Teaching mode innovation for undergraduates in operations management

Guo Li

Beijing Institute of Technology
Beijing, People's Republic of China

ABSTRACT: Operations management is a core and compulsory course for undergraduates in management engineering. In this article, the author analyses specific reasons for poor class performance in undergraduate teaching in operations management and, then, suggests a method for improvement based on the practical teaching mode. Then, the author considers this from the perspective of the design idea, teaching content, course organisation forms and implementation effect. In this context, innovations in the means and methods of practical teaching compared with the old ones are stressed. Finally, the plan-do-check-act (PDCA) cycle mode that aims at improving teaching quality is proposed and discussed.

INTRODUCTION

Operations management is a professional core course for undergraduate majors in management engineering, one that has been listed as compulsory for undergraduates and postgraduates in the field of management science and engineering all around the world.

With the development of economy, operations management has undergone an evolution from production management, production and operations management in the industrial economy era, to operations management in the post-industrial economy. The above evolution manifests the remarkable applicability of operations management. Therefore, the teaching of this course must focus on practicality and manoeuvrability. In the teaching process, because most teachers and undergraduates have not had the experience of working in enterprises, they lack perceptual recognition of business operations. Teachers feel it is difficult to teach and students feel that this course is difficult to learn [1].

How to innovate the teaching mode to stimulate students' enthusiasm is highly valued and needs to be addressed urgently. When engaging in undergraduate teaching in production and operations management, different teaching modes need to be tried, and the initial purely theory-oriented mode should be gradually adjusted to a task-based application-oriented mode, thereby, improving students' learning initiative to a certain extent. As to the teaching effect, purely theoretical teaching cannot stimulate students' interest in learning, and there will not be a positive interaction between teaching and learning [2].

In contrast, the dominant position of students in teaching is enhanced by the experimental teaching mode. Meanwhile, the learning motivation, self-learning ability, teamwork and presentation skills of students can be improved by independent course design, experienced teaching and shared knowledge [3]. This article aims to suggest innovations to the existing undergraduate teaching on operations management through the introduction of the experimental teaching mode.

BACKGROUND

Due to the broad coverage and strong practicality of operations management, classroom teachers generally complain that this course is hard to teach, and students do not have any practical production experience and they lack knowledge in production operations, resulting in poor class performance. The specific reasons are as follows:

- Many difficulties and challenges appear in the teaching process. This course covers many areas of knowledge like predicting, designing, procurement, production, sales and supply chain, and so on, which are all closely related with the daily operations of the enterprise. In comparison with other courses, such as corporate strategy, marketing

or human resource management, this course provides updates quickly on high technology and other multi-aspects that create a considerable challenge to teach this course well [4].

- Employment intentions may lead to a lack of enthusiasm and motivation for students' learning. Business administration graduates tend to obtain employment in non-production sectors, not understanding the important role this course can play in manufacturing and service industries, coupled with a widely held conviction that it is a so-called soft science, which also increases the difficulty to fully engaged in this course.
- Course content is too general, is unsystematic and lacks pertinence, and its depth needs to be strengthened. At present, the teacher generally explains knowledge points only in the class [5]. This course is facing two challenges. One is to reduce the content duplication with other courses, creating course features; and the other is to construct a knowledge system, meeting professional needs.
- The practice environment and appropriate case studies are lacking. This course has strong practicality, while teaching methods are too simple. Reform should focus on how to combine theory and practice, and more case studies and multimedia images should be adopted [6].

Practice has proved that the stronger the teachers' innovation sense and creative thinking, the more will be their motivation to pursue innovation and, then, promote the understanding of the nature and status of this course and grasp the teaching situation more accurately. Therefore, the depth of practical teaching does not depend on how to design and plan from the perspective of teachers, but how to make the process of students' self-learning and exploration more enlightening. The volume of knowledge in production and operations also determinates the need for appropriate practical teaching methods, based on different teaching content, and thus helping to deepen the students' appreciation and absorption of knowledge. Hence, there is a need for a certain degree of innovation in the practical teaching mode.

CONSTRUCTION OF PRACTICAL TEACHING MODE

The design idea and effect of practical teaching activities are:

- Design idea. The design idea of practical teaching activities focuses on training objectives and requirements, considering the characteristics and needs of this course, and correcting and supporting the contents of course theory, to ensure the viability and effectiveness of the design scheme. Only by doing so, can the implementation of multi-channel, multi-form, multi-stage practical teaching be achieved. Practice activities include course design, ERP project experiments, production site observations, enterprise professional internship and chief managers' lectures, which ensure that students master the practical skills of production and operations management.

- Programme schedule. Practical teaching activities' schedule is shown in Table 1.

Table 1: Schedule of practical teaching activities.

Content	Period	Notes
Enterprise professional internship	1 week	Before course theory teaching
ERP project experiment	12 periods	Embedded in course theory teaching
Chief managers' lectures	4 periods	Embedded in course theory teaching
Course design	2 weeks	After course theory teaching

- Implementation effect. Practical teaching activities, which are multi-form, multi-channel and multi-stage can effectively mobilise students' interest and enthusiasm, and students spontaneously set up a Production and Operations Management Society to carry out various forms of academic research and practical activities under the guidance of course instructor, and strive for winning awards at competitions based on this course, for example, the Entrepreneurial Cup or the Challenge Cup organised by the school, and other competitions taking production and Operations Management Society as the main body [7].

The practical teaching programme enhances the students' ability to analyse and solve problems effectively, so that students feel a real sense of having mastered relatively solid professional knowledge and skills, and it also makes the students more attractive to companies and society, which can be seen from the employment situation in the past few years, and the evaluation of business administration graduates of the school. In recent years, graduates with management majors have a better grasp of knowledge on production and operations management, and their solid performances in employment have been fully affirmed by various society sectors, especially, manufacturing companies.

Practical teaching course, content and organisation are:

- The design idea, effect and goal of this course. The course is designed to include an exercise to test the students' application of knowledge in practice after the completion of the theory teaching. Meanwhile, it is an important part for students to sort out and deepen their knowledge. Besides, the subjects of this course are close to the actual production and operations management, coinciding with knowledge modules of course theory, which can fully stimulate students' thinking capacity and encourage them to switch from passive to active learning. Through course design, students' ability to analyse and solve problems can be exercised and enhanced.

In recent years, the course of operations management has been based on actual business cases, keeping close contact with theoretical knowledge, and the design process is carefully planned, organised and guided. After the completion of the course, students are subjected to public defence and assessment that involves hiring business line managers to comment on the course design and give awards to outstanding students. The actions above increase significantly the enthusiasm and initiative of students participating in course and the impact of practical teaching becomes more obvious.

- Course content. The main contents and periods of the course, and the contents and periods in the computer laboratory are shown in the following tables.

Table 2: Main contents and periods of course design.

Project number	Project name	Periods
1	Facilities planning and layout design of industrial or commercial enterprises	1 week
2	Capacity balance and operation planning	1 week

Table 3: Contents and periods in the computer laboratory.

Experiment number	Experiment name	Periods
1	Basic data set	2
2	Plan management subsystem	2
3	Purchasing subsystem	2
4	Material requirement plan (MRP)	2
5	Production control plan	2
6	Inventory management subsystem	2

- Course organisation form and teaching methods. Course organisation form: first of all, the course design outline and guide books are distributed to students and these illustrate the design contents, procedures and requirements. Then, students are divided into several groups of three persons. In fact, the course design based on groups can help students discuss and inspire each other, and it can also train students' teamwork spirit. The course design is composed of two parts, each of which should be completed in one week, and both of the two can be done within two weeks. In addition, students are required to do the work in a designated classroom assisted by two teachers to provide guidance.

  Experiment teaching:

  1. Experiment teaching. Let students conduct simulation experiments by simulated or real teaching software based on real or simulated data in the business, which can enhance students' perceptions and train their practical abilities.
  2. Grouping experiment teaching. Students conduct experiments in small groups. Each student in one group plays a role to cooperatively complete an experiment project and, then, students switch roles. In the process, students can experience the different roles and functions, and obtain the operational capacity of different roles. At the same time, students' communication ability and teamwork spirit can be greatly improved.
  3. Student-centred and teacher-guided experiment teaching. During the experiments, students learn actively, and discovery, analysis and problem-solving can occur under the teacher's guidance.

- Assessment contents and methods. The course design is assessed according to the organisation and coordination ability of the group (10%) , the control of design schedule (10%), the final design submitted (70%) and the presentation and defence (10%). The assessment results are divided into five grades: excellent, good, moderate, pass and fail. The scores of the first three assessment indicators are given by the course instructor, and the assessment score of the presentation and defence by all students in the class according to their live performance. As to the experiment teaching, the assessment runs through the whole experiment process and final report.

  1. Assessment of experiment process. Experiments conducted by teaching simulation software can be assessed with the tracking and assessment functions of the software itself. Experiments conducted by non-teaching simulation software and manual operation experiments can be tracked and assessed based on intermediate results.
  2. Assessment of experiment results and report. The experiment report is an important aspect of experiment assessment, which can intuitively show the completion of the students' experiment and the degree of

understanding of the experiment results, etc. In addition, the authenticity of the report can be checked by comparing the experiment results in the report with that saved after finishing the experiment.

INNOVATION OF TEACHING METHODS AND MEANS

Goal, implementation process and effect of practical teaching methods are:

- Classroom teaching based on multimedia. This method makes full use of multimedia to achieve the goals of visualising abstract concepts, simplifying complex content, vivifying boring content and improving teaching quality. It takes heuristic and interactive teaching means and emphasises the problem-oriented teaching idea. Class discussion combined with the actual business problems has achieved remarkable results in inspiring students' creative thinking and stimulating their interest in learning.
- Course design. Topics drawn from present business practice, well-designed content and effective guidance ensure that students' ability to analyse and resolve problems, as well as their theoretical knowledge can be strengthened.
- Problem-oriented practical teaching. In the course schedule, there are production site observations, chief managers' lectures, production and operations management practice and investigation combined with summer social practice, production and operations management investigation combined with teachers' horizontal projects and student-centred and teacher-guided Production and Operations Management Society activities. All of these diversify the practical teaching system, which enhances students' perceptions of the production process and improve the teaching effect of this course.
- Class discussion. In order to cultivate students' ability to analyse and resolve problems, three to five classroom discussion cases, which combined with business practice issues are arranged. The class discussion raises students' interest in this course and strengthens the understanding of both the theory and methods of production and operations management.

Teaching means:

- The application of information technology in teaching. There are special Web pages about operations management, which contain a wealth of teaching resources, such as teaching courseware, course syllabus, course design instruction, course practice instruction, exercises, video data, teaching video, business operation video and a forum for answering questions and discussion, etc. The network teaching resources have a significant effect on teaching improvement and facilitate students' self-study, answering questions after class and discussion. After many years of operation, students and teachers speak highly of the effects.
- The reform of teaching methods, homework and examinations:

    1. The teaching method: changing from passive teaching to heuristic teaching method have effectively improved the students' interest in study with the methods of multimedia teaching, case analysis, experiments and course design, etc.
    2. The homework: in particular, the focus is now on both quality and quantity, and the combination of class assignment and class discussion. Each point of theoretical knowledge is combined with practical problems existing in enterprises to design the corresponding homework that unlocks students' initiative. Therefore, students' ability to analyse and solve problems can be cultivated.
    3. The examination: the standard test database system from the Ministry of Education has been purchased, and the system can help teachers produce the examination papers automatically. Before, examination papers were prepared by different teachers. The regular supplementary questions combined with practical problems in the enterprise make the examination more methodical and reasonable.

IMPROVEMENT MODE OF TEACHING QUALITY - PDCA CYCLE

The PDCA cycle, or the total quality management approach, was originally put forward by the American quality management expert W.E. Deming. Its basic idea is to treat quality management as a cyclically-driven process like a spiral, and each cycle consists of four parts, the plan - P (plan), the implementation of the plan - D (do), the check of implementation effect - C (check), and the corresponding action - A (act).

As PDCA is a cyclical method, which has a clear work plan, implementation, supervision and feedback, it will play a big role in improving teaching quality. Discussion of the application of the PDCA cycle and the concept of total quality management on the improvement of teaching quality follows:

- Teaching plan management. In the PDCA cycle, the first stage is the plan management. Only a good plan can ensure the completion of work. Evaluating the management of the teaching plan depends on two aspects: the completion of the teacher's teaching plan (such as teaching content, teaching method, classroom organisation) and learning assessment, etc. Before the course gets started, the teacher needs to establish a teaching plan, and it should be adjusted according to students' situation. The other aspect is management of the teaching plan by the teaching management department [8]. The department should provide guidance for the teaching plan, and

collaborate by implementing a business visit, organising a lecture by experts from the enterprise, teacher training activities, and so on.

- Teaching process check. Course evaluation at the Beijing Institute of Technology is undertaken by having the students fill out the evaluation sheet on-line. Students can rate the teacher according to his or her performance in the course. This method may not be as good for the quality control of the teaching process, so another quality control method is also required. The Management and Economy School at the Beijing Institute of Technology often organises teaching seminars, invites students and teachers to give advice about teaching in class, and encourages discussion in each semester. However, the discussion can lack pertinence, so it is recommend that at some time during the course (in the middle of a semester, for example) the teaching management department should conduct a check of course teaching and, then, put forward improvement measures.
- Teaching turnover. The method of most current teaching turnover depends on the given teaching assessment during the semester. If there are no big problems in the teaching assessment, the teaching management department will take few measures to change the teaching staff [9][10]. The reason is that the teaching quality could not otherwise be continuously improved. Figure 1 demonstrates the total quality management mode of the PDCA cycle, combined with the goal-oriented teaching for undergraduates.

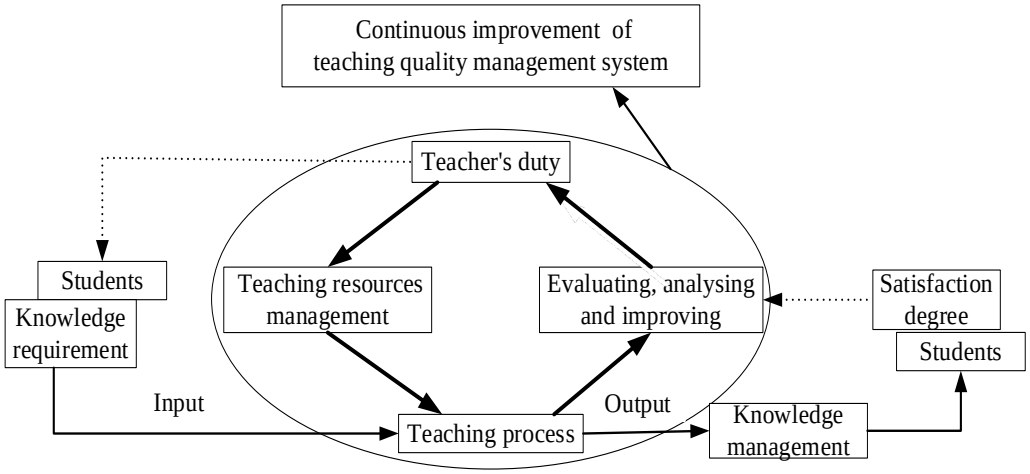

Figure 1: Continuous improvement mode of teaching quality.

CONCLUSIONS

The practical teaching of operations management, which treats students' autonomous learning as being at the centre of the diversified teaching process, helps students acknowledge the importance of this course, raises their interest in learning, improves their practical ability and enhances their teamwork spirit and analytical and problem solving skills. Teaching reform for the improvement of teaching quality is a long-term, complex and complicated system project. The scientific and artistic nature of the management discipline determines that the reform is only the beginning, and there will be on-going teaching mode innovations for all teachers.

ACKNOWLEDGEMENTS

This work is supported by the National Natural Science Foundation of China (Grant No. 71102174 and 71372019), the Beijing Higher Education Young Elite Teacher Project (Grant No. YETP1173), the Specialised Research Fund for Doctoral Programme of Higher Education of China (Grant No. 20111101120019), the Beijing Philosophy and Social Science Foundation of China (Grant No. 11JGC106), the Key Project Cultivation Fund of the Scientific and Technical Innovation Programme in Beijing Institute of Technology of China (Grant No. 2014CX01008) and the Basic Research in Beijing Institute of Technology of China (Grant No. 20122142016).

REFERENCES

1. Chen, Z.X., The establishment and reform of Production and Operations Management for undergraduate students. *J. of Researches in Higher Educ. of Engng.*, 10, **5**, 12-17 (2005).
2. Christensen, C.M. and Carlile, P.R., Course research: using the case method to build and teach management theory. *J. of Academy of Manage. Learning & Educ.*, 8, **2**, 240-251 (2009).
3. Jone, L.P. and Huang, L., The decreasing value of our research to management education. *J. of Manage. Learning & Educ.*, 11, **2**, 247-262 (2012).
4. Ates, O., Using case studies for teaching management to computer engineering students. *Inter. J. of Business & Manage.*, 8, **5**, 72-81 (2013).
5. Hibbert, P., Approaching reflexivity through reflection issues for critical management education. *J. of Manage. Educ.*, 37, **6**, 803-827 (2013).

6. Rubin, R.S. and Dierdorff, E.C., Building a better MBA: from a decade of critique toward a decennium of creation. *J. of Manage. Learning & Educ.*, 12, **1**, 125-141 (2013).
7. Mahour, M.P., Effectiveness of case study in enhancing student learning in Operations Management. *Operations and Supply Chain Manage.*, 3, **1**, 49-58 (2010).
8. Ramon, J.A., Bump it with a trumpet: on the value of our research to management education. *Academy of Manage. Learning & Educ.*, 11, **2**, 285-292 (2012).
9. Duane, R.I., Management research and managerial practice: a complex and controversial relationship. *Academy of Manage. Learning & Educ.*,11, **2**, 262-272 (2012).
10. Lin, S., Shih, T.H. and Chuang, S.H., Validating innovating practice and perceptions of course management system solutions using structural equation modeling. *Quality & Quantity*, 48, **3**, 1601-1618 (2014).