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"5G+Education"—Reflection and Practice on Smart Education in Technical Colleges

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Abstract: *5G is a new type of mobile communication technology that has emerged with the continuous progress of society, economy, technology, and other aspects. In such an environment, many industries have faced new development opportunities and challenges. Therefore, in the context of "5G+education", this article explored the curriculum teaching reform of technical colleges in the 5G network environment, which was a very meaningful work. Therefore, this article first started with the changes caused by 5G technology in the curriculum teaching of technical colleges. On this basis, the curriculum teaching in universities under the conditions of "5G+education" was explored, hoping to provide some reference for the reform and development of curriculum teaching in technical colleges under the conditions of "5G+education". According to the survey questionnaire, the average score of students' evaluation of the effectiveness of autonomous preview courses and their evaluation of smart classrooms exceeded 3, indicating that smart classrooms are widely praised by students and can improve their learning efficiency.*

Keywords: *5G+Education, Smart Education, Technical Colleges and Universities, Thinking and Practice*

1. Introduction

Smart education is based on big data and other technological means, utilizing digital data sources to systematically integrate, update, and optimize educational data and methods, in order to achieve humanization and efficiency. In the G+smart education model, online learning is a quantitative development that enables students to learn online. It overcomes the problem of theoretical education being overshadowed by practical education, and therefore deserves in-depth analysis and exploration by many scholars.

Scholars have conducted relevant research on the educational reform model of "5G+education". Liu X proposed a decision support system for evaluating the functionality of 5G networks and artificial intelligence in situational teaching research in universities. The experimental results of the study indicated that the expected research effect was good and the results were satisfactory. The system utilizes various technologies based on artificial intelligence, natural language processing, machine learning, and deep learning to improve learners' writing, speaking, and listening abilities. Nowadays, the learning process has become productive and interactive, and students can improve their language skills by communicating with machine agents based on artificial intelligence (rather than native speakers). Various platforms have the ability to understand students' uncontrollable abilities and ultimately create content based on their level [1]. Based on existing research results, Gao Y took an English major at a university in Northeast China as a case study to explore how to use "5G" technology to improve the teaching level of college English majors. The specific content is as follows: 1) the comprehensive quality of English major students; 2) applying modern educational technology to classroom teaching of English majors; 3) understanding modern educational technology for students; 4) the advantages and disadvantages of applying modern educational technology to classroom teaching in English majors; 5) opinions of English major students on applying modern educational technology to professional curriculum teaching. Subsequently, based on the analysis of the survey results, consideration was given to how to organically integrate modern educational technology with traditional teaching methods, and a beneficial exploration was conducted on how to apply modern educational technology in future English major teaching, thereby improving students' overall quality and improving the teaching quality of the major [2]. YANG J analyzed smart education technology and its eight typical applications in the 5G era, including: smart and safe campus, integrated learning space, synchronous

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online classroom, teacher professional development, robot learning partners, mobile ubiquitous learning, virtual simulation training, intelligent electronic textbooks, etc. He explored the impact of intelligent educational technology on learning and teaching models in the 5G environment from three aspects: individual learning, group cooperative learning, and class collective learning. Finally, from the perspectives of smart education technology and its typical applications, the transformation of learning and teaching, and the new ecology of smart education, he proposed a framework for smart education in the 5G era [3]. Although the above literature research has put forward their own views on smart education, it is not comprehensive enough.

"5G+education" is a hot topic in the current education field, and its connotations, core functions, and implementation models have received widespread attention. The changes in the educational landscape, the challenges faced by the application of educational informatization, and the integration of education in the 5G environment have attracted much attention. However, there are few reports on how 5G technology can play a role in education. In fact, the deep integration of information technology and education is essentially the use of information technology to create an ideal learning environment and enhance the effectiveness of teaching and learning. Therefore, the impact of "5G+education" on the traditional education ecosystem cannot be ignored. This article explores the composition, function, and construction strategies of a new education ecosystem from the perspective of "5G+education", hoping to arouse people's thinking.

2. 5G+Education and Smart Education

2.1 Characteristics of Higher Education Resources in the "5G" Era

Compared with the previous generation 4G technology, the data transmission speed of the fifth generation mobile communication technology is much higher, reaching 10Gb/s, which is more than 100 times that of the previous generation 4G network [4-5]. Meanwhile, the response speed of the network is below 0.2ms, and there is little transmission delay. 5G communication has a large communication capacity due to its fast data transmission speed. Based on this concept, in the process of higher education, the intelligence of teachers' teaching work, the autonomy of students' learning process, and the diversification of the learning environment have been achieved. With the help of 5G network, teachers can obtain more information [6]. Its characteristics include fast network speed, high time utilization, no delay in data collection, and greatly expanding the capacity of the classroom [7]. Due to the efficient transmission of network resources, remote synchronous teaching and resource sharing can truly be achieved, thereby achieving environmental protection and teaching effects such as precision teaching, talent-based teaching, remote teaching, and shared teaching.

2.2 Impact of "5G Communication Technology" on Course Teaching

On October 24, 2019, the UK Department of Education and Research issued a notice on the launch of the undergraduate curriculum plan. The main content of the "Notice" includes the establishment of new curriculum concepts, the development and innovation of new curricula, scientific curriculum evaluation, and the reform of educational and teaching methods. It is necessary to strengthen the close integration between modern information technology and vocational education and training, promote innovation in teaching and learning methods, and simplify and standardize the application of information technology [8]. It is necessary to enhance communication between teachers and students, attach importance to creative teaching, value critical thinking, and eliminate the phenomenon of "teachers speaking, student listening" [9].

2.3 Improvement in Visual Aspects of Teaching Classroom

From the perspective of bodily sensations, visual perception is the most effective way for humans to perceive external things. Many times, a person's perspective affects their judgment [10]. The education curriculum of modern higher vocational and technical colleges has started from the traditional teaching mode and has been improved and improved in specific details. By utilizing the online course model, students can learn at anytime and anywhere. At present, courses such as AR (augmented reality) and VR (virtual reality) have not yet been implemented, mainly due to limitations in data transmission on hardware in vocational colleges. However, with the popularization of 5G networks, courses such as AR and VR are becoming increasingly popular [11]. 5G networks have a new impact on the development of VR technology, providing more guarantees for future application development, and minimizing

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dizziness caused by slow network speeds. With the strong support of 5G networks, the quality of VR videos has been greatly improved, which helps vocational colleges promote one-on-one teaching models on a larger scale.

2.4 Content Generation of New Teaching Services

The 5G era is gradually entering thousands of households, and the problem of information exchange between people has been well solved. The relationship between people and things, as well as between things, has also been well expressed [12-13]. In the current situation, this is a new technological and information revolution. In this network environment, through the operation of diversified 5G education funds, innovation and improvement of vocational education can improve the teaching quality of vocational education [14].

Intelligent education is a deepening and modernization of digital universities, and a higher-level form of university computing. It combines new information technologies such as big data, mobile internet, cloud computing, artificial intelligence, social networks, the Internet of Things, knowledge management, virtual reality, etc., to intelligently identify the work status and personality characteristics of teachers and students, and provide a comprehensive understanding of the physical environment of the campus. The physical space and digital space of the school are organically connected to construct a complete virtual landscape of the campus [15]. In cyberspace, a virtual image of a campus is created. Network information technology is utilized to fully understand the operational laws of the campus and the feedback and control of physical space, creating an intelligent, open, comfortable, and convenient living and educational environment for teachers and students. The interaction between teachers and students and the school resource environment has changed, thus achieving innovative and personalized humanistic services that can support smart education. Its characteristics are as follows [16].

(1) Openness

Smart education has the characteristic of openness. It breaks through traditional ways of thinking and places education in a broader environment, allowing students to learn both inside and outside the classroom. This allows students to have a better understanding of the world and a more correct understanding of reality, enrich and exercise their thinking, and stimulate their learning enthusiasm [17].

(2) Digitization

Digital teaching is another characteristic of smart education, providing a brand new online world, allowing students to access richer educational materials, making it easier for them to teach and learn online, and making it easier for students and teachers to share [18].

(3) Interactivity

Smart education is characterized by interactivity, which promotes multidirectional communication between teachers and students, students, and others, achieving a bidirectional flow of educational information between humans and machines, as well as between humans and humans. Teachers' classroom teaching emphasizes the cultivation of students' emotions and the relationship between students and teachers.

(4) Personalization

An important feature of intelligent teaching is personalization, which can facilitate the smooth transfer of knowledge between teachers and students, help teachers better understand students' characteristics, and thus better respond to strategies. At the same time, it can also provide students with a better understanding of themselves and corresponding personalized guidance for learners, such as providing them with information according to their individual needs and pushing learning resources and services [19].

3. Application of "5G+Smart Education" in Online Teaching

3.1 Building a Cloud Platform to Provide Excellent Online Teaching Resources

5G+Smart Education can build a "teaching cloud" through 5G networks and artificial intelligence algorithms: a resource platform that stores a large amount of high-quality teaching resources. The cloud platform is jointly built by universities and enterprises, or by universities and vocational colleges. In

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this case, teachers can obtain the teaching resources they need on the cloud, while students can use various application software on a 5G network to easily and quickly access teaching resources. This platform can achieve the sharing of high-quality teaching resources, effectively solving the problem of uneven quality teaching resources and limited repetitive contribution output at different levels of universities [20].

3.2 Integrating advanced Technology for exciting Online Teaching

By utilizing the characteristics of 5G high-speed and low latency, combined with new technologies such as VR/AR (Virtual Reality/Augmented Reality) and holographic projection, online teaching content can be made more realistic, resulting in an immersive learning experience. Holographic projection technology is utilized to present the teacher's real-life image and textbook content in an intuitive and intuitive manner on the internet. Through the VR/AR teaching content captured with a 4K/8K panoramic camera, students can participate in remote classrooms through a 5G network and use VR devices for synchronous learning under the guidance of the teacher. The VR/AR platform is utilized and cloud applications are run to create an experimental VR environment. Remote virtual training is conducted in the intelligent experimental system, which can improve the efficiency of training and reduce the security risks of training. A three-dimensional and intuitive teaching content and methods can bring students a charming gamified effect, thereby stimulating their interest in learning [21].

3.3 Utilizing Intelligent Technology to form a Full Process Evaluation System

Students can use 5G terminals to attend classes, and teachers can communicate with students in real-time through video, sound, images, and other means. The "5G+" smart education system can record the entire teaching process in real time, transmit data at high speed on the 5G network, and analyze it using technologies such as big data and artificial intelligence, thus constructing a complete set of curriculum teaching data centers. In the process of classroom teaching, students can quickly receive feedback and evaluation from classroom teaching, thereby adjusting their learning state in a timely manner and promoting the formation of student-centered learning methods. Teachers can use data centers to comprehensively and objectively evaluate students' learning situations, identify deficiencies in the teaching process, and reflect and improve them, thereby improving the quality of online teaching.

4. Classroom Evaluation Questionnaire Survey on Smart Education

In order to investigate the impact of smart classrooms on students, this article sent 800 survey questionnaires to 2021 students in a certain university and received a total of 650 valid feedback questionnaires. The content information of the received survey questionnaires was analyzed.

4.1 Self Preview Course Effectiveness

According to the Likert scale scoring method, data analysis was conducted on the content of students' autonomous learning courses, and the average score of the dimensions was 3.92 points. According to the rating criteria of the Likert Level 5 scale, as long as the average score of the dimension exceeds 3 points, it can indicate that students have accepted micro videos for pre-class autonomous learning and can smoothly carry out teaching activities. Among them, A, B, C, D, and E represent the degree of agreement with the evaluation indicators, which decreases in order, indicating strong agreement, general agreement, disagreement, and extreme negation, respectively.

$$Score_q = \frac{w \times N}{N_t} \tag{1}$$

$$Score_d = \frac{\sum_{i=1}^{n} Score_q}{\mathrm{d}} \tag{2}$$

Among them, $Score_q$ refers to the average score of each question; w refers to the weight value;

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N refers to the frequency; N_t refers to the total number of entries in the question; $Score_d$ refers to dimensional averaging; d refers to the dimension.

Table 1: Average score of the effectiveness of independent preview courses

Student Evaluation Indicators	Average score
The need for prior pre-study before class	4.31
The tool for pre-course study is micro-video	3.73
Whether the knowledge points of the micro-video can be mastered	5.31
Improved quality and efficiency of learning	3.71

From Table 1, it can be seen that the minimum average score of the four indicators evaluated by students was 3.71, which exceeded 3 points. This means that students are relatively satisfied with using micro videos for pre-class autonomous learning.

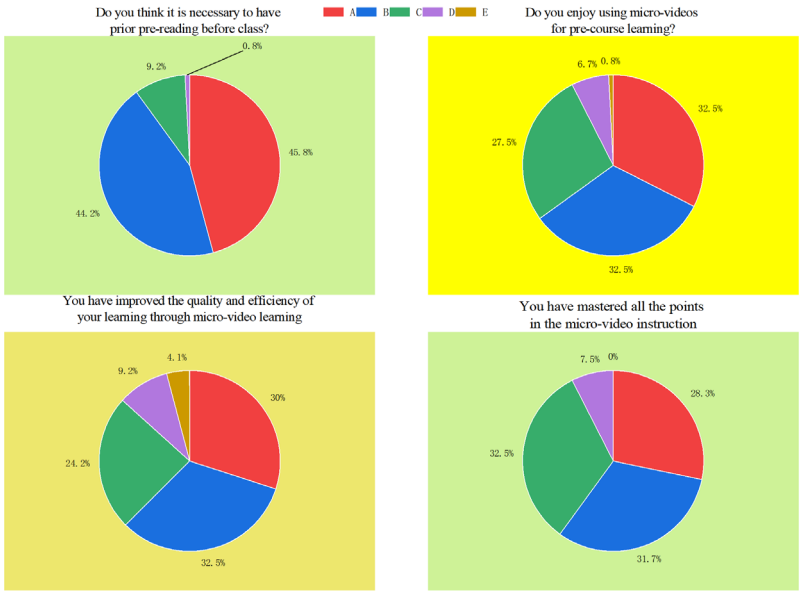

Figure 1: Analysis of the effect of autonomous preview courses

From Figure 1, it can be seen that 45.8% of students strongly agree with the need for pre-class preparation; 32.5% of students strongly approve of using micro videos for pre-class preview; 30% of students strongly agree that using micro-video learning has improved learning quality and efficiency; the proportion of students who have already mastered the knowledge points of micro video teaching is 31.7%.

4.2 Teaching Effectiveness of Online Courses

As shown in Figure 2, it represents the analysis of the teaching effectiveness of online courses for students. A survey and feedback on the use of games in online courses was conducted to stimulate students' interest in learning, with clear learning objectives, clear explanation of theoretical knowledge points, complete and clear explanation of case operations, and the form of learning in this online course that can be used for reference in other courses. The specific data analysis is shown in Figure 2.

From Figure 2, it can be seen that 40% of students strongly agree that using game-based explanations in online courses can stimulate learning interest, while only 2.5% of students strongly disagree and strongly disagree; 33.2% of students strongly agree with the concept of "very clear online learning objectives", while 49.2% roughly agree, indicating that the majority agree with this viewpoint; 33.3% of students strongly agree that "you think online teaching can explain theoretical knowledge points clearly", while only 5.8% of students hold a negative view; 95.8% of students expressed support for "you think the case operation explanation in the micro video is complete and clear"; the majority of students agree that online learning can be recommended to other courses. Based on the above evaluation, the online course teaching effect is very successful.

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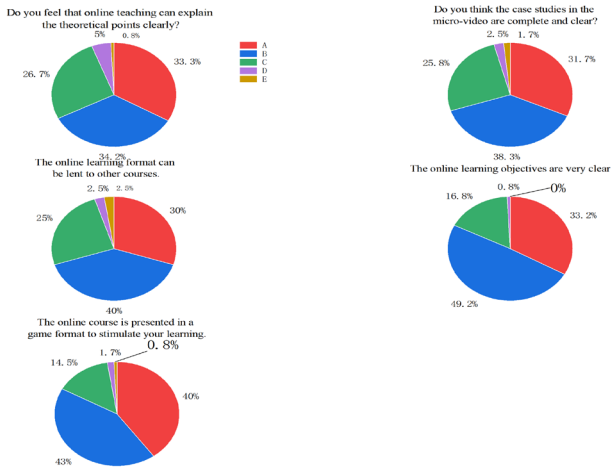

Figure 2: Analysis of online course teaching effectiveness

Table 2: Average score of online course teaching effectiveness analysis

Learner Assessment Indicators	Average score
Micro-video courses are in the form of games to stimulate learning	4.32
The objectives of the online learning program are clear	3.99
The theoretical concepts of the smart classroom learning program are clearly explained	3.61
Micro environmental case studies are clear and comprehensive	3.1
Learning format can be used for other courses	3.15

From Table 2, it can be seen that students' evaluation of smart classrooms is generally positive. The highest average score for student evaluation indicators is 4.32, and the lowest average score is 3.1. All indicators have an average score higher than 3. According to the Likert dimension averaging calculation method, the dimension averaging of this table is 3.634. It can be concluded that the online learning method designed in this case study can help students learn.

5. Conclusions

This article explored the development of intelligent learning platforms in universities and analyzed the concept of intelligent learning platforms. From the theoretical research level to the technical application level, the development ideas of intelligent learning platforms in universities were proposed, and the basic architecture and development plan were proposed. The research achievements include the effective integration of educational resources, the application of future innovative teaching methods, the development of a learning platform for technical colleges based on "5G+education" and the implementation of secure access to educational content, educational management, teacher-student roles, educational evaluation and analysis, data exchange, and the systematic application of network public security technology.

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