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INVESTIGATION, ANALYSIS AND SUGGESTIONS OF ONLINE LEARNING IN GUANGDONG UNIVERSITIES DURING THE EPIDEMIC SITUATION: BASED ON THE EMPIRICAL RESEARCH OF 67 UNDERGRADUATE UNIVERSITIES IN GUANGDONG PROVINCE

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ABSTRACT: *Under the background of the COVID-19 outbreak, an emergency policy initiative called "Suspending Classes without Stopping Teaching and Learning" was launched in China to continue teaching activities as schools across the country were closed. Universities in Guangdong province have organized the largest online teaching practice in history in a very short time. In order to gain a deeper understanding of the development and effect of online learning in undergraduate colleges and universities in Guangdong province, the author team conducted a questionnaire survey of "Online Teaching in Undergraduate Colleges in Guangdong Province". Based on the survey data of 462,499 students from 67 colleges and universities in Guangdong province, this article analyzes the online learning behavior, online learning experience, and online learning evaluation of students in detail, summarizes the online learning experience of Guangdong college students, and finds the problems in online learning. And then puts forward the prospect of online learning in colleges and universities during the post-epidemic period.*

KEYWORDS: Guangdong universities; online learning; questionnaire; learning result; COVID-19

INTRODUCTION

The outbreak of COVID-19 epidemic has brought unprecedented challenges to traditional college education, therefore, " Suspending Classes Without Stopping Teaching and Learning " [1] is the best choice for universities in Guangdong, and online learning has become the main learning method for college students during the epidemic. Facing the explosive online learning practice, how is the student's online learning situation? This paper uses questionnaires to obtain data on online learning of college students in Guangdong Province, and conducts statistical summary and cross-analysis

on online learning behavior, online learning experience, and online learning effect evaluation, and conducts qualitative and quantitative analysis of online learning. The questionnaire used in this study is the "Questionnaire for Online Learning in Undergraduate Colleges in Guangdong Province" [2]. This questionnaire adopts an anonymous method, and the question types are mainly single choice and multiple choice. The questionnaire is composed of basic information, online learning behavior, online learning experience, online learning evaluation and suggestions. A total of 462,499 questionnaires were returned in this survey, and 1662 invalid questionnaires were eliminated. Of these, 460,837 were valid questionnaires, accounting for 99.64%. The reliability is tested by SPSS software, the reliability is 0.862, and the questionnaire data is true and reliable.

The province's online learning survey

Basic survey

The students participating in this survey came from 67 undergraduate colleges and universities in Guangdong Province, and the proportions of boys and girls were 42.07% and 57.93% respectively; non-graduating students and graduating students accounted for 88.32% and 11.68% respectively; international students accounted for 0.6%; the proportion of students currently located in urban and rural areas is 58.27% and 41.73% respectively (see Table 1).

Table 1 Basic information of students

First category	Secondary category	Percent	Secondary category	Percent
Covering universities	Provincial Universities	100%		
Gender	Male	42.07%	Female	57.93%
Graduating student	Non-graduate	88.32%	Graduating students	11.68%
International student	Non-international students	99.4%	International student	0.6%
Current location	City	58.27%	Rural area	41.73%

Among the students participating in this survey, students from engineering disciplines account for the most, accounting for 24.11%, followed by management, literature, science, economics, art, education, medicine, law, agriculture, history, and philosophy. The proportion of students in different disciplines decreases successively, basically in line with the distribution of students in various disciplines and majors in universities in

Guangdong Province.

Online learning behavior

It mainly examines students' online learning behavior from three aspects: students' online learning terminal selection, online learning status and learning platform selection.

Learning terminal selection

The survey finds that mobile phones have the highest proportion of learning terminals, and the proportion is 88.02%; laptop computers have a higher proportion of 76.18%; tablet computers and desktop computers have a relatively low proportion of 14.01% and 12.11%. The main network access method is wireless network (WIFI), followed by mobile phone traffic access, and wired network access is relatively rare. This shows that China has basically built a basic environment suitable for online learning, hence, learning terminals and network conditions can meet online learning, providing support and guarantee for large-scale online learning.

Online learning status

Students' online learning status is mainly focused on learning. There are also some students doing irrelevant things while studying. At the same time, there are still a small number of students who "do irrelevant things after finishing their studies" and "learning while doing irrelevant things, and finally give up learning" (see Table 2) . This shows that on the one hand, students have high information literacy [3] and can quickly enter the state of online learning through notifications and guidance, and adapt to online learning; on the other hand, it also shows that the subject and object of online learning can quickly reach agreement and linkage on the development of online teaching. It can be seen that before the epidemic, Guangdong Province took the lead in conducting pilot trials on online teaching and achieved certain results. At the same time, from the perspectives of a small number of students " do irrelevant things after finishing their studies " and "learning while doing irrelevant things, and finally give up learning", it is shown that students' online learning habits need to be strengthened to guide and it is particularly important to cultivate and explore effective online teaching management models.

Table 2 Status of online learning

Learning Status	Percent
Focus on learning, but will do something irrelevant	58.1%
Concentrate on studying and don't do anything unrelated	19.9%
Do irrelevant things while learning, but do not affect each other	14.4%
Do irrelevant things after finishing their studies	4.5%
Learning while doing irrelevant things, and finally give up learning	3.1%

Learning platform selection

Certain results have been achieved in the construction, promotion and application of online teaching platforms in universities in Guangdong, which can quickly and effectively transfer physical classroom teaching to online classrooms, and implement them smoothly. The choice of online learning platforms for students is mainly based on multi-platform combination. The proportion of students who use online teaching platforms, online open course platforms, social media platforms, and video interactive platforms are all over 50%, and the proportion of students using online teaching platforms is the highest. The proportion of using online open course platform is relatively high, and the proportion of using online office software and virtual simulation experiment platform is relatively low (see Table 3). This aspect shows that the new network teaching platform and online open course platform provide an important guarantee for the transmission of teaching resources, the retention of teaching data, and the teaching practice before and after class. On the other hand, the introduction of video-based interactive platforms into online teaching shows that video-based real-time interactive platforms are more effective in presenting physical classroom lectures. At the same time, the virtual simulation experiment platform is less used, which shows that the existing virtual simulation experiment resources are scarce, the operation is complicated, and the guidance is not clear and standardized; on the other hand, it also shows that teachers and students have insufficient knowledge and understanding of online virtual experiments.

Table 3 Selection of online learning platforms

Learning platform	Percent
Online teaching platform (Rain Class, Blackboard etc.)	65.76%
Online open course platform (iCourse, xuetangX etc.)	62.77%
Social media platforms (QQ, WeChat etc.)	60.97%
Video interactive platform (Tencent Conference, Zoom, CCtalk, Panopto etc.)	53.12%
Online office software (Dingding etc.)	22.88%
Virtual simulation experiment platform (the national virtual simulation experiment teaching project sharing platform etc.)	6.47%

Online learning experience

It examines students' online learning experience from three aspects: likeness of online learning activities, the function of the learning platform, and the factors that affect the learning state.

Students' favorite aspects of online learning activities

When online teaching is fully implemented, in terms of students' likeness of learning activities, "live teaching" is the most popular, followed by "recorded teaching"; the popularity of "providing and recommending resources", "online discussion and answering questions" is higher than "tests and homework"; "virtual simulation experiment" is relatively more popular with students than "special discussion". This aspect shows that students have emotional dependence and psychological expectations for the sense of situation and scene of learning. Therefore, teaching organizers should create an atmosphere similar to physical classroom teaching in the process of teaching design and teaching implementation, and pay attention to the emotional construction between teachers and students, students and students. On the other hand, "peer evaluation" and "special discussion" are less popular, reflecting that Chinese students are relatively shy and introverted in classroom interaction and expression. Teachers need to strengthen guidance and supervision, and through relevant teaching design to create opportunities for students to actually speak, rather than textual expressions on the Internet.

Table 4 Online learning activities that students prefer

Learning activity	Percent
Live teaching	66.81%
Recorded teaching	44.69%
Provided and recommended resources (PPT, literature, video and audio etc.)	42.66%
Online discussion and Q&A	32.67%
MOOC Study/SPOC Study	29.83%
Test, homework	27.44%
Group task	7.78%
Peer evaluation	6.06%
Virtual simulation experiment	5.42%
Special discussion	3.75%
Other	0.93%

Functional aspects of the learning platform that help learning

In terms of learning platform functions to help learning, the data shows that the platform functions that students think are most helpful for learning are homework and testing; the proportion of live broadcast, check-in, and recording is relatively high; learning statistics, bullet screens and contributions, embedded questions in videos, voice responses, random roll call, forums, and peer evaluation functions contribute to a decrease in the proportion of learning. This aspect shows that the platform functions that are helpful for learning are mainly concentrated in the two links of knowledge transfer and course assessment. Online learning basically covers all links of offline learning. At the same time, it can be seen that online teaching is an emergency. This move has not been well optimized in terms of models and concepts. On the other hand, it shows that online learning has diversified requirements for learning platforms, and no platform function can meet all the needs of online learning. Third, the trend of gamified learning and socialized learning is clear during the period. How to effectively make gamified and socialized concepts easy to teach is a problem that needs to be solved urgently.

Table 5 Platform functions that are helpful for learning

Learning platform function	Percent
Homework, testing and evaluation	53.09%
Live broadcast	47.87%
Sign in	42.45%
Recording	34.24%
Learning statistics	27.08%
Bullet screens and contributions	27.04%
Embedded questions in the video	20.24%
Voice response	17.68%
Random roll call	14.40%
Forum	10.87%
Peer evaluation	10.43%
Other	0.62%

Factors affecting online learning status

When online learning, there are many factors that affect the learning status. The survey shows that 77.15% of students believe that "network instability" will affect the learning status, with the highest proportion, followed by "the online learning platform is not operating smoothly", with a proportion of 36.92%. 26.21%, 22.82%, and 21.54% think that “contact with teachers is not smooth”, “hardware equipment cannot meet the learning requirements”, and “high network costs” respectively have an impact on learning status. The percentages of "courses difficult to successfully found on the multiple platforms" and "time difference with teachers" have an impact on the learning status are 19.03% and 9.73% respectively. This shows that in the online teaching process organized in large-scale and emergency situations, the main factors affecting learning are concentrated in the two aspects of network stability and the fluency of the teaching platform. Therefore, in the promotion of information education and teaching reform, the basic infrastructure improvement is imperative.

Online learning evaluation status

The effect of online learning is investigated from five aspects: teacher-student interaction, learning resources, platform and software, teaching organization and learning effect in online teaching, and the overall satisfaction accounts for more than 70%.

(1) Satisfaction with teacher-student interaction

During the online learning process, 74.04% of the students express satisfaction with the teacher-student interaction, 5.83% express disagreement, and 20.12% are noncommittal. This shows that the overall interaction between teachers and students in online learning is smooth and satisfactory. For students who are dissatisfied and noncommittal, we need

to strengthen communication, exchange, attention and silent wake-up, and give online learning emotional construction and spiritual support.

(2) Satisfaction with learning resources

75.99% of students express satisfaction with the learning resources, 6.14% of students express disagreement, and 17.87% of them are noncommittal during the online learning process. This shows that the rich and diverse forms of online learning resources can basically meet the needs of students for online learning resources. Accurate surveys and in-depth interviews can be conducted for students who are dissatisfied and noncommittal, and personalized teaching resources can be developed and designed according to their demands.

(3) Satisfaction with learning platform and software

74.65% of the students express satisfaction with the platform and software, 6.53% of the students express disagreement, and 18.82% are noncommittal. This shows that the functions of online learning platforms and software can satisfy online learning and play a good auxiliary and supporting role. For a small number of students who are dissatisfied or noncommittal about the platform and software, platform and software research can be conducted to find the crux of the problem, improve and optimize platform functions and operating habits.

(4) Satisfaction with teaching organization

72.63% of the students express satisfaction with the teaching organization, 5.81% of the students express disagreement, and 21.55% are noncommittal. This shows that the universities' preparations and plans for online teaching are adequate, and the teaching managers have a deep understanding of the unconventional teaching development during the epidemic. The universities take the rapid actions, the efficient organization, and the inter-department coordination mechanism.

(5) Comparison of online learning effect and traditional classroom learning effect

The survey shows that 11.71% of students believe that "online teaching is better than classroom learning", and 39.72% of students believe that "basically it can be substantially equivalent to classroom learning", accounting for the highest proportion. The percentages of "inferior to classroom learning" and "far inferior to classroom learning" are 36.02% and 12.55%. In summary, 51.43% believe that online learning can be substantially equivalent or even better than classroom learning. This aspect shows that the overall effect of online teaching is good, the transition from emergency state [5] to normalization is smooth; and the teaching organizers and teachers of various universities are fully prepared in the early stage, deep in their ideological understanding and thorough implementation. On the other hand, it also shows that students recognize the input, guidance, and management of the universities' online teaching. However, many students believe that the effect of online learning is not as good as traditional classroom learning, indicating that a small number of universities are not fully prepared. What's more, these universities have unreasonable arrangements, chaotic and disorder organization, just blindly copy other college models, and are contrary to their own

teaching laws. It also shows that some teachers have rigid thinking, do not have a deep understanding and improvement of online education. Therefore, these teachers have chaotic and disorder teaching organization, messy and outdated resources, heavy schoolwork pressure and time squeeze, following a certain physical and psychological burden on students.

Table 6 Comparison of online learning effects and traditional classroom learning effects

Learning effects	Percent
Basically it can be substantially equivalent to classroom learning	39.72%
Online teaching is better than classroom learning	11.71%
Inferior to classroom learning	36.02%
Far inferior to classroom learning	12.55%

CONCLUSION AND PROBLEMS

Research conclusion

(1) Online learning is carried out smoothly and orderly, and the overall effect of online learning is good.

Thanks to the understanding and accumulation of universities and colleges in the construction of informatization conditions and their strong organization, 67 universities in Guangdong Province have conducted online teaching in various disciplines during the epidemic prevention and control period, and overall progress is smooth. The proportion of students in various disciplines that recognize the effect of online teaching ranges from 59.48% to 47.35% with certain differences. More than 70% of students are satisfied with the university's teaching activities and organization, and 51.43% of students believe that the effect of online teaching has reached or exceeded the effect of physical classrooms.

(2) Online learning resources are in various forms, and online learning platform tools are widely used.

The application of online learning resources presents diversified characteristics, including not only traditional teachers' self-built resources, but also many resources provided by online open course (MOOC) platform, virtual simulation experiment teaching, the online open course alliance, professional teaching steering committees, and other business platforms. Among them, online open course resources are fully used (student participation rate reaches 57.98%), realizing high-quality resource sharing.

The proportion of students using social media platforms, online teaching platforms, video interactive platforms, and online open course platforms is basically more than

50%. The use of online teaching platforms shows diversified and combined characteristics, and many personalized online teaching platforms have been obtained application.

(3) Gamification and social learning trends are established.

Teaching activities such as live teaching, recording teaching, providing and recommending resources, online discussion and Q&A, MOOC/SPOC learning and others are more popular among students, accounting for more than 30% of the total. Interactive methods such as live broadcast, bullet screens, contribution, and social software interaction are the most effective interactive methods considered by students. From the preferred teaching activities, it can be concluded that the learning mode of students is shifting to gamification [4] and socialization, and the willingness of these learning activities is increasing.

(4) Online learning helps achieve education equity.

High-quality online teaching resources are fully shared and MOOCs are quoted free of charge, which promotes educational equity. Although there are some differences in online teaching between different regions and universities of different nature, the differences are not significant. The proportion of students in public colleges who believe that online teaching can achieve substantially equivalent or better results with classroom learning is 4.84 percentage points higher than that of students in private colleges, and students in Pearl River Delta colleges are 2.24 percentage points higher than students in non-Pearl River Delta colleges.

Table 7 Comparative evaluation of online teaching effects and classroom learning effects between college students of different nature

	Public college students	Private college students	Average value
Online teaching is better than classroom learning	12.16%	11.07%	11.71 %
Basically it can be substantially equivalent to classroom learning	41.28%	37.53%	39.72 %
Inferior to classroom learning	35.34%	36.98%	36.02 %
Far inferior to classroom learning	11.23%	14.42%	12.55 %

Table 8 Comparative evaluation of online teaching effects and classroom learning effects between students in the Pearl River Delta and non-Pearl River Delta colleges

	Universities in Pearl River Delta	Universities in non-Pearl River Delta	Average value
Online teaching is better than classroom learning	12.06%	10.72%	11.71 %
Basically it can be substantially equivalent to classroom learning	39.95%	39.05%	39.72 %
Inferior to classroom learning	35.39%	37.80%	36.02 %
Far inferior to classroom learning	12.60%	12.43%	12.55 %

Exiting problems

This study designs the questionnaire from three aspects of students' online learning behavior, learning experience, and online learning evaluation. According to the questionnaire, it sorts out the problems of online teaching during the epidemic from four aspects: teaching design, teaching implementation, teaching management and teaching evaluation.

(1) Teaching design

In the survey, 7.6% of the students are in poor learning status, which is expressed as "do irrelevant things after finishing their studies" and "learning while doing irrelevant things, and finally give up learning ". Part of the reason is that the current online teaching is an adaptive online teaching, which lacks rigorous teaching and learning design. First of all, the online teaching design does not clearly divide the teaching goals and the important and difficult points of teaching. The optimization and incomplete reconstruction of the online classroom process design is more about the accumulation of new technologies, rather than the innovation of teaching design and concepts. Secondly, the teaching method is designed to be single and traditional with lecture-oriented. Third, the fit between teaching resource design, resource selection and teaching are not high. The utilization rate of high-quality MOOC resources is not high, and virtual simulation experiment resources are scarce. Finally, the design of teaching time is unreasonable, and there are crashes in course time, and the phenomenon of forcibly squeezing the time in the evening and weekends cause a heavy online learning load for students. This shows that there is no good hierarchical and sub-gradient design in online teaching design. The online learning does not achieve overall coverage and individual consideration, according to the different learning ability of students. What's more, it does not achieve precise and personalized teaching design and student training.

At the same time, teaching design seldom reflects the plan to improve students' learning ability.

(2) Teaching implementation

The problems in the implementation of online teaching are mainly reflected in the lack of understanding of online teaching by teachers and students [6], insufficient concept changes, and the lagging process of the transition from teaching-centered to learning-centered. The teachers' transition from knowledge lecturers and disseminators to knowledge server, organizer, and answerer is slow, and the process of students' transformation from passive receivers of knowledge to active participants, questioners, and reinventors is long. Secondly, teachers lack the ability to integrate teaching resources, the utilization of high-quality resources is not high, and the ability to reengineer and renovate online teaching of their own resources is insufficient. Students have insufficient ability to discriminate massive resources, lack of effective resource information retrieval ability, and low absorption of resources. Third, in the implementation of online teaching, the construction of teaching scenes is weak, and emotional transmission needs to be strengthened. Students have a strong sense of dependence on learning situations and learning scenes. This is what online learning lacks, therefore, in the process of online teaching, teaching scenarios and situations should be fully integrated into teaching, so that students have a sense of substitution. And in the teaching process, it is not only the transfer of knowledge, but also the strengthening of emotional connection and construction. Finally, the online teaching interaction has been slightly strengthened. However, the design of the teacher's teaching interaction is weak, and the students' active participation is not high. The quality of the interaction needs to be improved.

(3) Online teaching management

Some colleges and universities have incomplete organizational plans and support plans for online teaching development, insufficient plans for online teaching emergencies, and unclear information training and guidance for teachers and students. All these have not provided good support and assistance to online teaching. In the process of online teaching development, management and supervision are one size fits all. It fails to adjust strategies and management flexibly according to the actual situation. It does not give teachers and students enough freedom. It is limited by factors such as the network and platform, causing great problems for teachers and students. The inconvenience has increased a lot of psychological burden. Secondly, teachers' online teaching has not been scientific and reasonable in terms of time management, interactive design management, and homework management, which has increased the burden on students and students are tired of coping. In the process of online learning, students are weak in time management, energy arrangement, and online self-discipline management, and are easily distracted, which increases learning costs.

(4) Teaching evaluation

The high-frequency words suggested by students are homework. Teaching evaluation is single and traditional, continuing the traditional classroom teaching assessment. The main design of teaching evaluation is homework, and the students' knowledge mastery is tested through homework. In addition, teachers still value students clocking in on time. At the same time, even though the universities have introduced a variety of assessment models, teachers still have a special liking for proctored exams that can be achieved. The proportion of exams in the assessment is relatively large, and the multiple assessment mechanisms are not very good. At the same time, the advantages of the online teaching platform are not fully used, and the result evaluation is excessive to the process evaluation which realizes the process, data, and refinement of evaluation.

3. Future prospect

The epidemic situation accelerates informatization teaching. In the early stage of epidemic prevention and control, the large-scale and comprehensive online teaching is in response to the epidemic situation. When online teaching is carried out, it is inevitable to be a little rushed and hasty response. After the formal restoration of large-scale student return to school and face-to-face instruction in schools at all levels and types, it has entered the post-epidemic era[7]. In the post-epidemic era, online teaching has been going on for some time, and teachers and students will have more experience and calmness in their perception and practice of online teaching. Large-scale online teaching practice also brings challenges and opportunities to university education. Looking forward to the future of informatization teaching, we should prepare for the ideas, curriculum system and learning environment in order to better meet the challenges of the future.

(1) Changing the ideological concept-reconstructing the education ecology

The issues of "what to learn", "how to learn" and "where to learn" in the field of education should be recognized by people. "What to learn" mainly emphasizes the content of students' learning, "how to learn" mainly focuses on the teaching methods in the education process, while "where to learn" is more about the learning environment of teaching. Therefore, in the Internet era, the education ecology should be reconstructed, and the content of the reconstruction should basically include the role relationship between teachers and students, learning environment, educational content supply, teaching methods, and teaching management and evaluation. To reconstruct the future of education, to promote educational equity and the construction of intelligent education ecology, Minerva University has tried to take the first step. Relying on digital technology, Minerva University integrates high-quality resources, through the design of a future-oriented excellent curriculum system, a teaching mode that integrates online

and offline, and creates a global experiential learning environment. It has become a pathfinder for innovative universities in the era of MOOCs[8].

(2) Accelerating the development of interdisciplinary-restructuring the curriculum system

As early as 2004, some scholars proposed that the reform of university teaching must implement the restructuring of the curriculum system. For this reason, the university courses are divided into general education courses, professional basic courses, personal orientation courses and academic lectures. Among them, academic lectures courses should occupy an important position [9]. In recent years, the development of interdisciplinary subjects has been the subject of rapid development and high-quality development in universities, and the interdisciplinary penetration has triggered the need to restructure the curriculum system. Cross-discipline spans multiple disciplines, combines multi-discipline and complementary disciplines, strengthens the connection between knowledge, and accelerates the process of knowledge transformation. So interdisciplinary subjects are conducive to the creation of new knowledge, and enhance the practicality of solving practical problems. The construction of this is an important way to train innovative top-notch talents [10]. Some scholars have proposed that there are three types of interdisciplinary talent training: curriculum model, project model, and institutional model. The curriculum model is the initial level, which mainly refers to the addition of interdisciplinary curriculum settings, breaking through the original single subject model [11], and establishing a dynamic subject classification system that interacts with the academic community and the industry. Therefore, colleges and universities should carry out top-level design of systematic curriculum content according to the needs of interdisciplinary, and build a capacity-based curriculum system that includes logical analysis, data analysis skills, creative thinking, critical thinking and multi-modal communication skills; and then establish a talent training community that combines production, education and research, and build an effective and collaborative education ecosystem.

(3) New technology blessing-boosting the intelligent transformation of education

With the development of technology and the times, the intelligent transformation of education is an inevitable trend. The blessing of new technologies will accelerate the process of intelligent education transformation. The arrival of 5G will usher in a new information age. The performance goals of 5G [12] are high data rate, reduced latency, energy saving, cost reduction, system capacity improvement and large-scale equipment connection. As 5G network coverage is gradually improved, 5G will play a greater role in innovating teaching methods, balancing educational resources, expanding ways of learning, improving teaching quality and the assessment system, and realizing intelligent campus management, and access to high-speed channels for educational intelligence. The characteristics of blockchain decentralization, traceability,

immutability, anonymity, openness, and high trust can be applied to credit certification, certificate management, digital teaching resources, learner abilities and learning achievement management. This will reconstruct the education integrity system and promote the integration of online education into formal education, academic education, and lifelong education. At the same time, VR/AR [13] technology can be used in teaching to realize the multi-dimensional expansion of immersive teaching content, and guide students to master knowledge in specific situations. According to cognitive theory, most people's learning of knowledge is the result of contextual interaction. Therefore, the application of VR/AR technology to teaching can not only achieve teacher-student interaction, but also achieve situational interaction. Students' learning in a virtual environment can achieve an organic combination of virtual and reality. The virtual environment is closer to the real environment, which can stimulate students' enthusiasm for learning. So students can master new learning methods, and gradually increase their sense of initiative. At result, the learning results are better. In view of this, we should explore effective ways for the development of the deep integration of new technology and education and teaching to promote the development of higher education.

References

[1] Instructions on the Organization and Management of Online Teaching in Ordinary Colleges and Universities during the Period of Epidemic Prevention and Control [EB/OL].

[2] Gu Xiaoqing, Zhu Zhiting, Pang Yanxia. Teachers' Informatization Professional Development: Status Quo and Problems[J]. e-Education Research, 2004(01):12-18.

[3] Chu Jingli, Liu Jingyi, Zhang Dongrong, Li Ling. Beyond Information Literacy Education: the Changes and Prospect—15 Years' Practical Exploration in the University of Chinese Academy of Sciences[J]. Library and Information Service, 2020, 64(06):3-9.

[4] Shang Junjie. Games Making Learning More Scientific, Happier and More Effective[J]. Jiangsu Education, 2019(81):1.

[5] MU Su, WANG Yanan. Turning "Crisis" into "Opportunities": How Emergence Online Teaching Moves Towards Systematic Online Teaching[J]. Modern Distance Education Research, 2020,32(03):22-29.

[6] Wu Daguang, Shen Zhonghua. Rational Thinking of Online Teaching in Chinese Universities ——Based on the empirical investigation of 6 Undergraduate colleges[J]. Education Science, 2020, 36(2): 1-8.

[7] Wang Zhuli. How Should Education be Transformed in the Post-epidemic Era? [J].e-Education Research, 2020, 41(04):13-20.

[8] Wang Youmei, Bao Xue, Wang Xiaojing. Minerva School: Explorer of Innovative University in the era of MOOCs[J]. Distance Education Journal, 2015, 33(02):3-10.

[9] YUAN Zu-wang. On Reconstruction of Collegiate Curricula and Transformation of Teaching Model[J]. Tsinghua Journal of Education, 2004(02):79-83.
[10] Lu Jianfei, Wu Taishan, Wu Shuguang, Yin Chengmei. Research on the Cultivation of Graduate Innovative Talents Based on Interdisciplinary [J]. China Higher Education Research, 2006(01):46-48.
[11] Li Xuefei, Cheng Yongbo. Three Models of Interdisciplinary Graduate Training and Their Evaluation [J]. Academic Degrees & Graduate Education, 2011(08):10-15.
[12] Li Yanting. 5G Blessing, the Education Industry Ushered in Intelligent Transformation [J]. Communications World, 2020(15):32-33.
[13] Gao Wei, Wang Yulin, Guo Jin. The Hot Spot of Foreign Virtual Reality and Augmented Reality Technology Education Research and China's Enlightenment [J]. Journal of Open Learning, 2020, 25(02):47-54+62.