

Process Reengineering and Practice of Laboratory Management in Vocational Colleges Based on the Concept of Diagnosis & Improvement

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Abstract: The teaching quality of experimental training courses in higher vocational education determines the quality of vocational talent development. In the era of popularization of higher education, the number of experimental training rooms has surged. Meanwhile, the imbalance between traditional management mode & management process and the rapid development of practical teaching demand has become increasingly prominent. As a result, the traditional experimental training room management force and mode cannot satisfy the needs of practical teaching resource management. Therefore, the concepts of diagnosis & improvement, institutional guarantee, and information technology emerge to provide favorable support to reengineer the business process. This paper diagnoses the problems in the traditional management mode of higher vocational colleges, analyzes the necessity and realization path of the process reengineering in the construction and teaching of experimental training rooms, and studies two potential misunderstandings that may exist in the process reengineering of experimental training room management.

1. Introduction

As a crucial type of education, vocational education plays an irreplaceable role in the development of technical human resources. Vocational education informatization serves as a backbone in all processes of such education. Nowadays, campus informatization has entered the stage of digital campus construction, and has been gradually moving to an integrated information system by unified construction from a decentralized and independent information system. [1] In higher vocational education, the experimental training room serves as a vital teaching base for cultivating students' practical ability and innovative attainment. [2] Experimental training courses serve the core of practical teaching in higher vocational colleges, and the corresponding teaching quality will directly influence the quality of talent development. Hence, the construction and management of experimental training facilities are of great practical significance for vocational education. The top priority of improving the quality of vocational talent development is to strengthen the construction of the experimental training resources, optimize the management of the facilities, and foster more technical talents in higher vocational colleges. In the era of higher education popularization, the rapid scale expansion prompts higher vocational colleges to purchase considerable experimental training instruments and equipment in recent years, and the number of experimental training rooms has rocketed. As a result, the traditional experimental training room management workforce and model can no longer meet the needs of practical teaching resource management, so it is necessary to reengineer the business process with the favorable support of information technology. Especially in higher vocational colleges in some metropolises, considering of the limited school space, several experimental training rooms are usually concentrated in the same physical location. Some schools have maximized the efficiency of school space based on the concept of "trading time for space". However, this deficit challenges the management of experimental training rooms in higher vocational colleges, and the imbalance between traditional

management mode & management process and increasingly changing practical teaching needs have been growing with each passing day.

2. Problems in traditional management mode of experimental training rooms in higher vocational colleges

2.1 The college's experimental training room management mode has not been intelligitized, the degree of work informatization is not high, and the concept of diagnosis & improvement is lacking

The assignment and arrangement of practical teaching tasks serve as foundation for experimental training teaching in higher vocational colleges. Currently, most vocational colleges are yet to establish a unified information system that can arrange teaching tasks for theoretical credits and practical credits in parallel. The timetable of the experimental training room is only accessible to compile after the educational administration system firstly finishes its basic course arrangement. Colleges continue to use Microsoft Excel and other spreadsheets to make records and statistics in such aspects as the assignment and arrangement of practical teaching tasks as well as data analysis and statistics. The accounting tasks of experimental training rooms can only rely on the records of experimental trainers. Firstly, because of the failure to informationize basic data, there are difficulties in teaching arrangement of experimental training rooms. Secondly, the data statistics are not timely and accurate enough to reflect the teaching operation and management operation of experimental training rooms. Finally, under such management frameworks, it is even more demanding to achieve real-time monitoring. The insufficient informatization directly leads to the difficulty in implementing practical teaching quality monitoring, not conducive to the diagnosis & improvement of teaching quality.

2.2 A work linkage mechanism among departments has not been established, and resources and efficiency have not achieved Pareto Optimality

Pareto Optimality, also known as Pareto efficiency and Pareto optimal allocation, is a significant concept in game theory. It refers to an ideal state of resources allocation, which means, if and only if there is no alternative state that would make some people better off without making anyone worse off. The experimental training room has multiple funding sources and involves various business processes such as construction, teaching, and asset management. For these dimensions, not all higher vocational colleges have established a unified training center for integrated management. Under the traditional management mode, the degree of information sharing among multiple functional departments remains low, easily leading to the existence of information islands and failing to exert synergistic effects. The current management mode of higher vocational colleges has the problems featuring overlapped functions and multiple levels. Specifically, the bidding, procurement, acceptance inspection and scrapping of experimental training equipment are generally in the charge of the asset management department. In its turn, the educational administration department is generally responsible for the teaching organization, operation, monitoring, and management of experimental training rooms. Then again, the secondary teaching department joins the management process as it usually takes charge of the formulation of experimental training teaching plans, the design and implementation of experimental training projects, and the daily maintenance and open management of experimental training rooms. Planning department, educational administration department or an independently established experimental training center takes the lead in carrying out the planning and formulation of experimental training rooms. Finally, the security department oversees the safety work of experimental training rooms. Such functional departments are parallel in relations, constituting a confusing system of players who have to align their efforts to carry out the management process jointly. If a working linkage mechanism is not actively established, and each department acts on their own will, it will result in the repeated purchase of equipment, and the failure to effectively and rationally allocate teaching resources and give full play to the service efficiency of equipment. The second-level teaching departments make

demands of experimental training rooms only based on their own professional outlook and course needs without comprehensive consideration, resulting in the repeated construction of experimental training rooms and causing great waste. Besides, the construction and management of experimental training rooms in higher vocational colleges relate to multiple positions in multiple departments, and there is no platform for coordinating various departments and roles, which limits information exchanges and results in indefinite functions, failing to form an efficient operation system. In a word, the operating efficiency of the construction and management of experimental training rooms needs to be improved.

3. Process reengineering theory and practice of management of experimental training rooms in higher vocational colleges

3.1 Overview of process reengineering theory

Business Process Reengineering (BPR) originated from the United States. In 1990, Professor Michael Hammer, a renowned American business management master, and James Champy, the president of CSC Index Inc., proposed the concept of business process reengineering as the fundamental reconstruction of the business process of an enterprise to improve significantly in terms of cost, quality, service, and speed, proceed to adapt to the modern enterprise environment characterized by customers, competition, and change to the maximum degree. [3] The introduction of BPR has exerted an enormous influence on the management concepts held by business management communities in European and American countries. The construction of experimental training rooms and management process reengineering theory are a transfer of process reengineering theory from the field of enterprise management to the field of education. Colleges and universities at mature stages of informatization construction in China and other countries also utilize process reengineering to reform their school management. [4] The management process reengineering of experimental training rooms aims to realize the data sharing, business collaboration and process standardization of experimental training rooms, with service providing for teachers and students and teaching as the guiding, information technology as the support, and efficiency improvement as the core. The management process reengineering of experimental training rooms in higher vocational colleges and that of ordinary colleges and universities share same characters. However, the former harbors dual attributes such as higher education and vocational education, academia and industry, which prompts the construction and management process reengineering of experimental training rooms to stick to the historical traditions and carry unique attributes of teaching-centered, technology-prioritized, and school-enterprise cooperation scenarios. Through the construction and management process reengineering of experimental training rooms, the traditional management mode with functions, tasks, and roles as the core elements can be modified into a process-oriented management form, focusing more on the relationship among businesses. Vividly speaking, the original linear management is upgraded to mesh networking since the core of process management is to find the lines (relations) connecting different points (tasks).

3.2 Necessity analysis of process reengineering of experimental training rooms in higher vocational colleges

The construction and teaching approaches of experimental training rooms should be based on the foundation of informatization, and it is also necessary to reengineer the process.

Firstly, experimental training rooms have to experience the process of application, construction, acceptance, and use, and these data are processed offline. Feasible as it is, there is a lack of data records. Especially in practical usage of experimental training rooms, the application and equipment management are often not in the charge of the same functional department, resulting in difficulties for the management department in checking the declared equipment, and failing to effectively and rapidly search and judge the rationality of the purchased equipment. As such, it is necessary to diagnose and improve informatization approaches and management modes.

Secondly, in terms of the budget for the construction of experimental training rooms, there is often a certain difference and a time gap between the amount of the funds to be declared and the actual approved funds to start the construction. If work linkage and meticulous process management are not established, mistakes are easily made in the actual approval and construction process. Hence, diagnosis and improvement are needed for management modes.

Thirdly, process reengineering is adopted to strengthen school-enterprise cooperation and enhance the integration of innovation and entrepreneurship education to achieve the purpose of improving equipment utilization. The resources of experimental training rooms in higher vocational colleges mainly serve teaching and training, and their utilization rate in scientific research remains relatively low. As a result, the experimental training rooms see a significantly low utilization in higher vocational school colleges when there is no class scheduled for it, and the vacancy rate of large-scale, sophisticated or expensive instruments and equipment keeps relatively high. Besides, plenty of small and micro businesses in the start-up stage are incapable of purchasing related equipment in large quantities due to limited capital. As a result, there is an imbalance between the supply and demand of experimental training room resources and high-quality resources fail to be reasonably allocated. In terms of the construction and management of experimental training rooms in higher vocational colleges, colleges and enterprises are advised to consider performing school-enterprise cooperation and integrating innovation with entrepreneurship education. This integration requires a systematic redesign of the management system and process of experimental training rooms, and a clear definition of the responsibilities, obligations and rights of the school and the enterprise. By means of process reengineering, enterprises are encouraged to jointly build and use the schools' experimental training rooms in the form of school-enterprise cooperation. Meanwhile, students enter the experimental training rooms as project participants so as to realize the efficient and reasonable use of experimental training room resources in higher vocational colleges.

3.3 Path analysis of management process reengineering of experimental training rooms in higher vocational colleges

The management process reengineering of experimental training rooms in higher vocational colleges is to promote the standardization, informatization, and efficiency of the management process of experimental training rooms in these colleges. Besides, an institutionalized and orderly operation mechanism of a vertical (from teaching principal to educational administration department and to colleges and departments, teachers and students), and a horizontal (educational administration department and other departments) information communication and collaboration interaction should be built (as shown in Figure 1). [5] The process reengineering needs to be carried out under the top-level design framework of the school's modern university system construction. With the vigorous coordination of various departments in colleges, colleges should carry out the construction, combing, and standardization of their management system and reengineer the process.

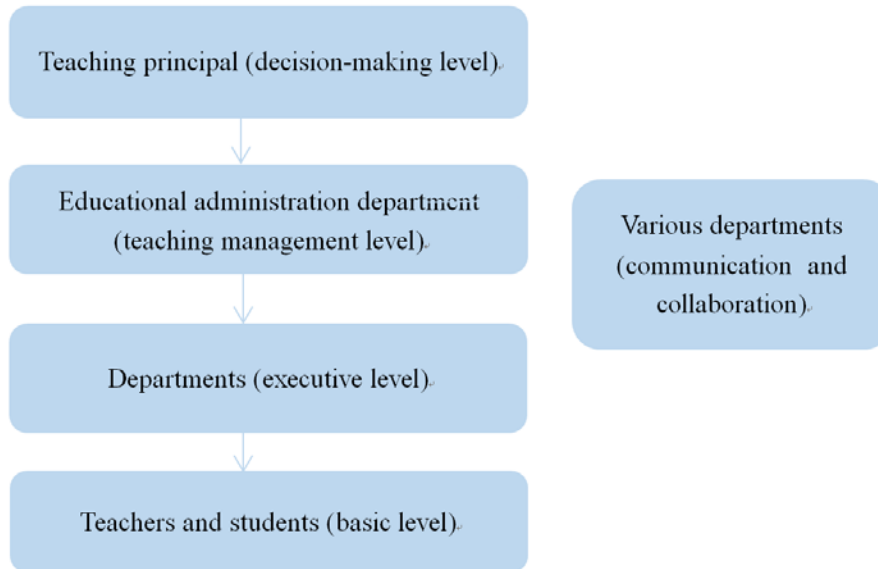


Figure 1 Vertical and horizontal coordinated operation mechanism

First, colleges need to perform the diagnosis & improvement of the management mode. The concept of diagnosis & improvement is used to reform the management mode via process reengineering. The definition and practice of the concept of teaching diagnosis & improvement symbolize that higher vocational education has developed to the era of quality, so greater requirements for practical teaching management are made. As the main body of quality assurance in talent development, higher vocational colleges should build an internal quality assurance system characterized by normalization and institutionalization, and a sustainable diagnosis & improvement mechanism following the principle of multiple diagnosis and focusing on improvement. The construction and management of experimental training rooms now in some higher vocational colleges are still in a mess with no system or process to follow. To ensure that the process is reasonable, scientific, and effective, the construction and management should be updated, optimized, and improved in the wake of time changes, environment evolvement, and organizational structure adjustment. During the experimental training rooms construction promotion, higher vocational colleges should advance the establishment of rules and regulations based on the goal of talent training, set up and improve the work system and standards of the experimental training room construction and management, and build a quality assurance system. In addition, according to the concept of diagnosis & improvement, the key points in the management system of experimental training rooms in higher vocational colleges must be diagnosed, and the process management system must be optimized and improved all the time, thus ensuring the continuing effectiveness of quality management. Process reengineering involves quality optimization as the goal as well as a realization path in the form of a continuous improvement process of process combing, process specification, process reengineering, and process optimization (as shown in Figure 2).



Figure 2 Process reengineering path

Second, vocational education institutions have to consider the diagnosis & improvement of information methods. They should establish an intelligent management system for experimental training rooms and integrate the schools' informatization resources via the school resource plan so as to improve informatization level and enhance management efficiency. The management work of experimental training rooms mainly involves the construction of and teaching at the rooms. The construction of experimental training rooms in higher vocational colleges should include project construction and system construction. The former now mainly comprises five procedures of project declaration, project approval, project initiation, project construction, and project acceptance. Before project declaration and project acceptance, expert argumentation is required according to the review

regulations. All the steps in the construction of experimental training rooms are interlocking, so it is necessary to set a standard process and integrate it into the information system. In practice, Shanghai Publishing and Printing College has launched a series of initiatives, realizing the whole process management of this module. Firstly, an intelligent management system for experimental training rooms is developed, thus realizing online management of the whole process ranging from online declaration, approval, initiation, to acceptance. Secondly, with the opportunity of the college's implementation of campus resource planning, the asset management department is connected for seamless connection of the experimental training room management and the experimental training asset information database. When the experimental training room is declared online, the announced assets will be compared with the asset information database to provide a reference for the business department of budget review and resolve problems that the business department may encounter when reviewing asset purchases. Process reengineering and its application to the information platform have altered the previous management mode. Based on the concept of process reengineering, a modern intelligent management system with service for teachers and students as guide, technology as support, and high efficiency as goal has been built, which improves management efficiency and level (as shown in Figure 3). [6]

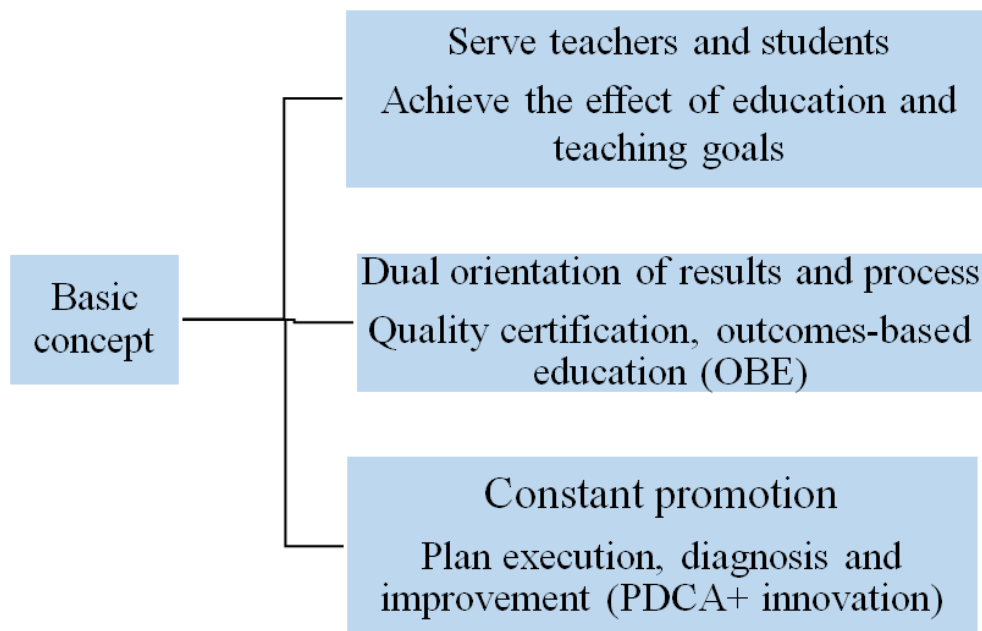


Figure 3 Utilizing the concept of process reengineering to build a modern intelligent management system

Third, the diagnosis & improvement of system should be among the vocational colleges' primary concerns. They should establish a complete practical teaching system and improve the college's internal control mechanism. System construction is a relatively urgent problem that higher vocational colleges encounter in the construction of experimental training rooms. It is the key to ensuring that a college has laws to follow and operates in order. Currently, according to the construction practices of modern university systems around China, the construction and management system of experimental training rooms in higher vocational colleges still need to be improved in the following perspectives. Firstly, the scope of the system is not complete enough, and the relationship between some important problems remains unclarified. Secondly, the system has not been updated in place. Some systems are quite old and have not been revised in time. Thirdly, with the consideration of the reform of the college organization, an experimental training room management organization (such as experimental training centers) should be set independently, and unified management or business guidance should be provided in terms of the construction and

management of the experimental training rooms (including computer room, language room), as well as the performance evaluation of lab workers. Fourthly, on the basis of the acceptance indicators for the construction of existing experimental training rooms, a complete and scientific experimental training room performance evaluation system is built, reflecting the construction effectiveness. As such, the sustainable construction of experimental training rooms is ensured.

4. Misunderstandings that may appear in management process reengineering of experimental training rooms in higher vocational colleges

According to a survey data in the United Kingdom, nearly half of the business process reengineering projects run counter to the original intention in practice owing to constraints in concepts, systems, and technologies or misunderstandings, even bringing counteractions. In the promotion of management process reengineering of experimental training rooms, higher vocational colleges inevitably meet troubles. For example, due to the inertia of the implementation of the system, some senior teachers and administrative staff of the school depend on the traditional paper-based operation methods and inherent processes. This situation has objectively hampered the advancement of new systems and new processes. Besides, a negation group totally overthrows the original mode in the construction and management process reengineering of experimental training rooms in some higher vocational colleges. Such a method completely abandons the beneficial elements in the original process, resulting in no continuity between the old and new systems and processes. In fact, the management process reengineering of experimental training rooms is a unity of opposite processes featuring continuity, standardization, and innovation. It should be an improvement of the traditional mode rather than just its demolition.

5. Conclusion

In the era of big data, practical teaching should also follow the trend of the times. The implementation process of campus informatization marks school management reform. [7] China's higher vocational education has entered the new stage of connotation enhancement and development from the prior stage of scale expansion. Higher vocational colleges introduce the theory of process reengineering to re-examine and solve various problems unsuitable for the construction and management of experimental training rooms. The intelligent management system of experimental training rooms and the school resource platform are utilized to integrate resources. In addition, a comprehensive and multi-dimension intelligent management platform is constructed via cross-departmental business process reengineering. In terms of teaching operation, it can make the connection between conventional teaching and experimental training room teaching smoother, providing convenience for the quality inspection on practical teaching. In terms of construction specifically, it can realize the complete process management from declaration, initiation, construction, and acceptance of the experimental training room, which simplifies procedures and realizes online office. In terms of management, it can provide big data for the management department from which statistics such as the utilization rate of the experimental training room, equipment utilization, account records can be made through class arrangement records and attendance swiping cards. The prior practical teaching management mode lacks of a dynamic evaluation-feedback-improvement mechanism and a data mining mechanism. Within this management dimension, information technology is integrated into the construction and management of practical teaching and a dynamic monitoring is established. [8] The approach allows to manage the teaching resources and analyze and improve the teaching implementation process and teaching quality, making immediate adjustments once knowing the issues in question. Process reengineering is carried out to optimize and streamline business processes, shorten the responding time, and improve problem-solving efficiency and management effects. Meanwhile, each link in the teaching management process can be better organized to form a benign closed-loop system, thereby eliminating barriers among departments, changing the way to transfer information among staffs, and improving the level of connotation construction of higher vocational colleges.

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