Exploration and Practice of Higher Vocational Education under the Development of Vocational Education Informatization Based on a Case Study of XJ College

Qingjun Liang[1*], Shuie Wang[2]
[1]School of Mechanical Engineering, Xijing University, Xi'an, Shaanxi, China
[2]Business School, Xijing University, Xi'an, Shaanxi, China
*Corresponding Author.

Abstract:

The reform of higher vocational education continuously puts forward new demands for information construction, such as continuous innovation of technology application and promotion of sustained development of information technology. In turn, the development of information technology promotes the reform of higher vocational education. The two influence and promote each other, forming a circular and spiral upward trend. Moreover, each cycle has further promoted the expansion of informatization connotation of higher vocational education and the continuous improvement of the overall development level at a new starting point. Higher vocational colleges must take into account the level and characteristics of higher vocational education in implementing educational informatization, and explore a high-quality development path with vocational education characteristics, in line with the school situation, effective and continuous improvement through practice.

Keywords: *Higher, Vocational education, Information technology, Development, Exploration and practice.*

I. INTRODUCTION

Higher vocational education, which falls into the category of higher education, is a higher technical education designed to cultivate senior technician talents for the actual needs of a specific occupation or occupation group. With the particularity of the curriculum and training plan, it is more inclined to the practical application and reflects the professional attributes compared with the ordinary higher education [1]. The development of education informatization promotes the deep integration of information technology into talent cultivation and teaching, which makes the development of higher vocational education upgrade and develop rapidly. Many scholars have carried out fruitful theoretical and practical research and achieved some results with significant academic value and practical influence.

Li Shaojuan [2] analyzed the information-based teaching reform of mathematics teaching in higher

vocational colleges, that is, the school built a shared teaching resource system to provide an information-based teaching carrier for mathematics teaching by creating an information-based teaching platform, which can display micro-courses, open classes and massive open online course made by teachers and guide students to learn. Li Hua [3] analyzed the practice of using "Mosoteach" platform in classroom teaching to improve the efficiency of classroom teaching and promote the all-round development of teachers and students. Wang Hanhua and Ruan Hongsheng [4] introduced the Fanya teaching platform into the "Practical Technology of Chinese Medicine Chemistry" course in higher vocational colleges, and redesigned the information-based teaching based on the platform advantages and course characteristics to improve the level of curriculum information construction. Gu Zengjun [5] believed that the introduction of Blackboard teaching platform into the network information-based teaching environment can build a platform based on digital teaching resources for universities taking advantage of its ease of use and scalability. The above studies of these scholars mainly focus on the construction, use and operation of the information-based teaching platform.

Liu Xiaoyan, Sui Qingru and Yao Yuxia [6] put forward that the construction of digital resources in higher vocational education should be realized by setting up a learning platform of digital teaching resources in higher vocational education with perfect functions, developing high-quality digital resources, building a team and division of labor.

After analysis, Liu Yuan, Yang Fangqi and Zhang Guojun [7] come to the conclusion that holding the information teaching contest in higher vocational colleges can not only promote the improvement of teachers' education and teaching methods and the improvement of information technology application ability, but also promote the innovation of education and teaching mode and the change of students' learning style in higher vocational colleges, and also effectively promote the deep integration of information technology and subject teaching in higher vocational colleges.

Li Yan [8] put forward that higher vocational teachers should use teaching methods innovatively under the background of educational informatization, and pay attention to the application of informatization means in classroom teaching, so that the traditional teaching method based on knowledge transfer will gradually change into blended learning method. In the blended learning mode, students are the main body, and students' classroom discussion is the main way, in which teachers guide students to complete their learning tasks and attach importance to personalized extension after class.

Liu Wenbo, He Dexiang and Jiang Yanyong [9] pointed out that information-based teaching management refers to a process in which management information support and decision-making systems are established to achieve specific goals in the process of information-based education, and appropriate multimedia technologies and incentive mechanisms are used to coordinate and control the relationships among members of the organization, optimize the allocation and management of resources, and give full play to the various coordination activities carried out in the best interests of the group. Higher vocational colleges should achieve the goal of "teaching, learning and doing" in the information-based teaching management, pay attention to the practical, open and professional requirements of the experimental,

practical and student teaching links, and strengthen the cultivation of students' professional ability. Under the guidance of information concept, information management theories and methods are applied to organize and allocate various teaching resources with modern information technology as the core technology, and information-based teaching management activities are carried out to achieve the teaching objectives and requirements.

As for the informatization in higher vocational education, scholars have different opinions on the research of information-based teaching platform construction, digital teaching resources construction, information-based teaching contest, teaching information technology and IT application in management, and put forward the viewpoint of informatization implementation in the process of higher vocational education from different perspectives. In this paper, the author will explain how to deepen the innovation of higher vocational education teaching model, reflect the characteristics of higher vocational education, further improve the quality of teaching and personnel training, and provide strong support for national economic and social development under the background of information technology.

II. ANALYSIS ON INNOVATION PRACTICE IN HIGHER VOCATIONAL EDUCATION

In this paper, the innovation of education and teaching mode, the development of teachers' information-based teaching ability, digital teaching platform and resources, and information-based teaching management in XJ College in the information environment were analyzed.

2.1 Practical Analysis of Information-based Teaching Mode

In recent years, XJ College has actively carried out innovative research and practice of education and teaching mode, and vigorously promoted the deep integration of information technology and education and teaching, which are mainly reflected the integration of information technology into education and teaching, the integration of production and education promoted by information technology, and the reconstruction of practical teaching process by virtual simulation.

2.1.1 Integration of information technology into education and teaching

In order to speed up the integration of information technology with education and teaching, and promote the reform of classroom teaching methods, XJ College has introduced Rain Classroom and xuetangx teaching platform, vigorously promoted teachers' application of information technology to carry out classroom teaching, and explored practical blended teaching. The author conducted a questionnaire survey on teachers and students in higher vocational colleges, including 80 teachers and 657 students, covering 17 majors of science and technology, economics and management, medicine, education and art. Data analysis shows that teachers generally agree with the concept of information-based teaching and actively apply information technology to use different teaching methods to carry out teaching, which is generally acceptable to students (see Tables I, II and III).

TABLE I. Teachers' attitude towards the positive role of using information technology in the teaching process

Improving class participation	Stimulating learning enthusiasm	Making it easier to understand the teaching content	Improving learning efficiency	Cultivating the awareness and ability of autonomous learning
85.77	81.60%	65.00%	63.14%	60.71%

TABLE II. Teachers' application of information technology to support the development of different teaching methods

Case teaching	Situational teaching	Project teaching	Duty actuation	Simulated teaching	Role play
76.84%	56.88%	60.51%	53.65%	38.67%	30.83%

Table III. Evaluation of students' online learning advantages

Advantages of online learning compared with traditional classroom learning (multiple choices)	Number of people	Percentage (%)
New online learning form and high interest in learning.	360	54.79
Online teaching can repeatedly play the teaching videos provided by teachers.	489	74.43
Online video materials can be paused at any time, which is convenient for taking study notes.	452	68.80
The online learning materials provided can be studied at any time.	380	57.84

XJ College has actively explored and practiced information technology in education and teaching, and achieved good results. The blended teaching based on information technology needs the support of multiple environments to form an organic unity (Fig. 1).
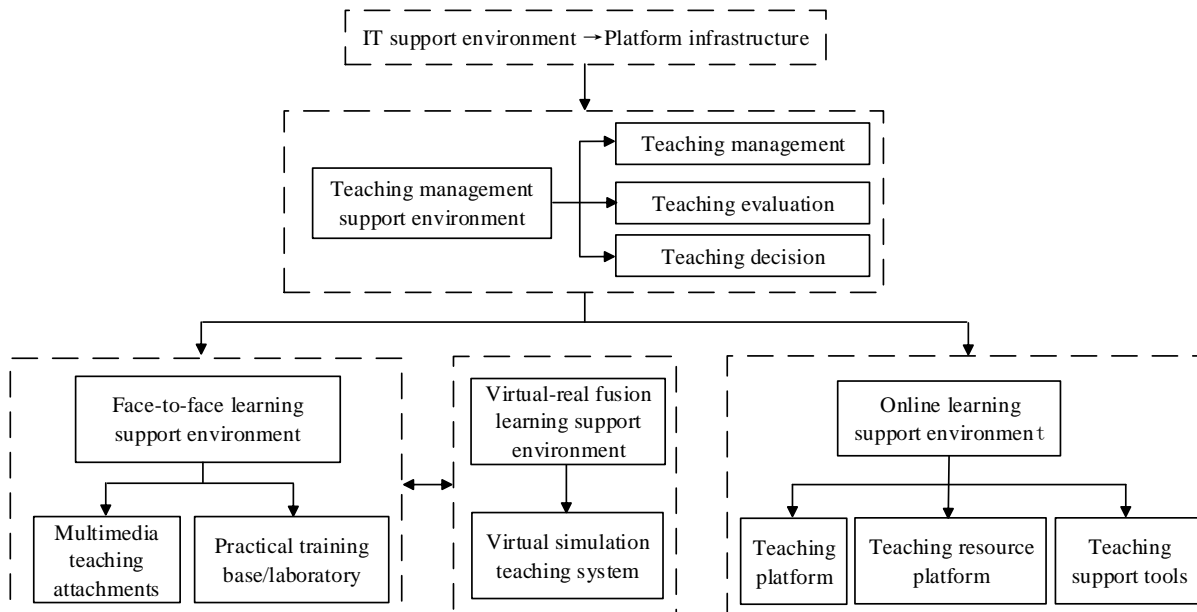
Fig 1: Information-based mixed teaching support environment

2.1.2 Integration of production and education promoted by information technology

Higher vocational education is characterized by the integration of production and education. The application and popularity of a new generation of information technology, such as cloud computing, big data, the Internet of Things, artificial intelligence, has accelerated the development process of information-based higher vocational education, bringing new opportunities for the development of the integration of industry and education. As a result, XJ College also applied information technology to the integration of production and education to seek an information-based model of integration of production and education, and took the lead in co-constructing a "Ala Xiaotu" studio with Ala Xiaotu Network Technology Co., Ltd.

"Ala Bunny" Studio is a studio jointly built by school and enterprise to provide Ala Cloud intelligent financial software experimental platform, with the investment of RMB 1,689,600 by the enterprise, the school providing a site of 80m2, 50 computers and other hardware facilities. Ala Cloud intelligent financial software experimental platform covers seven modules: set of books establishment system, general ledger management system, account analysis system, subsidiary ledger management system, project accounting management system, report management system and cloud platform comprehensive management system. And carries out basic accounting treatment for the growth of SMEs through intelligent cloud computing.

The "Ala Xiaotu" studio has adopted practices and achieved the following results in information integration and innovation:

(1) Both the school and the enterprise have selected 10 core vocational courses from the two majors of Accounting and Financial Management to built excellent courses with the characteristics of vocational education in the school (Table IV) and compiled 19 lecture notes in combination with corporate culture

and professional core skills competition (Table V), which have greatly enriched the professional teaching resource pool and enhanced students' learning ability under the information environment.

Table IV. Construction of "excellent class" in "Ala Xiaotu" studio

S/N	Course title
1	Intermediate Financial Accounting
2	Accounting Informationization
3	Tax Law and Taxable Accounting
4	Cost Accounting
5	Economic Law
6	Management Accounting
7	General Financial Accounting
8	Financial Management
9	Practical Training of Cashier
10	Practice of Tax Declaration and Application

Table V. School-enterprise co-compiled lecture notes in "Ala Xiaotu" Studio

S/N	Name of lecture notes
1	Lecture Notes of National College Student Market Survey and Analysis Competition
2	Lecture Notes of "NetInNet Cup" Financial Decision-Making Contest of National Higher Vocational Colleges
3	Lecture Notes of Skills Competition of "Enterprise Management Analysis and Decision-Making" of National Higher Vocational Colleges
4	Lecture Notes of "Imagine Cup" Big Data Analysis Contest of National Higher Vocational Colleges
5	Lecture Notes of "Yuantong Cup" College Students' Accounting Ability Competition
6	Lecture Notes of "Foster Cup" College Students' Accounting Applied Skills Competition
7	Lecture Notes of "Seentao Cup" Sand Table Enterprise Simulation Contest
8	Lecture Notes of "Seentao Cup" National College Students' Innovative Accounting Talent Skills Competition
9	Lecture Notes of "Chinaacc Cup" Campus Accounting Competition
10	Lecture Notes of "Tax Hengxin Cup" National Tax Skills Competition
11	Lecture notes of Chanjet "Hundreds of City League"
12	Lecture Notes of E-commerce Accounting Talent Skills Competition
13	Time Management

14	Self-Cognition
15	Effective Communication
16	Role Change
17	Presentation
18	Document and Mail Writing
19	Seven Habits of Highly Effective Employees

(2) The donated Ala Cloud Intelligent Financial Software is a real financial software experimental platform for enterprises that acted as the bookkeeping agent for three enterprises (Xi 'an Guangren Furniture Co., Ltd., Xi 'an Hanggeng Trading Co., Ltd. and Xi 'an Weiyuan E-commerce Co., Ltd.). During this period, the teachers led the students to do the real problems, integrating the teaching process with the production process, which highlighted the integration characteristics of production and teaching in vocational education, improved the teaching practice level and efficiency, and brought benefits to the enterprises. In addition, students took part in more than 30 accounting skills competitions on the platform, and carried out 300 virtual simulation on-campus training, cognition practice and production practice courses.

(3) Based on the platform, the deep integration of information technology and curriculum teaching has been achieved and significant results have been achieved in the application of school-enterprise cooperation in education. Compared with the situation before, teachers' guidance for students to participate in vocational skills competitions has made a big breakthrough both in the winning level and the number of awards (Table VI).

2.1.3 Reconstruction of practical teaching process by virtual simulation

In the process of building a smart campus, XJ College has actively transformed the traditional teaching environment, promoted the deep integration of information technology and teaching, and made full use of VR technology to build an intelligent learning space and learning experience center (Fig.II) for implementing the scene-based experiential immersion learning. The college has established a provincial-level virtual simulation experimental teaching center for mechanical engineering, and has been approved a provincial-level demonstration virtual simulation experimental teaching project, i.e. automobile braking performance test experiment based on virtual prototype technology (Notice on Announcing the Project Results of 2017 Demonstration Virtual Simulation Experimental Teaching Project in Shaanxi Province S.J. [2017] No.519). Moreover, the college, taking the opening of this virtual simulation experiment teaching project as an opportunity, also vigorously promoted the virtual simulation practice teaching and further deepened the reform of teachers, teaching materials and teaching methods.

Table VI. List of awards of "Ala Rabbit" studio participating in information teaching contest (Partial)

| S/N	Names of skill competitions	Awards
1	National College Student Market Survey and Analysis Competition	First and second prizes at the national level
2	"Imagine Cup" Big Data Analysis Contest of National Higher Vocational Colleges	First and second prizes at the national level
3	"NetInNet Cup" Audit Skill Contest of National Higher Vocational Colleges	The third prize at the national level
4	"Seentao Cup" College Students' Accounting Informationization Skills Competition	The third prize at the national level
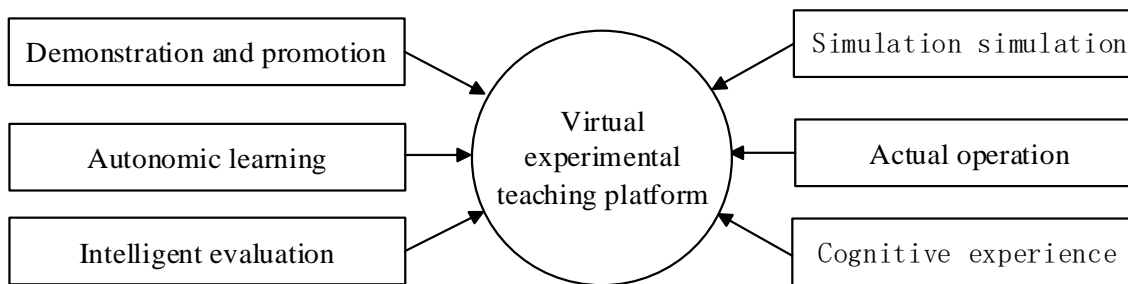
Fig. 2: Virtual simulation experiment teaching platform

2.2 Practical Analysis of Teachers' Informatization Teaching Ability Development

All teaching and learning activities will revolve around the Internet in the era of "Internet+ Education". Besides, the teaching mode based on micro-class teaching, flipped classroom, blended teaching and other information means forces teachers to constantly update the new technologies and teaching methods used in the teaching process. Therefore, XJ College attaches importance to teachers' use of modern information technology to promote the development of teachers' information-based teaching ability.

2.2.1 Providing information technology support and training

In order to improve teachers' IT application ability, XJ College adopts the training mode of combining special training, centralized training, "send-out and invite-in" training, distance training and on-the-spot investigation to carry out IT training for teachers in various ways. For example, Shen Zhengyu, the senior trainer of "Rain Classroom", trained teachers from all secondary schools on the practical operation of the "Rain Classroom" intelligent teaching tool, explained in detail from the installation of software to how to make courseware and each functional module of the rain classroom, and demonstrated the participants'

practical operation by participating in question-and-answer interaction, difficulty feedback, PPT push, on-site question answer, statistical investigation, sending contribution or bullet screen to projection screen, etc. to ensure that each participant can use the "Rain Classroom" for course teaching. Another example is to take advantage of the concentrated training time of the whole school staff in winter and summer vacation to give a lecture on the special training of multimedia courseware making for the whole school teachers. In addition to the training designated by the college, each secondary school also organizes its own teachers to carry out information technology training through various channels.

Through the training and intervention of information technology to teachers, they are urged to apply it to teaching more quickly and better (Fig. 3).
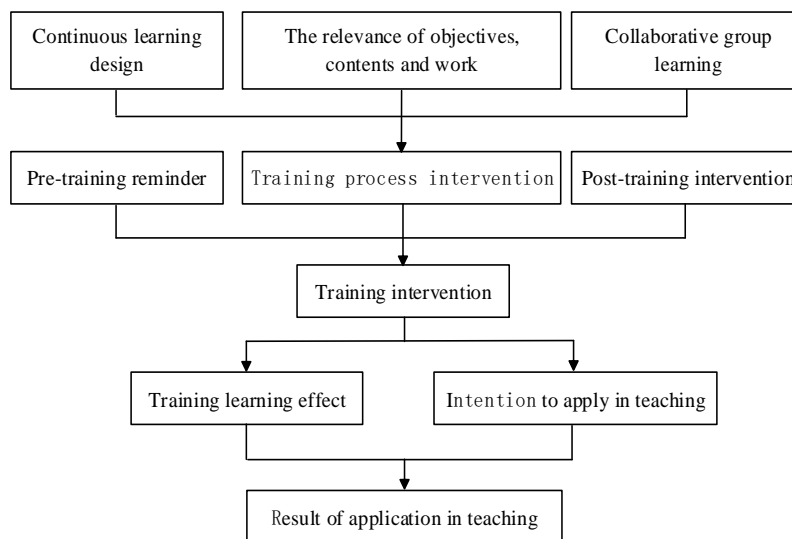

Fig. 3: Analysis framework of teacher training intervention

2.2.2 Application of information-based teaching design for teachers

XJ College requires teachers to use rain classroom in daily classroom teaching, which makes online and offline mixed teaching more common. In this way, teachers can make the teaching content complement each other from classroom to after class through mixed teaching design, and make the teaching link extend from online to offline to form a closed loop. The blended teaching design implements the OBE teaching concept, with which students can conduct online learning through the course resource platform, carry out task-driven or problem-driven classroom discussions, and take project examples as traction for offline participation, thus forming an "internet+ education" flipped classroom model of online learning+ project-based teaching, online learning +case-based teaching, online learning+ problem-oriented teaching, so as to gradually improve students' ability to solve complex engineering problems.

For example, in XJ College, Mechanical Design is a professional basic course for mechanical majors, which undertakes the task of cultivating students' design ability of common mechanisms and parts, and provides certain knowledge and ability for students to work in process planning, numerical control

programming, equipment maintenance and transformation, and CAD/CAM technology in the future. The teachers of mechanical design course group in XJ College explored and applied online and offline blended teaching in this course, which effectively stimulated students' learning enthusiasm, mobilized their learning interest, improved their self-learning ability, and cultivated their ability to apply the knowledge and skills of mechanical design to solve complex mechanical engineering problems. Under the current background of vigorously promoting the "output-oriented" professional certification of engineering education, it is undoubtedly of great theoretical and practical significance to design the teaching objectives in a reverse way based on the course support for graduation requirements, reconstruct the teaching content, study and explore the teaching organization of the course.

As shown in Table VII., the force analysis of gear mechanism in mechanical design, for example, has formed an overall teaching design system of three stages before, during and after class, as well as teacher activities, student activities, teaching resources, evaluation methods and other links aiming at the target knowledge points.

Table VII. Example of teaching design of Mechanical Design course

Stages	Goal knowledge points	Teacher activities	Student activities	Teaching resources and technologies	Ways of evaluation
Before class	The direction of gear helix; Radial, circumferential and axial forces of gears	Uploading the list of online learning tasks; releasing test questions and collecting feedback	Self-study according to task list; completing the test	Online course platform, SPOC video	Online learning time+unit test
During class	The relationship between the forces exerted on various gears and their reaction forces; Left and right hand spiral	Case introduction → inspiration → key point explanation combined with online learning after moderate flipping → case exercise → summary → comprehensive application	Listening + Thinking+ Interaction → Case Practice	Rain Classroom	Classroom performance + final paper grade

	rule of driving wheel	homework of after-school engineering			
After class		Summarizing and analyzing the design of teaching links, the effectiveness of teaching methods and means, the design of teachers' and students' activities and the effect of teaching and learning to determine the improvement measures and programs	Review+homework	Online course platform, SPOC video	Homework

2.2.3 Promoting teachers' information teaching ability by holding classroom teaching innovation contest

XJ College actively leads teachers to innovate teaching concepts, contents, methods, means and evaluation, reasonably use modern information technology, and actively participate in classroom teaching reform and innovation practice by carrying out classroom teaching innovation competition, which effectively promotes the improvement of all teachers' teaching methods and the enhancement of information technology application ability, the innovation of teaching model and the change of students' learning methods, as well as the deep integration of information technology and subject teaching. The competition for classroom teaching innovation is divided into three levels: the preliminary competition between departments, the semi-finals at the college level and the final at the provincial level. The participating teachers must first participate in the preliminary competition of the departments, and on this basis are recommended to the semi-finals at the college level, and finally those with higher level are selected to represent the college in the provincial finals. The competition is fair and just, and extremely challenging and innovative. Since 2018, XJ College has held more than 30 contests and four classroom teaching innovation competitions, with a total of more than 2,400 participants.

2.3 Practice Analysis of Digital Teaching Platform and Resources

Only in 2006 did XJ College really begin to build an information-based teaching platform for application. It invested a large amount of funds to promote teaching management with information

technology and accelerated the pace of application construction, which gradually brought various management systems online. In 2015, Zhengfang Educational Administration System Platform was introduced, and in the same year, Singapore Bamboo Network Course Teaching Platform was introduced. In order to improve the application level of school teaching information, rain classroom and xuetangx teaching platform were introduced in 2019 and are currently in use. After years of exploration and practice, XJ College's network teaching comprehensive platform (excellent course resource platform, multimedia resource platform, and online classroom platform) has been launched step by step to establish a scientific evaluation system for network registration learning process, covering the educational administration system, teaching information network, bank character examination question resource library, and higher education management cadre training platform, which strengthens the school information construction level, promotes the school resource network construction, strengthens the information technology and classroom teaching, school management integration research, and improves the school information digital management level through the effective use of modern information technology.

Since 2015, XJ College has implemented the construction project of "one teacher and one excellent course" based on the online course teaching platform, and continuously strengthened the construction of teaching resources with the construction of "one teacher and one excellent course" as the starting point. After several years of construction, the school currently offers 1,153 courses on the rain classroom platform, and has completed 479 "excellent courses," with a total of 83,366 resources and 53,000 registered student users.

2.4 Practice Analysis of Teaching Information Technology Management

Based on the established integrated teaching service platform and the rain classroom, the XJ College has implemented the information-based teaching management. For example, XJ College requires every teacher to build an excellent course, whose use effect should be evaluated online and offline. The use of online platforms is evaluated by five indicators: registered users, online communication, online homework, online Q&A and online examination. Registered users refer to the proportion of students taking courses using online platform. Online communication refers to the ability to have online discussions with students on key and difficult points of the course as well as professional fronts, thus stimulating students' learning interests. Online homework refers to the effective assignment for the course chapters and correcting the homework in time to master the students' learning situation. Online Q&A refers to answering students' questions in time, with clear, concise and clear ideas. Online examination refers to the ability to make full use of online question bank to organize students to take the course platform examination.

In addition, the teaching management cadres can be set as one of the backstage administrators of the rain classroom teaching platform according to the needs, so that they can enter the "online" classroom to attend lectures and inspect classes at any time as needed. During the COVID-19 epidemic, college-and department-level leading cadres and teaching supervisors and all teaching management personnel in the school (department) entered the online classroom to attend lectures and watch classes, and all teachers entered the online classroom to attend lectures and evaluate classes, thus realizing the coverage of all

courses and strengthening the real-time monitoring of the online teaching quality.

III. LEADING ROLE OF INFORMATIZATION IN EDUCATION

With the guidance of educational informatization, XJ College has deepened the teaching reform of higher vocational education and boosted the connotation development of the school.

3.1 Improving the Information Literacy of Teachers, Students and Managers

For teachers, the school has provided them with resources and platforms for daily offline and online blended teaching and information-based teaching competitions to participate in various types of information-based education, teaching and training, thus strengthening their information-based teaching ability in various ways. Rain Classroom and DingTalk have become the main platform for students to learn online, so they have to spend more time to learn information technology, which has cultivated their ability to use information technology. Managers supervise and evaluate online teaching by means of information technology and carry out online teaching evaluation activities, which greatly improve the quality of education and teaching.

3.2 Improving the Informatization Level and the Ability of Educational Governance of Managers

The information-based teaching platform has been widely used in XJ University, especially during the COVID-19 epidemic, when online teaching became the norm, which urges educational administration managers and supervision experts to improve their information level to achieve management accuracy. XJ College has solved the difficult problem of online education management by deepening the application of information technology, improved the management efficiency and education governance ability, and freed teachers from the multifarious labor to concentrate on education and teaching and create conditions for learning to generate long talents, which has promoted educational informatization, realized the deep integration of information technology and education, and improved the informatization level and education governance ability of managers.

3.3 Information Technology Promoting the Reform of Talent Training Mode

In recent years, the platform course construction in XJ College has achieved fruitful results and rich teaching resources. During the epidemic, information technology was used to carry out blended teaching and achieved good results. In particular, under the practice teaching system, a trinity teaching model of "teaching, training and doing" with project-based practical courses, process-based practical operation and modularization of tasks was constructed. Simulation and simulation training were carried out relying on information technology to improve students' comprehensive professional ability.

IV. CONCLUSIONS

In XJ College, information construction is used as an important means to promote the college's high-quality development, which promotes practical innovation in education and teaching mode innovation, development of information-based teaching ability of teachers, digital teaching platform and resources, information teaching management, etc., thus improving the application level of information technology in school education and management, improving the quality of personnel training, and accelerating the pace of information construction in higher vocational education.

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