Teaching Economics With Case-Based Learning and Problem-Based Learning

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We explore the impact of two active learning methods – case-based learning (CBL) and problem-based learning (PBL) – and summarize our experiences using these methods in an applied managerial economics course. Our empirical analysis evaluates cognitive, affective, and behavioral dimensions of learning. In the cognitive category, analysis of student exam performance on topics covered by either CBL or PBL demonstrates improvements compared to topics covered only in traditional lectures. In the affective category, which focuses on student satisfaction, and the behavioral category, which concerns student skills, survey evidence demonstrates a positive impact of active learning.

Keywords: economics education, case-based learning, problem-based learning

INTRODUCTION

One of the instructional challenges in teaching economics courses in business schools, at both the undergraduate and M.B.A. levels, stems from the theoretical focus of the economics component in the business curriculum. When students fail to see real-life applications of economic concepts, their motivation and engagement in the course are diminished (Becker & Watts, 1998). Two interactive teaching methods are increasingly recognized as valuable pedagogical approaches to address such issues – case-based learning (CBL) and problem-based learning (PBL). The advantages and shortcomings of each of these approaches have been discussed in prior literature independently of one another (Becker & Watts, 1995; Volpe, 2002; Hung et al., 2008; Forsythe, 2010; Volpe, 2015; Chulkov & Nizovtsev, 2015a; Zhang & Ma, 2023). Wijnia et al. (2024) present a meta-analysis based on over 100 studies from various disciplines and report a positive impact of both PBL and CBL on student motivation. Recently, Borah, Paudel and Stivers (2024) compared the effectiveness of CBL and PBL based on student test scores in a core finance course. However, there is a gap in the literature as we are not aware of any studies that explore the impact of both CBL and PBL on multiple dimensions of learning in managerial and applied economics education.

The objective of this article is to compare the outcomes and experiences of using active learning methods in place of traditional lectures to deliver the same managerial economics course content to two groups of students. We describe the specifics of implementing both the CBL and PBL methods separately in a managerial economics course taught at two U.S. business schools and present our findings regarding the educational value these methods provide. In our study design, faculty members at each business school

used either the CBL or the PBL method, in addition to traditional lectures, for one semester and then switched to using the other active learning method for the second semester.

Our empirical analysis follows Anderson and Lawton (2009), Ranchhod et al. (2014), and Chulkov and Wang (2020) in applying a model of the educational value of an interactive teaching strategy to evaluate its impact on three dimensions of learning: cognitive, affective, and behavioral. These dimensions are grounded in the work of Bloom (1956) and Krathwohl et al. (1964) on the taxonomy of learning outcomes. We employed an analysis of student performance on exams as well as surveys of the students to evaluate the impact of the learning methods.

In the cognitive value category that is concerned directly with students' knowledge attainment, we performed an analysis of student exam performance on topics covered by CBL and PBL. This analysis demonstrates improvements compared to performance on topics covered only in the traditional lecture-based format. In the affective category, which focuses on student satisfaction, as well as the behavioral category that concerns student skills, we conduct surveys among the students. The responses demonstrate a positive impact of the use of either CBL or PBL on students' satisfaction with the course and their perception of skill-building, respectively.

The article is organized as follows. The next section provides a review of the academic literature about the two active learning methods and their use in economics education. The third section provides a detailed account of our experience using CBL and PBL in a managerial economics course. The fourth section reports empirical findings on the observed impact of CBL and PBL on student attitudes and learning. The final section provides a conclusion.

CASE-BASED LEARNING AND PROBLEM-BASED LEARNING IN ECONOMICS

Case-based learning (CBL), a popular approach in management education, is designed to incorporate real-world examples into the curriculum. A typical teaching case features a rich narrative centered on a real-world scenario in which individuals or groups must make a decision or solve a problem. Accordingly, a case usually concludes with a set of questions or a dilemma presented to the decision maker. A case narrative provides detailed information, but the analysis of the events in the case, the identification of available options, and the evaluation of the consequences of actions are performed by the students (Becker & Watts, 1995, 1998; Christensen & Hansen, 1987; Volpe, 2002).

Several studies (Velenchik, 1995; Volpe, 2002; Carlson & Velenchik, 2006; Volpe, 2015; Depro & Rouse, 2022) offer examples of case-based teaching in economics instruction. A specific implementation of CBL may take a variety of forms, ranging from occasionally embedding news articles into the lecture, to a course that eliminates lectures completely and is built entirely around cases (for an excellent overview, see Volpe 2002). Based on the specific implementation, case analysis can be conducted individually or in groups, with the latter approach being more commonly used. In CBL implementations, a class-wide discussion almost invariably accompanies the case and ensures that a group learning element is present. Lastly, cases may be tied to specific topics or given as a capstone project. The latter scenario is more challenging for students, who then have to select from a larger set of analysis tools; however, it is also better at teaching the holistic approach to analysis. Prior research suggests that CBL has a positive impact on student engagement, motivation, and learning (Velenchik, 1995; Ray, 2018).

An alternative pedagogical strategy that is also aimed at enhancing the application of theoretical concepts is problem-based learning (PBL). That approach, originally developed in medical education to enhance problem-solving skills (Savery, 2006), typically uses simulated but realistic scenarios and situations around which student learning is structured (Gijselaers et al., 1995; Hung, 2015). Students may be presented with a problem before a formal presentation of relevant concepts in the course. Consequently, PBL requires students to find the necessary information and techniques for the solution through self-directed study. This differs from traditional textbook problem-solving, where the solution mechanism is well-defined (Stinson and Milter, 1996).

PBL implementation typically begins with unstructured questions or problems assigned to groups of students (Barrows, 1996; Hung et al., 2008; Forsythe, 2010). Students are expected 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. This is followed by the self-directed study phase, typically conducted in a group setting. A group element is an important aspect of PBL, enabling students to learn from one another as well as from outside sources. Finally, students integrate their findings and solutions in presentations or discussions. The results of the analysis, as well as the logic and methods used to arrive at the solution, are discussed at this stage. This documentation aspect builds on the work of Angelo and Cross (1993). Wilson et al. (2010) point out that documenting problem-solving focuses on the process, rather than the answer, which helps build critical thinking and problem-solving skills.

It is also possible, and not uncommon, for PBL to replace traditional lectures entirely and serve as the primary mechanism of learning. The role of the instructor in the PBL method is closer to that of a facilitator who supports reasoning and helps organize group and interpersonal dynamics. While Gijselaers et al. (1995) as well as Stinson and Milter (1996) proposed PBL as a way to enhance problem-solving skills in business students, wide implementation of PBL in business and economics education is only starting to emerge (Forsythe, 2010; Rigall-i-Torrent, 2011; Chulkov & Nizovtsev, 2015; Olesen & Madsen, 2017). One special example is the area of business and economics simulations that may serve as a subset of PBL (Schmidt, 2003; Anderson and Lawton, 2005; Chulkov and Wang, 2020). Studies analyzing the outcomes of PBL implementation in economics courses are still relatively rare, especially at the upper undergraduate or M.B.A. level. Much of the discussion of PBL has centered on high-school-level economics. Maxwell et al. (2001, 2005) and Mergendoller et al. (2006) argue that PBL may be an effective way to engage students in high school microeconomics classes, whereas Smith and Ravitz (2008) report mixed evidence on the effectiveness of PBL for college-level economics courses.

There are several similarities between CBL and PBL as both methods present student-centered learning with the instructor playing the role of facilitator. Realistic problems or dilemmas serve as cornerstone features of both approaches as these are designed to build critical thinking skills. In both active learning methods, students are asked to seek and find information independently, resulting in a greater diversity of responses and increased student exposure to a wider variety of opinions compared to a typical lecture, where information is delivered by the instructor. Wijnia et al. (2024) present a meta-analysis based on 83 PBL and 19 CBL subsamples from various disciplines, reporting a positive impact of both PBL and CBL on student motivation.

The differences between the two pedagogies lie in the implementation details and focus (Chulkov and Nizovtsev, 2015a; Borah et al., 2024). The case method typically focuses on real-life examples, whereas PBL problems, while realistic, are often synthesized. Discussion is a key element of both active learning methods; however, in CBL, it often involves the entire class, whereas in PBL, the emphasis is on the exchange of ideas within small groups or teams. PBL relies on documenting the analysis and decision-making process to a greater extent.

INCORPORATING CBL AND PBL IN A MANAGERIAL ECONOMICS COURSE

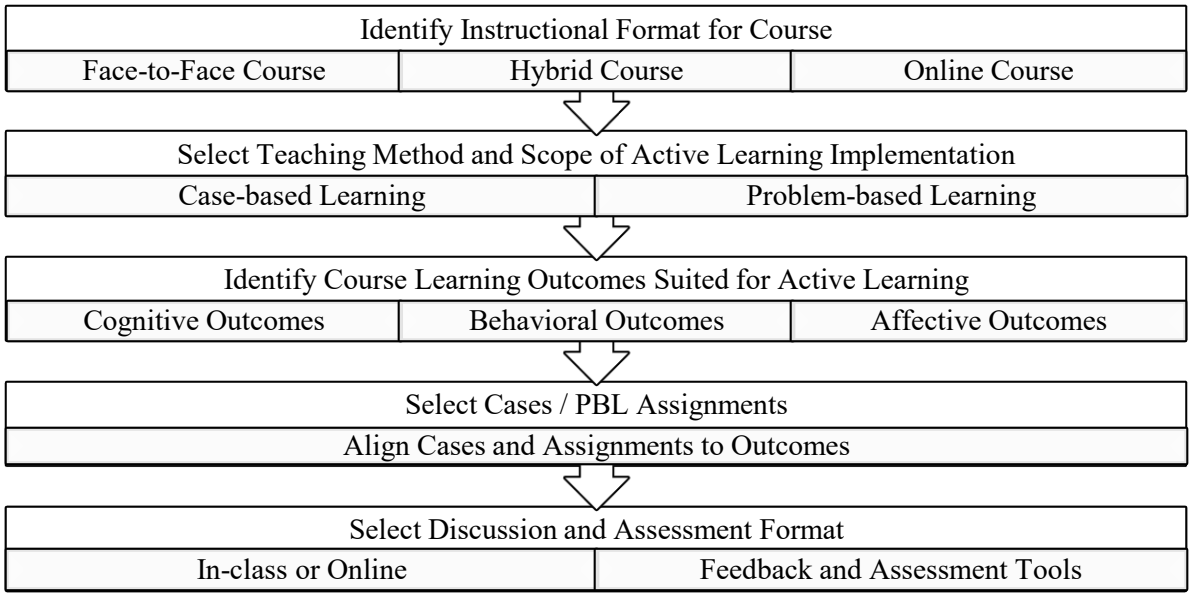
Decisions regarding the inclusion of either CBL or PBL teaching methods in the economics curriculum depend on several factors. The decision process, summarized in Figure 1, starts with identifying the course format, which imposes the first constraint on the set of choices and is often beyond the instructor's control. CBL is quite flexible and may be integrated with many typical economics courses regardless of the course format or class size. In contrast, PBL relies on teamwork and requires frequent mediation and feedback from the instructor. Although PBL implementation in online courses is possible in principle (Tan and Hung, 2007), our experience led us to conclude that this method is better suited for face-to-face or hybrid, small- to medium-sized classes.

We implemented both CBL and PBL in a required managerial economics course taught in a hybrid format at two M.B.A. business schools. Such required courses have many well-defined learning outcomes that students are expected to apply in other courses in their programs. Proper command of economics requires both the mastery of economic concepts, models, and approaches as well as the ability to apply them to real-life situations. To ensure proper coverage of all course learning outcomes, we implemented a

partial PBL or CBL approach, which included lectures alongside cases or problem-based assignments for topics linked to specific learning outcomes. This course design enabled us to fully leverage the strengths of both traditional and active learning methods in teaching the theory and its applications, respectively.

Furthermore, we are convinced that there is little benefit in having students approach an assignment with no prior knowledge of related course concepts. Therefore, we prefer a two-step approach that begins with basic knowledge delivery through lecture or directed learning, perhaps in a condensed format compared with a traditional lecture-based course and then focuses on applications with CBL or PBL. In our experience such a structure elevates the level of students' work and increases their engagement and interest in the topic at hand. This increased motivation is further used to deliver additional content in the form of concept refinements or extensions via the discussion that follows the learning activity.

FIGURE 1
STEPS IN INTEGRATING CBL / PBL PEDAGOGY IN AN ECONOMICS COURSE



Course Learning Outcomes

The implementation of the active learning method and its assessment mechanisms starts with the course learning outcomes. Typical course-level learning outcomes state what students will know or be able to do upon the successful completion of the course. While it is natural in an economics course to focus on the cognitive domain of learning, learning outcomes may represent all three domains of learning – cognitive, behavioral, and affective (Anderson and Lawton, 2009; Ranchhod et al., 2014).

Cognitive learning outcomes encompass the new concepts students are expected to understand and apply in the course (Bloom, 1956; Krathwohl et al., 1964). However, it is also typical for program-level and institution-level learning outcomes to address general skills that fall into the behavioral domain. Behavioral skills relate to the learners' ability to apply their cognitive knowledge by performing specific tasks. Assessment of student learning often tracks both cognitive and behavioral outcomes, aiming to provide a holistic view of students' educational achievement.

Affective outcomes focus on the students' perceptions and feelings about the course. If students learn the course concepts but dislike the experience, they may be less likely to apply these concepts in their future careers. Affective outcomes are seldom explicitly linked to assessments in a course, but are often measured using survey instruments. In the empirical section of this study, we report data on all of the three types of outcomes – cognitive, behavioral, and affective – based on our implementations of CBL and PBL.

Once the specific learning outcomes for the course are determined, the next step in implementing active learning is to identify the learning outcomes to be addressed through various learning methods. Among cognitive outcomes, some more content-intensive ones may be better suited for the traditional lecture-based format, whereas topics that are best mastered through applications are good candidates for active learning. In our implementation of either CBL or PBL in the managerial economics course, we reviewed the list of all learning outcomes used in the course and identified those that can be meaningfully supported by PBL and CBL, respectively. We chose to cover only four of the learning outcomes with PBL and four outcomes with CBL in the two different implementations, as described in Figure 2.

FIGURE 2
LEARNING OUTCOMES COVERAGE IN ACTIVE LEARNING IMPLEMENTATIONS

	Learning outcomes	PBL Cohorts	CBL Cohorts
1	Apply demand and supply model	Lecture	Lecture
2	Define various measures of cost	Lecture	Lecture
3	Apply principles of making business decisions under uncertainty	Lecture	Lecture
4	Apply regression tools to the analysis of real business problems	PBL	Lecture
5	Demonstrate knowledge of optimization techniques with applications to revenue, profit and costs	PBL	Lecture
6	Model strategic interactions between firms in the marketplace using tools of game theory	PBL	CBL
7	Analyze unstructured real-world problems and cases using cost-and-benefit and marginal analyses	PBL	CBL
8	Analyze pricing strategies used by firms in the marketplace	Lecture	CBL
9	Critically and objectively evaluate decisions made by businesses and policymakers	Lecture	CBL

While linking learning outcomes to specific teaching methods, we considered the availability of instructional materials that are suitable for the course level and align with the course learning outcomes. The fact that the number of economics-themed cases and PBL assignments lags far behind the numbers in such disciplines as management or marketing partly explains why PBL and CBL were utilized for only four of the learning outcomes in each student cohort. These numbers may increase as the active learning methods become more prevalent.

One goal of this project was to compare the outcomes resulting from teaching the same content to two different cohorts of students using different combinations of teaching methods. It is worth highlighting that the two versions of the course used in this study shared the exact same topic coverage, the same set of learning outcomes, and used the same textbook. The difference between the two versions of the course consisted in the active learning method used. Each section of the course used for this study utilized only one of the two active learning techniques – PBL or CBL. The specifics of implementing each method that follows represent what we consider best practices for the purposes of this course and are based on multiple experiences with both methods over the years.

Case-Based Learning Implementation Details

In our implementation of CBL, four teaching cases (Chulkov & Nizovtsev, 2014; Chulkov & Nizovtsev, 2015b; Chulkov & Nizovtsev, 2016; Byrne at al. 2019) were assigned to students at four different points in the semester. A set of questions and notes accompanied each case. Each student was asked to provide two initial posts to an online discussion forum to address two different questions from the list accompanying the case. Posts had to meet the minimum length guidelines. Special attention was given to ensure an even coverage of case questions. We took advantage of the hybrid course format and conducted most of the peer discussion of the cases in an online discussion forum, which was then followed by an in-class summary and by further in-class discussion led by the instructor.

After the initial posts, students were asked to make at least two additional entries in response to posts by other students. Those response posts had to address two questions different from the ones the students had originally posted on. As a result, each student had to provide input on four different questions for each of the cases. Typically, students were given one week to complete the entire cycle, which consisted of two initial posts and two responses. To minimize the occurrences of students recycling the same set of ideas, the discussion board settings did not permit them to see and respond to others' posts until they posted their initial entries. The discussion forum rubrics also required secondary responses to be substantive and contribute additional ideas or information.

Discussion posts were graded on their relevance to questions at hand, but not on their correct application of the course concept. This approach allowed students more freedom to be creative and open-minded in their answers and brainstorm a broad variety of possible solutions. On numerous occasions, this led to cross-pollination of ideas and produced non-trivial interpretations and approaches. At the same time, such freedom did not diminish the overall quality of student answers. We attribute this to the students' awareness that their posts would be read by the rest of the class, which maintained the pressure to keep the posts sensible and intelligent. To ensure the proper flow of initial posts and responses that followed, honoring the deadlines was also part of the grade.

The instructors' role in the process included conducting an in-class summary, or "closure," that referenced some of the more thought-provoking student comments. Extensions of theoretical concepts that helped attain greater insight into the issues involved were also presented at this stage. Note this in-class "closure" is somewhat different from a conventional class-wide case discussion in which the entire case is discussed at one time. After experimenting with that form, we found it challenging to manage our time effectively while trying to achieve a sufficiently even coverage of all the questions. In contrast, we were quite pleased with the level of participation in the online discussion forum, as well as with the fact that even initially misguided answers could be as beneficial for learning as correct ones.

Problem-Based Learning Implementation Details

Our PBL implementation was based on modular case assignments unified by a common theme, as presented in Chulkov and Nizovtsev (2012). This teaching instrument contained ten assignments designed to be used over a typical managerial economics course. Each assignment addressed a challenge faced by the management of a fictional car rental agency located in a college town. The focus on the challenges of one specific firm in these PBL assignments unified the experience and ensured that common assumptions about the market and the industry did not have to be presented multiple times.

Individual PBL assignments were grouped into blocks given to the students at regular intervals. The PBL implementation featured learning from peers, but unlike in the CBL implementation, this occurred through interaction in a small group setting. Students were organized into teams of three or four. This size was large enough to facilitate a lively exchange of opinions but small enough to minimize free-riding and instill a sense of accountability for the final outcome. The student teams needed to structure the problems presented to them, determine the information needed to work out a solution, select analytical methods as applicable, and then organize the process of addressing the problem. Groups were allowed to self-govern. The teams often divided the work and then brought together the solutions developed by different team members.

The set of PBL assignments contained both quantitative and qualitative questions. Quantitative assignments, for instance, asked students to perform statistical analysis for demand estimation and use those results for forecasting and optimization problems. Examples of qualitative questions included issues such as advertising media choices and critical analysis of price match guarantees. The set of assignments was structured in such a way that, while the questions presented to each group were the same, no two groups worked with exactly the same sample of data; therefore, the results of their analysis were designed to differ. This minimized the risk of academic misconduct and provided the instructor with the opportunity to focus not on the individual answers but rather on the methodology of analysis by comparing various problem-solving approaches and their effects on the results.

An important component of PBL is peer feedback, which, in our implementation, was provided during presentations and peer discussions of the teams' findings at several points throughout the semester. This also provided the instructor with the opportunity to highlight the effects of variations in assumptions and analytical techniques among student teams. After each block of PBL assignments, student teams were also asked to submit a formal, typed report detailing their ideas and solutions as part of documented problem-solving (Wilson et al., 2010). The instructor then provided feedback on those interim submissions, pointing out any misconceptions or imperfections in the analysis. A key feature of our approach was allowing teams to make changes to their work based on that feedback. Students could try out various possible solutions without the fear of being punished for mistakes. This also meant that the same concepts were revisited multiple times, enhancing student learning. As a result, students developed a more holistic view by the time of their final end-of-semester submission of a complete project report, on which their PBL project grade was based.

Peer evaluations within student teams were also taken into account at that point. Quantitative peer feedback was collected using a feedback form, which was submitted along with each phase of the project. At the end of the semester, the lowest of the evaluation scores for each student were dropped, and the remaining scores were averaged. The final grade for each individual student for the PBL project was calculated as a function of the score assigned to the team's final report and the individual's average peer evaluation score.

IMPACT OF CASE-BASED LEARNING AND PROBLEM-BASED LEARNING

Data and Methodology

Designing an empirical study to assess the outcomes of a learning strategy presents several challenges. It has been acknowledged that designing a study with properly controlled experimental settings is difficult because "…utilizing different pedagogies between course sections for the same instructor runs the risk of student complaints of unequal workloads and protestations of using students as guinea pigs while putting their education at risk, [and] few instructors are willing to run this risk when student evaluations influence tenure and promotion decisions." (Anderson and Lawton, 2009, p.209) Furthermore, studies evaluating active learning strategies in business education tend to rely more on student perceptions, which are easier to measure, rather than on the objective evaluation of cognitive outcomes (Gosen and Washbush, 2004; Anderson and Lawton, 2009). We tried to mitigate both of these concerns in our study.

One distinctive feature of our empirical study of the learning method's impact is that it examines three dimensions of learning – cognitive, behavioral, and affective – by combining objective and subjective measures. We analyze the cognitive outcomes through assessment results collected from a common portion of an exam administered to all participants in this study, and the behavioral and affective dimensions via a survey administered to students in each cohort.

The study collected observations from four separate sections of the required M.B.A. managerial economics course taught at two business schools at two public U.S. universities. One section at each of the two business schools used the CBL method, while the other used PBL. Extending the study across two institutions was an attempt to reduce the effect of individual teaching styles and focus specifically on the effect of the methods. Each business school's courses had the same instructor in the PBL and the CBL

cohort. The empirical results for the CBL cohort and the PBL cohort are calculated across the two business schools, including observations from all sections that used each of the teaching methods.

Table 1 presents the demographic composition of the study sample. There were 49 students in the CBL cohort and 49 students in the PBL cohort, totaling 98 students across the two business schools. The gender composition of the sample was fairly even. There was significant variation in the amount of relevant work experience the participants claimed, with the CBL cohort reporting lower average work experience and lower prior knowledge of economics. The students' areas of specialization were distributed across the spectrum of business disciplines, with only 21 percent of the total specializing in finance or economics. Overall, the study sample exhibits sufficient variation in terms of gender, age, specialization, and prior experience, and thus can be expected to yield reliable results.

TABLE 1
DEMOGRAPHIC INFORMATION FOR THE SAMPLE

Question	PBL	% of cohort	CBL	% of cohort
1. Gender				
Male	30	61%	24	49%
Female	19	39%	25	51%
2. Age				
24 or below	27	55%	29	59%
25 or above	22	45%	20	41%
3. Years of full-time relevant work experience				
Less than 1	14	29%	22	45%
Between 1 and 5	22	45%	19	39%
More than 5	13	27%	8	16%
4. Degree concentration				
Accounting	15	31%	16	33%
Economics/Finance	11	22%	10	20%
Management	14	29%	16	33%
Marketing	5	10%	3	6%
Operations/MIS	3	6%	1	2%
Other	1	2%	3	6%
5. Prior knowledge of Economics				
Minimal	2	4%	7	14%
Limited	9	18%	6	12%
Average	23	47%	27	55%
Good	13	27%	7	14%
Excellent	2	4%	2	4%
Total	**49**	**100%**	**49**	**100%**

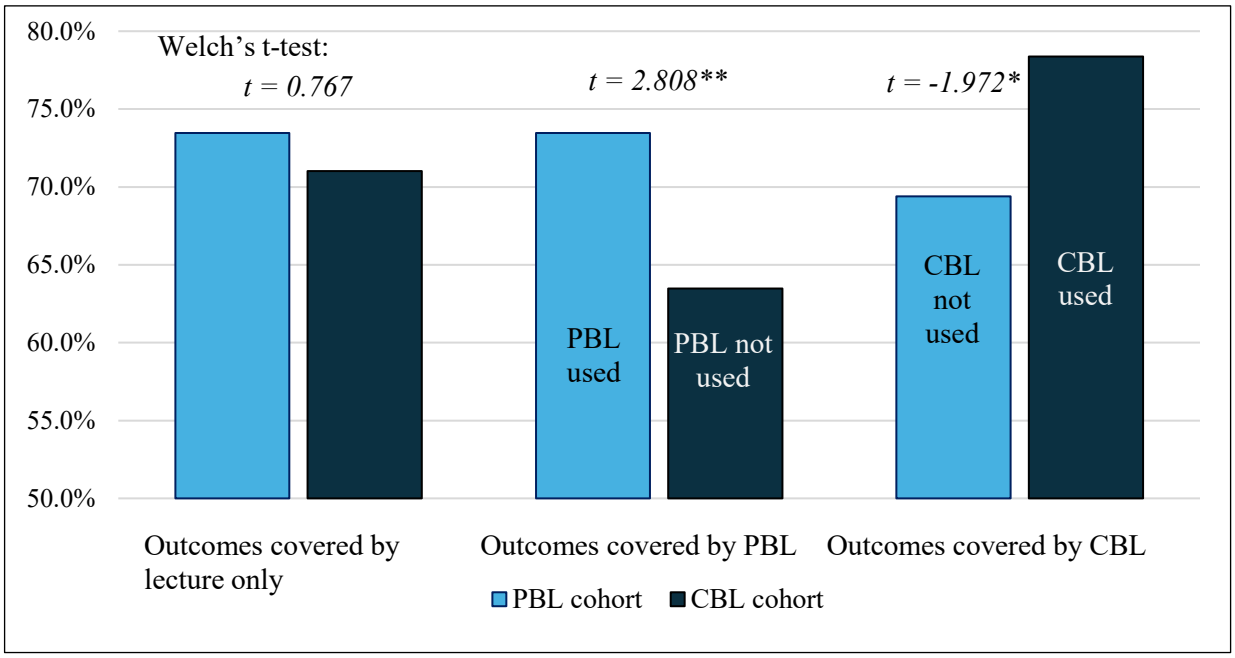
Results: Cognitive Outcomes

The impact on cognitive learning outcomes was assessed using a common set of multiple-choice questions on a course exam given in all the course sections. For the purposes of this study, we selected three subsets of topics that were delivered to the two cohorts using different learning methods. Topics addressing learning outcomes 4 and 5, as listed in Figure 2, were delivered to the PBL cohort through PBL assignments

but were featured in the CBL cohort only via lecture. Material related to Learning Outcome 8 was delivered to the PBL cohort primarily through lectures, whereas the CBL cohort relied heavily on teaching cases. Furthermore, we selected learning outcomes 1 and 2 to be attained only through lectures in both cohorts, serving as a control that enabled us to compare the level of performance between the two cohorts under similar conditions. For these three categories of topics, we developed a set of multiple-choice questions linked to the individual learning outcomes. We tracked individual student performance on the questions linked to each of these learning outcome categories in each cohort.

Figure 3 illustrates the mean percentage score for each cohort in relation to the questions associated with the three groups of learning outcomes. We performed the two-tailed heteroscedastic t-test for equality of sample means on the distributions of individual test scores in each of the above learning outcome categories. The null hypothesis was that the mean scores of the two cohorts 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. For topics covered only by traditional lectures in both cohorts, the difference in the two cohorts' mean scores was not statistically significant, indicating that there were no systematic differences in the performance levels of students between the two cohorts.

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



Notes: * Difference in sample means is significant at the 5% level, ** Difference in sample means is significant at the 1% level

The PBL cohort performed significantly better on the topics covered by the PBL assignments, with a p-value of 0.01 (t=2.808). Conversely, the CBL cohort performed better on the topics addressed by the teaching cases, a difference that was significant at the 5-percent level (t = -1.972). These findings lead us to conclude that the utilization of CBL and PBL has positively contributed to student learning for the topics that featured the respective learning methods.

Results: Affective Outcomes

To explore the affective and behavioral outcomes of learning methods for students, a survey was conducted. This process was reviewed and approved by the appropriate Institutional Review Boards (IRBs). The survey consisted of several categories of questions. First, a series of questions asked about the students'

attitudes toward the teaching method. Student responses to these questions were used to assess affective outcomes. A second set of questions on the survey focused on behavioral outcomes by examining the development of students' skills. Student attitudes were measured with a standard 5-point Likert scale. The possible responses ranged from 1, "Strongly disagree", to 5, "Strongly agree". Finally, open-ended questions asked the participants to report their most and least favorite parts of the CBL or PBL assignments, respectively, and the most important skills they developed from the assignments. The full survey questionnaire is provided in the Appendix.

Table 2 presents survey results on student attitudes in the two cohorts by reporting the average ratings for each survey question in each cohort and the percentage of respondents who selected the "Agree" and "Strongly agree" answer choices. In the PBL cohort, the mean score for the question evaluating whether the PBL assignments were appropriate and facilitated learning resulted in a mean score of 4.49, with 95.9% of students selecting either "Agree" or "Strongly agree". Furthermore, 91.8 percent of the students were satisfied by the amount they learned from the assignments with a mean score of 4.37 out of 5.00. In the CBL cohort, these scores were close but slightly lower, as 93.9 percent of the respondents agreed that the assignments facilitated learning, and 89.8 percent were satisfied with the amount they learned, with mean scores of 4.47 and 4.31, respectively.

TABLE 2
AFFECTIVE OUTCOMES: STUDENT 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 are appropriate in the course and facilitate learning	4.49	95.9%	4.47	93.9%
The case/project assignments complement other course materials well	4.45	89.8%	4.47	91.8%
I prefer a mostly lecture-oriented class to a class with interactive cases / projects	3.04	42.9%	3.43	57.1%
I am satisfied with the amount I learned from the case/project assignments	4.37	91.8%	4.31	89.8%
I am satisfied with my performance in the case/project assignments	4.12	89.8%	4.31	89.8%
Classmates actively participated in the case/project assignments	3.94	81.6%	4.00	79.6%
Number of participants	49		49	

The largest difference between the two cohorts was observed in the preference for a lecture-based class. In the PBL cohort, 42.9 percent preferred the lecture-based class, while in the CBL cohort, 57.1 percent of students —a surprisingly large proportion —expressed their preference for lectures, despite the overall positive attitude toward CBL. One explanation is that many students in that cohort transitioned into the graduate program directly from their undergraduate studies. A lack of full-time work experience may have given them insufficient exposure to unstructured problems and, therefore, less appreciation for them. In general, female and older students, as well as students majoring in accounting were more likely to prefer a lecture-based class. The implications that such divergent preferences have for teaching methods remain an area of further research.

The survey concluded with open-ended questions that asked about students' opinions on the learning method they experienced. The first question asked about their most favorite part of the learning method.

The vast majority of the responses to this question were positive and encouraging. In the PBL cohort, two common themes emerged as students positively commented on the application of economic concepts and 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."

Students in the CBL cohort commented positively on the real-world nature of the cases and on the accompanying discussions. 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." Such comments confirm the notion that CBL and PBL naturally expose students to a greater variety of opinions and approaches than face-to-face instruction in a traditional lecture.

The second question in this section of the survey asked the participants about their least favorite aspect of the assignments. In the PBL cohort, students complained about the lack of class time to complete their analysis and the unstructured nature of the problems they faced. The students also expressed the preference for having more class time allocated to project work due to challenges in coordinating group member schedules outside of class. In the CBL cohort, students pointed out that reading the cases and participating in online discussions was quite time-consuming.

Results: Behavioral Outcomes

Business schools' mission typically calls for graduates who are ready to meaningfully contribute to the workforce. A recent study that surveyed employers on their perception of newly hired business school graduates (Hickman and Stoica, 2023) established that while content knowledge proficiency is important it is not sufficient to fully prepare students for career success. Survey respondents in that study ranked problem-solving, critical thinking, and teamwork particularly highly as skills integral to career success. Therefore, we included a separate series of questions in our survey to address behavioral outcomes by inquiring about students' perceptions regarding their skill development. Responses to this group of questions were measured with the 5-point Likert scale. Table 3 reports survey results for these questions. Students indicated that both active learning methods were effective in building analytical skills. In the PBL cohort, 91.8 percent of the respondents agreed that the assignments helped them analyze real-world, unstructured problems more effectively, with a mean score of 4.39 out of 5.00. In the CBL cohort, 93.9% of the students agreed with this statement, and the mean score was 4.49. The students also agreed that the assignments helped build skills for the job market. The mean score for the PBL cohort was at 4.10 and 77.6 percent of the participants agreed with this statement. In the CBL cohort, the mean score was at 4.06 and 81.6 percent of the respondents agreed.

Some differences were observed in the question that examined the impact of the active learning method on teamwork skills. In the PBL cohort, the mean score was at 3.84 and 65.3 percent of the students agreed that the assignments helped them work more effectively in groups. Meanwhile, in the CBL cohort, only 55.1 percent of the students felt that working on cases improved their ability to work in groups, with a mean score of 3.51. This difference is understandable as our CBL implementation did not feature small teams and relied on class-wide discussions of the cases.

TABLE 3
BEHAVIORAL OUTCOMES: STUDENT SKILL DEVELOPMENT IN 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	4.39	91.8%	4.49	93.9%
The case/project assignments helped me develop skills for the job market	4.10	77.6%	4.06	81.6%
The case/project assignments helped me work more effectively in groups	3.84	65.3%	3.51	55.1%
Skills and knowledge acquired in the case/project assignments helped me with other parts of the course	4.06	71.4%	4.14	81.6%
Number of participants	49		49	

Further analysis of average responses by students in each area of specialization revealed that, in both CBL and PBL cohorts, economics and finance majors showed the most appreciation for active learning methods. Such students especially valued the way active learning methods expose students to unstructured problems. Students majoring in accounting, on the other hand, showed the least enthusiasm, perhaps due to the weak connection between the issues discussed and their professional interests. Management majors' reactions to cases were on par with the rest of the sample, but they expressed some aversion to PBL assignments, many of which required extensive quantitative work.

One of the open-ended questions on the survey asked about the most important skills developed in the active learning assignments. In the PBL cohort, students noted that their critical thinking and analytical skills were enhanced through 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 usual homework.” “I learned to look at the economics of a project from different sides.” “[I learned] 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, participants also wrote about developing analytical and critical thinking skills, including the ability to examine an issue from different perspectives and argue a position on it. “The best skill I learned was to better critically think. It also helped me to reply to my classmates’ posts.” “[I learned] 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.” “[I learned] to be able to argue and give my point of view in a more professional way. And also be able to develop what I [was] thinking a broader way.”

CONCLUSION

This article describes our experiences in incorporating the active learning strategies of case-based learning (CBL) and problem-based learning (PBL) separately into the same managerial economics course at two business schools. We focused on the impact of the learning method while keeping the rest of the course design identical across the two cohorts, to the best of our ability. We collected both objective and subjective empirical measures to gauge the impact on three dimensions of learning.

Our findings suggest that incorporating the CBL and PBL methods improves outcomes on the cognitive, affective, and behavioral dimensions. In addition to stronger cognitive test scores for the

outcomes covered by active learning, we found survey evidence of students' increased confidence in their ability to apply the material, stronger perception of the material's relevance and skill development in the course. Both CBL and PBL improve students' performance on exam questions compared to the design when the same topic was exclusively covered in the traditional lecture format and active learning was not used for the same learning outcomes. However, the relative effectiveness of the two active learning methods in improving cognitive outcomes remains a topic for further investigation.

Our experience with implementing the PBL and CBL methods extends beyond the scope of this study and enables us to compare and contrast some of the learning methods' features. One important conclusion is that proper implementation of PBL demands more involvement from the instructor than CBL. In PBL, the instructor faces the need to provide detailed feedback on students' interim submissions of documented problem-solving. Furthermore, the PBL teamwork component places high demands on students' time and organization outside class which can be a source of frustration for them if a team lacks cohesion. At the same time, PBL provides better opportunities to implement quantitative applications. While teaching cases with quantitative elements certainly exist, we still found CBL to be better suited for qualitative analysis. CBL can be implemented in a broader variety of class sizes and delivery formats than PBL, and such flexibility is clearly an advantage. Teaching cases are also easily assigned in a modular format.

Further empirical method improvements, including the random assignment of both students and instructors to sections as recommended by Anderson and Lawton (2009), remain a goal for the future. Another topic for further research is the evolution of CBL and PBL teaching methods given the ongoing shift towards online learning. We used both strategies in a hybrid course with a 50-percent split between the face-to-face and online components and found that online learning creates valuable opportunities for CBL and PBL discussions that are accomplished in an online learning management system (LMS). Such discussions may be well-structured and easier to track than in-person ones, especially for large classes. The implementation of CBL and PBL in a fully online course, however, may require additional adjustments and a specific instructional design.

Our experience with this study increased our confidence in the overall benefits of active learning. As students develop skills in critical thinking, teamwork, and problem-solving, they become better prepared for the job market. Due to the limitations of active learning strategies in conveying a large number of specific concept knowledge, we continue to believe that a thoughtful combination of CBL or PBL with lectures is the optimal instructional strategy in applied and managerial economics courses. Our empirical analysis of student perceptions supports this notion. This study aims to serve as an invitation to a broader discussion and the adoption of active learning in economics. We hope that our experiences pave the way for larger-scale research on active learning in economics, with coordination among a broader group of willing and interested instructors.

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APPENDIX: SURVEY QUESTIONNAIRE

Student Demographic Characteristics

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)

1-5 levels: Strongly disagree, disagree, undecided, 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 learned from the case/project assignments
10. I am satisfied with my performance in the case/project assignments

Skill Development (Behavioral Value)

1-5 levels: Strongly disagree, disagree, undecided, 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?