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Management and Operation Mechanism of On-Campus Training-Base Targeting at Cultivating Research-Based Students with Practical Ability

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Abstract: The training bases joint constructed and operated by universities and enterprises helps to cultivate high-quality professional talents, which provides new solutions for industry-education integration. This paper focuses on the practical ability cultivation of research-based students in the major of logistics management major in a research-oriented technology university. Taking an on-campus training-base as an example, this paper explores its management and operation mechanism. From seven aspects including organizational management, resource and funding, production and teaching, operation and services, technical support, supervision and evaluation, and enterprise-university communication, this paper investigates the relationships and coordination methods among various participants, operation activities, investment sources and types. The demonstrated management and operation mechanism provides a reference to those universities who are looking for ways to effectively integrate industry and education via training-bases for high-quality students with practical ability.

1. Background

With the deep integration of advanced information technologies such as the Internet plus, big data, cloud computing, artificial intelligence, and the Internet of Things, as well as scientific management methods like lean production and agile manufacturing in modern logistics, intelligent logistics facilities and equipment, such as drones, unmanned delivery vehicles, automated warehouses, sorting robots, AGVs (Automated Guided Vehicles), and robotic arms, are getting popular in logistics enterprises. The deep integration has characterized modern logistics with high informatization, digitalization, networking, flexibility, intelligence, automation, globalization, high technology, and high added value[1]. As one of Shenzhen's pillar industries, modern logistics industry could also benefit from the joint construction and operation of training-bases by universities and enterprises. It facilitates the cultivation of high-quality talents in the major of

logistics management , providing new cooperation ways between universities and enterprises, as the dynamic response to the industry trends enables the corresponding optimization of development directions of this major.

Training-bases serve as critical platforms for implementing practical teaching, enhancing talent skills, improving teaching quality, and fulfilling educational objectives. However, existing training-bases commonly have issues such as prioritizing hardware construction over content development, emphasizing training-base construction over operation management, and focusing on teaching functions while neglecting social services[2]. The operation mechanism serves as the guiding framework for training-base construction. By establishing an appropriate management and operation mechanism for on-campus training-bases in applied technology universities, we can significantly enhance management efficiency and operational effectiveness. This will enable production-oriented training bases, which serve both to the companies and universities, to fully realize their vocational, practical, and open characteristics, playing a crucial role in cultivating applied talents.

2. Related Research

There have been numerous research results related to the operation mechanisms of training bases. After a careful literature review to this topic, it was found that their key contributions to this topic mainly focus on the following areas. Firstly, some research emphasized the dimensions of industry-education integration and industry-university-research collaboration, which include aspects such as the operational management system [3], management and operational mechanisms [2], functions [4], and patterns [5]. secondly, some research summarized the operational and management patterns of production-oriented training bases, focusing mainly on the leading roles of universities and enterprises [6], different investment patterns between universities and enterprises [7], and the differentiated management functions between universities and faculties [8]. Thirdly, other research focused on the pattern of benefit balance inside the operation mechanism, mainly involving how to protect interests among universities, enterprises, teachers, and students [6,9-101], and the institution which can guarantee responsibilities, rights, and benefits for each participant [11].

Existing research on training-bases also has some limitations for further exploration. Firstly, most of current research on the operation mechanisms of training-bases focused on vocational colleges rather than universities. Some examples include the on-campus beer production training base at Hunan Chemical Vocational and Technical College [3], and the comprehensive training-base of the Beijing Information Vocational and Technical College, which is established via a physical supermarket integrating marketing, logistics, finance, and information centers for students in finance-related majors [12]. The training content in vocational college training bases mainly involves on-the-job training internship positions, where students operate and familiarize themselves with procedural tasks. However, there is a lack of summary and refinement of related issues encountered during the work process, which could serve as a breakthrough during the cultivation of practical abilities. In particular, there is a gap of experience in the operation mechanisms of training bases in applied technology universities. 2) Studies [2] mentioned the innovation of management and operation mechanisms, but few specified measures for implementing this innovative management and operation mechanisms. 3) Some vocational colleges [13] have explored how the students get involved in the daily operations of training-bases, encouraging students' participation by offering subsidies and considering their involvement in awards and evaluations. They also use established rules and regulations to standardize daily operations. However, there is still gap in guiding students to participate in training-base operations via enhancing their skills.

To fill the above mentioned gaps, this paper takes the Shunfeng training-base at Shenzhen

Technology University (hereinafter referred to as the "SF training-base") as an example, to explain its management and operation mechanisms in applied research-oriented technology universities. The aim is to enrich the theoretical framework of practical ability cultivation in technology universities to guide practice. With this framework, on-campus training-bases can be fully functioning in cultivating the practical innovation abilities of students.

3. Management and Operation Mechanism of the SF Training Base

3.1. Objectives of Cultivating Research-Based Applied Talents

The concept of cultivating students with research-based practical abilities embodies the dual mission of higher education in modern society. On one hand, the university with this goal is committed to the innovation and exploration of knowledge. On the other hand, it satisfies society needs by educating high-quality and interdisciplinary students who can integrate theory with practice.

This concept and its goal can be understood from following two aspects. First, research-based practical ability emphasizes the development of innovative capabilities. It requires the students not only possess a solid theoretical foundation but also can apply critical thinking to investigate problems and ideas encountered in practice, resulting in advancing new perspectives and methods for scientific research. Second, the cultivation focuses on the close integration of practical ability and theoretical knowledge. Unlike purely research-oriented or skill-based students, students of this type must not only master cutting-edge theories in their disciplines but also transform the theories into tangible practical outcomes or develop the ability and awareness to conduct research on issues identified during practical applications.

3.2. Framework of the Management and Operation Mechanism

As a training-base designed for the logistics management major in a research-oriented technology university, it focuses on cultivating high-quality students with corresponding practical abilities. At the same time, as an on-campus training-base jointly built and operated by the university and enterprises, it serves two main functions, i.e. supporting daily production tasks and enhancing students' practical training and competency development.

To ensure the above mentioned functions, a management and operation mechanism framework has been established considering the win-win principles of university-enterprise collaboration during the construction and operation. This framework consists of seven key modules, which are further explained as follows.

3.2.1. Organizational and Management Module

Organizational and Management Module primarily focuses on the composition of management personnel, the coordination mechanisms among staff, and the division of management responsibilities within SF training-base. As the management personnel of SF training-base is from both university and enterprise, it is vital to specify their representatives, which are listed as follows.

- Management Personnel from university are teachers who work as student training instructors in the SF training-base. They ensure the function and safety of the training-base. Besides, they also coordinate between the enterprise and other departments in the university, organize and manage the training content and progress for students.
- Management Personnel from enterprise are working staff assigned by the the enterprise. They are responsible for arranging their staff to train students, overseeing the operation of production

activities, and coordinating training content and schedule with teachers from university side to ensure the training in depth and progress.

3.2.2. Resource and Funding Management Module

The resources of the training-base include space resources, equipment resources, and teaching resources.

Regarding the space resources, as SF training-base is on-campus, the university provides the site. During the construction phase of the training-base, the enterprise invests the necessary manpower, materials, and financial resources for site development.

Regarding the equipment resources, once the training-base is operational, equipment resources are jointly provided by the university and the enterprise. The enterprise supplies the essential hardware and software required for normal production activities, including shelves, computers, monitoring systems, networks, express tracking systems, and parcel delivery applications. The university is responsible for investing in equipment resources related to practice cultivation. As the curriculum plan the development of an on-campus unmanned system, the university provides autonomous delivery vehicles and drones for campus-usage.

During the operation of these equipment, consumable material is also a necessary investment and the costs are allocated based on their usage. If the consumables are used for production activities, the enterprise covers the expenses. Otherwise, if they are used for training activities, the university bears the cost.

Regarding teaching resources, they are also jointly provided by both the university and the enterprise. The enterprise contributes resources that satisfy its production standards, ensuring that training outcome stays consistent with industry practices. The university optimizes and deepens the teaching resources based on its cultivation objectives, ensuring that students receive both industry-relevant training and an academically enriched learning experience.

3.2.3. Production and Teaching Implementation Module

To ensure that the training-base can simultaneously support enterprise production activities and university training programs, the Production and Teaching Implementation Module includes two key components.

1) The one is Production Activity Content System and Standards. It follows the content and standards of enterprise production activities, ensuring that training-base operations such as distribution, pickup, and sorting are consistent with other similar nodes on the enterprise network. All activities follow the same industry standards, ensuring that students receive same standardized operational training as in the industry.
2) The other one is Professional Training and Skill Development System. This system ensures that cultivation follows both university educational objectives and industry-specific professional training needs. As a result, The training goals are integrated into enterprise production activities, enabling students to gain experience as in real-world logistics operations. Additionally, the students have opportunity to do the analysis and evaluation of production activities. So the system encourages exploratory research on optimizing production operations, fostering innovation and continuous improvement in logistics practices.

3.2.4. Operation and Service Assurance Module

To ensure the smooth operation of the training base and the successful implementation of both production activities and teaching practice, a series of regulations and guidelines have been established. These include "SF Training-Base Student Training Management Regulations", "SF

Training-Base Mentor Guidance Regulations", "SF Training-Base Safety Management Regulations", "SF Training-Base Student Training Evaluation and Assessment Regulations" and etc. These regulations clearly define the responsibilities of all participants involved in the operation of the training base. Additionally, they standardize processes, ensure safety, and establish evaluation and assessment mechanisms for both production and training activities. Implementing these guidelines ensures efficient management, operational safety, and high-quality training outcomes, providing a well-regulated environment for teachers, students and enterprise staff.

3.2.5. Technology and System Support Module

At the same time, the training-base utilizes a node business platform, a laboratory management system, and an academic affairs system to ensure the smooth execution of various activities.

1) Node business platform is a software from the enterprise, same as the one used at other enterprise nodes. In addition to connecting with the enterprise's overall production operations, it technically supports the collection and delivery of parcels, warehouse management, courier status tracking, site loading and unloading, waybill inquiries, and other essential operations within the training-base.
2) Academic affairs system is a software from the university, used for managing training programs, including scheduling training activities, organizing course selection, recording student grades, and conducting evaluations of training performance.
3) Laboratory management system is also a software from the university, used to monitor the usage and maintenance of training equipment. It can make sure that all hardware and software used in training activities remain in optimal working condition for continuous learning and hands-on practice.

3.2.6. Quality Monitoring and Evaluation Module

To ensure real-time monitoring of the effectiveness and quality of production and training activities, a Quality Monitoring and Evaluation Module has been included to monitor and assess all activities within the training-base.

This module is implemented through following assessment ways, Regular Faculty-Student Training Seminars, University-Enterprise Operation Meetings, Student Evaluations and Feedback Sessions. These assessments are conducted at different frequencies based on their format, ranging from weekly, biweekly, to per semester.

Any issues arising during operations can be promptly identified and addressed by the following activities in this module. These activities include identifying and diagnosing problems in operations and training activities, conducting cause analysis to understand the issues, developing and implementing corrective strategies to improve operations.

3.2.7. University-Enterprise Coordination and Communication Module

As the training-base includes both university and enterprise personnel to conduct both production and teaching activities, it's operation involves the interests of enterprise staff, teachers, and students. To obtain smooth integration and collaboration, the University-Enterprise Coordination and Communication Module is established to facilitate regular and temporary meetings to handle the interest conflicts during the operation. These meetings are usually in the format of Industry-Academy Board Meetings, Training Base Operation Meetings, Training Workshops and Seminars, and Training and Research Advancement Meetings. They strengthen the role of the training base as a bridge between academic and industry.

4. Conclusions

This paper explores the management and operation mechanism of an on-campus training base for the logistics management major in a research-oriented technology university, with the goal of cultivating research-based applied talents. The proposed management and operation mechanism can well handle multiple stakeholders, including universities, enterprises, teachers, and students. It integrates enterprise production activities with university cultivation. Seven key functional modules are established to handle the coordination of facilities, hardware and software equipment, consumables, and personnel from both sides to ensure smooth operation. This mechanism aims to achieve a mutually beneficial outcome for both education and industry, cultivating high-quality students with practical ability.

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