

# Teaching Model Innovation of Production Operation Management Engaging in ERP Sandbox Simulation

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**Abstract**—In light of the course of production operation management status, this article proposes the innovation and reform of the teaching model from three aspects of from the curriculum syllabus reform, the simulation of typical teaching organization model, and the enterprise resource process (ERP) sandbox application in the course practice. There are an exhaustive implementation procedure and a further discussion on the promotion outcome. The results indicate that the innovation of teaching model and case studying practice in production operation management based on ERP sandbox simulation is feasible.

**Index Terms**—production operation management; e-ERP sandbox, Teaching model innovation, Case practice

## I. INTRODUCTION

Production and operation management is one course requiring very strong background of practicality and experience. During the teaching process, it is quite common that it is difficult to teach for the teachers, whereas it is difficult to learn for the students [1]. Because the students do not have a perception on production operation management, they generally reflect that the course is abstract, which is not easy to understand, resulting in being lack of learning enthusiasm. How to improve the students' interest in learning, how to convert the abstract knowledge into practical application, are fundamental to improve the teaching effect. A more innovative teaching method and teaching model has become the alternative solution towards such an urgent problem [2].

The purpose and significance of this study lies in the following content. Through the problem driving oriented, it implements enterprise resource process (ERP) hierarchical teaching towards different level students for the sake of improving their ability. After the teaching system construction, it would benefit most students and help the excellent student promotion. The theory and practice of student oriented and lamination teaching concept is carried out successfully. Moreover, the sand table teaching tools are used in production and operation management, which changes the abstract, dull knowledge into specific activities, dynamic scene and helps the students personally experience in the real environment. Through this integration of "teaching and practice", it not only increases the learning interest of the students, but also trains students' operating ability, problem analysis ability and problem solving ability, which cultivates students' future production operation management ability. As a result, it is of importance to enhance the students the quality of

knowledge and the ability of teamwork, communication from a global perspective.

## II. BACKGROUND

Production is the most basic human activities, which is the source of social wealth. Improving the production efficiency is the eternal theme of social production, which is the main way for enterprises to level up competitiveness and profit. "Production management" course is one of the core courses of undergraduate business administration majors [3]. Because the students do not have a perception on production operation management during the teaching process, they generally reflect that the course is abstract, which is not easy to understand, resulting in being lack of learning enthusiasm [4]. A more innovative teaching method and teaching model has become the alternative solution towards such an urgent problem. At present, there mainly exist the following problems during the teaching process in this course.

(1) The teaching content is lack of practice. And the teaching content is full of academic and theoretical knowledge, but lack of the ability toward the targeted post. A considerable number of domestic production and operation management of teaching material contents concentrates on the theory, not the case study, , which are the problem of inadequate thinking and content design, lack of vividness, inspiration and application. It is difficult for students to associate the theory and practice, who not only fail to be interesting in learning, but also feel difficult to learn and practice. In addition, some textbooks are compiled not according to the students' logical thinking and cannot reflect the new development of the theory and practice of the production and operation management etc.

(2) The classroom teaching methods are lack of innovation. Classroom teaching of production and operation management course generally consists of presentation and writing on the blackboard. Basically, it is full of the teachers' lectures, whereas the students are coercive to listen to lectures. This traditional teaching method ignores students' individual demands and the cultivation of their application ability. Although the so-called case studying method is adopted, the case studying is scarce. It could not play a role in mobilizing the enthusiasm of the students through the case selection, the degree of theory integration. The dull atmosphere in the classroom is full of teaching methods of basically cramming way.

(3) The teaching is lack of internship. Production and operation management is a practical subject. The existing

production operation management courses focus on theory teaching, whereas case study and field practice teaching are scarce, which is difficult to convert the theoretical knowledge into practical ability. At the same time, when production and operation management are deviated from the management environment and the management object in the teaching process, it is difficult to be implemented as well as simulated by equipment or software. And therefore, production operation management practice teaching becomes more difficult.

(4) The curriculum assessment methods are single. Examination is an important part of teaching. Through the examination it can understand the student's learning effect, reveal the deficiencies exist in the teaching process. At present, most colleges and universities curriculum assessment methods of operation management are mainly the final grades produced from a larger proportion of test scores plus a less proportion of attendance scores. The attendance scores are mainly consisted of participation, lecture listening behavior and assignments or notes. It still regards the exam as the main criterion for judging the quality of student learning. The examination method uses the closed written form. The topic distribution is that objective questions are more, while subjective ones are less. Because the objective questions are more initiative, it focuses on the testing of students' knowledge and memory. It is difficult to test the comprehensive quality and ability of students.

After all, it is essential to carry out the teaching reform and innovation in the course content and the teaching syllabus based on the industry background of the above "production management" course setting, the human resource training status, function and benefit of this course, the analysis of the status quo of this course.

### III. RESEARCH CONTENTS

According to the Information Management program requirements, it is necessary to set a clear program position and teaching objective, which is fostering high-quality professional talents relying on related industry and taking the employment as the priority. It deploys the teaching method of 'Problem oriented' as the main line to set the curriculum system. It selects the teaching content on the basis of the professional ability. It constructs the curriculum structure on the basis of position task. It implements the teaching process based on the actual situation, and develops the course system in three aspects from the curriculum syllabus reform, the simulation of typical teaching organization model, ERP sandbox <sup>[5]</sup> in the "production management" course practice.

(1) The curriculum syllabus reform. According to the Information Management program requirements, it is necessary to set a clear program position and teaching objective, which is fostering high-quality professional talents relying on related industry and taking the employment as the priority. It deploys the teaching method of 'Problem oriented' as the main line to set the curriculum system. It selects the teaching content on the basis of the professional ability. It constructs the curriculum structure on the basis of position task. It implements the teaching process based on the actual situation, and develops the course system in six aspects from the curriculum, teaching content system, teaching resources, teaching methods, evaluation, teacher training, curriculum system.

(2) The simulation of typical teaching organization model. Taking the case study model and teamwork projects as an example, it explains the process and content of typical teaching organization model. As a matter of fact, it proves that better teaching organization model will bring better teaching effect, which mainly includes two models: one is the case study model, while the other is the teamwork project model.

(3) The application of ERP sandbox in the teaching process of production operation management. With ERP sandbox teaching tool, students would have an understanding on the enterprise limited resources under the interactive learning atmosphere and unstable dynamic environment. It would help them have a deep sight in the importance of making long or short-term production planning and forecasting quantitative demand. The teaching content covers the plant site selection, layout, design, production process and production line design and work measurement, demand management and demand forecasting, production planning, production planning and control, manufacturing resource planning, material management, production process quality management. After that, the students would have a more profound knowledge and specific understanding on production operation management related the concept, principle, method and application.

### IV. IMPLEMENTATION METHOD

This article would adopt the following methods regarding the three aspects above-mentioned.

(1) The reform towards the curriculum system. In light of the course nature, it is necessary to add some certain proportion of other organization model on the basis of the traditional way of teaching and learning theory and method, such as multimedia teaching, heuristic teaching model, the scenarios, case studying model and teamwork project model. Under such circumstances, it would promote the students' enthusiasm and cultivate the students' scientific and active thinking as well as an aspiration on production and operation knowledge of the enterprise management. For example in the MRP principle part, through the use of multimedia technology on the three drawer file cabinet decomposition principle, it enables students to master the structure and levels of BOM table components. In the enterprise strategy, using heuristic teaching, it guides students to analyze the social factors of Shenlong Fukang car fault strategy step by step. In the production process part, it plays the video of ASUS notebook computer assembly process and Michelin tires production process for the students, which helps the student experience the difference between processing type production and assembly type production. In the JIT Kanban management part, the application of situational teaching method helps the students play a role in production workers and transport workers. It is a simulation of the production department to use production Kanban and delivery Kanban to complete the JIT production operation. In the assembly line design part, the use of case study method demonstrates the U type assembly line of ASUS computer production base. Through the picture and simulation operation, it inspires the student to provide a better flexible layout, including the advantages of U type line. In the part of material requirement planning, the case analysis model could help students understand the difficulty of ERP implementation and the precautions in China. In the part of the location and facility layout, the teamwork project model allows students to

effectively solve the actual problem of location and layout through the use of qualitative and quantitative analysis methods. In addition, if the environment is available, it can extend the practice in teaching such as ERP software training and large enterprises visiting. It helps the students experience information system function and production system process.

(2) The reform towards the simulation of typical teaching organization model. There would be two models towards the simulation, the details of which are explained below.

a) The case discussion mode. The teacher provides the failure business cases information construction, such as Sanlou Lenovo cooperation failure case; Hayao ERP project failure case; Guangzhou Peugeot car company MRPII failure cases; Henan XJ Group ERP failure case. Through one week learning, the student would produce a written analysis report of selected cases. The teachers would score them and pick some outstanding ones to demonstrate them. The teacher would comment and summary the reports, point out that the implementation of ERP should learn successful experience in China, while it should bear in mind the lessons of failure. It is of importance to carry on the comprehensive analysis on the three partners of software and enterprise and suppliers in a step-by-step manner for the sake of a successful outcome.

b) The teamwork project model. The students in one class form 6 project teams spontaneously, elect one team leader for each team. Through group discussion and questionnaire, it would determine the selection of enterprise group for themselves. Through the data collection and quantitative study of one week, students are required to submit complete report including the feasibility and suggestions of location and facilities. And by means of speech presentation and accept students questions, all members of the group participate in the whole process of presentation and Q&A time. The teacher would review and remark all the team performance, and point out the advantages and disadvantages of their performances. The exhaustive implementation process is described below. □ Select a Hunan mold factory, and evaluate the selection and assembly line, then point out the shortcomings of the assembly line balance and provide improvement solution. □ Select the rural and urban WAL-MART shops in Changchun City, compare the two location economic performance. □ Select the Taiyuan MEITEHAO supermarket, review the shop's location strategy and shopping district layout, and provide the suggestions for improvement. □ Select the Starbucks Coffee Chain Corporation, and make an analysis on the successful location selection strategy. □ Select Taiyuan Foxconn Park, and evaluate the factors of city selection and location, and analyze the rationality the park layout. 6] Present one proposal of small ornaments shop business entrepreneurship after graduation. Put forward a number of site selection and evaluate them. Select the optimal scheme, and put forward the conception of small ornaments shop layout.

(3) The reform towards the application of ERP sandbox in the teaching process of production operation management. Through ERP sandbox teaching, it could cultivate the students' ability to combine theory with practice. The teaching content system emphasizes the frame knowledge content from the overall perspective. It helps the students from a strategic level to consider the relationship between enterprise production control management and the other

management activities, which enhances the students understanding of knowledge. When the students experience from theory to practice and then back to theory, such a process can help students fully understand the importance of strategic management, production plan and material requirement plan management, demand management and demand forecast and comprehensive management. They would learn to make production plan according to the specific circumstances, learn to master the best purchasing model, reasonable control and inventory management association to meet the market demand and capacity. When they engage in the wholesale production planning, they can accurately grasp the best opportunity for profit, to maximize the benefits. At the same time, the traditional method of learning is also changed to cultivate students' ability of thinking and comprehensive understanding. In the enterprise business strategy, the students make use of the thought of supply chain management, which includes only doing their own adept part to achieve a win-win situation via enterprises cooperation. In the aspect of production management, ERP sandbox teaching crosses the professional division and departmental barriers, combining the procurement management, production management, quality management into the production management field. In the face of new product development, materials procurement, production and operation management, brand building, decision problems, students make full use of the knowledge, positive thinking, and obtain new knowledge during the success and the failure. It can not only enhance the students' ability of interdisciplinary knowledge fusion, but also greatly enhance students' view of the overall situation, independent innovation ability of a comprehensive analysis and problem solving. Additionally, when the enterprise is recession, it fosters the students to cope with adversity tolerance and anti frustration ability in the management. When the enterprise is under dynamic circumstances, it fosters the students to cope with the environment and opportunity.

## V. CASE STUDY

During the years of teaching exploring, we integrated the ERP sandbox experiment, combined with the curriculum characteristics of information management and information system, and the objectives of production operation management. Also, we carried on the long-term and effective teaching practice. The teaching research has gradually applied in the course, which produced positive outcome and many achievements [6].

The following analysis combines with the process of electronic ERP sandbox experiment and production operation management through a case. In the ERP sandbox experimental process, according to the knowledge of production operation management, there would be supplementary supply chain management and manufacturing management content. It helps students to understand the two knowledge systems, which focuses analysis of purchasing decision analysis and inventory management in supply chain management, such as increasing the purchase order management and sales order management etc [7,8]. The contents are shown in Figure 1.

And in the production manufacturing management process, it continues to help students master production planning and material requirements planning as the main content of knowledge, which strengthens the order forecast, rough capacity planning and management, as shown in

Figure 2. As for the quality management, workshop schedule management and outsourcing management are not easy to be demonstrated in the original sandbox simulation, and it is not necessary for improvement.

The exhaustive improvement mainly includes the steps of raw material procurement, production assembly line improvement, inventory management improvement, sales management improvement, product research & development improvement, market development improvement as well as the financial management improvement. The improvement of the procurement of raw materials can increase the purchase of raw materials in the futures market, futures for 6 months and 1 year. The improved scheme can also consider inventory cost of raw materials in the sandbox simulation, i.e. increasing restrictions of purchased raw material in the experiment. For example, in the first, the two quarter of each year it can buy raw materials, whereas in the third, four quarters it can't order raw materials. The improvement of the production line can give a reasonable business in the company at the beginning of the production assembly line could be the 2 manual line, 1 and a half automatic line, and gives the production assembly line plant purchasing decisions under the sufficient financial condition. For example, in the first three years the limitation is that it could purchase production assembly line, but plant. Improved inventory management can

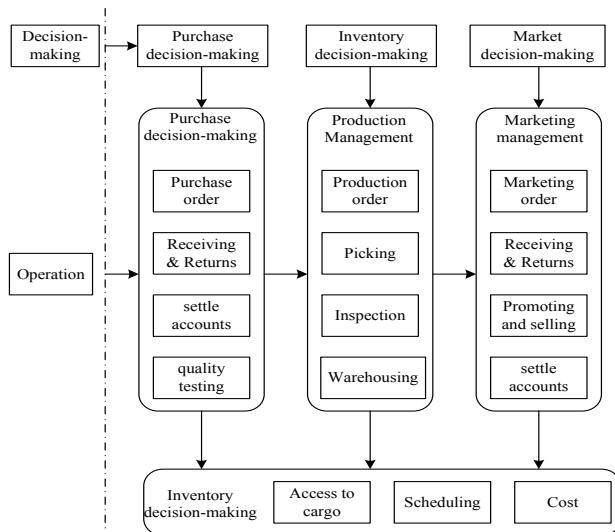


Figure 1. The framework of supply chain courses

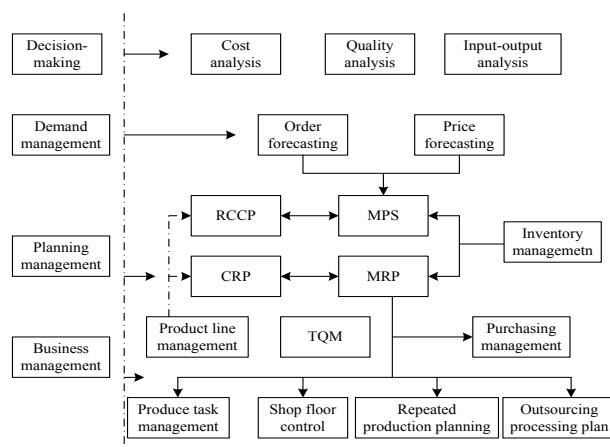


Figure 2. The framework of product manufacturing courses

be considered dividing the inventory into raw material inventory and finished product inventory. As the inventory of raw materials and raw materials futures linked, it could cultivate students' ability of purchasing cost calculation. And finished product inventory is divided into semi-finished products and full-finished products. The semi-finished products could not be sold, which could only be applied as parts of production and assembly. For the sake of a better students training, in the improved scheme it could focus on inventory management on the semi-finished product, setting that the provisions of its inventory cost is the highest. The sales management improvement requires that the sales must fill in the sales registration form, while the orders must fill in the orders registration form, which could determine the clear company needs and orders. In the advertising bidding order, it must fill in the advertising investment registration form. While the product R & D and marketing improvements can be considered that market segmentation and development are promoted by product development and the sales management, it must fill in the R & D project registration form in advance. Finally, the financial management improvement is mainly simplifying the financial indicators, and the reducing the financial statement report. The sources of funding by the enterprise can be mainly regulated as the following four items. The receivable accounts, short-term loans, long-term loans, and discount. It should set a 10M as the minimum short-term loans, the amount of which should be integer, while it should set a 10 M as the minimum long-term loans, the amount of which should be integer.

Through these improvements above, it can increase the students' interest in learning, can improve their ability to analyze and solve problems, so that it can enhance the effect of experimental teaching. Therefore, there would more and better improvements in the future. It would play a greater and better role in promoting the combination of production operations management teaching and ERP sandbox simulation experiment.

## VI. PRACTICAL EFFECTS

After the introduction of the innovative teaching model of production operation management, the effects were as follows:

- Students were able to retain their own comprehension of the whole enterprise business process through the case-study teaching. Student can, therefore, immediately analyze any relevant issues about process optimization, and they can improve their ability to find out the deficiencies in enterprise production operation.
- Student's attitude in taking part in business simulation experiments becomes more active. The effects of experiments are higher and students may also achieve much knowledge that can be obtained in books or classrooms. Furthermore, there is a noticeable increase in students' reading in order to solve some problems existing in experiments.
- Students' interests in conducting simulation experiments were enhanced, and more students put up with suggestions and comments so as to improve the quality of this course. Their enthusiasms have been aroused;
- Recognition of importance of this course among students has risen.

In addition, some other achievements have also obtained. For example, the employment rates of related majors such as information management, electronic commerce, logistic engineering etc. had risen in the last five years shown in figure 3. This was mainly because there were short of business process management talents in China but more students in our school could engage in this profession due to having abilities to conduct business process reengineering through ERP sandbox simulation experiments. Furthermore, as can be seen from figure 3 that during the first two or three years, the employment rates increased slowly. The possible reason might be that the innovative teaching model was not understood immediately and the other one might lie in the economic crisis from the latter half of 2008. However, during the latter two or three years, the employment rates increased quickly and the reason was that more and more students recognized the importance of this teaching model and showed more interests in participating production operation simulation experiments. What's more, another potential factor might be that the global economy has started to recover since 2010. (Note that the abbreviate letters "IM", "EC" and "LE" represent "information science", "electronic commerce", and "logistic engineering" respectively.) The following table listed all the outcomes related some key education quality improvement indexes through adopting this innovative teaching model in the past five years.

## VII. CONCLUSIONS

The application of ERP sandbox teaching tool changes the dull and abstract knowledge into specific activities and dynamic environment, which help the students experience the real situation. Through this model of "teaching and practice", it not only increases the learning interest of the students, but also trains students' operating ability, problem analysis ability and problem solving ability. Moreover, it cultivates the students' future production operation management ability, which enhances the students' knowledge from a global perspective, and a sight into the importance of quality of teamwork and communication. Through the personal experience, the students could have further and deeper understanding on the concept of production management, would review their own advantages and disadvantages in advance. In addition, it could lay the foundation for the shift to the job vacancy in the future, which would help their future recruitment, employment and entrepreneurship.

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TABLE I.  
OUTCOMES AFTER ADOPTING THIS INNOVATIVE TEACHING MODEL

	2009	2010	2011	2012	2013
enrolment growth rate	5%	7%	10%	15%	20%
employment growth rate	1%	1%	3%	4%	4%
wage growth rate	2%	3%	5%	10%	15%
social certification	85%	85%	89%	94%	99%

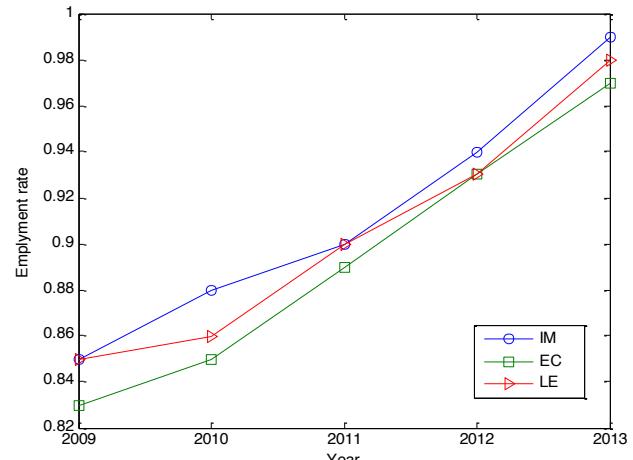


Figure 3. The framework of product manufacturing courses