Enhancing Learning Performance Through Problem-Based Learning

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ABSTRACT

Teaching methods relying solely on textbooks or PowerPoint presentations often fail to capture students' attention. Integrating real-life examples, case study videos, expert lectures, and off-campus visits can significantly enhance student engagement and learning outcomes. This study used these strategies to deepen students' understanding of customs clearance operations and stimulate their interest in learning. Additionally, problem-based learning (PBL) was employed for group discussions to enhance students' ability to explore the logic and reasons behind knowledge, encourage diverse perspectives, and foster critical thinking, thereby improving learning performance. The study was conducted with 55 students in the 'Customs Practice' course and utilized qualitative analysis and regression models. Results revealed positive correlations between 'real-life examples and case study videos,' 'expert lectures,' 'off-campus visits,' 'PBL mode,' and 'learning performance.' Furthermore, 'real-life examples and case study videos,' 'expert lectures,' and 'off-campus visits' correlated positively with 'PBL mode,' with PBL showing partial mediation effects between different teaching strategies and learning performance. Qualitative analysis indicated that students found the course 'interesting' by mid-term and reported increased engagement, proactive learning, and improved retention through 'active thinking,' 'self-directed learning,' and 'preparation or review enhancing understanding' by the end of the term.

Keywords: Problem-based learning method, Learning performance, Real-life examples and case study videos, Off-campus visits, Expert lectures

1. Introduction

Business education must transform itself to support students' acquisition of twenty-first-century competencies, such as critical thinking, effective communication, and collaborative problem-solving [1]. With the development of social media, students can access a broader and more convenient range of learning information. Teachers lecturing from textbooks or slides, as a traditional teaching method, is now often seen as uninteresting and difficult for students to understand, making it challenging for

them to apply what they have learned. In Taiwan, in light of the core competencies emphasized in the 12-year Basic Education curriculum, which focuses on nurturing "lifelong learners" with a human-centered approach, three main aspects are highlighted: "autonomous action," "interactive communication," and "social participation." The so-called "core competencies" refer to the knowledge, skills, and attitudes an individual needs to adapt to life and face future challenges. It emphasizes that learning should not be limited to academic knowledge and skills but should focus on integrating learning and life, demonstrating the learner's holistic development through practical application. Learning through real-life examples allows students to develop knowledge that can be transferred to real-world practice [2].

Moreover, most studies have indicated that training and development are significantly associated with work performance [3,4,5]. However, more research is needed to explore training methods. This study will implement teaching innovations in university practice courses to address the gap in previous research that lacked recommendations on teaching methods. Since these are practical university courses, professors often use practical case studies to explain the concepts. Nevertheless, students may need relevant work experience to resonate with these examples. However, if the courses start with current news and real-life examples, will students be more interested in learning? Thus, in the study taking the customs practice course in this study as an example, the course is paired with common cases or videos from real life, such as using personal travel experiences to learn about immigration management and duty-free allowances, learning about international online shopping and cross-border e-commerce, including the use of maritime or air express delivery and the process of simplified customs declaration; understanding the concept of "flexible tariffs" in response to urgent needs or typhoon damage during domestic vegetable shortages, which is often seen in current news; and discussing Taiwan's involvement in the Trade and Investment Framework Agreement (TIFA) and the Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP), which are regional trade agreements/free trade agreements (RTA/FTA) under the World Trade Organization (WTO). These examples help students understand why Taiwan seeks to participate in trade agreements and the impact of customs on our daily lives and import/export activities, thereby integrating theory with practical and current real-life cases.

Furthermore, the class often remains silent since students are accustomed to rote learning when teachers pose questions to assess student learning outcomes. Therefore, this study also incorporates Problem-Based Learning (PBL), allowing students to work in groups to discuss, collect, think about, and debate questions designed by the teacher. This collaborative learning approach allows students to apply their acquired knowledge and skills. Interaction and discussion within the groups can also deepen learning impressions and enhance learning outcomes, achieving the goal of mutual learning and growth for teachers and students. Overall, case-based instruction exposes students to real-life situations and enhances interaction between instructors and students by PBL. The academic strategy, which is the locus of control, has shifted from relying on teachers' knowledge to interactive group discussions and the introduction of 'active' or 'participative' learning [6].

In light of this, this study not only replaces commonly used practical cases with real-life

examples but also primarily incorporates the "PBL teaching model." This allows students to learn through thinking and discussion, relating to their past experiences or daily lives or reflecting on social events and trends. This approach aims to enhance students' learning impressions, integrate practice with theory, and enable students to apply their knowledge in practice, thereby improving their learning performance. Additionally, for organizations, fostering highly skilled and motivated learners improves overall performance[7]. Thus, the practical implications of this study are significant and will engage educators and researchers in the field of education. This study provides valuable insights for educators and trainers to enhance the effectiveness of training and skill development policies, fostering highly skilled and motivated learners and contributing to improved overall performance. Therefore, the purposes of this study are:

(1) To explore the impact on students' learning performance after implementing teaching methods that include real-life examples and case study videos, expert lectures, off-campus visits, and Problem-Based Learning (PBL);
(2) To investigate the mediation effects of Problem-Based Learning (PBL) on the relationship between teaching strategies (real-life examples and case study videos, expert lectures, off-campus visits) and learning performance in order to understand the benefits of PBL for teaching;
(3) Finally, to analyze the reflections and growth of teachers after implementing real-life examples and case study videos, expert lectures, off-campus visits, and Problem-Based Learning (PBL) in their courses, based on the study results.

2. Literature Review

2.1 Problem-Based Learning

Problem-Based Learning (PBL) is an educational approach first introduced by Professor Howard Barrows at McMaster University Medical School in 1963. Unlike traditional teaching methods that rely on theoretical lectures, PBL starts with real-life examples. Real-world case problems can stimulate student learning and serve as tools for developing problem-solving skills [8]. The authenticity of these examples often piques students' curiosity and motivates them to understand and resolve issues, fostering their problem-solving and decision-making abilities for future complex challenges.

The PBL approach uses a systematic method, beginning with an authentic, real-life problem scenario that provides a context for students to collaborate and learn [9]. A crucial aspect of the PBL process is the student's ability to assess their existing knowledge, identify gaps in their understanding and experience, and acquire new knowledge to bridge them [10]. Critical elements for successfully implementing PBL teaching include planning the teaching process to meet course requirements, selecting problems or cases that fit real-life scenarios, and having teachers appropriately guide group collaboration and discussion.The model aims to help students develop their thinking, problem-solving, and intellectual abilities [11]. In implementing PBL, students are divided into small groups and tasked with identifying learning issues and objectives and formulating hypotheses about the case and group

study. A facilitator, also known as a tutor, is present to guide the tutorial activities and support the final learning process. The tutor adjusts problem complexity and tailors PBL activities to match students' proficiency levels, ensuring that all students, whether retaking the course or with prior experience, are appropriately challenged and supported [12].

PBL has been widely applied in many undergraduate and postgraduate degree programs, such as medicine [13, 14, 15] and education [16, 17, 18, 19], in past studies. Due to the importance of students being able to apply the knowledge gained in higher education, learning activities should promote interaction with others, active hands-on experiences, information seeking from various sources, and autonomous work and responsibility[20,21]. Moreover, PBL fosters critical thinking, enhances peer interactions, and reduces instances of burnout and stress[22,23,24]. Therefore, this course utilizes the PBL model to allow group members to initially identify learning issues through collaborative efforts. Subsequently, students engage in self-directed learning, discussion, and problem-solving. Ultimately, this process aims to achieve the principle of 'I experience, therefore I learn '[25], which emphasizes the importance of experiential learning in the PBL approach, and it also has a positive impact on students' competence because it enhances their skills and knowledge [26]. Therefore, it is hoped that the PBL teaching model will significantly contribute to students' learning performance and have a positive impact.

2.2 Application of Real-Life Examples or Case Studies, Expert Lectures, Off-Campus Visits, and Problem-Based Learning in Teaching

Traditional education methods involve teachers imparting knowledge of various subjects in the classroom, with the assumption that students will be able to apply this knowledge when facing problems. However, traditional teaching methods alone appear ineffective [27,28], resulting in a poor learning experience for students [29] and often leading to a gap between learning and application. Most students in schools do not learn how to think, discover, and solve practical problems. Instead, they are often required to memorize facts and knowledge [30]. As a result, any knowledge they acquire becomes what is known as 'inert knowledge ', meaning it is not applied in real-life situations to effectively solve problems [31].

In the teaching process, teachers often observe that students start the class attentively, but if the teaching method lacks variation or engagement, students gradually lose focus. Numerous studies have confirmed that maintaining students' attention in the classroom is challenging [32]. Maintaining student attention and interest in learning is crucial, and teachers play a significant role in this [33].Since attention is a key indicator of learning effectiveness, it is up to the teacher to maintain and stimulate student focus. Moreover, an effective learning environment should be rich in memorable experiences, such as engaging experiments, interactive discussions, and hands-on activities, allowing students to see, hear, taste, touch, and try. To create such an experience-rich learning environment, it is recommended that new teaching materials and methods be developed and the potential of audiovisual aids be promoted. This approach provides vivid and unforgettable experiences, unrestricted by time and space [34].

Using real-life events and case study videos as a teaching strategy, students enjoy discussing

relevant cases and applying them to current events. The selection of teaching videos is crucial; it is essential to identify the issues and learning content to be highlighted and to connect them with students' prior experiences [35,36]. Additionally, allowing students to identify themes related to the course from the videos allows them to practice applying learned concepts [37]. When discussion topics align with the course learning objectives and reflect students' past experiences or current social trends, it helps enhance their learning impressions and ability to apply knowledge in practice, improving their knowledge application skills and making them feel more focused on the learning process. Thus, by learning from real-world issues, students can enhance their learning abilities, thereby improving their learning performance [38].

In the expert lecture component, experienced industry professionals are hired to conduct teaching. These expert lectures enhance the practical teaching abilities of instructors, strengthen the connection between academia and industry, and make the teaching model more dynamic and the course content richer. Students led by experts exhibited higher levels of satisfaction and better performance [39]. This approach aims to improve student learning outcomes and develop students' employability and practical skills. Moreover, students stay curious and keen on off-campus visits, with a high degree of participation, and it is designed to endow students with management skills, such as teamwork and practical application abilities, and so on [40]. Therefore, this study proposes researching the impact of teaching strategies, such as using real-life examples and case study videos, expert lectures, and off-campus visits, on student learning performance.

3. Research Design

In the study, qualitative and quantitative learning surveys were conducted during the midterm and final periods of the course. The midterm evaluation dimensions included: "Traditional Teaching," Real-Life Examples and Case Study Videos," "Expert Lectures," "PBL Model," and " Learning Performance." In addition to these dimensions, the final evaluation also included "Off-Campus Visits." All the variables were selected and modified based on reviewing literature. The questionnaire was rated on a six-point Likert scale, ranging from "Strongly Disagree" to "Strongly Agree," with scores from 1 to 6. The evaluation questions for each dimension are listed in the appendix.

Given the relatively small sample size, the research analysis uses simple regression to explore the relationships between dimensions such as "Traditional Teaching," "Real-Life Examples and Case Study Videos," "Expert Lectures," "Off-Campus Visits," and "PBL Model" with students' "Learning Performance" to identify direct effects. Hierarchical regression is then used to examine the mediating effects of the "PBL Model" within the research framework; these methods were selected and are well-suited for analyzing the effects and mediation within the study, as illustrated in Figure 1. The research hypotheses are as follows:

H1: Traditional teaching positively influences learning performance.

H2: Real-life examples and case study videos positively influence learning performance.

H3: Expert lectures positively influence learning performance.

H4: Off-campus visits positively influence learning performance.

H5: The PBL model positively influences learning performance.

H6: Traditional teaching positively influences the PBL Model.

H7: Real-life examples and case study videos positively influence the PBL model.

H8: Expert lectures positively influence the PBL model.

H9: Off-campus visits positively influence the PBL model.

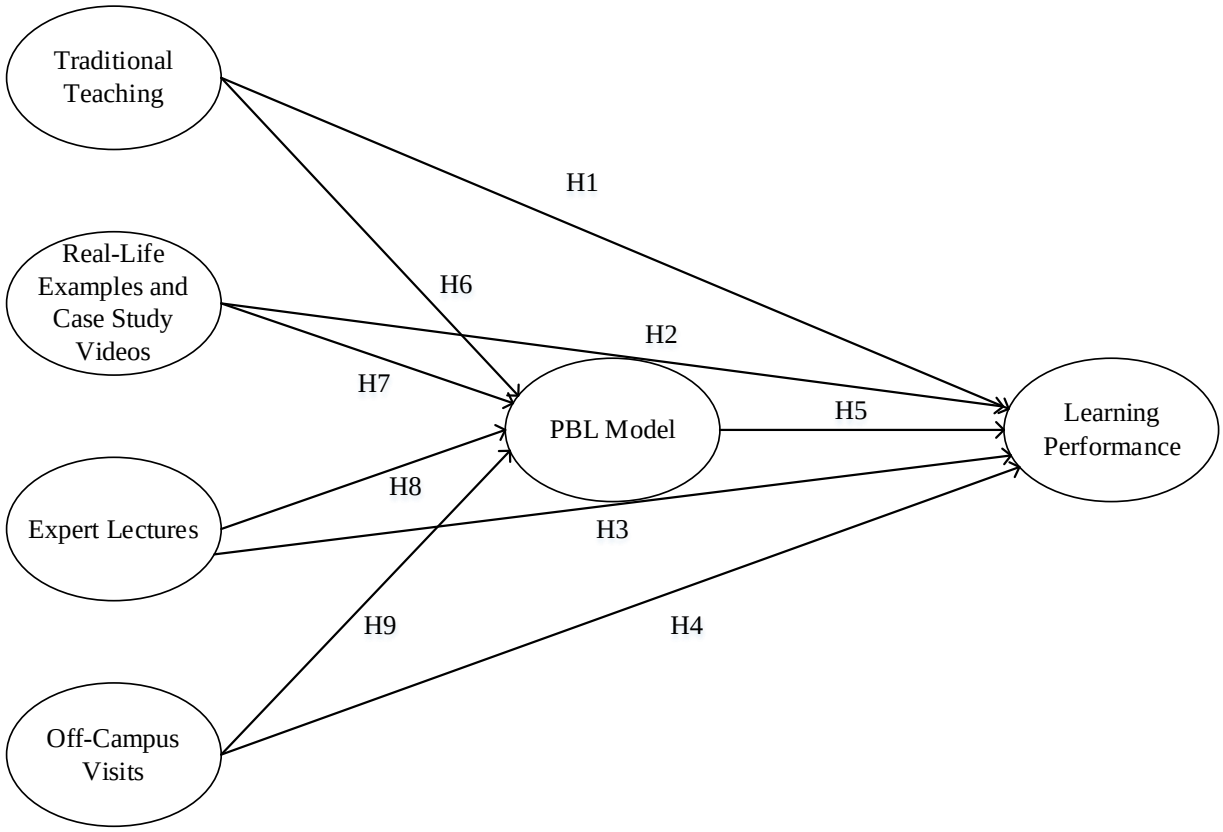

Figure 1. Research framework

Source: By an author.

As for the qualitative analysis of the questionnaire, the assessment aimed to explore students' attitudes, perspectives, and outcomes during the learning process. Data were collected through anonymous surveys. The evaluation questions are as follows:

(1) PBL emphasizes active learning. Do you think this course has guided you in achieving that? Why or why not?

(2) PBL highlights group discussions. Do you believe that group collaboration and discussion have helped your learning? Why or why not?

(3) Do you think this has increased your interest in learning when exploring answers from real-life news or case studies? Why or why not?

(4) Regarding learning from expert lectures, do you think it has enhanced your interest in the subject? Why or why not?

(5) Regarding learning from off-campus visits, do you think it has increased your interest in the subject? Why or why not?

Finally, this study was conducted in the required course 'Customs Practices' for second-year university students in the first semester. The study involved 55 students, including 12 fourth-year students retaking the course. The sampling method involved selecting all students from this course offering. The research questionnaire was completed anonymously during class sessions in both the midterm and final exam weeks, achieving a 100% response rate with no invalid questionnaires.

Among second-year students, the background shows that only three had prior knowledge of the course, having studied the International Trade program in a vocational high school. Regardless of whether they had previously taken or were retaking the course, the majority of students needed to familiarize themselves with customs procedures.

After the instructor explained the teaching methods in the first week, students filled out an anonymous "Informed Consent Form for Research Participants." Non-participation did not affect any of the students' rights. All the forms were collected, and all students agreed to participate in the study.

4. Results and Discussion

4.1 Quantitative Analysis of the Questionnaire

4.2.1. Factor analysis

This study used factor analysis on the final questionnaire to reduce the number of questionnaire items from among many. A total of 55 students participated in the course, providing 55 valid responses. The study used a factor loading threshold of 0.40 or above for item selection and named the factors based on variables meeting this criterion, ensuring the construct validity of the designed questionnaire items. The results revealed six main factors, with a total cumulative explained variance of 84.437%. Initially, there were 28 variables; after removing the non-significant ones, 19 remained. Reliability analysis was conducted for each named factor, with Cronbach's α values all greater than 0.7, indicating good reliability for the factors in this scale. The results are shown in Table 1.

Table 1. Results of factor analysis

Items	Factor Loading	Factor Named	*Cronbach's α*
V1	0.790	Traditional Teaching	0.852
V3	0.902		
V4	0.922		
V5	0.642	Real-Life Examples and Case Study Videos	0.905
V7	0.653		
V8	0.601		
V10	0.779	PBL Model	0.791
V11	0.877		
V13	0.583		
V16	0.852	Expert Lectures	0.932
V17	0.864		
V18	0.780		

V19	0.795		
V26	0.791		
V27	0.815	Off-Campus Visits	0.959
V28	0.875		
V22	0.825		
V23	0.809	Learning Performance	0.832
V24	0.680		

4.2.2. Regression analysis

To investigate the relationships between 'Traditional Teaching, " "Real-Life Examples and Case Study Videos, " and "Expert Lectures. " " Off-Campus Visits, "and the " PBL Model " with " Learning Performance," this study used simple regression analysis. The results are shown in Figure 2. The findings indicate that 'Real-Life Examples and Case Study Videos, " "Expert Lectures, " "Off-Campus Visits," and the "PBL Model" have positive correlations with " Learning Performance. " The results were consistent with the findings of [6,26,38,39,40]. These studies support hypotheses H2, H3, H4, and H5, which propose that real-life examples and case study videos, expert lectures, off-campus visits, and PBL positively impact students' learning performance. Additionally, "Real-Life Examples and Case Study Videos, " "Expert Lectures, "and "Off-Campus Visits" also have positive correlations with the "PBL Model. "

Furthermore, hierarchical regression analysis was conducted to explore whether the "PBL Model" has a mediation effect. The results showed:

(1) The coefficient for 'Real-Life Examples and Case Study Videos' was initially 0.565 ($p<.001$). However, upon the inclusion of the PBL Model, the coefficient shifted to 0.360 ($p>.001$), a significant change that underscores the role of PBL as a partial mediator.

(2) The coefficient for "Expert Lectures" was initially 0.535 ($p<.001$). After including the PBL Model, the coefficient changed to 0.376 ($p>.001$), which is still significant, indicating that PBL is a partial mediator.

(3) The coefficient for "Off-Campus Visits" was initially 0.533 ($p<.001$). After including the PBL Model, the coefficient changed to 0.340 ($p>.001$), which is still significant, indicating that PBL is a partial mediator.

Problem-Based Learning (PBL) emphasizes real-life problem scenarios as a context for learning [41]. In this approach, teachers pose questions in practical or real-life contexts, and students use their acquired knowledge to analyze, deduce, and solve problems, highlighting their active role in learning [42]. Consequently, real-life examples, case study videos, expert lectures, and off-campus visits positively impact PBL. Furthermore, PBL also enhances student learning, motivation, and short- and long-term performance [17]. Thus, PBL is also considered as a partial mediator in the study.

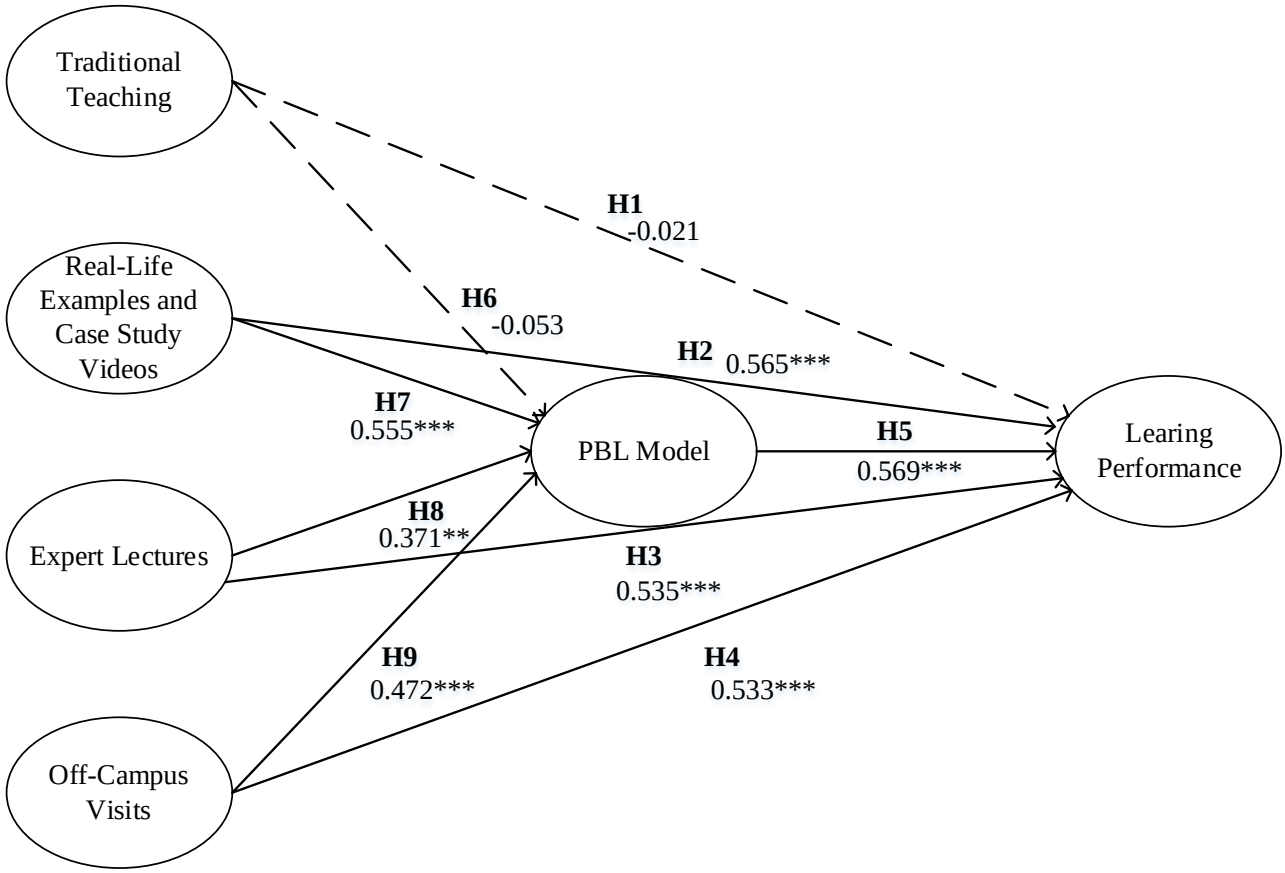

Figure 2. Results of regression analysis

4.2 Qualitative Analysis of the Questionnaire

A summary of the top three responses for each question by percentage is in Table 2. In question 1, which asks if PBL emphasizes active learning and if the course has guided students in achieving that, most responses are "Yes." In the midterm questionnaire, the ranked responses were finding information outside of class (38.5%), increased interest and understanding (30.8%), and improved problem-solving skills (15.4%). In the final questionnaire, 40.60% of respondents reported beginning to engage in active learning, 30.40% started to engage in active thinking, and 19.30% conducted preliminary research.

In question 2, which asks whether PBL highlights group discussions and whether group collaboration and discussion help with learning, most responses are "Yes." In the midterm questionnaire, 38% indicated that discussions allow them to hear different opinions and ideas, 22% noted that they could learn through mutual discussion, and 20% believed it allowed them to express their ideas. By the final questionnaire, 40% found group discussions more effective than studying alone, 30% said it enhanced their learning impressions, and 22% appreciated hearing different perspectives.

In question 3, which asks whether real-life news or case studies would increase interest in learning, most responses are "Yes." In the midterm questionnaire, 32% indicated increased interest in learning, 22% noted a connection to knowledge, and 20% felt more engaged in the course. In the final

questionnaire, 26% reported a better understanding of course content, 25.3% stated that knowledge could be applied, and 22% indicated increased interest in learning. The results correspond with past studies that show that offering training programs with practical case studies or real-life examples leads to better understanding [7]. Moreover, Problem-Based Learning (PBL) actively engages students in asking questions, finding and collecting information, reasoning, and communicating [26].

In question 4, which asks whether learning from expert lectures would increase interest in learning, most responses are "Yes." In the midterm questionnaire, 28% indicated that it made learning more interesting, 25% noted that it was not just theoretical, and 21.8% felt they gained a better understanding of the industry. In the final questionnaire, 30% reported that it better aligned with real-world practices, 27% noted it was not just theoretical, and 22% felt they gained a better understanding of the industry.

Finally, this study conducted an off-campus visit at the end of the term. Most responses indicated a positive impact on learning. In the final questionnaire, 30% reported that it made a stronger impression, 26% felt it increased their interest in learning, and 23% gained a better understanding of the industry, as shown in question 5.

Table 2. Top three response percentages for each question

(1) PBL emphasizes active learning. Do you think this course has guided you in achieving that? Why or why not?							
Midterm	Finding information outside of class (38.5%)	Increased interest and understanding (30.8%)	Improved problem-solving skills (15.4%)	Final	Active learning (40.6%)	Active thinking (30.4%)	Preliminary research (19.3%)
(2) PBL highlights group discussions. Do you believe that group collaboration and discussion have helped your learning? Why or why not?							
Midterm	Hearing different opinions and ideas (38%)	Learning through mutual discussion (22%)	Expressing their own ideas (20%)	Final	More effective than studying alone (40%)	enhancing learning impressions (30%)	Hearing different perspectives (22%)
(3) When exploring answers from real-life news or case studies, do you think this has increased your interest in learning? Why or why not?							
Midterm	Increased interest in learning (32%)	A connection to knowledge (22%)	More engaged in the course (20%)	Final	Better understanding of course content (26%)	Increased interest in learning (25.3%)	Knowledge could be applied (22%)
(4) Regarding learning from expert lectures, do you think it has enhanced your interest in the subject? Why or why not?							
Midterm	Learning	Not only	Better	Final	Aligned with	Not only	Better

	more interesting (28%)	theoretical (25%)	understanding of the industry (21.8%)		real-world practices (30%)	theoretical (27%)	understanding of the industry (22%)
(5) Regarding learning from off-campus visits, do you think it has increased your interest in the subject? Why or why not?							
Midterm	--	--	--	Final	Stronger impression (30%)	Increased interest in learning (26%)	Better understanding of the industry (23%)

Based on students' responses, it was found that before the midterm, students indicated that with learning methods such as PBL and real-life cases, they began actively searching for answers online, engaging in discussions with peers to hear different perspectives, and resonating more with real-life examples. They started to connect current events with the course, leading them to find the course "interesting" by the midterm. By the end of the course, feedback revealed that students had begun to "think proactively," "engage in active learning," "use pre-study or review to deepen their understanding," and had experienced a significant increase in "interest," showing an evident change in their learning behavior. The PBL technique can also improve student engagement by enabling knowledge and information sharing and discussion[43], which is consistent with the results of this study.

5. Conclusions

Studying diverse teaching strategies combined with problem-based learning methods has become increasingly important for understanding student learning performance. The conclusions, recommendations, and reflections of this study are as follows.

1. Using real-life case videos, expert lectures, and off-campus visits positively correlates with learning performance. Real-life news and case videos, expert lectures, and off-campus visits all positively correlate with learning performance. Moreover, the PBL model serves as a partial mediator between other teaching strategies and learning performance, indicating that using the PBL model helps enhance the effectiveness of other teaching strategies and learning performance.
2. PBL emphasizes active learning, encouraging students to proactively "prepare." Although PBL inherently stresses the importance of preparation, the term "preparation" repeatedly appeared in the qualitative questionnaire responses. It is recommended that teachers provide preparatory materials before class, enabling students to contribute more effectively during group discussions and enhancing their willingness to engage in active learning.

3. Teaching Improvement Suggestions: It is crucial to manage discussion time effectively and provide more opportunities for students to present and engage in discussions. This approach empowers educators, giving them control over the learning process. Finally, from the qualitative questionnaire, it can be observed that a "sense of accomplishment," "fun," and "resonance" can all spark students' interest in learning. Students also expressed a dislike for the traditional lecture-based teaching method. In the final questionnaire, terms such as "active learning," "active thinking," and "preparation" appeared, indicating that students are more engaged, which in turn gives teachers a greater sense of accomplishment in their teaching.
4. Ultimately, the teaching strategies proposed based on the results of this study are also recommended for future corporate trainers to enhance organizational performance, providing valuable insights for both college and corporate training personnel.

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Appendix - Questionnaire Items

Code	Item
V1	I think I can understand the course content just by reading the textbook.
V2	I think the examples given by the teacher during class do not significantly help in understanding the course content.
V3	I think I can understand the course content if the teacher follows the textbook in class.
V4	I find the teacher's lectures interesting when they follow the textbook.
V5	I think using real-life examples and case study videos helps me better understand the course content.
V6	I think this course is closely related to everyday life.
V7	I think using real-life examples and case study videos helps me better understand the learning objectives of this course.
V8	I think using real-life examples and case study videos increases my interest in learning.
V9	I think using real-life examples and case study videos helps me apply what I've learned to future real-life situations.
V10	I think group discussions in class are helpful for my learning in this course.
V11	I feel that I have learned about teamwork through this course.
V12	I think discussing using Problem-Based Learning methods is beneficial for my learning in this course..
V13	I believe that preparing before class helps with my learning in this course.
V14	I think sharing and feedback within the group contribute to my learning in this course.
V15	I find the content presented in expert lectures very engaging.
V16	I believe that expert lectures contribute to my learning in this course.
V17	I think that expert lectures help me better understand the course content.
V18	I feel that expert lectures are helpful for understanding the industry.
V19	I think that expert lectures increase my interest in learning.
V20	I feel that my motivation for learning in this course has increased.
V21	I believe I am able to collaborate with others in group work.
V22	When faced with complex or unfamiliar problems, I now make an effort to find information to solve them.
V23	I believe this has helped improve my self-learning and problem-solving skills.
V24	I feel that I better understand the units and key points of this course.
V25	I believe I have attentively observed the various facilities at the visit locations.
V26	I think that on-site visits contribute to a deeper understanding of the course material.
V27	I feel that the visit activities help me better understand the work of customs.
V28	I believe that the off-campus visit provided me with a better understanding of customs practices in the course.

Source: By an author.