, and assessments and reshape the classroom ecosystem. My country should take the classroom teaching in colleges and universities as the breakthrough point of reform, integrate traditional teaching with information-based classroom teaching, build a teaching community of teachers and students, and create a smart classroom. The smart classroom has become the product of the interaction between educational thinking and educational emotion. It is the process and result of the symbiosis of intelligent interaction between teachers and students.

In the current smart classroom teaching, there are problems such as education of students’ innovative ability, ability training education, and personalized training. The effect of classroom teaching is closely related to the teaching environment, and different teaching environments often produce different teaching effects. At present, 5G mobile communication and the Internet of Things have not been fully popularized in schools, and the equipment for data collection and processing technology is not advanced enough. In the construction of smart classrooms, the construction of the school network environment is still in the preliminary stage, and the school is not equipped with basic professional classrooms. As a result, teachers cannot push learning materials to be learned before class, and students are difficult to download materials; there is a lack of timely feedback mechanism in class, teachers It is difficult to adjust the teaching plan; after class, students cannot conduct independent tutoring, and it is difficult for teachers to provide personalized guidance.

Therefore, we aim to investigate innovative strategies about intelligent classroom teaching mode in the “5G” Era. The characteristics of high speed and low latency in the 5G era have been introduced. And, different teaching strategies have been promoted to solve the problems existing in an intelligent classroom in universities. To sum up, higher vocational colleges should follow the development of the times, make full use of the convenience brought by 5G to information-based teaching, and create a new type of information-based teaching. Model, realize the remote sharing of course resources and teachers, break the barriers of education in time and region, improve the teaching level and talent quality, and truly deliver a large number of high-quality applied talents to all walks of life.

2. Characteristics and Integration of “5G” Technology

The technology refers to the fifth-generation mobile communication technology, which is the latest generation of cellular mobile communication technology. It has the characteristics of ultrareliable and ultra-low-latency communication, ensuring that the network maintains stability and will not be congested and interfered with during

operation [3]. On the basis of face-to-face physical one-dimensional classrooms, 5G technology is used, online classrooms are added, and a dual-channel hybrid teaching environment is formed. Combined with the advantages of emerging network hardware resources and software resources, it adds new impetus to classroom teaching, thus forming a new driving force for classroom teaching. Smart classroom, followed by 5G’s ubiquitous network, low latency, Internet of everything, and other features provide technical support for educational and teaching applications such as blended teaching, distance education, and online interaction, which can realize visualization, scale, and real-time online teaching. Breaking the limitations of traditional teaching time, place and resources help to optimize teaching resources, realize resource sharing, and improve teaching quality. From a macro level, the emergence of smart classrooms in the 5G era further breaks the time and space constraints, and students can study anytime, anywhere. From a micro level, education informatization makes the course content, teaching methods, assessment methods, and teaching evaluations in classroom teaching more objective and data-based.

Under the guidance of the teaching concept of “learning first, then teaching, and learning to teach,” the smart classroom has comprehensively built a teaching model of “pre-class microlecture guidance, classroom interactive inquiry, and after-class personality counseling,” breaking the traditional single-class teaching mode. The teaching method can better realize the two-way interaction between teachers and students. Bian and Xu [4] further pointed out that the learning mode based on the smart classroom mainly refers to the use of intelligent, personalized, and diversified learning services for learners in the system environment, and the use of mobile terminal equipment to achieve specific teaching goals. Deep, efficient, autonomous, and open classroom learning mode. The premise that AR and VR can give full play to their advantages is that data can be processed and transmitted quickly and effectively. 5G technology can meet the above requirements to the greatest extent. It can be said that the advent of the 5G era has provided strong support for the two to reach commercial standards, and their use in tourism, education, and other fields can usually achieve twice the result with half the effort. 5G technology is building a new high-speed information highway. With the continuous optimization of 5G technology, the deep integration of education + 5G provides a broader development vision and new development space for education informatization. The promotion and popularization of “5G” technology highlight the inevitable trend of adjusting the teaching mode of colleges and universities. Colleges and universities can explore a blended teaching model that points to practical projects to improve students’ comprehensive literacy. In contrast to the traditional teaching model, students are limited to a limited teaching space, and there are not many opportunities for interaction and discussion between teachers and students. The emergence of 5G technology has effectively solved this problem, not only the time and space boundaries are broken but also teachers and students. The interaction and communication are also

more convenient. The blended teaching model is a change to the traditional classroom teaching model. The fundamental purpose of the blended teaching model is to use a more flexible way to help students acquire knowledge and achieve better learning effects. It is centered on students' offline self-learning and summary.

3. Smart Classroom in the “5 G” Application Scenario

Realize the operation, rendering, display, and control of VR/AR applications with cloud computing technology, and then transmit the processed audio and video information flow to the smart classroom terminal through the 5 G network [5] and develop a text, image, and animation integrated system. Teaching content, and three-dimensional plane knowledge to improve the interaction and participation of the classroom, realize active interactive learning and display real scenes. This display method will reduce the delay of information dissemination, and the teaching records will also be shared. And, storage for a long time, the performance of VR/AR technology that requires extremely high network speed and capacity will be greatly improved. Integrating digital technologies such as VR and 3D into the teaching process, students' classroom experience jumps from 2D to 3D and is no longer the flat content presented by books or blackboards, such as three-dimensional graphics in mathematics, electromagnetic fields in physics, and the earth in geography Sports, etc., will no longer require teachers to explain, and students will rack their brains to imagine. VR/AR can display these scenes visually and visually, and students can easily recognize and understand them as shown in Figures 1 and 2.

Holographic technology actually uses the principle of interference of light to record all the information of the object in the form of interference fringes, and under certain conditions, forms a three-dimensional image that is highly similar to the object itself. Aiming at the problem of uneven distribution of educational resources in China, 5 G holographic projection teaching uses virtual reality and augmented reality technology to collect classroom teaching image information through holographic projection to present remote students' listening conditions and real-time interaction; the use of holographic technology can be more vivid To present things in other spaces in the classroom, in addition to introducing other expert teachers to explain knowledge to students as in this lesson, holographic technology can also be used to introduce a specific thing into the classroom for all-round display, such as An artifact, animal, or instrument. With the development of optical devices, holographic technology can also be used to superimpose another scene into the classroom space in the future, allowing students to experience the feeling of being in any place in the classroom. In addition, the holographic platform is deployed in the classroom, and through 3D technology, the real images and courseware content of some famous school experts and teachers can be presented to the remote students. Compared with the connection forms such as telephone and video, holographic technology can retain



FIGURE 1: Students learn through VR (1).



FIGURE 2: Students learn through VR (2).

more The information that is visible to the naked eye connects and integrates the two separate spaces, so that the interaction between students and teachers and resources in different places can get rid of the limitation of separation of time and space, and realize the distance teaching of natural interaction [6]. Teachers can also reproduce the content of nature, science, history, biology, physics, chemistry, and other disciplines through holographic technology, making teaching and learning more vivid and improving teaching quality.

The key technology of speech recognition is to convert speech data into corresponding text or instructions by intelligent means. Speech recognition technology currently has a wide range of applications. For example, in the application of smart education, all the audio data of the teaching classroom are collected, and after the analysis of the pronunciation and semantics, it can assist the analysis of the teaching situation and the students' learning situation, and scientifically test the teaching level of the teachers and the learning situation of the students. It can also understand the individual characteristics of students through feedback data, and practice the people-oriented teaching concept. The main process of speech recognition is shown in Figure 3.

With the support of 5 G technology, the interaction between various multimodal resources will become more convenient, which provides an opportunity for the innovation of teaching and learning models and the integration

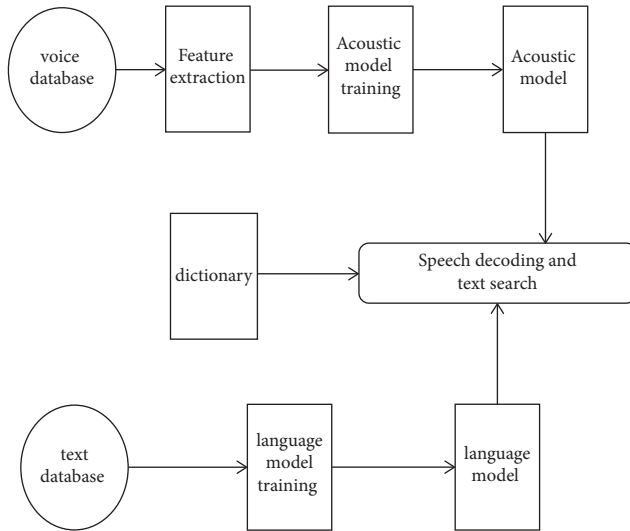


FIGURE 3: Speech recognition analysis flow chart.

and reorganization of many educational elements. Teachers, students, learning resources, and the learning environment are the four basic elements of educational scenarios supported by 5 G, and they interact and influence each other [7]. Multimodal smart classrooms need to give full play to the advantages of each element and use multimodal information technology in the 5 G environment to make the interaction between students and teachers, learning resources, and learning environments more diverse and personalized and explore various modalities. The potential of each element complements each other [8]. Online teaching, offline teaching, blended teaching, virtual simulation teaching, and other teaching forms in a smart environment help to integrate diversified online and offline learning resources, optimize teaching paths, improve teaching effects, and improve teaching evaluation.

Based on the above-given design ideas, we combined practice to build a multimodal smart classroom model in the 5 G environment, as shown in Figure 4. After the introduction of the smart teaching system, a network system environment covering smart learning terminals, smart learning management platforms, smart learning software, and resources has been formed based on the support of 5 G technology, forming a flexible, open, shared, convenient, and traceable smart learning space [9–11], and at the same time realize the seamless interconnection and collaborative work between a variety of software and hardware devices, providing learners with a truly immersive real-time learning experience [12–14]. In addition, the multimodal learning environment under the 5 G network should make full use of the technical characteristics of 5 G's high bandwidth, low latency, and large connection, by connecting to various forms of intelligent terminals and educational equipment (such as VR/AR/MR equipment, and holography). Projection, smart whiteboard, mobile terminal, smart learning pen, etc., to achieve seamless interconnection and collaborative work between various software and hardware devices, providing learners with a truly immersive real-time learning experience.

4. Discussion

With the guidance and expansion of teachers as the auxiliary, a new teaching method combines the two. The blended teaching model is conducive to expanding the dimension of teaching, promoting the interaction between teachers and students, and stimulating students' learning initiative. Teachers should not only pay attention to students' knowledge acquisition but also pay attention to students' ability development, and pay attention to the interaction between students' existing concepts and new concepts. Therefore, smart classrooms should design news broadcasts, new class explanations, assignments, and summaries. The way students explore awareness, optimize their learning experience, and the innovation of teaching models in colleges and universities should involve the exploration of employment orientation and employment preparation; that is, they need to be based on employment, give full play to the advantages of 5 G and cultivate talents needed by society.

"5 G" has just entered the first year of commercial use, and there are still great deficiencies in talent training. For ordinary people, "5 G" may just mean faster internet speeds. The 4 G era has created the live broadcast industry, and the "5 G" era will also create a new industry. However, the development of the "5 G" era also needs the support of talents, and the innovation of the smart classroom teaching mode in the "5 G" era requires compound talents from the Internet industry and the education industry. It is not perfect, resulting in a serious shortage of "5 G" talents and also makes the innovation of smart classroom teaching mode in the "5 G" era temporarily stay in the conceptual stage.

In the 5 G environment, "Internet + education" will introduce more means such as AR/VR technology, which can be presented in a virtual way for the history, training process, and dangerous operations that cannot be presented in the classroom, and even voice can be realized, context simulation, etc. The above-mentioned are not presented vividly in the traditional teaching process. Many teachers still rely on their own explanations and always grasp their central position in the classroom. In this way, students' thinking will be greatly affected, and even if it is solidified, the vitality of the classroom will be insufficient, and the students' enthusiasm for learning cannot be fully mobilized in a timely manner, which will affect the students' own learning efficiency. On the one hand, a smart classroom is a relatively new teaching method. Teachers of different age groups have different views and acceptance of the new teaching method. Some teachers' teaching mode has been fixed, and it is difficult to change their ideas and accept new ideas in a short period of time. [15]; on the other hand, some teachers blindly believe in their own traditional teaching mode, ignoring the characteristics of students in the new era and the changes in social needs to talents, resulting in students not being able to grasp the essence of learning in the learning process. Under the new teaching method, teachers' attitude towards smarter classroom determines the quality of classroom teaching. Although some teachers agree to adopt new teaching methods to carry out teaching activities, more teachers still

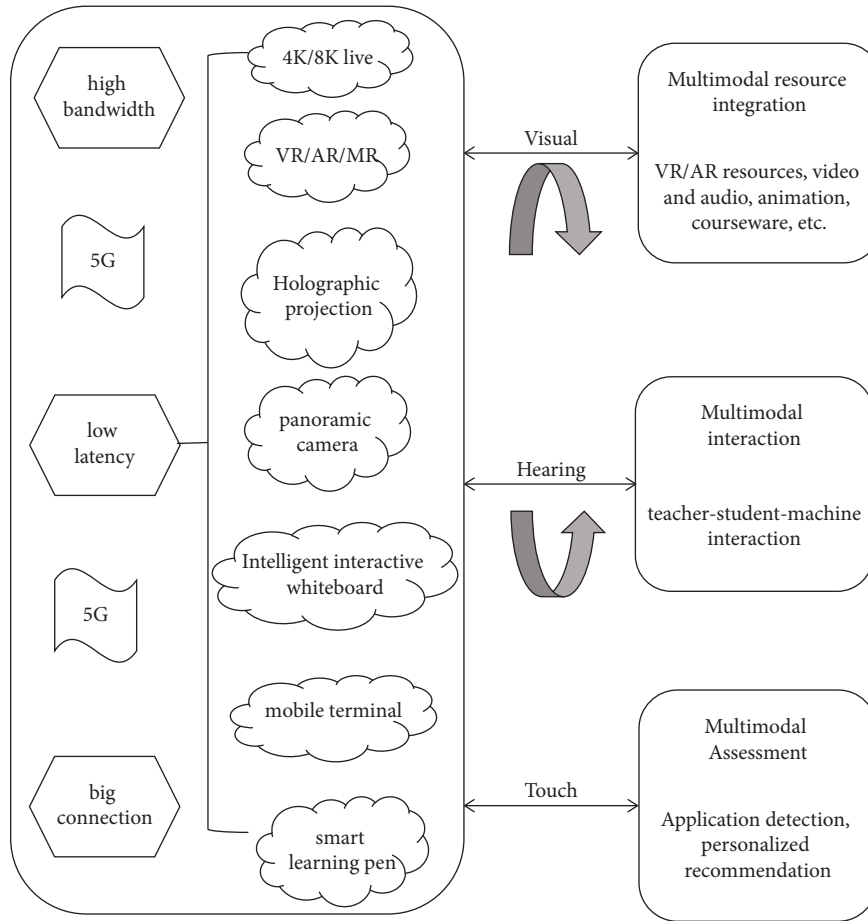


FIGURE 4: “5G” multimodal smart classroom model.

adopt the traditional teaching mode, and this attitude has certain obstacles to the development of smart classrooms in schools. These teaching concepts are difficult to understand the obstacles in students’ learning and their reasons, and it is difficult to provide accurate practical guidance, but repeated and inefficient practice, which is difficult to reduce the burden on students.

Colleges and universities should select teaching content and optimize teaching resources. Relying on 5G technology, we carefully design classroom content that is conducive to students’ experience, so that students can feel the interest of the content and consciously apply the content in practice. In other words, because 5G is rich in teaching resources and can optimize teaching links and teaching methods, it can greatly enrich the teaching materials of various disciplines and majors in colleges and universities, so that text, pictures, audio, video, and other content can be properly presented in front of students. Under the background of the 5G era, college teachers should make preparations for the teaching reform of various disciplines based on the transformation requirements of employment goals, so that students can be placed in a teaching environment that is more conducive to employment exploration. Facts have proved that through the efforts of these aspects, a teaching environment that meets expectations will be formed in time, and the environment construction will serve the teaching model innovation in the

5G era together with the two key points of employment understanding and skill development. For the construction of a teaching resource library, higher vocational colleges should pay enough attention. Teaching resources should be designed and used according to the specific content of the course and the design of teaching links. To achieve complete matching of resources and tasks or projects, avoid formalized educational information applications.

5. Conclusion

“5G” is the current social hotspot and a new technology that carries the hope of the country and the nation. It fundamentally impacts the current education model. The innovation of the smart classroom teaching model in the “5G” era is undoubtedly a subversion of the traditional classroom teaching model. Smarter classroom teaching not only builds a smart learning environment and promotes the embodied experience of students’ learning scenarios but also helps teachers monitor students’ learning progress and conduct teaching big data analysis. It has also enhanced the technological innovation in the field of education. For this reason, the country needs to further explore the integration of information technology and the education industry, continuously catalyze the maturity of technology, reduce technology costs, and increase the number of “5G” talent

training and talent reserves. However, in the teaching of colleges and universities, the application of informatization needs to be scientifically and reasonably planned and managed and cannot be blindly followed or used in a mere formality. It should be determined according to the current school conditions and specific learning conditions, and appropriate changes should be made in terms of teaching concepts to adapt to the current development of education. Only in this way can we effectively promote the innovation and development of the smart classroom teaching model in the “5G” era. Students will naturally have the conditions to move towards applied talents, making education fairness a reality and achieving access to the highest quality educational resources in the shortest time possible. It is believed that in the near future, the smart classroom teaching model in the “5G” era will also become the mainstream education model in my country’s education industry, fully realizing my country’s education informatization. It’s important to realize the people-oriented concept and help students grow and become talents.

Data Availability

The datasets used and/or analyzed during the current study are available from the author upon reasonable request.

Conflicts of Interest

The author declares that there are no potential conflicts of interest.

Acknowledgments

(1) This research had been financed by The Key Projects of Humanities and Social Sciences Research in Anhui Colleges and Universities in 2017, “Research on the Application of the concept of “people-oriented” in Moral Education in Higher Vocational Education” (Grant no. SK2017A0944). (2) This research has been financed by Anhui Vocational and Adult Education Society of Education Scientific Research Planning Project ““moral education” the current situation and strategy of higher vocational colleges” (Grant no. Azcj046).

References

- [1] J. Yang, Ji Xin, and Q. Hu, “Power cloud service platform based on micro-service architecture,” *Power Information and Communication Technology*, vol. 1, pp. 8–12, 2017.
- [2] Ministry of Education of the People’s Republic of China, *Guiding Opinions on Promoting the Construction of New Educational Infrastructure and Building a High-Quality Education Support System [EB/OL]*.
- [3] L. Xiang, *5G Era - what Is 5G and How Will it Change the World*, pp. 95–98, Renmin University of China Press, Beijing, 2019.
- [4] J. Bian and F. Xu, “Study on the design and effect of learning mode based on smart classroom,” *China Electronic Education*, vol. 2, pp. 64–68, 2016.
- [5] L. Li, “Research on the integration of 5G+VR technology and ideological and political teaching: taking the first VR ideological and political education training room in Jiangsu as an example,” *Education Modernization*, vol. 6, no. 62, pp. 183–185, 2019.
- [6] G. Chen and Z. Guo, “Research on smart classroom Application supported by 5G network,” *China Education Technique and Equipment*, vol. 6, pp. 68–70, 2020.
- [7] L. Yuan, Y. Zhang, and G. Luo, “Elements of educational scenario elements reform and countermeasures in the 5G era,” *Distance Education Journal*, vol. 37, no. 3, pp. 27–37, 2019.
- [8] H. Wang and H. Wang, “Research on the teaching mode of flipped classroom under the multi-modal perspective,” *Electronic Education Research*, vol. 36, no. 12, pp. 70–76, 2015.
- [9] J. Liu, T. Guo, T. Yang et al., “Smart Classroom: a new way for future school classroom development in the Internet + era,” *The International Journal of Biochemistry & Cell Biology*, vol. 86, no. 7, pp. 14–21, 2017.
- [10] L. Tang, “Reform and innovation of reading course for English majors in 5G era,” in *Proceedings of the Sixth International Conference on Information Management and Technology*, NY, USA, August 2021.
- [11] X. Li, Z. Xu, and C. Ling, “Research on information technology of vocational education based on 5G Era,” in *Proceedings of the International Conference on 5G for Future Wireless Networks*, Springer, Beijing, China, February 2022.
- [12] C. Su, X. Jiao, and Y. Yang, “Multimodal intelligent classroom practice in 5G environment,” *Modern Distance Education Research*, vol. 5, pp. 103–112, 2021.
- [13] P. Xiaoling and X. Zhou, “The transformation of artificial intelligence in the 5G era and the impact on education,” in *Proceedings of the 2022 IEEE 2nd International Conference on Electronic Technology, Communication and Information (ICETCI)*, IEEE, NY, USA, August 2022.
- [14] M. Zhang and H. Zhang, “Construction of music teaching effect evaluation model based on 5G technology,” in *Proceedings of the 2020 International Conference on Data Processing Techniques and Applications for Cyber-Physical Systems*, Springer, Singapore, December 2021.
- [15] X. Zhu, *Research on the Problems and Countermeasures of Promoting Smart Classrooms in Rural Junior High Schools*, Soochow University, Suzhou, 2018.