

Research on the Reform of Logistics and Supply Chain Management Courses Based on PDCA Quality Circle

Xinghong Qin, Hainan Li, Yue Wen

School of Management Science and Engineering, Chongqing Technology and Business University, Chongqing 400067, China

Abstract: The courses on logistics and supply chain management exhibit numerous professional attributes, including expertise in process management. Within logistics and supply chain management courses, several professional features are present, such as process management. Despite this, several issues continue to exist in the reform of the logistics and supply chain management curriculum. Currently, there is room for improvement in the effectiveness of teaching. Hence, this study employs the PDCA quality circle model to assess the teaching process and identify an effective teaching approach for enhancing the quality of logistics and supply chain management courses, as well as other academic courses. In this method, each lesson will consist of theoretical instruction, fostering student-led discussions on the topics and enabling students to present their queries to teachers. Teachers will document feedback and issues to address in the subsequent teaching session. By implementing this method, there will be a significant enhancement in both the quality of teaching and its impact. The findings of this study can be utilized in various courses, in conjunction with the unique attributes of each course and the instructional needs, to enhance the efficacy and quality of teaching outcomes.

Keywords: PDCA mode, teaching management, logistics and supply chain management, curriculum reform.

1. Introduction

In our teaching practice, we have noticed that many students lack enthusiasm for participating in course interactions. The issues lies not in a deficiency of motivation among these students, but rather in the teaching method itself. It is conceivable that the teaching process merely mirrors the teaching method without incorporating timely evaluation and events within the process. This will lead to unclear learning goals and low levels of participation in class activities. It is possible that students are unsure about the extent of effort needed to reach the course goals. The management of teaching in colleges and universities exhibits characteristics that are both goal-oriented and process-oriented. The PDCA cycle represents a contemporary management approach that is well-suited for instructional purposes[1]. Hence, this study aims to incorporate the PDCA quality circle model in the course teaching methods reform. This will not only improve the quality of logistics and supply chain management courses, but also serve as a model for other courses. By continuously evaluating and improving the teaching process, the overall teaching effect will be greatly enhanced.

2. PDCA Quality Circle and Teaching Mode

2.1. PDCA quality circle model

The PDCA quality circle, also known as the Deming circle or PDCA circle, was introduced by Deming, a renowned figure in quality management[2]. The process consists of four stages: Plan (P), Do (D), Check (C), and Action or disposal (A). During the planning stage, the primary objective is to identify key issues and propose strategies and actions in alignment with pertinent policies and objectives following an analysis of the present circumstances. Subsequently, the implementation stage aims to execute the plan operations in accordance with the specified goals and plan details. Finally, the purpose of the checking phase is to evaluate the precise

execution of the plan[6].

The objective of the endeavor is to consolidate the insights gained and derive corrective actions to address outstanding issues and enhance the execution strategy. The PDCA cycle diagram is depicted in Figure 1. Based on the preceding cycle, proceed to the next PDCA cycle, implementing the aforementioned activities in a fresh context, and effecting enhancements. The continuous improvement process of PDCA comprises multiple cycles, as depicted in Figure 2. This approach allows for constant evaluation and improvement of the teaching process, leading to a more effective and efficient course delivery. By incorporating the PDCA quality circle model, students will have a clearer understanding of the learning goals and the effort needed to achieve. This will ultimately result in a more goal-oriented and process-oriented approach to learning, leading to improved learning outcomes. In conclusion, the PDCA quality circle model is an essential tool in the reform of course teaching methods, and its implementation will greatly benefit logistics and supply chain management courses and serve as a model for other courses. By continuously evaluating and improving the teaching process, the overall teaching effect will be greatly enhanced.

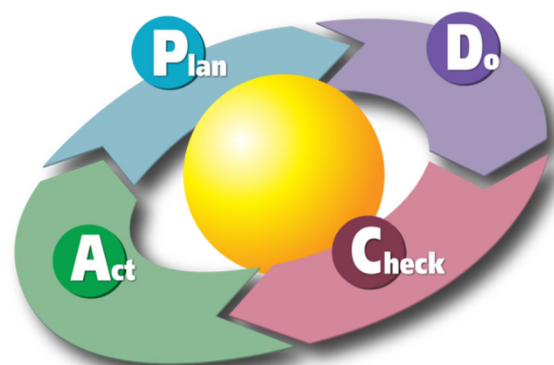


Figure 1. PDCA cycle diagram[3]

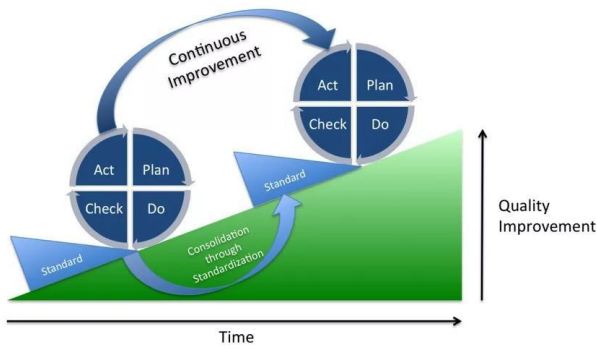


Figure 2. PDCA continuous improvement process[2]

2.2. Characteristics of PDCA teaching mode

The PDCA quality circle model, hereinafter referred to as the “quality circle model,” originated in the manufacturing sector and has since found application across diverse industries. Utilizing the quality circle model enables effective control over both the teaching process and content. Integrate the instructional duties across various educational programs and levels. Once students have acquired the professional theories and operational skills, it is imperative for the teacher to promptly assess their learning outcomes and identify any areas of weakness. The learning effect is summarized, followed by the subsequent teaching step which takes into account the identified issue and implements the necessary enhancements. Students engage in self-directed learning within the PDCA framework, often lacking teacher guidance. The interactive PDCA model can effectively

address these deficiencies by providing timely feedback to students, thereby promoting independent learning.

Students are able to identify and rectify any issues or mistakes they encounter during the learning process promptly. To accomplish this aim, teachers must evaluate the course objectives and student attributes during the initial phase of constructing the PDCA model, which typically involves considerations of students’ learning motivation, knowledge structure, and learning aptitude. This will ensure that the teaching process is tailored to meet the specific needs of the students, promoting a more effective learning experience. Ultimately, the implementation of the PDCA quality circle model will result in a more dynamic and adaptive teaching approach that is better suited.

3. Reform Design of Logistics and Supply Chain Management Courses Based on PDCA Quality Circle

After preliminary analysis, we identified that the primary cause of the flipped class’s failure prior to implementing PDCA-based teaching methods was the omission of clearly articulating the task’s specific implementation goals and the course’s learning objectives to the students. Students typically focus on fulfilling homework and assignments to earn grades without fully grasping the potential benefits. Based on this foundation, we have developed a comprehensive framework for the educational administration of logistics and supply chain management, utilizing the PDCA cycle. This framework is illustrated in the subsequent table.

Table 1. The overall framework of the teaching management of logistics and supply chain management based on the PDCA

PDCA cycle stage	Main content and key issues at this stage
1. Plan	(1) Propose the teaching concept for the curriculum and develop the curriculum plan.
	(2) The teaching chapters should be decomposed into distinct parts, each with its corresponding teaching methods designed accordingly.
	(3) Categorize students according to the lecture’s subject matter.
2. Do	(1) Matching course knowledge points to assessment requirements.
	(2) Present course requirements and assessment content to students.
	(3) Theoretical instruction and the subsequent execution of course activities.
3. Check	(1) It is encouraged to ask questions and interact at any time during lectures.
	(2) Participate in pre-programmed interactive games, such as beer games, and more.
	(3) Record and publish student evaluations promptly.
4. Action	(1) Analyze the issues, identify their underlying causes, and suggest remedial actions.
	(2) Enhance the quality of experience and suggest proactive measures.
	(3) continuous improvement and optimization

3.1. The plan of the quality circle (P stage)

Propose ideas prior to implementing instruction. Teaching and course learning through task-driven, project-driven, problem-driven, topic-driven approaches are all superior methods. Hence, this study will incorporate these methods into the curriculum to enhance student learning outcomes, foster their autonomy, and promote a dynamic classroom environment. In pursuit of these objectives, the study has devised a series of practical strategies and identified project-driven and task-driven approaches as the initial phase of the PDCA cycle[4]. Initially, we introduce the chapters outlined to students in the form of topics. The course can be

categorized into four main topics: supply chain strategy, operational supply chain, logistics in the supply chain, and reverse logistics, including closed-loop supply chain. The course comprises four main topics: supply chain strategy, operational supply chain, logistics in the supply chain, reverse logistics, and closed-loop supply chain. Each group of students is subdivided into smaller groups based on the project tasks assigned to them, each responsible for completing specific subtasks. Upon completion of the project, it is essential to furnish students with relevant references and materials for their perusal and utilization. Simultaneously, establish precise project requirements, objectives, and deadlines, and request key stakeholders to present their

outcomes within the designated timeframe.

In addition, tasks such as case analysis, homework assignments, and market research are assigned for the projects of each major group and the sub-tasks within each group. Each subgroup within the larger group is responsible for specific tasks. For instance, the initial four subtasks encompass aspects like establishing a supply chain partnership with Feihe milk powder and selecting third-party logistics providers for e-commerce enterprises. The evaluation of these sub-tasks is conducted by team members and teachers at their discretion. During the preparatory phase, each group submits their text to the teacher at any given time and subsequently revises it based on the teacher's feedback until deemed satisfactory. If students are unable to implement feedback within a reasonable timeframe, they will forfeit the chance to showcase their ideas. The instructor will publish all materials used in the classroom and share them with students. The purpose is to investigate the reasons for any incomplete tasks. 1. In the event that team members display laziness and do not fulfill their responsibilities, this may impact their subsequent contributions and aid in rebuilding their self-assurance.

3.2. Implementation of the quality circle (D stage)

Prior to the start of classes, it is crucial to assess all work during the planning stage to confirm the clarity of the plan. Following that, we proceed to the implementation stage. Teachers should allocate teaching responsibilities in advance based on the schedule of weeks and class hours. 1. Any delay in any step will diminish the effectiveness of the entire plan. The effectiveness of the overall plan will be compromised by any delay in any step[5]. The fundamental concept of Just-In-Time (JIT) production, aiming to manufacture necessary items in the precise quantities required and deliver them promptly, is directly implemented in the classroom. This approach enables students to gain a practical comprehension of JIT by engaging in group tasks that must be completed satisfactorily within specified timeframes. Failure to meet the specified deadlines and quality standards will result in a deduction of points.

Additionally, we incorporated two classroom games relevant to the profession during the respective sessions: the beer game and the risk-sharing game. These two games facilitate students' comprehension of pertinent knowledge and theories with great ease, fostering a highly conducive classroom environment where virtually no students disengage. After the game, students are expected to record their scores on the blackboard and engage in collaborative discussions regarding their reflections. Based on our observation and analysis, previous classroom teaching reforms primarily emphasized student-centered learning, neglecting timely feedback to students on teacher evaluations, assessment results, and improvement suggestions. This research aims to provide timely feedback to students regarding their issues and shortcomings, enabling them to enhance their learning in the subsequent stages. This approach promotes a growth mindset and encourages students to take ownership of their learning journey.

3.3. Check of the quality circle (C stage)

Evaluating students through testing is crucial for assessing their overall learning progress within this course[5]. It is typically conducted through a final comprehensive

examination. In the current curriculum reform, we aimed to replace the final comprehensive test with a series of graded teaching tasks, each assigned a specific score. The final score is then calculated based on the weighted average of these task scores. Generally, students with above-average scores are likely to excel in the final examination.

Before the course begins, the instructor will notify students about the course delivery format, modes of participation, assignment requirements, assessment procedures, and related details. Meanwhile, teachers outline the grading guidelines and strategies for execution, ensuring students are fully informed about the learning objectives. Teachers find grasping classroom theory teaching to be the most difficult aspect of this process. In general, teachers speak extensively on stage, while students are preoccupied with their mobile phones in class. This phenomenon has emerged in numerous universities, presenting a deadlock that requires resolution. In this regard, the study suggests randomly posing questions to students. The aim is to assess the impact of traditional classroom instruction. Concurrently, it acts as a reminder and caution to students displaying inattention to concentrate on their studies. Simultaneously, allocate ten minutes post-lecture for the review of key theoretical concepts or engage students by prompting them to present these concepts through random questioning. In the context of demand variation within the supply chain operation domain, educators may inquire: "What are the factors contributing to fluctuations in demand?". Following class discussions, students have the opportunity to inquire about concepts such as the "bullwhip effect," "hockey stick theory," and "double marginal effect". Thus, an atmosphere is established. Consequently, an atmosphere is established. The scoring system will be displayed on the screen for students to refer to at any given time, ensuring clarity. The scores and deductions of both yourself and your peers act as a guide for the subsequent stage of the learning process. By utilizing the PDCA cycle, students can cultivate effective study habits and enhance their academic performance.

3.4. Actions of the quality circle (A stage)

The action or disposal link represents the final stage of a quality loop, marking the initiation of the subsequent improvement cycle. The primary aim of this study is to identify and address key issues and deficiencies within this process, and to suggest potential enhancements. Therefore, its significance cannot be overstated. The teacher's summary of the teaching plays a pivotal role in enhancing teaching quality continuously, with the students' comprehensive test results serving as a crucial foundation for this summarization process[7]. After the students finish the test, the teacher should analyze the results comprehensively, summarize the course's overall teaching, identify any existing issues, and integrate them into the next cycle. There exist diverse forms of immediate summarization. The immediate summary and enhancement that can be implemented in the course primarily occur through the pre-class announcements and group assignments. Preceding the initiation of class broadcasts, students alternate in each class. During the week, a classmate presents current events relevant to our major or course, followed by the teacher providing an in-depth analysis of the incident's context and importance to the entire class. Engage in theoretical analysis to discuss with students the effective communication of news by the student and identify areas for data collection to enhance the introduction.

4. The Application Effect of PDCA in the Reform of Logistics and Supply Chain Management Courses and Some Advice of Promotion the Method

Through practical and theoretical research, we have observed that the quality circle model, commonly utilized in production and business management, is equally applicable to classroom instruction, albeit with potential modifications to the setting. The primary function of the PDCA model in logistics and supply chain management education involves planned instruction, task-oriented learning, regular assessment, feedback provision, and the implementation of suitable incentives[8]. Effective teaching hinges on thorough preparation and coordination prior to class, while proactive coordination necessitates a transparent incentive mechanism as its foundation. The implementation of the teaching plan should entail practical strategies and actions. The PDCA quality circle model can effectively be applied in logistics and supply chain courses, representing a further expansion of the business philosophy. Simultaneously, the utilization of the PDCA cycle in supply chain and logistics management can be expanded to other disciplines[9]. (1)It is important to note the emphasis on total quality management in the PDCA quality circle model. The teaching process must mirror the production process entirely, necessitating ongoing enhancements to yield optimal outcomes. (2)Instructors must possess a thorough understanding of their courses and be well-versed in the Plan-Do-Check-Act (PDCA) cycle. By adjusting the steps and components of the quality circle, they can effectively address and resolve a variety of issues that may arise during implementation. (3)When utilizing the quality circle teaching approach, it is crucial to consider students' feedback and promptly address any adverse psychological effects on them. The quality loop model, initially implemented in manufacturing enterprises, has gained widespread adoption. When implementing teaching strategies, it is essential to make appropriate adjustments or modifications as needed.

5. Conclusion and Discussion

The application of the quality circle model to the field of supply chain and logistics management represents an extension of management methodologies. Its core principles are also relevant for enhancing the quality of teaching. The effectiveness of teaching is contingent upon various factors, primarily the instructor's course preparation, classroom management, post-class student expectations, and feedback mechanisms for student communication prior to subsequent classes. The teaching process fosters a close connection between teachers and students, enhancing teachers' comprehension of students and enabling prompt adjustments to teaching content, while also providing guidance and encouragement to students. The enhancement of the course is an ongoing process without a definitive conclusion. We posit that advancements in educational technology, learning environments, and student capabilities will lead to continuous

enhancement in teaching effectiveness. In our current active learning environment, students are encouraged to apply the PDCA cycle to a variety of tasks in order to achieve their individual developmental objectives. The quality circle model is employed in the course to facilitate students in acquiring knowledge while also gaining clarity on their career positioning and strategies for goal attainment. This represents the fundamental aspect of education. The utilization of the quality circle model in education proves to be an effective strategy for elevating teaching standards and enhancing student academic achievements. The cyclical nature of this approach facilitates ongoing enhancement and adjustment, rendering it a valuable resource for educators in the dynamic landscape of modern education.

Acknowledgment

The authors are grateful for comments and suggestions by two anonymous referees which helped to improve the paper. This research was supported by the Chongqing Municipal Education Science "14th Five-Year Plan" Research Project "Research on Multidimensional and Cross-Cutting Incentive Mechanisms for University Teachers in the New Era Based on Differentiated Group Characteristics"(No. 2021-GX-025), and "Research on the Construction of a Quality Evaluation System for Innovation and Entrepreneurship Education in Universities Based on Big Data"(No. 2021-GX-023).

References

- [1] Taufik D. PDCA cycle method implementation in industries: a systematic[J]. Indonesian Journal of Industrial Engineering & Management, 2020, 1(3): 157-166.
- [2] W. Edwards Deming. Deming on Quality Management[M]. Haikou: Hainan Publishing House, 2003.
- [3] Wikipedia. PDCA [EB/OL]. http://www.taggedwiki.zubiaga.org/new_content/aad134348407dc6358f63b793dae7167 (Access date: 2024.04.03)
- [4] Zhang Xianhua. Tao Xingzhi's "Xingzhi Theory" and its enlightenment to the teaching reform of applied universities[J]. Journal of Mianyang Normal University, 2017(1): 49-52.
- [5] Hu Yingmei, et al. The application research of PDCA model in higher vocational course teaching reform[J]. Journal of Chengdu Textile College, 2017(1): 270-273.
- [6] Fan Ronghua. "Four Lets" teaching method in the practical training of logistics and supply chain management course[J]. Journal of Changchun Normal University, 2015(4):122-124.
- [7] Yu Feng, Yang Shiyang. The process and summary of the teaching reform of political economy course[J]. Operation Manager, 2017(1):360.
- [8] Zhao Ya. Research on Organizational Inertia in Teaching Reform from the Perspective of Value Chain Model[J]. Science Education Journal, 2015(12): 40-42.
- [9] Yang Y, Xu Y. Research on the PDCA quality management model of the undergraduate innovation and entrepreneurship training programs[C]//Proceedings of the 13th International Conference on Education Technology and Computers. 2021: 370-374.