

Exploration and Practice of Diversified Wall-Free Classroom Under the Background of Innovation and Entrepreneurship Education

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Abstract: The change of talent training plan for innovation and entrepreneurship has affected the change of the structure of college teachers. Under the background of innovation and entrepreneurship, the teaching methods and management mode of college education need to be improved. Students can no longer be confined to learning in the classroom, providing students with a wall-free social classroom based on teaching time and space and diversified teacher-student relationship. Guided by students' innovation and entrepreneurship, we develop curriculum and learning mode based on school enterprise cooperation. The construction idea of the whole course teaching content is simple and effective, that is, to set up relevant curriculum system based on the direction of employment. We define the training objectives of students, and build a scalable and renewable professional curriculum in the school-enterprise cooperation education system. A "double qualified" teaching team with practical ability is built, and the effective development of our production, teaching and research is reached. Finally, social services, innovation and entrepreneurship talent training activities are promoted.

Keywords: Wall-free classroom, Innovation and entrepreneurship education, curriculum and learning mode, school-enterprise cooperation.

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I. INTRODUCTION

With the substantial increase of college enrollment, higher education has become a popular education, and the quality of students is not as good as before. However, most college teachers also use traditional teaching methods. In addition, new technology is developing too fast, and each course has less class hours. Teachers need to teach more teaching content in relatively less classroom teaching time. Therefore, classroom teaching can only teach basic knowledge points and important content. Students need to learn, digest and absorb the knowledge they should master after class, which adds difficulty to college teaching. The change of the talent training plan for innovation and entrepreneurship (Fridhi, B., 2021; Sun, D., 2020; Roig-Tierno, N. et al., 2018) has affected the change of the structure of college teachers, and the training of teachers requires a period, which has led to the situation where the training of college teachers lags behind the market. Some colleges and universities have even seen the aging of college teachers' knowledge, and the outdated knowledge (Chan, K.K.H. and Yung, B.H.W., 2018) is still being taught in the classroom. At the same time, people who are rich in their own professional knowledge and experience in the society are also difficult to walk on the university platform for various reasons. Therefore, in the context of innovation and entrepreneurship, the teaching methods and management models of college education need to be improved to meet the needs of innovation and entrepreneurship.

Our university is the vice chairman unit of the National Alliance of Applied Technology Universities of China, the first batch of pilot units of national outstanding engineers, and the chairman unit of the Zhejiang Provincial Alliance of Applied Undergraduate Colleges and Universities. The establishment of the College of Innovation and Entrepreneurship is an important embodiment of the orientation of our university and the characteristics of talent training. The purpose is to cultivate high-quality innovative and entrepreneurial talents, encourage and support college students to innovate and start businesses, and better adapt to the training requirements for high-quality talents in the construction of a new industrialization and innovative country. The College of Innovation and Entrepreneurship (CIE) in our university was awarded the title of Demonstration College of Ordinary Colleges and Universities of Zhejiang Province, and the Engineering Training Center was awarded the title of Comprehensive Engineering Training Experimental Teaching Demonstration Center of Zhejiang Province. With the goal of cultivating high-quality and application-oriented talents for all-round development, CIE focuses on popularizing innovation and entrepreneurship education, takes building a mass

entrepreneurship education platform as the basis. The college inherits innovation and entrepreneurship culture as the foundation, and takes innovation and entrepreneurship education achievements as the guidance. We actively promotes the "1625" action plan of innovation and entrepreneurship education, that is, 100% of students will receive innovation and entrepreneurship general education, 60% of students will participate in innovation and entrepreneurship training, 20% of the students will participate in innovation and entrepreneurship practice, and 5% of the students will be able to work in the company they will found. The college now has four internal institutions, including the college central office, innovation and entrepreneurship base, metalworking base and electrical and electronic base. The college covers an area of 7098m², and 9174m² is dedicated to university level innovation and entrepreneurship education (874m² for innovation practice base, 1000m² for entrepreneurship practice base, 1000m² for entrepreneurship square, and 6300m² for science and technology park). The college has 26 full-time teachers and more than 30 part-time innovation instructors. Professor Li Jiahua, the director of the KAB Institute of Entrepreneurship Education of the International Labour Organization of China, the vice chairman of the National University Students Innovation and Entrepreneurship Alliance, and the vice chairman of the Higher Education Entrepreneurship Education Steering Committee of the Ministry of Education in China, was invited as a visiting professor of the college. In combination with the actual situation, the university has set up a special class for entrepreneurship practice and a special class for intelligent innovation. The entrepreneurship practice characteristic class promotes entrepreneurship practice and project incubation by comprehensively and systematically carrying out entrepreneurship education and training, further cultivating students' entrepreneurship, entrepreneurial awareness and entrepreneurial ability, and aims to cultivate a group of entrepreneurial talents and excellent entrepreneurial teams with entrepreneurship and entrepreneurial ability. On the basis of careful study of professional knowledge, students should carry out practical activities related to entrepreneurship simulation, with the core of *Three Innovations* (i.e., innovation spirit, entrepreneurial quality and entrepreneurial ability) and *Five Abilities* (i.e., research learning ability, creative thinking ability, integrated innovation ability, team organization and cooperation ability, and cross-cultural communication ability), to cultivate and improve the innovation and entrepreneurship ability of students.

II. THE PROPOSED PROJECT

With this project, students can no longer be limited to learning in the classroom. The various resources of this project platform provide students with a wall-free classroom (Tshephe, G. P., 2013, Doohan, N.C.; Mishori et al., 2020). A variety of new curriculum teaching methods will break through the limitations of teaching time and space, and promote the teaching mode from closed to open (Yen, SC., 2018; Jia, Y. and Zhang, L., 2021; Liu, XY. et al., 2022). In terms of curriculum teaching organization, from well structured closed classroom teaching to semi-open mixed curriculum, fully open project-based and socialized curriculum teaching. To this end, teaching time and space, and teacher-student relationship are further diversified. In terms of course evaluation method, with the help of big data learning analysis technology of this project, students' knowledge construction and complex ability evaluation will provide more personalized and effective support for students' learning. The innovation of these curriculum teaching modes has enriched the connotation and practice of wisdom education.

2.1 The construction content of OTO oriented diversified wall-free classroom.

Guided by students' innovation and entrepreneurship, curriculum learning content and learning mode based on school-enterprise cooperation (Zhang, Y., 2021) are developed. By analyzing the current employment demand, the corresponding functional modules are designed. The functions of the platform mainly include course resource module, course learning module, grouping module by project position, student grouping module, learning incentive ladder module, offline guidance module, site management module and enterprise docking module. The platform implements the tutor responsibility system, and the academic ideas, subject knowledge and teaching ideas of entrepreneurial tutors run through the entire student training process. In the process of teaching and learning, students, interns, counselors and tutors constantly repair and promote the whole discipline system. The construction of the teaching staff is to establish a two-way cooperation mechanism by combining with the training company to achieve innovation and entrepreneurship theme training and share entrepreneurial experience by relying on tutor resources.

When students enter the platform, they first fill in the basic information and choose the voluntary learning direction in the system, and then determine the direction through interview, enter into groups and designate counselors to judge the current learning stage. During the learning process of students, the instructor supervises the learning progress by interacting with the students and answering questions. At the same time, the information of the students' learning process is submitted to the platform. When a certain learning stage is completed, the instructors and enterprise instructors will assess the students respectively, and the outstanding students can become instructors. Then enter the next stage of the proposed learning path. When all the stages are completed, the trainees who pass the final assessment can become interns and grow into enterprise mentors.

When the trainees become interns, they will be grouped according to the project positions, redeveloping the previous commercial projects to complete the training of project development, and timely incorporate the interns into the actual project development. In the aspect of offline coaching, the counselors or tutors shall be assessed, rewarded and punished according to their phased objectives, and the basis for upgrading, leading and entering the project team shall be completed through the points-based system.

By participating in the actual project development, students can complete the overall understanding of project management and company operation, and obtain the perception of key links in the entrepreneurial process through the tutor resources (Lemke, M. et al., 2020; Sockalingam, N., 2011). Through the implementation of commercial projects and linking all aspects of daily project implementation, students can participate in activities related to innovation and entrepreneurship practice and operation management, laying a solid foundation for their subsequent entrepreneurship.

2.2 The wall-free classroom is seamlessly connected to the Gao-College

The wall-free classroom is seamlessly connected to the *Gao-College*, which is an online learning environment. Take the function point decomposition of students' learning path as an example, where *APP* means that the function supports mobile terminals. In terms of organizational structure, it is a hierarchical management mechanism, that is, one instructor manages several instructors, and one instructor manages several students. When recording the assessment results, the instructor will make a preliminary assessment and the instructor will make a final assessment. The assessment results will serve as the basis for the next group of student instructors. After the learning roadmap is completed, the student can be used as a tutor candidate (as an intern). The system provides automatic grouping of students, and the rules are described as follows. First, the students who are evaluated as excellent grade in the first stage will act as counselors, and the number of new students will be equally divided into counselors. If the number of students is too large to be assigned to the instructor, the students who are evaluated as good at the first stage will be assigned as instructors. If the number of trainees is still too large, they will be allocated manually. Second, it is to set the maximum number of students led by each instructor. The instructor can view the situation of this group of students, and the instructor can view the situation of all students under the instructor.

When setting up the content of the curriculum system, we not only show the list of post-centered technical courses, but also provided workplace related soft ability training, such as core knowledge points of innovation and entrepreneurship, industry ethics, effective communication and daily etiquette, time management and team cooperation, quality control, pressure management, workplace writing and public expression.

Through the ladder learning mode and interview, students can choose different modules to learn according to their own voluntary direction in the learning process. The instructor is responsible for supervising the learning progress, interacting and answering questions with the students during the learning process, and viewing the process information submitted by the students. With the deepening of learning progress, the counselors grasp the opportunity to assess the students, and then the enterprise tutors assess the students, and select excellent students to become counselors. At the end of the whole learning stage, the cooperative enterprise can determine whether the students can become interns through the final assessment.

2.3 Course Resources Construction

Take Python module as an example, the curriculum syllabus is listed as shown in Figure 1. The construction idea of the whole course teaching content is simple and effective, that is, to set up a relevant curriculum system based on the employment orientation.

Phase I Python basics

- Python advanced features include functional programming, network programming and multi-threading.
- Python Web development includes Web development foundation, front-end technology, Flask, Django, Tornado and Redis.
- Project training includes using Gao API+Python to solve the rental problem; implements the train ticket query tool using Python 3, and builds a personal blog based on Flask framework.

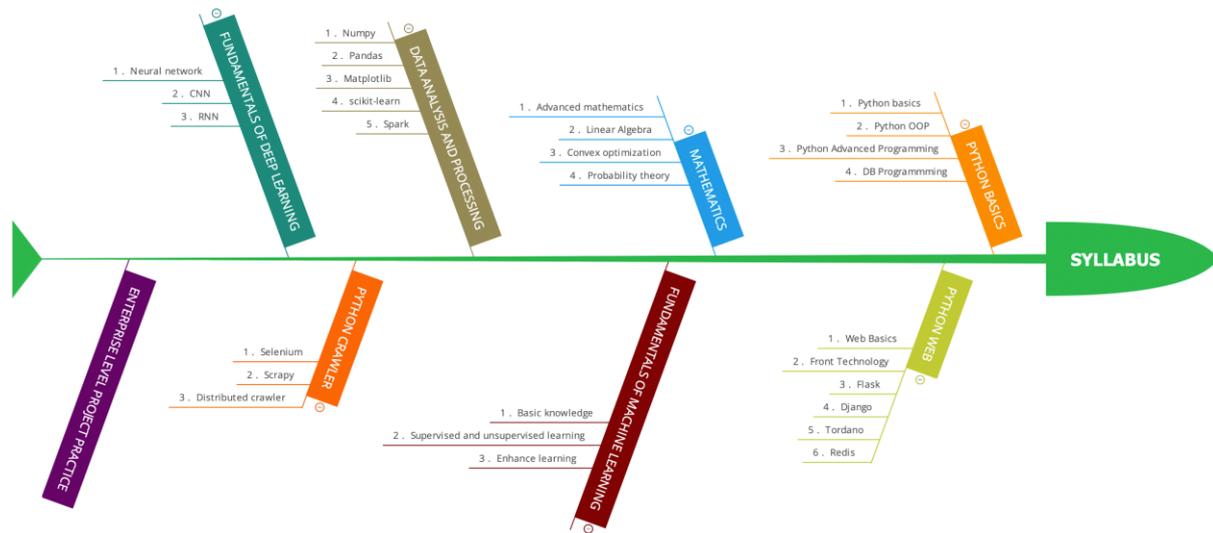
Phase II Machine learning and data analysis

- Mathematical basis includes advanced mathematics, linear algebra, convex optimization and probability theory.
- Fundamentals of machine learning includes basic knowledge, supervised and unsupervised learning, and enhanced learning.
- Data processing module includes Numpy, Pandas, Matplotlib, scikit-learn and Spark.
- Python crawler includes Selenium, Scrapy and distributed crawler.
- Project training: airline customer value analysis, financial revenue forecast analysis, household water heater user behavior analysis and event identification, and scikit-learn implementation of ebay data analysis.

Phase III Machine learning advanced skills improvement

- Deep learning foundation includes neural network foundation, CNN and RNN.
- Graphic and image processing includes image detection, image recognition, image segmentation and splicing, and image 3D processing.
- Natural language processing includes statistical language model, maximum entropy model, LSTM and Seq2Seq.
- Recommendation system includes evaluation indicators of collaborative filtering recommendation, content based recommendation, rule-based recommendation, combined recommendation and recommendation system.
- Deep learning tools includes Keras, PyTorch and Tensorflow.
- Project training includes using TensorFlow to realize YOLO real-time object detection, Titanic crew death prediction, restaurant dishes recommendation, machine translation and robot chat.

Figure1. The curriculum syllabus taking Python module as an example.



III. PROJECT IMPLEMENTATION

3.1. Project organization structure

In view of the overall objectives and construction requirements of the project, we formed a human resource pool with senior researchers, managers and technical developers from Hangzhou Wotu Education Technology Co., Ltd (hereinafter referred to as Wotu). and Zhejiang University of Science and Technology (hereinafter referred to as ZUST). Through resource integration and linkage, we conducted research, development and deployment of the project in the mode of production, education and research. In the implementation process of the project, the quality, schedule and resource allocation shall be effectively managed and controlled to ensure the normal development of the project. The research of this project is of high complexity and large professional span. In view of these characteristics, we adopt a matrix organization. Matrix organization is a rectangular array of functional organization and professional organization structure. The leading group of this research project is composed of decision makers from all participating units of this project. The horizontal research group is the main executive system, and the vertical functional group provides the auxiliary support and service system, forming an integrated organization and management system with both command and functional support. The organizational structure of the project team is as follows:

(1) Project Leading Committee

It is composed of relevant leaders from Wotu and the College of Information and Electronic Engineering of ZUST. It is responsible for the overall management of the project, the overall control of the system research, development and implementation, and the coordination with the competent department of the project and other relevant projects.

(2) Expert Advisory Committee

The innovation and entrepreneurship experts and computer information technology experts from ZUST are invited to form an expert advisory committee to guide the formulation of the design and implementation plan of

this project, and provide decision-making basis for the leadership committee. They guide and participate in research work, and organize innovation and entrepreneurship to tackle key problems. To ensure that the project objectives and tasks are completed with high quality as planned, they track the completion of the project dynamically in real time.

(3) Project Coordination Group

Be responsible for the business and technical connection between the project and the competent department of the project and the relevant departments undertaking other projects, and ensure that the research content and specific implementation of the project are consistent with other projects.

(4) Research team

According to the task setting of the project, research, development and implementation of relevant tasks are carried out as planned. It is divided into indicator designated group, technical architecture group, requirements analysis group, design and development group, test group and pilot implementation group. The team is directly managed by the project leader.

(5) Project functional group

To carry out the management function for the development of the subject, and ensure to complete the objectives and tasks of the subject with high quality according to the plan. It is internally divided into quality control group, progress control group, configuration management group, project management group and financial management group.

3.2. Project implementation steps

Step 1. Through further investigation of IT production enterprises of various sizes and types, track, investigate and study the innovation and entrepreneurship model, and study the basic process and control means of their daily operations.

Step 2. On the basis of follow-up investigation, we will work with Wotu to build a curriculum system suitable for training innovative and entrepreneurial talents. The system mainly includes three aspects as follows. (1). Based on the cultivation of innovation and entrepreneurship ability, we set training modules, courses of each module, and teaching contents of each course. (2). Form a set of project operation system conducive to the cultivation of innovation and entrepreneurship ability of students. (3). Build a diversified wall-free classroom for OTO based on school-enterprise alliance (Zhang, Y., 2021.), and cultivate students' innovation and entrepreneurship ability and related professional quality based on entrepreneurial mentors and enterprise projects.

Step 3. To implement the innovation and entrepreneurship talent training curriculum system according to the model constructed in step 2, undertake business projects to support students' participation in project practice. Also, the entrepreneurship tutor and school teachers will jointly guide students' project practice to cultivate students' innovation and entrepreneurship ability.

IV. CONCLUSION

The focus of innovation and entrepreneurship education is to cultivate students' awareness and ability of innovation and entrepreneurship. The OTO oriented diversified wall-free classroom with the tutorial system as the core takes the business project operation as the link and the innovation, and entrepreneurship training team as the driving force to cultivate students' ability to understand the project, various innovation and entrepreneurship abilities, interaction and cooperation with other learners, etc. The wall-free classroom has become a bridge for students to enter the workplace and a good place to cultivate potential entrepreneurs among students.

The application of this project enables students to effectively organize the data and information at different levels generated in the learning process of innovation and entrepreneurship courses, including students' individual level, behavior level, content level and environment level. Based on comprehensive big data and relevant evaluation models for analysis, we can pay more attention to the learning process, understand what factors affect the level of innovation and entrepreneurship, and what relationship these factors have, so as to provide a basis for improving innovation and entrepreneurship ability of students.

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