

Teaching Managerial Economics: Case-based Learning vs. Problem-based Learning

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One of the instructional challenges in teaching managerial economics courses at both undergraduate and M.B.A. levels results from the theoretical focus of the economics component in the school of business curriculum. When students fail to see real-life applications of economic concepts, their motivation and engagement in the course are diminished. Two interactive teaching methods have been proposed to address these issues – case-based learning (CBL) and problem-based learning (PBL). In this study and the associated poster presentation, we describe the implementation of both of these methods, separately, in a managerial economics course taught at two U.S. business schools. We discuss the specifics of the implementation of the two teaching strategies and present empirical results on the educational value they provide.

The empirical analysis follows Anderson and Lawton (2009) and Ranchhod et al. (2014), among others, in applying a model of the

educational value of an interactive teaching strategy to evaluate its impact on three dimensions of learning – affective, behavioral, and cognitive. These dimensions are grounded in the work of Bloom (1956) and Krathwohl et al. (1964) on the taxonomy of learning outcomes. In the affective category that focuses on student satisfaction, as well as the behavioral or psycho-motor category that concerns student skills, survey responses demonstrate a positive impact of the use of either CBL or PBL on satisfaction with the course and skill-building, respectively. In the cognitive value category, analysis of student exam performance on topics covered by CBL and PBL demonstrates improvements compared to performance on topics covered only in the traditional lecture-based format.

I. Case-based Learning and Problem-based Learning

Case-based learning (CBL) is designed to bring real-world examples into the curriculum. This method combines two elements: the case itself and the case discussion. A teaching case is a rich narrative in which individuals or

groups must make a decision or solve a problem. This narrative provides information, but not analysis. The analysis of the events in the case, identification of available options and evaluation of the consequences of actions are performed by students during the case discussion (Becker and Watts 1995, 1998; Christensen and Hansen 1987). Extant studies suggest that CBL has a positive impact on student involvement, motivation, and learning. CBL focuses on real-world situations, and cases typically have a clear dilemma presented to the decision maker (Carlson and Schodt 1995; Velenchik 1995; Carlson and Velenchik 2006).

An alternative pedagogical strategy that is also aimed at enhancing real-life application of theoretical concepts is problem-based learning (PBL). PBL was originally developed in medical education to enhance problem-solving skills (Savery 2006). In contrast to the traditional lecture-based model, PBL uses realistic problems to structure student learning around problem solving (Gijsselaers et al. 1995). Rather than present the concepts first, and then pose problems to the students, the PBL approach reverses the order and starts with the problem.

An implementation of PBL typically involves the following sequence. First, unstructured questions or problems are

assigned to groups of students. Students have to define and structure the problem based on what they already know, and then develop hypotheses or conjectures that help them identify what they need to find a solution. Then comes the self-directed study stage in which individual students or the entire group complete their assignments. Individual results are reported back to the group. The instructor serves as a facilitator who supports reasoning and helps organize group and interpersonal dynamics, rather than provides direct answers to student questions. Finally, at the end of the learning period students summarize and integrate their findings and solutions in presentations or discussions (Barrows 1996; Hung et al. 2008). Both the results and the methods used to arrive at the solution are discussed at this stage.

PBL goes beyond the traditional textbook problem solving where the solution mechanism is well defined (Stinson and Milner 1996). The student-centered approach in PBL requires that the students find the information and techniques necessary for the solution on their own. As a result, problem solving in PBL often replaces traditional lectures and serves as the main mechanism of learning. Studies on the implementation of PBL in economics courses are relatively rare, especially at the upper undergraduate or M.B.A. level. Much of the

discussion on PBL has centered on high-school-level economics (e.g. Maxwell et al. 2005).

There are a number of similarities between CBL and PBL as both methods include student-centered learning facilitated by the instructor, making peer learning an important feature of both approaches. The differences lie in the focus of these pedagogies. The case method focuses on real-life examples, whereas PBL problems, while realistic, are often synthesized.

For CBL implementations the group size is of secondary importance, and the discussion - a key element of CBL - often involves the entire class. In contrast, PBL implementations typically involve groups of up to five students, and group-level discussion is often more prominent than the classroom-level one since the group assumes responsibility for their findings.

II. Incorporating CBL and PBL in the Managerial Economics Course

A number of existing studies present discussion of case-based teaching in economics including Carlson and Schodt (1995) Velenchik (1995) as well as Carlson and Velenchik (2006). PBL usage in economics at the level of higher education is not as common

(Smith and Ravitz 2008). One exception is the area of economics and finance simulations that serve as a subset of PBL (Anderson and Lawton 2009). A discussion of issues related to PBL implementation at the university level is presented by Stinson and Milter (1996).

Including either CBL or PBL teaching methods into the economics curriculum requires a number of steps. Some of these are common for both methods, while others are more specific.

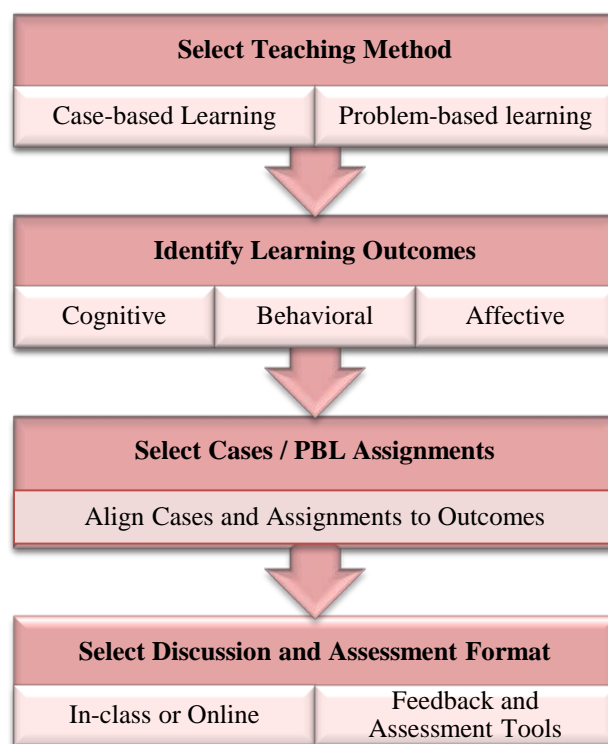


FIGURE 1. STEPS IN INTEGRATING CBL / PBL PEDAGOGY IN A COURSE

The sequence starts with the selection of the teaching method, which may depend on the specifics of the course. CBL may be integrated with any typical managerial economics course regardless of course format (face-to-face or

online) or class size. In contrast, PBL relies on team work and requires frequent mediation and feedback from the instructor. It is therefore better suited for face-to-face, small- to medium-sized classes, although PBL implementation in online courses is also possible (Tan and Hung 2007).

The implementation of the teaching method and its assessment mechanisms should be grounded in the course learning outcomes. While in an economics course it is natural to focus on the cognitive domain, learning outcomes may represent all three domains of learning – cognitive, behavioral, and affective (Anderson and Lawton 2009).

In our implementation of CBL and PBL in the managerial economics course, we reviewed the list of the eight learning outcomes used in the course under consideration and identified ones to be supported by PBL and CBL, respectively, in the two different instances. We intentionally covered only five of the learning outcomes by PBL, and four of the outcomes by CBL as described in Figure 2.

In linking learning outcomes to specific teaching methods, we took into account the availability of teaching materials. The number of cases available for economics courses lags far behind the numbers in such disciplines as management or marketing. However, there are several general peer-reviewed case journals

and case-writing associations that serve as resources for instructors interested in CBL. Our implementation of PBL relied on the materials presented in Chulkov and Nizovtsev (2012) that contain ten PBL assignments for use over a typical semester.

	Learning Outcome	Included in
1	Demonstrate knowledge of optimization techniques with applications to revenue, profit and costs	PBL only
2	Apply regression tools to the analysis of real business problems	PBL only
3	Explain variations in market structure across industries and the effect of market structure on optimal behavior of firms	Lecture only
4	Analyze pricing strategies used by firms in the marketplace	PBL / CBL
5	Model strategic interactions between firms in the marketplace using tools of game theory	PBL / CBL
6	Apply principles of making business decisions under uncertainty	Lecture only
7	Analyze diverse and unstructured real-world problems and cases using cost-and-benefit analysis and marginal analysis	PBL / CBL
8	Critically and objectively evaluate decisions made by businesses and policymakers	CBL only

FIGURE 2. LEARNING OUTCOMES IN THE MANAGERIAL ECONOMICS COURSE

The final step in the implementation of both CBL and PBL is the selection of discussion and assessment mechanisms. Discussion is a key element of both teaching methods. In CBL, the

case discussion may be organized in class or online, as appropriate. Students should be given the opportunity to explore varied viewpoints and apply the course concepts in new ways. In our CBL implementation, we took advantage of the hybrid course format and conducted most of the peer discussion in an online discussion forum, which was then followed by an in-class recap, summary, and occasionally an additional discussion led by the instructor. The grades for each case assignment in our implementation were based on students' written discussion posts.

The PBL method also enables students to learn from each other, but that happens through interaction in a group setting. In our implementation of PBL, students were organized in small teams. These teams needed to structure the problems presented to them, determine the information needed to work out a solution, select analytical methods such as optimization or regression analysis, and then organize the process of solving the problem. The teams often divided the work and then brought together the solutions developed by different team members. The students also utilized external learning resources in the process of working on their solutions. Peer feedback was provided during presentations of the teams' findings at several points in the semester. As the teams worked on the

assignments, the instructor also provided feedback on each submitted part of the overall assignment. The final solutions were presented to the other teams in the course, which provided both the instructor and the other students with the opportunity to focus on the analytical processes used and highlight the role of various assumptions and analytical techniques. The final grade for the PBL project was based on the written summary of all answers to the PBL assignments submitted at the end of the semester.

III. Impact on Student Attitudes and Learning

1. Study design

Our empirical analysis of the impact of CBL and PBL in the managerial economics course follows the approach proposed by Anderson and Lawton (2009) and captures the cognitive, behavioral, and affective dimensions of learning. Our approach is two-pronged. The first part of our empirical study explores the behavioral and affective values of the teaching strategy via a survey of students that experienced the teaching method. The behavioral category of value encompasses skill practice and development, while the affective value examines students' attitudes, motivation, and engagement with the course content. The

second part of the analysis explores the assessment results collected from a common portion of an exam taken by all participants in this study. This part focuses on the cognitive value and includes a comparison of student performance on different course outcomes.

The sample of observations included two separate sections of the M.B.A. level managerial economics course taught in the business schools at two public U.S. universities. One section utilized the CBL approach, while the other experienced PBL. There were 33 students in the CBL section and 20 students in the PBL section for a total sample size of 53 students.

In order to explore the behavioral outcomes and the affective outcomes of the teaching method for the students, a survey was conducted in both the CBL and the PBL sections. This process was reviewed and approved by the appropriate Institutional Review Boards (IRBs).

The survey consisted of several categories of questions. First, the survey collected student demographic information and data on their prior experience with economics. Second, a series of questions asked about the students' attitudes toward the teaching method, which falls into the affective outcome category. These factors were measured numerically with a 5-point Likert scale. The possible responses on

the scale ranged from 1 "Strongly disagree" to 5 "Strongly agree". Third, a series of questions were asked regarding the behavioral outcomes for the students. These questions that involved development of students' skills were also measured with the same 5-point Likert scale. Fourth, open-ended questions asked the participants to report their most and least favorite part of the CBL or PBL assignments, respectively, and the most important skills they developed from the assignments. The full survey questionnaire is shown at the end of this paper.

Table 1 below presents the demographic composition of the sample for the survey of the students' perceptions and attitudes. There were 30 responses from the CBL cohort and 20 responses from the PBL cohort marking a total response rate of 94.3 percent.

In the survey sample, 48 percent of participants were female and 52 percent were male. 58 percent of respondents indicated the age of 24 or below, while 42 percent were 25 years old or above. There was significant variation in the amount of relevant work experience the participants claimed, with 36 percent having less than 1 year, 44 percent having between 1 and 5 years, and 20 percent having more than 5 years of experience. There were relatively more inexperienced participants in the CBL cohort. The areas of specialization

were distributed across the spectrum of business disciplines, with only 18 percent specializing in Finance or Economics. Also 18 percent of the participants claimed either good or excellent prior knowledge of economics. Overall, the survey sample exhibits sufficient variation in gender, age, specialization, and prior experience and thus can be expected to yield reliable results.

2. Results: Affective outcomes

Table 2 presents the results for the affective outcomes of the CBL and PBL teaching methods for the students. This table reports the average ratings for each survey question in each cohort and the percentage of respondents that indicated the “Agree” and “Strongly agree” answer choices.

In the PBL cohort, the mean score for the question that evaluated whether the PBL assignments were appropriate and facilitated learning resulted in a mean score of 4.75 with all students selecting either “Agree” or “Strongly agree”. 95 percent of the students were satisfied by the amount they learned from the assignments with a mean score of 4.60 out of 5.00.

In the CBL cohort, these scores were slightly lower. Still, 93.3 percent of the respondents agreed that the assignments facilitated learning and 90 percent were satisfied with the amount

they learned with the mean scores being 4.37 and 4.33, respectively.

The largest difference between the two cohorts was observed in the preference for a lecture-based class. In the CBL cohort, 73.3 percent stated such a preference and only 20 percent preferred a fully interactive class. Meanwhile, in the PBL cohort the preference was more equally distributed with 35 percent preferring the lecture-based class, 30 percent undecided, and 35 percent selecting the interactive option.

In general, female and older students, ones with more work experience as well as students majoring in accounting were more likely to prefer a lecture-based class. The implications such divergent preferences have for the teaching methods remain an area of further research.

3. Results: Behavioral outcomes

Table 3 reports the survey results on the behavioral outcomes. The students indicated that both teaching methods were effective in building analytical skills. In the PBL cohort, 90 percent of the respondents agreed that the assignments helped analyze real-world unstructured problems more effectively and the mean score was at 4.55. In the CBL cohort, 93.3 percent of the students agreed with this statement with the mean score of 4.37.

The students also agreed that the assignments helped build skills for the job market. The mean score for the PBL cohort was at 4.20 and 70 percent of the participants agreed with this statement. In the CBL cohort, the mean score was at 4.00 and 80 percent of the respondents agreed.

There were some differences observed in the question that measured the impact on the skills for working in groups. In the PBL cohort, the score was at 4.15 and 75 percent of the students agreed with the statement. Meanwhile, in the CBL cohort only 50 percent of the students agreed and the mean score was at 3.43. This evidence demonstrates how the importance of teamwork in the PBL methodology translates into greater confidence of the students regarding their teamwork ability.

The survey concluded with three open-ended questions that asked the students opinions about the teaching method they experienced. The first question asked about the students' most favorite part of the simulation exercises. The vast majority of the responses to this question were positive and encouraging.

In the PBL cohort, there were two common themes as the students positively commented on the application of economic concepts and on the teamwork they experienced. A representative comment stated: “[I liked] applying knowledge from the course in a more

creative way. You were not given the numbers, method, etc. Instead my group was tasked with finding the solution using limited information and assumptions.”

In the CBL cohort, the students commented positively on the real-world nature of the cases and on the discussions they had about the cases. The comments included the following representative quotes. “[I liked] that they were about real world problems. I also enjoyed that we had to use real life experience to answer some of the questions.” “[I liked] the ability to hear others' opinions about a topic that you may not have thought of.” Comments of this nature confirm the notion that CBL and PBL naturally expose students to a greater variety of opinions and approaches than face-to-face interaction with an instructor in a traditional lecture.

The second question asked the participants about their least favorite aspect of the assignments. In the PBL cohort, the students complained about the lack of class time to complete their analysis and the unstructured nature of the problems they faced. In the CBL cohort, students pointed out that reading the cases and participating in online discussions was time-consuming for them.

Finally, the third question asked about the most important skills developed in the work on the assignments. This question relates to the

behavioral outcomes of the learning method. In the PBL cohort, the students pointed out the critical thinking and analytical skills built in their work on the PBL assignments. Representative quotes include the following. “I believe it forced me to think more critically about the specific questions that were asked that I might not have considered with only the assigned homework.” “I learned to look at the economics of a project from different sides.” “The way to think about economics more creatively. Generally, students are asked to solve problems after being given all the information and assumptions. This felt more realistic.”

In the CBL cohort, the participants wrote about their analytical and critical thinking skills, being able to look at an issue from different sides and argue a position on an issue. “The best skill I learned was to better critically think. It also helped me to reply to my classmates posts.” “Being able to reflect on real-life situations and applying economic knowledge to it. If I had read the same articles before I had this class, I might have interpreted it completely differently.” “To be able to argue and give my point of view in a more professional way. And also be able to develop what I thinking a broader way.”

4. Results: Cognitive outcomes

In addition to analyzing the survey results, we also explored the data on assessment of student learning using a common portion of a course exam. All the students participating in the study completed this common exam section which was written in the multiple-choice format and contained questions related to the learning outcomes covered by PBL in its cohort, ones covered by CBL in its cohort, and ones that were not covered by either teaching method and appeared only in traditional lectures.

We performed the two-tailed heteroscedastic t-test for equality of sample means on the distributions of individual test scores related to each learning outcome. The null hypothesis was that the two sample mean scores in a particular group of topics were equal, and the alternative hypothesis was that the mean score within a specific category correlated with the teaching method used.

Figure 3 presents a summary of our findings. It shows the mean percentage score in each cohort for the questions linked to each of the three groups of learning outcomes. For topics covered only by traditional lectures in both cohorts, the difference in the two cohorts’ mean scores was not statistically significant. This confirms that there were no systematic differences in the achievement level of students

between the two cohorts. The PBL cohort performed significantly better on the topics covered by the PBL project, and conversely the CBL cohort did better on the topics addressed by the teaching cases. These last two results are significant at the 5-percent and 10-percent level, respectively.

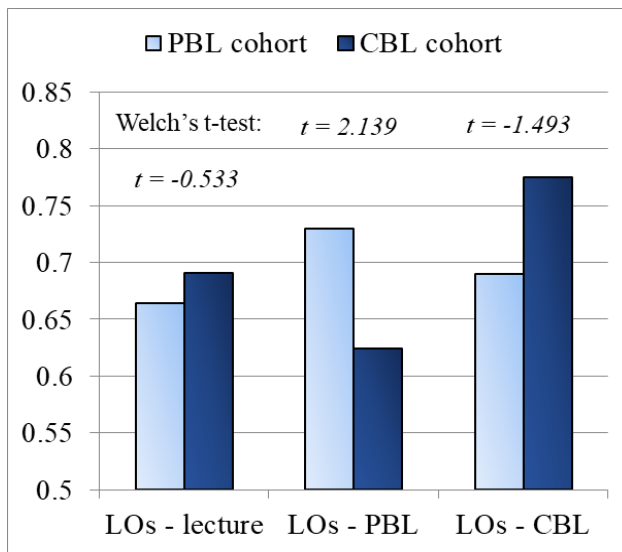


FIGURE 3. STUDENTS' EXAM PERFORMANCE ON LEARNING OUTCOMES LINKED TO CBL AND PBL

These findings lead us to conclude that the utilization of CBL and PBL has improved student learning overall. The question whether that occurred at the expense of other topics remains, however. We continue to collect assessment data and expect to obtain more conclusive results with a larger sample size.

IV. Additional Information

In our implementation of CBL and PBL, we used original teaching cases and PBL

assignments. All of these original teaching materials are freely available to interested instructors. The case-based course used a sequence of case studies including the published cases presented by Byrne et al. (2019), as well as Chulkov and Nizovtsev (2014, 2015a, 2016). These journal publications also include full instructor notes available from the journal's web sites or from the authors on request.

The full text of the PBL assignments and teaching notes appears in Chulkov and Nizovtsev (2012). This publication is available through major research databases as well as the journal's web site.

Copies of the cases as well as datasets for the PBL assignments are also available at the following web address:

<http://www.washburn.edu/sobu/dnizovtsev/CBLandPBL.html>

TABLES

Question	PBL Cohort	CBL Cohort	Percentage
1. Please state your gender			
Male	11	15	52%
Female	9	15	48%
2. Please state your age			
24 or below	11	18	58%
25 or above	9	12	42%
3. How many years of full-time relevant work experience do you have?			
Less than 1	4	14	36%
Between 1 and 5	13	9	44%
More than 5	3	7	20%
4. My main degree concentration / future career is in			
Accounting	7	9	32%
Economics or Finance	5	4	18%
Management	5	13	36%
Marketing	2	2	8%
Operations or MIS	1	0	2%
Other	0	2	4%
5. Before this course, my knowledge of Economics was			
Minimal	0	7	14%
Limited	5	4	18%
Average	9	16	50%
Good	6	1	14%
Excellent	0	2	4%
Total	20	30	100%

TABLE 1. DEMOGRAPHIC INFORMATION FOR RESEARCH SAMPLE

	PBL Cohort		CBL Cohort	
	Mean	Strongly Agree or Somewhat Agree	Mean	Strongly Agree or Somewhat Agree
The case/project assignments are appropriate in the course and facilitate learning	4.75	100.0%	4.37	93.3%
The case/project assignments complement other course materials well	4.65	95.0%	4.43	93.3%
I prefer a mostly lecture-oriented class to a class with interactive cases / projects	2.90	35.0%	3.87	73.3%
I am satisfied with the amount I learned from the case/project assignments	4.60	95.0%	4.33	90.0%
I am satisfied with my performance in the case/project assignments	4.20	95.0%	4.37	93.3%
Classmates actively participated in the case/project assignments	4.55	100.0%	4.17	83.3%
Number of participants	20		30	

TABLE 2. AFFECTIVE OUTCOMES: STUDENTS' ATTITUDES TO PBL AND CBL ASSIGNMENTS

	PBL Cohort		CBL Cohort	
	Mean	Strongly Agree or Somewhat Agree	Mean	Strongly Agree or Somewhat Agree
The case/project assignments helped me analyze real-world unstructured problems more effectively	4.55	90.0%	4.37	93.3%
The case/project assignments helped me develop skills for the job market	4.20	70.0%	4.00	80.0%
The case/project assignments helped me work more effectively in groups	4.15	75.0%	3.43	50.0%
Skills and knowledge acquired in the case/project assignments helped me with other parts of the course	4.30	80.0%	4.13	86.7%
Number of participants	20		30	

TABLE 3. BEHAVIORAL OUTCOMES: STUDENTS' SKILL DEVELOPMENT IN PBL AND CBL ASSIGNMENTS

SURVEY INSTRUMENT

Student Demographic Characteristics – Please provide one answer for each question

1. Gender: Male, Female
2. Age: 24 or below, 25 or above
3. My major specialization or future career is in: Accounting, Finance or Economics, Management, Marketing, Operations or MIS, Other
4. My prior knowledge of economics was: Minimal, Limited, Average, Good, Excellent

Student Attitudes (Affective Value) – Please provide one answer for each question

1-5 scale levels: Strongly disagree, Somewhat disagree, Neither agree nor disagree, Somewhat agree, and Strongly agree

5. The case/project assignments are appropriate in the course and facilitate learning
6. Classmates actively participated in the case/project assignments
7. The case/project assignments complement lecture materials
8. I would prefer a more lecture-oriented to an interactive class
9. I am satisfied with the amount I learnt from the case/project assignments
10. I am satisfied with my performance in the case/project assignments

Skill Development (Behavioral Value) – Please provide one answer for each question

1-5 scale levels: Strongly disagree, Somewhat disagree, Neither agree nor disagree, Somewhat agree, and Strongly agree

11. The case/project assignments helped me analyze real-world unstructured economic problems more effectively
12. The case/project assignments helped me develop skills for the job market
13. The case/project assignments helped me work more effectively in groups
14. Skills developed in the case/project assignments helped me with other parts of the course

Student Opinions

15. What was your most favorite aspect of the case/project assignments?
16. What was your least favorite aspect of the case/project assignments?
17. Which are the most important skills you developed from the case/project assignments?

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