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*Retraction*

# Retracted: Education Mode Reform of Colleges and Universities in Music Teaching under 5G Internet

**Mobile Information Systems**

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This article has been retracted by Hindawi following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of one or more of the following indicators of systematic manipulation of the publication process:

(1) Discrepancies in scope
(2) Discrepancies in the description of the research reported
(3) Discrepancies between the availability of data and the research described
(4) Inappropriate citations
(5) Incoherent, meaningless and/or irrelevant content included in the article
(6) Peer-review manipulation

The presence of these indicators undermines our confidence in the integrity of the article's content and we cannot, therefore, vouch for its reliability. Please note that this notice is intended solely to alert readers that the content of this article is unreliable. We have not investigated whether authors were aware of or involved in the systematic manipulation of the publication process.

Wiley and Hindawi regrets that the usual quality checks did not identify these issues before publication and have since put additional measures in place to safeguard research integrity.

We wish to credit our own Research Integrity and Research Publishing teams and anonymous and named external researchers and research integrity experts for contributing to this investigation.

The corresponding author, as the representative of all authors, has been given the opportunity to register their agreement or disagreement to this retraction. We have kept a record of any response received.

## References

[1] L. Luo, "Education Mode Reform of Colleges and Universities in Music Teaching under 5G Internet," *Mobile Information Systems*, vol. 2022, Article ID 7701567, 12 pages, 2022.

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*Research Article*

# Education Mode Reform of Colleges and Universities in Music Teaching under 5G Internet

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The benefits of music education are immense and highly beneficial to students. Music positively impacts a child's academic performance, assists in developing social skills, and provides an outlet for creativity that is crucial to a child's development. This study combines 5G communication and music education to analyze the application of 5G in music education. The application principles of 5G technology in music education are investigated, and the role of digital technology in the development of music education is explored. Results show that the 5G has good application performance in music education, and as a result of 5G Internet technology, college and university music teaching approaches are becoming more diverse and teachers gradually introduce students to many musical styles and ideas, resulting in the expansion and development of music education and the transformation of traditional music education approaches into advanced musical educational techniques. Furthermore, in the context of the advanced communication era, the direction of music online education reform and innovation is correct, combining a 5G network environment with artificial intelligence. This study broadens the application scenario of 5G technology and offers suggestions for reforming and innovating music online education in the new era.

## 1. Introduction

With the development of modern science and technology, especially the rapid development of information technology represented by "5G Internet+," modern teacher learning has been given a strong motivation. In the context of modern curriculum reform, teachers' teaching capacity has been put forward to new standards. Knowledge is mostly imparted by schools in traditional education, and people have relatively few channels to acquire knowledge [1]. However, as 5G Internet and education continue to develop, there are more channels and ways to disseminate knowledge, and the way people receive education has changed dramatically. The ongoing growth and refinement of 5G Internet and education have steadily undermined schools' monopoly on information distribution, allowing education to transition from being closed to open [2]. With the continued growth of 5G Internet and education, music teaching has evolved in various novel forms such as catechism, WeChat, and mobile app, laying a basis for the development and study of music instruction. This has allowed the conventional music classroom to increasingly overcome time and space constraints and achieve the sharing of resources for good music teaching modalities [3]. In this environment, the key challenge for a college education is to rationally assess and actively respond to the new model of music teaching in the context of 5G Internet and to closely blend conventional and emergent music teaching modes to improve school education quality [4].

The methods of music teaching and delivery methods have undergone significant changes as a result of the Internet's influence, and the Internet will serve as a positive and effective replacement for conventional music teaching, with effective compensations and useful new attempts possible in the web teaching mode [5]. Internet education has a significant practical value in compensating for the timing and spatiality of traditional music instruction. Students who did not have the chance or conditions to learn face to face in the past may receive online music instruction through online music teaching forums. This type of music instruction requires certain technological equipment, and by transmitting video and audio in real time, space constraints may be overcome, and today's Internet technology can completely support the deployment of this instructional tool [6]. The second aspect is that we can use the Internet to get

history and documentation for the works, as well as video and audio, which contrasts with conventional music study, where acquiring material is extremely difficult and time-consuming. We can access a large number of resources and materials by searching the Internet instead of wasting time and energy searching, having to sort, and reviewing relevant materials, allowing students to focus more on the learning process, have more energy at their disposal for learning, and have access to higher-quality video, audio, articles, and visual resources [3].

Researchers have explored new ways of teacher learning development as primary and secondary education continues to develop under the influence of 5G communications. Cao [7] investigated the possibility of using 5G for music education with big data and in light of rapid scientific and technological development, to clarify and lead music teachers to apply spontaneous and conscious awareness of new media and fully apply new scientific and technological achievements in the information society for future music classroom teaching and to investigate the mode, method, trend, characteristics, advantages, and disadvantages of using 5G for music education [8]. By realizing the time and circumstance of 5G Internet+education, the authors in [9] made more people aware of the changing scenario and educational changes induced by 5G Internet+. Alt et al. [10] examined the characteristics of music education in the "5G Internet+" environment and assessed the development trend of music education through research, concluding that in the "5G Internet+" environment, the geographical relationship of teachers' learning communities has been dissolved, and the membership relationship has taken precedence. Based on the fast growth of information technology and the expanding public demand for music instruction, Waqas et al. [11] showed that online piano education, which may provide more tailored training programs and educational services, is a viable option. Wang et al. [12] proposed that online music education will become the mainstream and dominating style of music teaching in the future. We must first grasp the features of network information technology and the potential of integration with music training to properly employ it.

This study examines the applicability of 5G in music education by combining 5G communication with music education. The concepts of 5G technology's use in music education are examined, as well as the role of digital technology in the growth of music education. The results show that 5G has high application performance in music education and that college and university music teaching methodologies are growing more diversified as a result of 5G Internet technology.

The rest of the manuscript is organized into 4 sections. Section 2 is about materials and methods. In Section 3, a detailed description of the application of 5G in music education is presented. Section 4 illustrates different results, and Section 5 is about the conclusion.

## 2. Materials and Methods

*2.1. 5G Communication Networks.* Presently, the 5G network is the newest generation of mobile network technology throughout the world. Its advantages include fast data transmission, higher bandwidth, cost, and energy-saving. 5G has a significant improvement in transmission speed compared with the older cellular network, namely, about 100 times faster than 4G (the 4th generation mobile communication technology). For example, downloading a 1G (1st generation mobile communication system) video can be completed in 4 seconds under a 5G network [13]. Compared with traditional networks, the advantages of a 5G network are as follows:

(i) Faster transmission of the 5G network

Compared with 4G, 5G has a prominent improvement in transmission speed. Using 5G technology in data transmission can significantly reduce time cost and improve work efficiency greatly [14].

(ii) Stability of the 5G Network

There are advantages of 5G Internet communication technology in transmission stability as well. Application of 5G net communication technology can adapt to various types of complicated fields and perform transmission functions stably. The work efficiency of relative workers will be largely improved by 5G due to its stability in practical application [15].

(iii) High-frequency transmission technology of the 5G network

High-frequency transmission technology is the core technology of 5G. With expanding need for 5G net communication technology in daily work, higher frequency transmission technology and higher bandwidth need to be developed to guarantee the operation of 5G. Figure 1 shows the advantages of the 5G network.

According to the history of world computer network development, 5G network building, technology standards, terminal tests, and practical application are getting to perfection. Thus, kinds of industries have prepared to 5G's arrival. 5G net technology breaks through communication between people. Now its business use has taken priority in world economic competition and will accelerate every development process of products in industrial chains. The prime goal of 5G is to get approval and access to the market, which can make 5G net communication technology develop and enhance to the most extent [16].

5G must seize the opportunity and accelerate its business use under the development of service in the information era. The sooner the 5G is used in a business way, the faster it can be applied in real-life scenes, and it needs to be kept optimized until mature. Problems appearing in 5G business use, such as application scenes and users' experience, direct how to make improvement and optimization. The subject of application and consumer can participate in producing progress so that the level of 5G application can be finally improved [17].

*2.2. The History of the 5G Network.* Modern 5G net development has experienced mobile communication technology reform time after time. Its history is as follows:

In 1986, relying on the Frequency Division Multiple Access (FDMA) technology, the 1G era arose. China carried

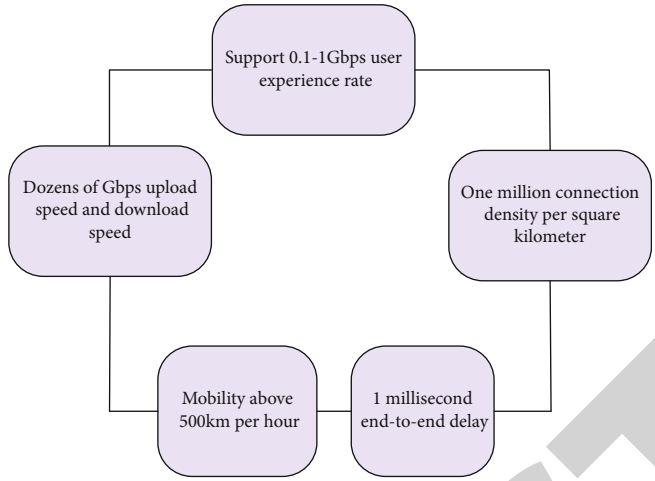


Figure 1: Advantages of the 5G network.

out a nine-year compulsory education system in that year and many people get access to education. In 1995, saying farewell to the 1G era, Time Division Multiple Access (TDMA) technology brought humankind into the 2-Generation Wireless Telephone Technology (2G) era. At this moment, reform and opening started to accelerate. China began to vigorously develop education careers, and both hardware and software of education had some promotion [18].

In 2007, with Code Division Multiple Access (CDMA) technology developing, the 3rd-generation (3G) network saw its popularity. Closely after that, education enterprise met its unprecedented huge changes. At this time, mobile online learning appeared and the development of distance education began to lunge [19]. In 2013, the application of Orthogonal Frequency Division Multiple Access (OFDMA) technology gave birth to 4G. The era of mobile internet formally occurred. The smartphone seemed to be a part of people, but television gradually faded out of people's daily life. New educational companies and every kind of live platform appeared one after another. The Internet giants of China—-BAT (Baidu, Alibaba, and Tencent)—entered the market promptly. Holding the slogan "the Internet will finally subvert traditional education," varieties of education entrepreneurs joined the business. Nowadays, 5G rushed into people's eyesight with 4G not thoroughly fading away. Most time, the impact of technologies on business is gradual reform at a slow pace. But it will be a great lap between the 4G era and the 5G era [6].

Since 2020, 5G was being located in China with high speed. Three giant telecommunication companies—China Telecom, China Mobile Communications Group Co., Ltd., and China Netcom—released their 5G building plan. Before those happened, 5G investment plans of 2020 went out from these three telecommunication companies. According to these plans, 500 thousand of 5G base stations would be built in 2020. Among them, 250 thousand base stations would be built by China Mobile Communications Group Co., Ltd. In the meanwhile, about 250 thousand base stations which cover all prefecture-level (including) and above cities in China would be built by China Telecom and China Netcom jointly. Figure 2 shows the 5G building plan of these three giant telecommunication companies.

*2.3. Multiple Input Multiple Output (MIMO) Technology.* Multiple Input Multiple Output (MIMO) technology is gradually becoming the core technology in the communication industry, which is also one of the key technologies in the 5G mobile network. This technology also plays an important role in the reform of teaching mode under the 5G network. The single-user MIMO (SU-MIMO) system is a point-to-point MIMO system (Point-to-Point MIMO) [20]. Multiple antennas are placed at the transmitter and receiver, respectively. Assuming that the single-user MIMO system has a transmitting antenna root $N_t$ and receiving antenna root $N_r$, the signal received by the receiver can be described as

$$y = \sqrt{p_u} G x + n, \tag{1}$$

where

$$x = \left[x_1 x_2 \cdots x_{N_t}\right]^T. \tag{2}$$

The transmitting signal in equation (2) is a column vector of $N_t \times 1$ dimensions, which $x_i$ represents the transmitting signal of the root antenna *i*.

$$n = \left[n_1 n_2 \cdots n N_r\right]^T. \tag{3}$$

Equation (3) is a column vector of $N_r \times 1$ dimensions, which represents the noise and interference in the signal transmission process and $n_1.n_2.\cdots nN_r$ is an independent and identically distributed complex Gaussian random variable with a mean of 0.

$$R_n = E\left[\mathrm{nn}^H\right] = \mathrm{I}_{N_r}. \tag{4}$$

Equation (4) is the covariance matrix of noise; the user's transmission power is represented by $p_u$. Assuming that a

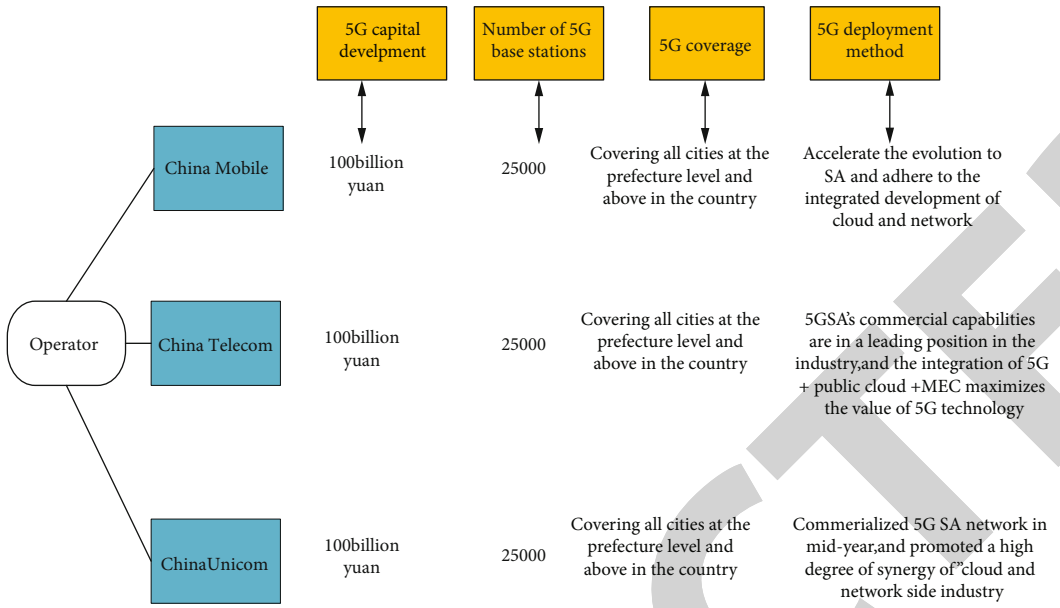


Figure 2: 5G building plan of thse three giant telecommunication companies in 2020.

standard is made on the total power of the transmitted signal, then

$$E\{\|x\|^2\} = 1. \tag{5}$$

Channel matrix $G$ is a matrix of $N_t \times N_r$ dimensions, which can be expressed as

$$G = \begin{pmatrix} g_{11}, g_{12} \cdots g_{1N_t} \\ g_{21}, g_{22} \cdots g_{2N_t} \\ g_{N_r1}, g_{N_{r2}} \cdots g_{N_{rN_t}} \end{pmatrix}. \tag{6}$$

The element $g_{ij}$ represents the channel fading coefficient between the transmitting antenna $j$ and the receiving antenna $i$.

Assuming that the transmitted signals are independent and identically distributed complex Gaussian random variables and the receiving end has ideal Channel State Information (CSI), the instantaneous achievable rate can be expressed as

$$C = \log_2 \det\left(I + \frac{p_u}{N_t} GG^H\right) \text{bit/s/Hz}. \tag{7}$$

When the transmission coefficient of the channel matrix is standardized, the upper and lower bounds of the channel capacity can be obtained by using the Yansen inequality:

$$(1 + p_u N_r) \le C \le \min\left(\mathrm{N}_t.\mathrm{N}_r\right)\log_2\left(1 + \frac{p_u \max\left(\mathrm{N}_t.\mathrm{N}_r\right)}{N_t}\right). \tag{8}$$

The actual achievable rate depends mainly on the numerical distribution of the elements of the matrix $GG^H$. When the user is at the edge of the neighborhood, that is, when the signal-to-noise ratio (SNR) is low, there is a variety in the achievable rate in

$$C = \frac{p_u Tr\left(\mathrm{GG}^H\right)}{N_t \ln 2} = \frac{p_u N_r}{\ln 2}. \tag{9}$$

Equation (9) shows that when the user is at the edge of the neighborhood, the achievable rate is independent of the number of transmit antennas $N_t$.

The development potential of massive MIMO technology in improving data transmission speed and transmission reliability makes the technology a research hotspot of 5G mobile communication in recent years [21]. The research on an uplink signal detection algorithm of a large-scale MIMO system is also an important research direction of signal processing technology of the 5G baseband. With the continuous development of MIMO technology, 5G will further accelerate the reform of music education mode in colleges and universities and promote the development and reform of education in the future, which is the driving force for the continuous innovation and development of education informatization in China [22].

*2.4. Status of 5G in Music Education.* From the perspective of education career development in China, advanced technologies such as the most representative 5G will be the stable basis of education career construction during a long period in the future. In the meanwhile, innovations that change the era will be developed. Educational informatization will keep moving forward and will focus on the 5G as the society will continue increasing [23]. Along with the combination of 5G upgrading with educational developing and advancing, significant changes in development and perspective of education will occur. These things create a huge impact on the ever-lasting traditional education methods. With 5G Internet technology environment continuous upgrading

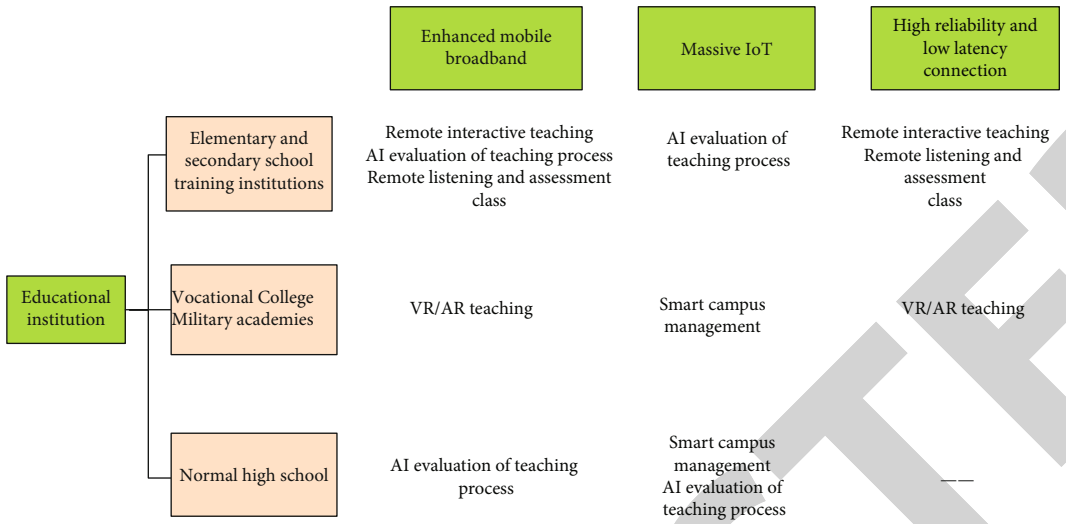


Figure 3: Requirement scene catalog of an education institution.

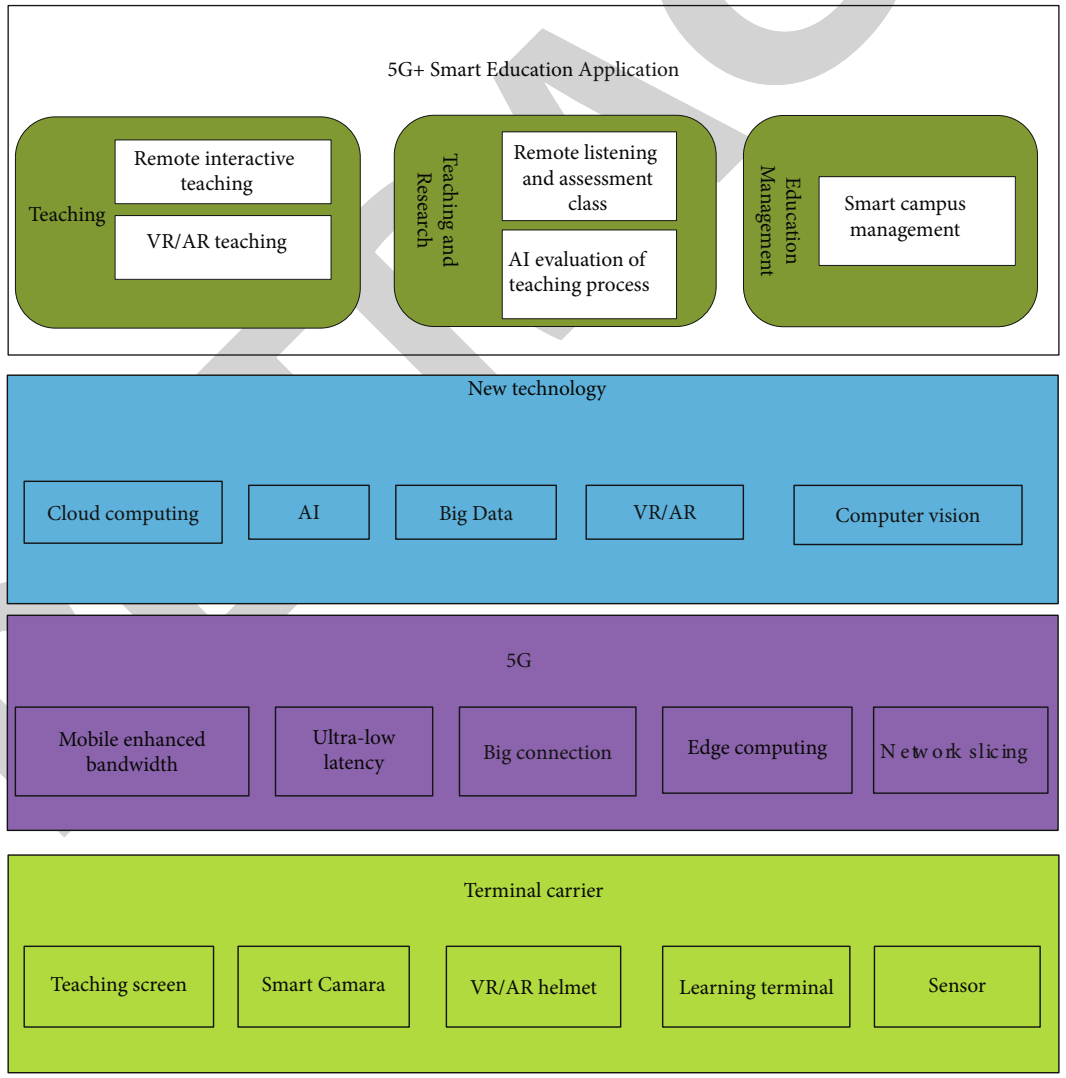


Figure 4: General viewgraph of 5G internet educational informatization.

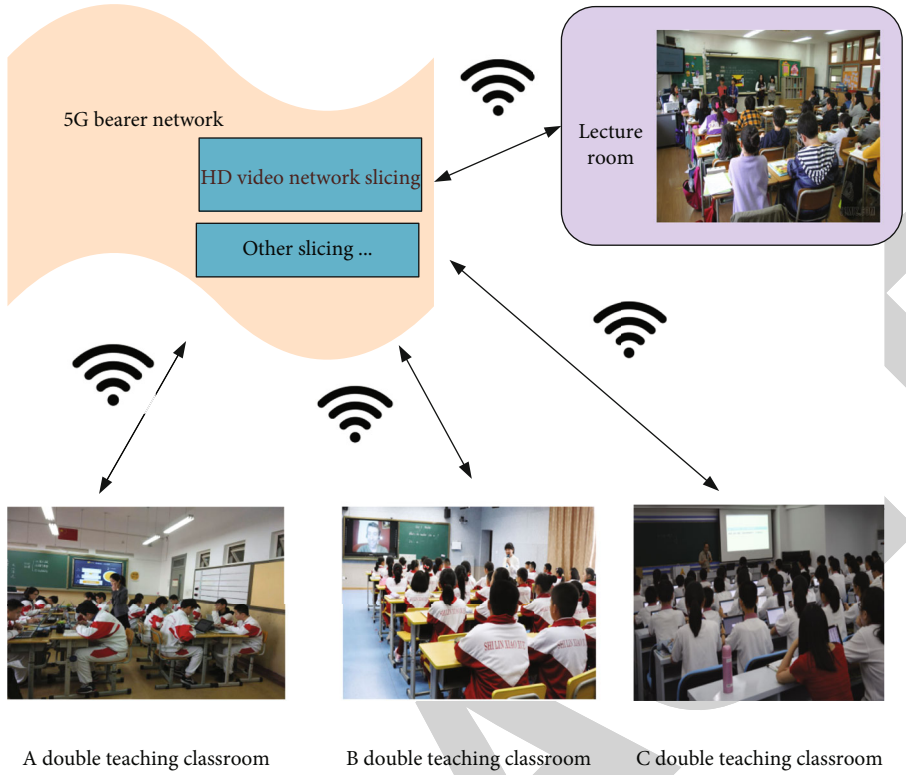


Figure 5: Distance interactive teaching scenes based on 5G technology.

and developing, varieties of smart educational information sharing and interaction will become more convenient. This means that the combination of factors during the teaching process can be realized and brand-new education methods, as well as presentation forms of content, can be structured. Educational service will be in an arm's touch. Finally, an unprecedented education system will be formed [24].

Knowledge comes from practice; it is the same in educational informatization. During practice, Information Technology (IT) development brings a prominent affection [23]. A high-speed communication network accelerates the development of the information industry. Cloud computing plays a role in the information industry competition. Organization methods of educational service are under reconstruction by big data, artificial intelligence (AI), and other intelligence Internet technology. All kinds of public educational service systems are open to society, leading to the collective intelligence direction. Cloud network integration will be the result of the development. The popularization of intelligent services provides convenience to immersive intelligent educational services.

According to the background description above, it is anticipated that the main characteristics of educational informatization construction at present and in the future include the following:

(i) Educational information unlimited transmission. Data analyses provide enough support to the realization of immersive intelligent education experience. Perception of environment and data collection make it possible to transmit data from one place to another, which breaks through limits of time, distance, and media [25]

(ii) Educational resources and services will cooperate more intelligently. Based on the development of intelligent technology and communication environment, multimode connection and coordination of all kinds of educational operation will be effectively and conveniently achieved. The intelligent ability of coordination will be put into management training in the educational field, educational service, and other aspects to promote the reconstruction of business processes and innovate new service modes. Smart learning and development systems will provide more professional and educational businesses to meet the requirement of different individuals [26].

(iii) Strong promotion of education equity, high-grade educational resources, and service can be integrated through mobile Internet. Breakthrough and development of technology also make them accessible to daily study. Successful application of IT technology realizes education equity in the real scene. All of these are due to the large education development in AI [27]

5G technology steadily guarantees educational technology informatization. AI, Virtual Reality (VR), big data, and other advanced technology will lead to education informatization in the future. 5G technology propels development and reform in the education area greatly and will bring a big move to educational informatization in the future. The combination of ultralow latency and Big Internet of Things of 5G network environment with advanced IT technologies such as

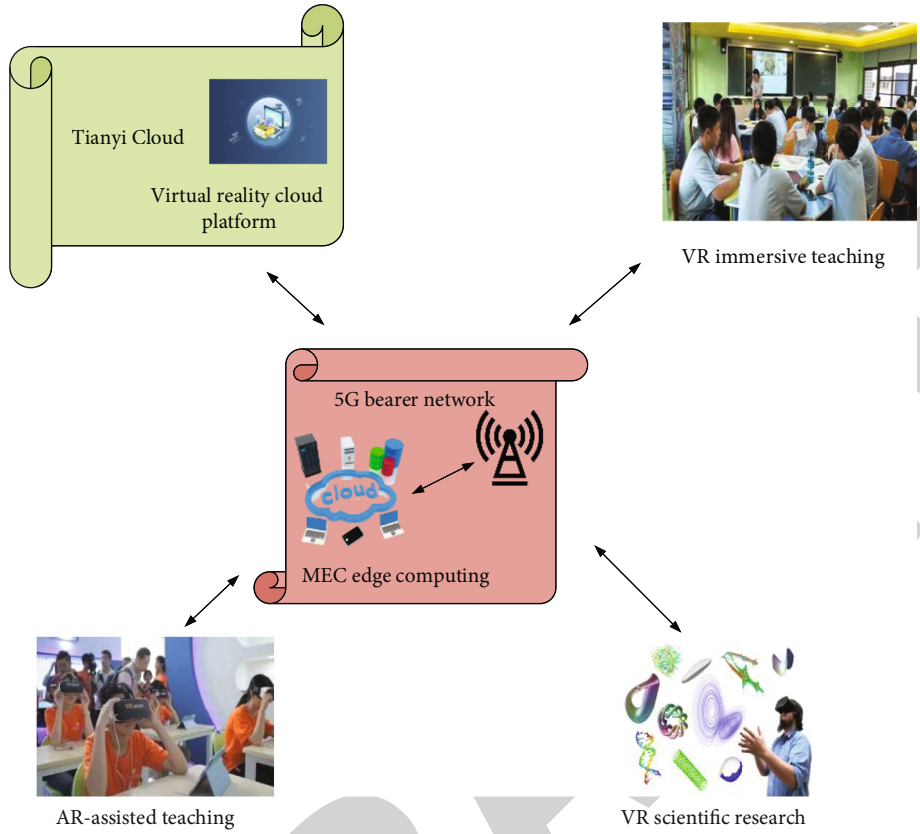


Figure 6: VR/AR teaching scenes based on 5G internet technology.

slice technique, mobile edge computing, and AI is essential to the development of the brand-new smart school and class application [28].

The Wi-Fi network in school supports the data network of the traditional classes. It is Bluetooth and ZigBee that make the network between things available. 5G smart class makes the best of technical advantages in 5G's nature. By generalizing 5G with all hardware terminals, 5G smart class meets up with the real educational requirement of users in school with better educational experience, mainly because schools with integrated networks do not need to accommodate many kinds of networks and smart classes equipped with ultrahigh network bandwidth can bear a high-level picture effect. In addition, higher speed or lower delay supports smart class learning video to be recorded at any time and anywhere [29].

## 3. Design Planning of 5G Technology in Education Applications

*3.1. Demand Scenario.* Three main kinds of 5G technology application scenes are brought out on International Telecommunication Union (ITU) [30] and Enhanced Mobile Broadband (EMBB) and Ultrareliable and Low Latency Communication (URLLC). It has a high peak rate, and it can meet up with the requirement of people who are often on a high-speed trip or in an area with a large population. It meets up with the requirement of ultra-high-speed and ultralow delay operation scenes; mMTC (Massive Machine Type Communication) fulfills the need for low power dissipation, low cost, and low flow rate of a communication network in some operation scenes. Relying on the need of integrating 5G technology and education scientifically and technically, after research and exploration, the requirement of 5G technology in educational operation scenes has been listed in Figure 3.

According to Figure 3, the requirements of secondary and primary schools as well as educational institutions mainly lay on distance listening and evaluating class, distance interactive teaching, and AI evaluating teaching effect. Requirements of training college and military college mainly lay on Virtual Reality/Augmented Reality (VR/AR) teaching and smart school application of management. The requirements of ordinary universities mainly lay on AI evaluating teaching effect and smart school application of management.

*3.2. 5G-Based Smart Education System.* From the perspectives of teaching, teaching research, and education management, a general viewgraph is designed about 5G's effect on modern education. Distance control teaching and VR/AR are the most scenes in the education area support. Distance listening and evaluating class and AI teaching effect evaluating are the most scenes in education research. 5G technology is primarily used in smart school management characterized by the Internet of Things in the education management area. Figure 4 shows the general viewgraph of 5G internet technology educational informatization.

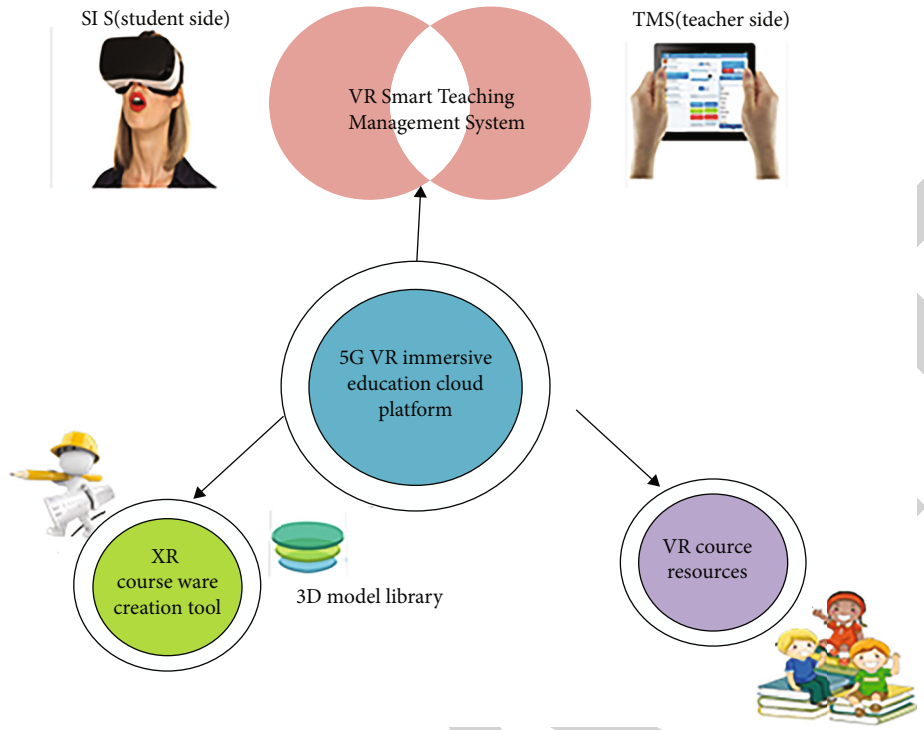


Figure 7: 5G VR immersive education cloud platform.

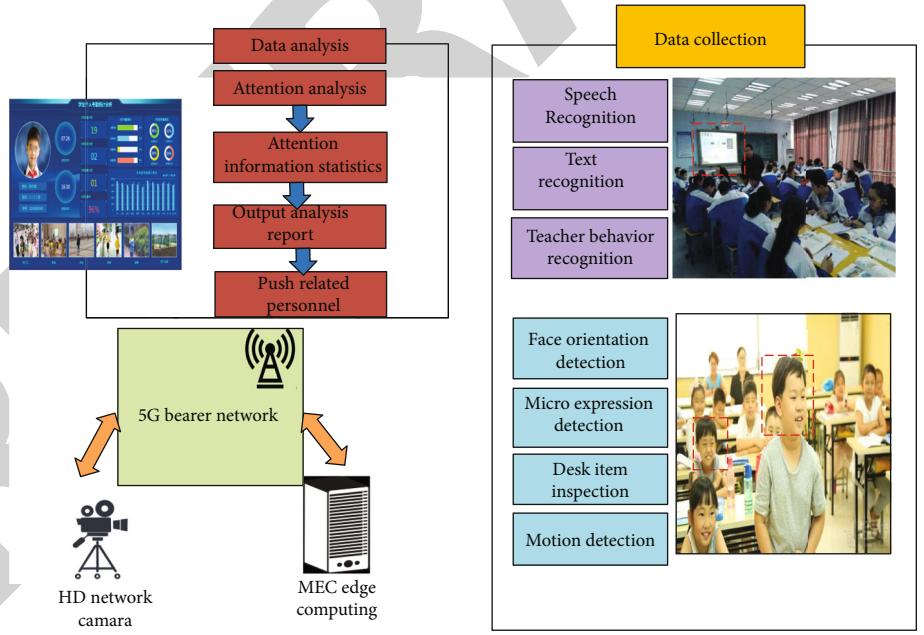


Figure 8: Scenes of AI evaluating the application in teaching.

## 4. Results

There are prominent changes in traditional education forms, with the personal computer used on the Internet. Varieties of online learning platforms appear so that Internet learning resources are available to people at any time. People enjoy great convenience in their learning. Development and innovation of 5G network technology give learners a chance to get learning experience whenever as well as in real classroom by the Internet of Things and VR technology, which set them free from limits of wireless network and spaces. Technology makes learning always in an arm's touch and novel. On the Internet, experts can communicate and learn with each other. Research of 5G technology in the education area


Figure 9: Smart school management based on the 5G Internet.

is fully carried out to combine education industry and 5G technology reform intimately. The main idea of this study is to explore the impact and effect of 5G on the core business of education [29].

*4.1. Remote Interactive Teaching.* Compared to the other technologies, 5G network technology makes online teaching available to clients and mobile applications. It solves the inconvenience of distance communication of traditional teaching and makes lessons available to learners everywhere, which provides powerful technology support to optimization of the classroom for teachers and students. 5G application in the terminal equipment in distance teaching scenes makes traditional learning mode limits vanish to students of any place. In the meanwhile, teaching methods have been seeing changes that are superior to traditional teaching methods. Figure 5 shows distance interactive teaching scenes based on 5G technology.

*4.2. Teaching Based on the VR/AR Cloud Platform.* Relying on the advantages of 5G's ultrabig bandwidth, ultra-high-speed, and ultralow delay, VR/AR teaching application's functioning, rendering, and control on the "cloud" are realized by the strong computing power of the "cloud." The structure of the edge cloud is designed to fulfill every application need of teaching. Users can set low-delay mode on the edge near them. Thus, the problems such as low speed of Internet and high delay of cloud service can be thoroughly solved.

A VR/AR cloud platform fitted with communication should be made. The application of new technologies such as the cloud and VR/AR/MR (Mediated Reality) can make teaching scenes in real classrooms abundant. These technologies also make an online virtual classroom more immersive, interactive, and experienced. Use VR to realize experiential teaching, and let students have in lessons. Transforming knowledge into virtual things that students can watch and interact with makes them placed in the real space to comprehend and feel the knowledge. As a result, students can learn knowledge in every aspect scientifically. Figure 6 shows VR/AR teaching scenes based on 5G internet technology.

The VR K12 Smart Education Resource Cloud Platform combines technologies such as VR technology and the

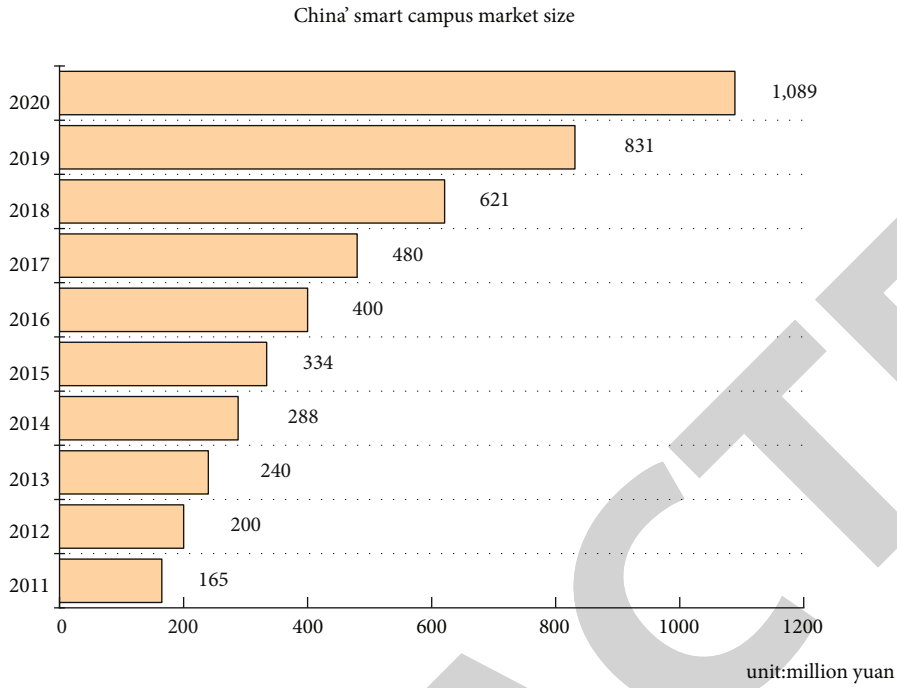


Figure 10: The market scale of smart schools in China.

Internet with teaching to develop and innovate education information technology, effectively propelling education reform. Figure 7 shows how it realizes the construction of a digitalized, modern, and permanent education platform.

Compared to traditional education, education based on the VR/AR cloud platform is characterized with the following: (i) class experience of students arises from 2D (two dimensional) to 3D (three dimensional). As a result, the abstract knowledge can be shown in a digital figure and is easier for students to understand and comprehend so that they can feel three dimensions better. (ii) Subjectively interacting learning, in which students can pause, repeat, or continue the class by their will. This nonsequence or circling learning mode is good for students and will not harm teaching. (iii) Gaming learning, through which teaching materials of much fun can be carried out in visualized and interactive VR/AR classes. Students can enjoy learning in the process. (iv) Distance teaching by VR/AR. Students and teachers from several different places can join in a class together. They can interact with others on the spot. Thus, sharing of the educational resource and education equity can be realized. (vi) Decreasing possible teaching accidents. For example, using AR/VR technologies to virtualize experiments can reduce the security risks of doing physics or chemistry experiments in laboratories or classrooms [31].

*4.3. AI Evaluation of the Teaching Process.* AI application will be the direction of education development in the future. AI-based cameras can be set in classrooms to collect visual information and judge the facial direction of students to examine whether students listen carefully or not. Through monitors, teachers will know if students are working hard and give hints or warnings accordingly. A focused degree of individual and whole-class learning can be concluded by the collected data, where an autofocus degree data analyzing model is necessary. In conclusion, student management of schools can be strengthened, under the integration of 5G technology and education management. AI technology has certain security risks in the science teaching area, which should be given enough attention. Figure 8 shows scenes of AI evaluating the application in teaching [32].

*4.4. Smart Campus Management.* Smart and intelligent school management primarily covers public facilities' intelligent management of the school. Equipment such as cameras and sensors can collect information about the school environment, students, teachers, and other kinds of stuff. Intelligent research can be made against the massive data by the Internet of Things and intelligent sensors. Using the results of research in the teaching and management service can realize real-time monitoring, property management, environment monitoring, security monitoring, energy management, etc. Then, the intelligent monitoring and operation of schools can be guaranteed. Figure 9 shows smart school management based on the 5G Internet.

5G smart and intelligent school management has several advantages such as enhancing information flow conversion degree, structuring in formalization environment, and intelligent management of equipment; realizing communication between electronic educational equipment and different platforms; realizing direct local management and indirect distance management; data collecting and management optimizing; and secularly collecting equipment operation data and deeply analyzing them, besides optimizing intelligent monitoring and management standard to achieve the goal of improvement effect of school management [33].

In these few years, China firmly propels informalized intelligent management development of the school and smart education develops a lot. The market scale of China's smart school industry has been expanding, which breaks through 20 billion yuan in 2012 and achieves 62.1 billion yuan in 2018. It is estimated to be beyond hundreds of billion yuan in 2020. Figure 10 shows the market scale of smart schools in China [34].

## 5. Conclusion

With the advent of the 5G Internet, Internet of Things, cloud computing, and other state-of-the-art technologies, the era of big data has quietly arrived. 5G Internet communication technology characterized with ultrabig bandwidth and stability can be applied in online education even modern education construction. This study explored the feasibility of the application of new technologies for music teaching. The general application of 5G technology in the modern education area is examined, and the main characteristic of music education informatization is illustrated. Then, it proposes concrete requirement scenes and innovative application of internet technology in music education. Finally, the research forms a general viewgraph of education informatization based on 5G internet communication technology. This study concluded that the 5G technology will keep innovating, developing, and leading upgrading in the future. Its innovation and application will give more deep content into education scenes continuously and massively to propel the development and reform of future education. 5G technology will be a native motion to keep China's education informatization innovative and moving forward. More contributions will be made from multiangle about 5G's impact on education. The present study is an initial attempt to highlight the major applications of 5G in colleges and universities' music education.

## Data Availability

The data underlying the results presented in the study are included within the manuscript.

## Conflicts of Interest

The author declares that there are no conflicts of interest.

## References


[1] H. Zhang, "Problems in China's college music teaching in recent years," *International Journal of Management and Education in Human Development*, vol. 2, no. 2, pp. 458–460, 2022.

[2] M. A. Abdel-Malek, M. M. Sayed, and M. Azab, "UAV-based privacy-preserved trustworthy seamless service agility for NextG cellular networks," *Sensors*, vol. 22, no. 7, p. 2756, 2022.

[3] N. Al-Falahy and O. Y. Alani, "Technologies for 5G networks: challenges and opportunities," *It Professional*, vol. 19, no. 1, pp. 12–20, 2017.

[4] Z. Ding, Y. Liu, J. Choi et al., "Application of non-orthogonal multiple access in LTE and 5G networks," *IEEE Communications Magazine*, vol. 55, no. 2, pp. 185–191, 2017.

[5] X. W. Liu, "The 5G era brings new development opportunities for the IoT industry," *China's Foreign Trade*, vol. 576, no. 6, pp. 54-55, 2019.

[6] X. Wang, S. Zhao, J. Liu, and L. Wang, "College music teaching and ideological and political education integration mode based on deep learning," *Journal of Intelligent Systems*, vol. 31, no. 1, pp. 466–476, 2022.

[7] H. Cao, "Innovation and practice of music education paths in universities under the popularity of 5G network," *Wireless Communications and Mobile Computing*, vol. 2021, 2021.

[8] Z. M. Yao, "Promoting education modernization with education informatization," *China Higher Education*, vol. 20, pp. 52–54, 2018.

[9] R. Frenneaux and A. Bennett, "A new paradigm of engagement for the socially distanced artist," *Rock Music Studies*, vol. 8, no. 1, pp. 65–75, 2021.

[10] R. Alt, A. Göldi, H. Österle, E. Portmann, and S. Spiekermann, "Life engineering," *Business & Information Systems Engineering*, vol. 63, no. 2, pp. 191–205, 2021.

[11] M. Waqas, Y. Niu, Y. Li et al., "A comprehensive survey on mobility-aware D2D communications: principles, practice, and challenges," *IEEE Communications Surveys & Tutorials*, vol. 22, no. 3, pp. 1863–1886, 2020.

[12] B. Wang, W. Mao, and G. Li, "China's digital publishing moving towards in-depth integrated development," *Publishing Research Quarterly*, vol. 35, no. 4, pp. 648–669, 2019.

[13] H. M. Ma, D. S. Wan, and H. Yin, "Pedagogy in the information technology age is an entertainment science," *Journal of East China Normal University (Educational Sciences)*, vol. 37, no. 5, pp. 56–66, 2019.

[14] X. Zhang and Z. S. Pan, "The situation, problem and prospect of curriculum reform in the process of intelligentization," *Journal of Shanghai Educational Research*, vol. 52, no. 9, pp. 87–90, 2019.

[15] M. S. Tj and M. R. Pooja, "A survey on 5G network technologies and communication," *Journal of Network Security Computer Networks*, vol. 8, no. 1, pp. 18–24, 2022.

[16] H. Lin and L. Chen, "Practice and thinking on the construction of teaching informatization in colleges and universities," *Research and Exploration in Laboratory*, vol. 38, no. 8, pp. 236–239, 2019.

[17] H. B. Yan, "Research on the evolution characteristics and path of China's informatization promoting education equity," *Journal of the Chinese Society of Education*, vol. 9, pp. 22–26, 2019.

[18] Z. L. Wang, X. Y. Li, and J. Lin, "Smartphones and the "Internet + class": a new thinking and new pattern of information technology integrated into the curriculum," *Journal of Distance Education*, vol. 33, no. 4, pp. 14–21, 2017.

[19] Y. Q. Ren, Y. C. Feng, and X. D. Zheng, "Integration and innovation, intelligent lead — greeting the new era of educational informatization," *China Educational Technology*, vol. 34, no. 1, pp. 7–14, 2018.

[20] Z. D. Yang, "Discussion on the characteristics and application of 5G mobile communication technology," *Telecom World*, vol. 9, pp. 42-43, 2017.

[21] H. Yu, H. Lee, and H. Jeon, "What is 5G? Emerging 5G mobile services and network requirements," *Sustainability*, vol. 9, no. 10, pp. 1848–1869, 2017.

[22] J. Liu, Q. Y. Wang, and Y. L. Lin, "Mobile VR application in 5G network," *Telecommunications Science*, vol. 34, no. 10, pp. 143–149, 2018.

[23] D. Prit Kaur, A. Mantri, and B. Horan, "Design implications for adaptive augmented reality based interactive learning environment for improved concept comprehension in engineering paradigms," *Interactive Learning Environments*, vol. 30, no. 4, pp. 589–607, 2022.

[24] J. Fang, C. Fan, F. Wang, and D. Bai, "Augmented reality platform for the unmanned mining process in underground mines," *Mining, Metallurgy & Exploration*, vol. 39, no. 2, pp. 385–395, 2022.

[25] K. Tran and T. Nguyen, "Preliminary research on the social attitudes toward the AI's involved Christian education in Vietnam: promoting AI technology for religious education," *Religions*, vol. 12, no. 3, p. 208, 2021.

[26] S. I. Popoola, "Smart campus: data on energy consumption in an ICT-driven university," *Data in Brief*, vol. 16, 2018.

[27] A. A. Ajiboye, S. I. Popoola, O. B. Adewuyi, A. A. Atayero, and B. Adebisi, "Data-driven optimal planning for hybrid renewable energy system management in smart campus: a case study," *Sustainable Energy Technologies and Assessments*, vol. 52, article 102189, 2022.

[28] W. Fu, "Random network calculation under the background of 5G network in remote piano music video teaching application," *Journal of Ambient Intelligence and Humanized Computing*, vol. 5, pp. 1–15, 2021.

[29] D. Dash, R. Farooq, J. S. Panda, and K. V. Sandhyavani, "Internet of things (IoT): the new paradigm of HRM and skill development in the fourth industrial revolution (industry 4.0)," *IUP Journal of Information Technology*, vol. 15, no. 4, pp. 7–30, 2019.

[30] S. Stickland, R. Athauda, and N. Scott, "Design and evaluation of a scalable real-time online digital audio workstation collaboration framework," *Journal of the Audio Engineering Society*, vol. 69, no. 6, pp. 410–431, 2021.

[31] P. Jandrić, A. MacKenzie, and J. Knox, "Postdigital research: genealogies, challenges, and future perspectives," *Postdigital Science and Education*, vol. 15, pp. 1–7, 2022.

[32] J. Mihailović, "The future of mobile operators - new business models," *Management: Journal of Sustainable Business and Management Solutions in Emerging Economies*, vol. 24, no. 2, pp. 73–84, 2019.

[33] P. Bellini, P. Nesi, and G. Pantaleo, "IoT-enabled smart cities: a review of concepts, frameworks and key technologies," *Applied Sciences*, vol. 12, no. 3, p. 1607, 2022.

[34] J. Chen and H. Li, "The development prospect of China's new consumer economy in the new situation—concurrently discussing the impact of COVID-19," *Open Journal of Business and Management*, vol. 8, no. 3, pp. 1201–1205, 2020.