Macrothink Institute™

Journal of Studies in Education
ISSN 2162-6952
2025, Vol. 15, No. 4

# The Dilemmas and Optimization Strategies of Project-based Learning in Financial Accounting Courses

Haijing Liu

Department of Business Administration

Shandong Vocational College of Industry

No. 69, Zhangbei Road, High-tech Zone, Zibo 255000, China

Received: Oct. 1, 2025 Accepted: November 16, 2025 Published: November 27, 2025

doi:10.5296/jse.v15i4.23259 URL: https://doi.org/10.5296/jse.v15i4.23259

**Abstract**

This study systematically investigates the implementation of Project-Based Learning (PBL) in financial accounting courses, aiming to diagnose its inherent dilemmas and propose targeted optimization strategies. Although financial accounting demands that students master both fundamental theories and practical problem-solving skills—making PBL, with its authentic projects, a seemingly ideal bridge between theory and practice—its practical application faces significant challenges. Based on cross-analysis of 215 valid questionnaires from three vocational colleges in Shandong Province, this research identifies key dilemmas in curriculum design, classroom implementation, and the assessment system. The findings reveal that: (1) in course design, PBL activities often lack alignment with core knowledge points, failing to stimulate students' inquiry interest; (2) during implementation, vague instructional guidance and ineffective team collaboration mechanisms hinder the achievement of deep learning objectives; and (3) the prevailing assessment model overemphasizes grading the final product while neglecting the assessment of process-related competencies, thereby weakening the formative role of assessment. In response to these dilemmas, this paper proposes feasible optimization strategies grounded in pedagogical principles. The findings are expected to inform teaching reforms in financial accounting courses and contribute to enhancing students' core competencies and comprehensive application abilities.

**Keywords:** financial accounting courses, project-based learning (PBL), assessment dilemma, curriculum design dilemma, implementation dilemma

## 1. Introduction

### *1.1 Introduce the Problem*

Vocational education is globally recognized as pivotal to connecting academic knowledge with workplace practice, a notion particularly salient in the field of accounting, where practical skills are as crucial as theoretical mastery (Nguyen et al., 2024). As a fundamental core course for accounting majors in higher education institutions, financial accounting equips students to apply accounting standards to real-world scenarios (Spraakman & Jackling, 2014). However, the traditional lecture-based teaching model prevalent in this course often relies on simplified textbook cases and one-way knowledge transmission (Mihălțan, 2019), leading to a common student refrain: "I can memorize journal entries, but I don't know how to use them in an actual business." This disconnection between theory and practice has prompted educators to explore more interactive teaching methods, among which project-based learning (PBL) stands out as one of the most promising approaches. Research on PBL in accounting education has evolved through a logical sequence: from initial validation of its effectiveness, to in-depth analysis of implementation challenges, and finally to the development of optimization strategies. Early studies primarily focused on comparing PBL with traditional instruction to establish its suitability for the discipline. This line of inquiry highlighted the inherent compatibility between the practical nature of accounting and the authentic, problem-driven focus of PBL, aiming to bridge the theory-practice divide (Gijbels et al., 2005; Sugeng & Suryani, 2020). As the field matured, scholars began to systematically identify major implementation barriers, such as projects lacking real-world relevance, inadequate teacher facilitation, and oversimplified assessment criteria (Kim, 2016; Ebun et al., 2018).

Project-Based Learning (PBL) refers to a student-centered instructional methodology anchored in "solving complex, authentic projects" (Barrows, 1996). It has been widely adopted in higher education, particularly in business and accounting disciplines. Unlike traditional instruction, PBL requires students to complete iterative tasks in small groups, thereby fostering critical thinking, teamwork, and practical problem-solving skills (Loyens et al., 2023). In essence, PBL emphasizes the transition from passive knowledge reception to active knowledge construction through engaging with complex situational tasks. This model fundamentally transforms the traditional "teacher-lectures, student-memorizes" paradigm, aligning the learning process more closely with the logic of problem-solving in the real world. The advantages of PBL manifest in three key areas. In professional skill development, students show marked improvement in applying integrated knowledge (Dochy et al., 2003), a process that naturally cultivates advanced cognitive skills like critical thinking. Regarding soft skills and professional literacy, PBL significantly improves competencies such as information retrieval and structured communication (Fathi Abdollahi et al., 2022). This comprehensive skill development makes it a highly effective strategy for workforce preparation. Finally, in knowledge transfer, the methodology addresses the theory-practice divide by embedding learning within realistic, iterative cycles (Saraswati et al., 2025). Ultimately, the core strength of PBL lies in effecting a paradigm shift from passive knowledge transmission to active competence building.

It follows that the success of PBL hinges on the design of authentic projects and the guidance of the facilitator, underscoring that accounting PBL projects must be grounded in genuine business problems to avoid existing in a theoretical vacuum. Despite its significant advantages, the application of PBL in financial accounting courses faces unique challenges, which are particularly pronounced in the context of Chinese vocational colleges. Firstly, the student population in vocational colleges exhibits strong heterogeneity, with significant disparities in accounting background, practical experience(including no practical experience, academic practical experience, internship experience, both academic and internship experience), and more (Lee, 2025). Secondly, the issue of PBL scenarios being disconnected from accounting practice persists. Many PBL projects rely on generic cases (Li, 2025), failing to reflect the complex operational realities of modern business, which hampers students' ability to rapidly adapt to workplace demands after graduation. Moreover, the imperfect assessment system undermines the effectiveness of PBL. Most institutions still base their assessment primarily on the final report, neglecting the evaluation of the collaborative process and individual contributions (Li & Rohayati, 2024).).

In summary, this study investigates PBL implementation dilemmas in vocational financial accounting, centering on curriculum design, pedagogical delivery, and assessment. It employs cross-analysis of questionnaire data to delineate the influence and mediating mechanisms of student characteristics on dilemma perception. The ultimate aim is to derive targeted, resource-efficient optimization strategies, thereby addressing a critical gap in the empirical literature on vocational accounting PBL.

### *1.2 PBL Application in Financial Accounting*

The design logic of PBL projects fundamentally revolves around a tripartite equilibrium—scenario authenticity, knowledge relevance, and competency alignment. Under this framework, international and domestic practices exhibit distinctive characteristics, each yielding representative paradigmatic cases. Globally, mature financial accounting PBL projects commonly employ "end-to-end enterprise accounting operations" as core scenarios, emphasizing tight integration with industry practices (Milne and McConnell, 2001; Radianto, 2013). A predominant prototype in Euro-American contexts involves the "monthly accounting cycle of manufacturing enterprises", frequently utilizing sanitized authentic enterprise data (Gallego et al., 2018), such as component procurement invoices and production labor records. These projects feature clearly articulated knowledge points where each sub-task corresponds to core curricular concepts, with difficulty progressing incrementally to align with student developmental trajectories. Furthermore, international approaches emphasize interdisciplinary integration, combining PBL with tax accounting to design projects like "annual tax reconciliation for small enterprises." This requires simultaneous execution of bookkeeping tasks and tax return preparations, thereby enhancing synergistic accounting-taxation capabilities (Stanley and Marsden, 2012; Chin et al., 2022).

Chinese implementations, conversely, demonstrate dual characteristics of contextual adaptationandinnovation under resource constraints. Limited by university-industry collaboration depth and software resources, most institutional PBL projects utilize "simplified

operational scenarios of small-medium enterprises" (Li et al., 2023), subsequently developing a two-tier case system comprising foundational and advanced levels. Foundational PBL projects focus on tasks like "retail revenue accounting for independent stores" and "inventory discrepancy resolution in small outlets." While primarily adapted from textbook cases, these incorporate distinctive operational details from local businesses (Xu and Liu, 2010). Advanced PBL projects attempt to leverage industry collaboration resources, co-developing initiatives such as "production cost accounting projects" with local enterprises. Companies provide genuine production floor timesheets and material requisition forms, enabling students to compute direct material costs and generate cost reports using specialized software (Huang et al., 2023; Liu, 2022).

A critical analysis, however, reveals a universal challenge across both international and Chinese contexts: inadequate competency scaffolding. While international projects offer high-fidelity scenarios, they often lack sufficient instructional support for true novices. Conversely, Chinese projects grapple with the authenticity-simplicity paradox. In attempts to accommodate heterogeneous student preparedness, some curricula oversimplify business contexts, ultimately impairing graduates' readiness for authentic corporate accounting environments (Wang, 2020; Li & Rohayati, 2024).

### *1.3 PBL Implementation in Financial Accounting*

The PBL implementation process constitutes a dynamic cycle of instructor facilitation, student collaboration, and outcome generation. Its alignment with the financial accounting curriculum critically influences pedagogical effectiveness. Current practices predominantly organize this process around course scheduling and collaborative efficiency; however, the extent of alignment exhibits considerable variation. The widely adopted PBL model unfolds in three iterative stages: the preparatory stage involves instructors introducing tasks and grading criteria; the collaborative stage entails team role allocation and task execution; the outcome stage encompasses the submission of reports and final class presentations. This structure generally aligns with typical course schedules, reserving remaining sessions for theoretical instruction and knowledge reinforcement (Pan et al., 2023). Alternative approaches employ a hybrid model blending in-class collaboration with out-of-class self-directed learning. In-class time focuses on group discussions of critical issues, while out-of-class tasks leverage digital platforms like Learning Pass for progress submission and instructor consultations, thereby enhancing operational flexibility (Shiru, 2020).

However, a deeper analysis reveals three critical misalignments. The first is the group efficiency-heterogeneity paradox. The specialized nature of financial accounting PBL frequently polarizes team roles, contradicting the objective of universal competency. Proficient students dominate complex tasks, while novices are confined to peripheral activities like data collection, effectively barring them from practicing essential procedures (Andalusia et al., 2024). Second, the instructional facilitation-boundary dilemma sees instructors struggling to find an equilibrium. Some, concerned about potential failure, provide direct solutions that undermine self-directed discovery. Others, adopting a hands-off approach, neglect timely feedback, allowing misconceptions to become entrenched. This clashes with

the goal of balancing standardization and flexibility. Third, an assessment-competency gap arises from the over prioritization of final outputs at the expense of process-oriented skills like collaborative problem-solving. This disconnect fails to cultivate the practical judgment central to the course goals, undermining PBL's educational value (Bate et al., 2013).

Furthermore, the integration of digital tools directly shapes curricular alignment. Some institutions use AI-assisted tools to provide real-time error feedback and links to accounting standards (Xu et al., 2023), closely meeting the curriculum's precision demands. Conversely, most institutions, limited by resources, rely on manual grading. This leads to delayed feedback and limited personalized guidance, undermining the goal of efficient skill mastery (Henderson et al., 2015; Wolcott and Sargent, 2021).

## 2. Method

### *2.1 Measurement Instrument Development*

The Financial Accounting PBL Dilemma Perception Scale was the primary tool. It was developed iteratively through classroom observations, expert panel reviews, and content refinement to ensure contextual and content validity for financial accounting PBL. The instrument measured three dimensions: (1) course design, (2) classroom implementation, and (3) assessment system dilemma perceptions. Each used five items on a five-point Likert scale (1 = strongly disagree to 5 = strongly agree). Sample items included: "The task difficulty exceeds my current knowledge base" (course design); "Instructor guidance lacked clarity on accounting standards" (classroom implementation); and "Peer scores misrepresented individual contributions" (assessment system). For cross-analysis, mean scores were categorized into: low (1.0-2.5, minimal challenges), medium (2.6-3.5, neutral perception), and high (3.6-5.0, strong agreement with dilemmas).

### *2.2 Sampling and Data Collection*

A convenience sampling method surveyed students from three vocational colleges in Shandong, China, who had completed a PBL-based financial accounting course. Prior to participation, students were informed about the anonymous and confidential use of data for research purposes. They were assured that their involvement would not affect their grades or academic records. Informed consent was obtained from all participants, and a small incentive was provided upon completion of the questionnaire. Overall, 270 questionnaires were distributed across five classes (all >30 students) via cluster sampling. From 232 returns, 17 were invalid, yielding 215 valid responses (79.6% response rate). Demographic characteristics are in Table 1.

Table 1. Demographic Characteristics of the Sample (N=215)

| Variable | Type | Frequency | % |
|---|---|---|---|
| Gender | Male | 74 | 34.4 |
| | Female | 141 | 65.6 |
| Grade | Freshman | 45 | 20.9 |
| | Sophomore | 132 | 61.4 |
| | Junior | 38 | 17.7 |
| Major | Financial Accounting | 146 | 67.9 |
| | Financial Management | 32 | 14.9 |
| | Other Business Disciplines | 37 | 17.2 |
| Monthly Living Expenses (CNY) | <1500 | 19 | 8.8 |
| | 1501-2000 | 121 | 56.3 |
| | 2001-2500 | 28 | 13.0 |
| | >2500 | 47 | 21.9 |
| Total | | 215 | 100 |

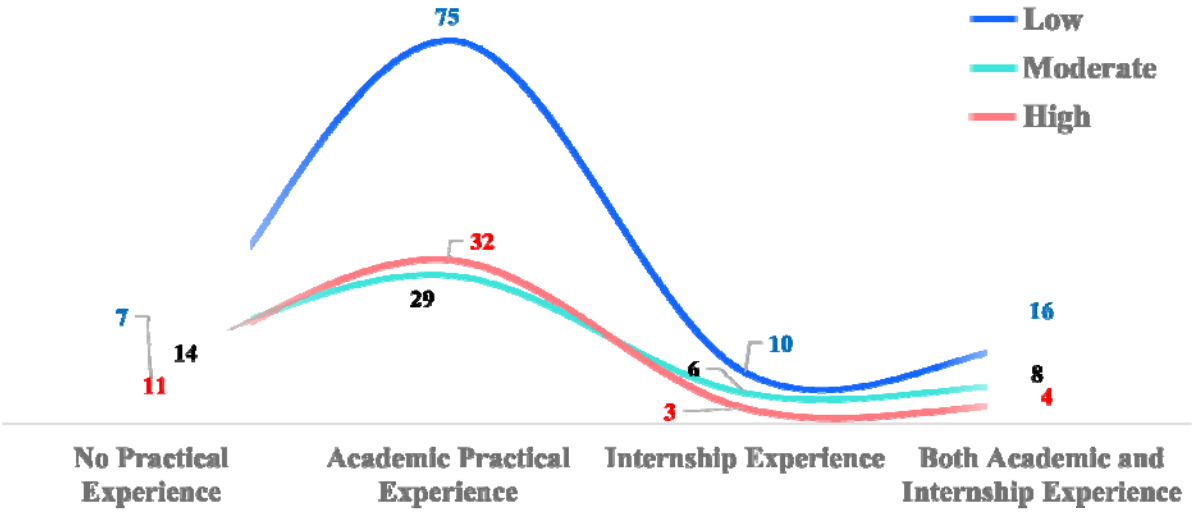
## 3. Results

### *3.1 PBL Curriculum Design Dilemmas*

Curriculum design, the core of implementing PBL in financial accounting courses, directly affects students' knowledge absorption efficiency and practical ability development through its rationality. Preliminary teaching observations and research find that curriculum design dilemmas mainly focus on three aspects: insufficient scene authenticity, lagging standard timeliness, and imbalanced difficulty - student learning condition adaptation. Moreover, the degree of perception of such dilemmas may be influenced by two key variables: one is students' accounting practical experience/internship experience, which determines their cognitive depth of real corporate financial scenarios; and the other is the frequency of accounting software usage. Financial accounting courses need to rely on software to complete core tasks such as report preparation, and the frequency of use directly affects the judgment of the practical adaptability of the course. Therefore, this section uses cross-analysis to explore the correlations between accounting internship/practical training experience, frequency of accounting software usage, and perceptions of curriculum design dilemmas. It clarifies the characteristics of dilemma perceptions among students with different backgrounds, and provides comprehensive empirical support for the precise hierarchical optimization of subsequent curriculum design.

Figure 1 shows a statistically significant association between accounting internship/practical training experience and perceptions of curriculum design dilemmas ($\chi^2 = 14.391$, $p = .026$). Specifically, greater practical training experience was associated with lower levels of perceived dilemmas. Examining the differences across group characteristics revealed distinct patterns in dilemma perception. The group with no practical experience exhibited the most pronounced high dilemma perception. This outcome is attributed to their lack of exposure to authentic corporate financial contexts, which led them to misinterpret simplified course cases

and basic knowledge tasks as theoretically esoteric and practically irrelevant, thereby amplifying their perceived challenges. In contrast, the group with hands-on experience demonstrated a clear advantage of low dilemma perception. This benefit stems from their training establishing a cognitive framework that bridges curriculum design and practical application. Specifically, academic practical experience clarified the alignment between fundamental processes and knowledge points, whereas internship experience honed the ability to evaluate the rationality of simplified cases and the timeliness of standards. Notably, 23.5% of the subgroup with only academic practical experience still reported high dilemma perception, indicating a gap between campus-based instruction and actual business practices. This discrepancy explains why this subgroup's dilemma perception remains elevated compared to their peers with internship experience or both academic and internship experience.




*Note: Chi-Square Tests = 0.026 < 0.05*

Figure 1. Curriculum Design Dilemmas × Internship Experience

Table 2 shows a strong inverse association between accounting software usage frequency and perceived instructional design dilemmas ($\chi^2$ = 31.725, p = 0.000 < 0.001). Specifically, increased software usage frequency correlated with a decrease in overall dilemma perception. However, the nature of this perception differed significantly among user groups, following a distinct and logical pattern. The no-usage group 47.1% exhibited the highest dilemma perception. This stems from the common inclusion of "software-assisted practical tasks" (e.g., automated report generation) in financial accounting curricula. Lacking basic software skills, this cohort struggled to comprehend the integration of course tasks with software functionalities. Consequently, they were unable to validate the practical value of case studies through software, often misinterpreting software-related tasks as pedagogically misaligned with their competencies. In contrast, the low-frequency user group (1-2 times/week) 64.7% exhibited the most favorable outcome, with the lowest dilemma perception. This advantage

arose because they possessed basic software skills that aligned with the curriculum's "basic software + knowledge point" approach. Moreover, since their skills had not yet created a demand for advanced features, the course design was well-matched to their proficiency level. The very low-frequency user group (1-2 times/month) exhibited an intermediate level of dilemma perception. Their limited software skills often triggered a misattribution of operational challenges to course design flaws, particularly the perceived inability to accommodate varying skill levels. Conversely, the high-frequency user group (3+ times/week) 47.4% presented a unique profile of moderately elevated dilemma perception. Their perception arose from a belief that the software tasks in the curriculum were overly simplistic and failed to mirror the complex applications encountered in real-world professional settings, thus generating a moderate sense of instructional misalignment.

Table 2. Curriculum Design Dilemmas × Software Usage (N = 215)

| Variable | | Software Usage Frequency | | | | | |
|---|---|---|---|---|---|---|---|
| | | Never | Very Low (1-2times/month) | Low (1-2 times/week) | High (3+ times/week) | Total | % of Total |
| Curriculum Design Dilemma Perception | Low | 17 | 43 | 33 | 15 | 108 | 50.2 |
| | Moderate | 10 | 17 | 12 | 18 | 57 | 26.5 |
| | High | 24 | 15 | 6 | 5 | 50 | 23.3 |
| Total | | 51 | 75 | 51 | 38 | 215 | 100 |
| % of Total | | 23.7 | 34.9 | 23.7 | 17.7 | 100 | - |

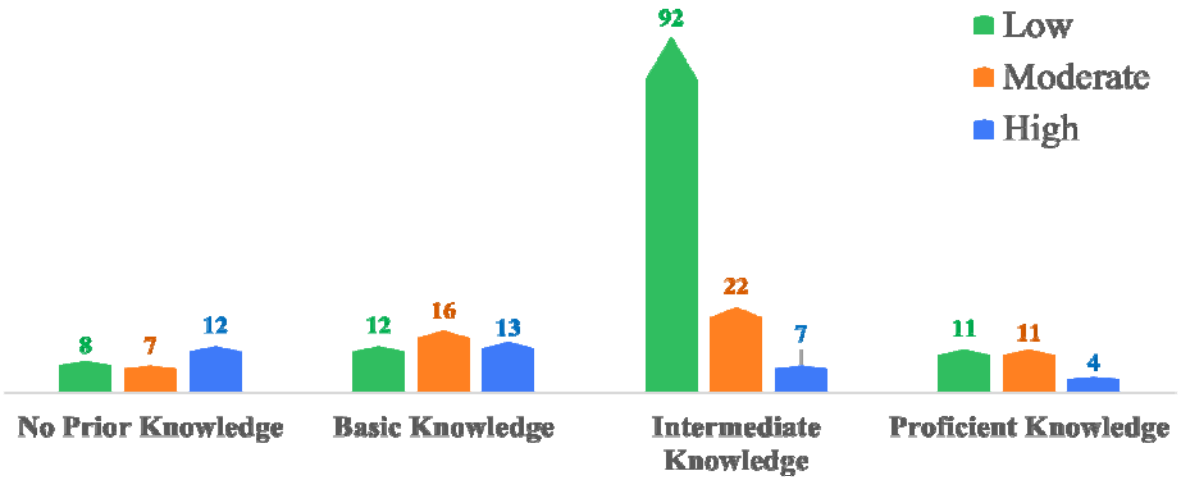
*Note:* $\chi^2 = 31.725$, df = 6, p = 0.000 < 0.001

### *3.2 PBL Classroom Implementation Dilemmas*

Classroom implementation is the critical phase for enacting PBL in financial accounting courses, and its effectiveness directly depends on the alignment between student engagement and the suitability of instructional support. Preliminary investigations revealed that implementation dilemmas primarily manifest as three core issues: imbalanced group collaboration (free-riding), marginalization due to disparate knowledge foundations, and ambiguous teacher guidance boundaries. The intensity of perceiving these dilemmas is closely related to students' prior knowledge of financial accounting (which determines their ability to participate collaboratively and comprehend guidance) and the volume of assigned tasks (which affects their in-class time investment and effort distribution). Therefore, this section performs a cross-analysis of prior accounting knowledge, task quantity, and classroom implementation dilemma perception. This analysis aims to clarify perception characteristics across proficiency levels and provide empirical evidence for optimizing implementation.

Figure 2 shows a strong, statistically significant association between prior accounting knowledge and classroom implementation dilemma perception ($\chi^2 = 52.415$, p = 0.000 < 0.001). Overall, higher prior knowledge predicted lower perceived dilemmas. However, this trend was nuanced by distinct, context-specific patterns across groups. The Intermediate

Knowledge group 76.0% demonstrated the most favorable profile, characterized by the highest rate of low dilemma perception and the lowest rate of high perception (5.8%). This advantage stemmed from their proficiency in core tasks (e.g., formulating basic journal entries, understanding financial statements), enabling smooth group collaboration. Importantly, their knowledge was sufficient yet not overly advanced, preventing them from dismissing instructional guidance as too elementary. This precise alignment with the course demands resulted in their minimal dilemma perception. Both the No Prior Knowledge 44.4% and Basic Knowledge groups 31.7% exhibited high dilemma perception. This pattern stemmed from their lack of accounting exposure or, at best, a grasp of basic concepts without the ability to prepare journal entries, which led to group marginalization. Simultaneously, their heightened need for precise guidance often resulted in perceptions of vague support, amplifying their overall dilemma awareness. Furthermore, the No Prior Knowledge group showed a higher proportion of high perception than the Basic Knowledge group, reflecting a progressive pattern where weaker foundational knowledge correlated with stronger dilemma perception. Conversely, the Proficient Knowledge group 42.3% displayed a distinct profile of moderately high dilemma perception. Contrary to expectations, their elevated perception arose because their competence in handling complex transactions and applying accounting standards made basic tasks (e.g., preparing elementary journal entries) seem unchallenging and insufficient, thus generating a moderate dilemma perception.




***Note:*** *Chi-Square Tests = 0.000 < 0.001*

Figure 2. Classroom Implementation Dilemmas × Prior Knowledge

Table 3 reveals a significant inverse association between the number of accounting tasks and the perception of implementation dilemmas ($\chi^2 = 13.989$, $p = 0.030 < 0.05$). Overall, more task experience predicted lower dilemma perception. This trend demonstrated a clear, experience-driven pattern across participant groups. This inverse relationship can be explained by experiential learning. For instance, repeated task participation familiarized students with collaborative processes (e.g., group role allocation) and guidance modes (e.g.,

instructor hints). This familiarity, in turn, enabled more efficient collaboration (e.g., reducing free-riding) and a clearer understanding of guidance boundaries, which significantly lowered dilemma perception. The pattern was further evidenced by the >5 task group's 65.4% higher low-perception proportion compared to the 4-5 task group 60.4%, confirming that greater experience weakens dilemma perception. In contrast, the groups with the least task exposure one task 37.5% and 2-3 tasks 22.2% exhibited high dilemma perception. The one-task group's minimal experience led to unfamiliarity with collaboration rules (e.g., task allocation) and instructor guidance methods (e.g., hinting at key points), which induced anxiety and amplified their perception. Although the 2-3 task group had preliminary experience, it was insufficient for handling emergent collaborative issues (e.g., disagreements) or ambiguous guidance (e.g., "rethink the logic"), resulting in persistently high perception. The higher perception in the one-task group versus the 2-3 task group confirms that inexperience is a key driver of this effect.

Table 3. Classroom Implementation Dilemmas × Task Frequency

| Variable | | Homework Task Frequency | | | | Total | % of Total |
|---|---|---|---|---|---|---|---|
| | | 1 Tasks | 2-3 Tasks | 4-5 Tasks | >5 Tasks | | |
| Classroom | Low | 5 | 10 | 55 | 53 | 108 | 50.2 |
| Implementation | Moderate | 5 | 11 | 21 | 19 | 57 | 26.5 |
| Dilemma Perception | High | 6 | 6 | 15 | 9 | 50 | 23.3 |
| Total | | 16 | 27 | 91 | 81 | 215 | 100 |
| % of Total | | 7.4 | 12.6 | 42.3 | 37.7 | 100 | - |

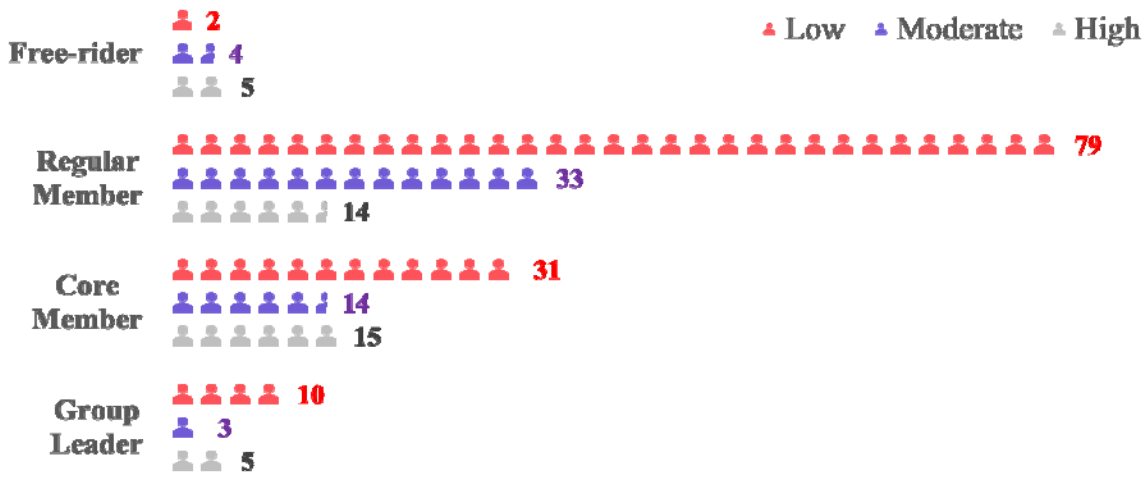
*Note:* $\chi^2 = 13.989$, df = 6, $p = 0.030 < 0.05$

### *3.3 PBL Assessment System Dilemmas*

The assessment system is the core safeguard for achieving "assessment-driven learning" in financial accounting PBL; its rationality directly shapes students' judgments of learning value and skill improvement directions. Dilemmas within this system primarily manifest as three issues: overemphasis on outcomes, vague grading criteria, and lack of peer assessment fairness. The perception intensity of these dilemmas correlates with students' usual academic performance (reflecting differential assessment needs) and their assigned group role (determining contribution levels and perceptions of assessment fairness). This section analyzes the association between usual academic performance and the perception of assessment dilemmas to clarify characteristic perceptions across achievement levels and provide empirical evidence for stratified assessment optimization.

As shown in Figure 3, a statistically significant association was identified between group task roles and the perception of assessment system dilemmas ($\chi^2 = 15.581$, $p = 0.016 < 0.05$). This revealed distinct perception characteristics across roles, shaped by differences in contribution content and participation depth. Regular Members 62.7% exhibited the weakest dilemma perception regarding feedback specificity and peer assessment fairness. This primarily stemmed from their engagement in auxiliary tasks including data collection and consolidation, which involved clearly defined and quantifiable outputs. This clarity made their contributions

less susceptible to rating disputes in peer assessment. Additionally, due to the low complexity of these tasks, instructor feedback easily aligned with their input, as seen in critiques of data completeness. Free-riders 45.5% (members with low contribution in groups) demonstrated the most pronounced high dilemma perception. This outcome originated from the contradiction between their low contribution level and the assessment feedback they received. Their minimal involvement in core tasks left them unable to comprehend instructor feedback targeted at "core assignments," while simultaneously predisposing them to receive lower peer assessment scores due to inadequate contribution. This frequently led to the misattribution of low scores to peer assessment unfairness rather than to their own lack of participation, ultimately amplifying their perception of systemic assessment dilemmas. Core Members presented a concentration of moderate-to-high perception (23.3%; 25.0%). Tasked with core duties such as journal entry preparation and financial statement compilation, their contributions were characterized by complexity and professional expertise. This expertise created a dual challenge: during peer assessment, regular members might undervalue their contributions due to a lack of understanding of the task's complexity, leading to a mismatch between rating and actual input. Additionally, if instructor feedback focused solely on outcome accuracy without acknowledging the students' logical reasoning in handling complex transactions, it could lead students to perceive that their core value was not recognized. Group Leaders presented a concentration of moderate-to-high perception (16.7%; 27.8%). Their primary responsibilities involved managerial rather than technical contributions, such as task decomposition, coordination of role assignments, and progress management. Consequently, if the group's final output was suboptimal, leaders often received lower peer assessment scores due to shared accountability. This led to a perception of unfairness and a resultant moderate level of dilemma perception.




*Note: Chi-Square Tests = 0.016 < 0.05*

Figure 3. Assessment System Dilemmas × Academic Performance

Table 4 shows a significant association between usual academic performance in financial accounting and perception of assessment dilemmas ($\chi^2 = 13.674$, $p = 0.033 < 0.05$). Higher

grades predicted lower dilemma perception, with variation across grade bands exhibiting a need-based adaptive pattern. The high-performance group 71.1% (> 90 points) exhibited the weakest dilemma perception. This group possessed a solid learning foundation and demonstrated excellent outcomes, enabling them to meet result-oriented assessment criteria (e.g., statement accuracy) and rapidly identify advanced improvement points from instructor feedback. Simultaneously, their high contribution level in group work facilitated the receipt of fair peer assessment, resulting in minimal perception of assessment system dilemmas. The low-performance 35.3% (< 69points) and medium-performance 24.4% (70-79points) groups both demonstrated high dilemma perception, albeit for distinct reasons. The < 69 points group, due to their weak foundational knowledge, primarily required clear, directive feedback for improvement. Consequently, they easily perceived general feedback as lacking specificity. The 70-79 points group, navigating a performance plateau, desired guidance on transitioning from good to excellent and exhibited heightened sensitivity to ambiguous grading criteria. These factors contributed to their prominent high dilemma perception, marking them as a key target for assessment system optimization. The good-performance group 27.0% (80-89points) presented a profile of moderate perception, intermediary between the high- and low-performance groups. Although the good-performance group (80-89 points) possessed a relatively good foundation and partial understanding of assessment criteria and feedback logic, they perceived a lack of process-oriented assessment. This resulted in an intermediate level of dilemma perception, below that of lower-performing groups yet above that of top performers.

Table 4. Assessment System Dilemmas × Group Role

| Variable | | Usual Academic Performance(points) | | | | Total | % of Total |
|---|---|---|---|---|---|---|---|
| | | < 69 | 70-79 | 80-89 | >90 | | |
| Assessment System Dilemma Perception | Low | 5 | 44 | 46 | 27 | 108 | 50.2% |
| | Moderate | 6 | 18 | 21 | 9 | 57 | 26.5% |
| | High | 6 | 20 | 11 | 2 | 50 | 23.3% |
| Total | | 17 | 82 | 78 | 38 | 215 | 100% |
| % of Total | | 7.9% | 38.1% | 36.3% | 17.7% | 100% | - |

*Note:* $\chi^2 = 13.674$, df = 6, p = 0.33 < 0.05

## 4. Optimization Strategies for PBL Application

### *4.1 A Scaffolded Curriculum Framework*

To address prevalent curriculum design dilemmas such as unrealistic scenarios, outdated standards, and inadequate software integration, we propose a tiered system that accommodates students' varying levels of hands-on experience and accounting software usage frequency. This system encompasses three tailored approaches: (1) For the no practical experience and basic-software group, we implement a dual module labeled "Accounting Practice + Software Fundamentals". This module employs immersive virtual business tasks to build process understanding, supported by micro-videos and operational manuals. Assignments adopt a "manual + software" dual-path approach for verification, with

knowledge point connections clearly labeled to reduce unfamiliarity. (2) For the academic practical experience and occasional-software-use group, we introduce a repository of real business cases from emerging industries. This repository is supplemented with analyses highlighting differences between campus and corporate training. Software tasks focus on "functional and knowledge-point synergy" to strengthen the understanding of tools serving learning. (3) For the internship experience/both academic and internship experience and high-software-use group, we develop complex, enterprise-level problem-solving tasks. Students analyze and propose optimizations for course cases based on practical experience, establishing a "practical experience to curriculum iteration" feedback mechanism. This mechanism enhances design authenticity and timeliness, thereby achieving precise content adaptation for different groups.

### *4.2 A Dynamic Implementation Mechanism*

To resolve critical classroom implementation dilemmas, including collaborative marginalization, ambiguous guidance boundaries, and process confusion due to inexperience, a dynamic adaptation mechanism is proposed. This mechanism integrates students' prior knowledge and task participation frequency through the following strategies: (1) A heterogeneous grouping model is adopted, consisting of one proficient, one intermediate, and two novice students. Roles are clearly defined (e.g., proficient students tackle core tasks and mentor peers; novices focus on data gathering), supported by a Role Responsibility Guide to mitigate marginalization. (2) guidance strategies are differentiated by task participation: students with no task involvement receive teacher-led prompts with key hints; those with 1–3 tasks are guided through inquiry chains to stimulate reflection; and those with 4 or more tasks receive support only in dispute resolution, ensuring appropriate guidance levels. (3) A task experience repository is established, where experienced students document collaboration optimizations and problem-solving protocols into a handbook. Low-experience groups undergo pre-class process simulations, and senior students act as mentors, creating a cycle of experience transfer to alleviate process confusion and participation anxiety. Instructors are also encouraged to integrate a sense of professional mission (Yang & Su, 2025) into accounting courses, fostering long-term value identification and role awareness, thereby promoting students' proactive adaptation to tasks according to their knowledge and participation levels.

### *4.3 A Differentiated Assessment Framework*

To tackle key assessment system dilemmas such as an overemphasis on outcomes, insufficient feedback specificity, and a misalignment between peer assessment and actual contribution, a differentiated assessment framework is established. This framework incorporates students' group roles and usual academic performance via three mechanisms: (1) Role-specific assessment dimensions are defined: free-riders are assessed focusing on participation improvement supported by participation tracking forms; regular members are assessed on auxiliary task quality; core members are rated emphasizing core task competency and logical reasoning; group leaders receive additional management contribution scores with reference to leadership logs, ensuring comprehensive recognition of all roles' contributions.

(2) Adaptive feedback mechanisms are designed according to usual academic performance: the <69 points group receives feedback emphasizing error identification, criterion anchoring, and procedural breakdown; the 70-79 points group receives additional advanced suggestions and exemplary case references; the 80-89 points group receives feedback focusing on process logic optimization with added process portfolio scoring; the >90 points group receives guidance emphasizing practical value expansion with outstanding assignments incorporated into a case repository, significantly enhancing feedback specificity. (3) A contribution disclosure + multi-round peer assessment mechanism is implemented: group members first disclose contribution lists, then conduct self-assessment and peer-assessment with annotated justifications; instructors review cases with significant rating discrepancies based on objective materials, ensuring alignment between peer assessment and actual contributions while resolving fairness and orientation issues in assessment. After all, the more teachers mentor students, the higher students' proactive behavior becomes (Yang et al., 2024), thereby increasing their interest and enhancing learning outcomes.

## 5. Discussion

This study examined 215 students from finance-related programs at three vocational colleges in Shandong Province, China, focusing on the application dilemmas and optimization pathways of PBL in financial accounting courses. Through empirical cross-analysis, it revealed the characteristics and differentiated needs of PBL implementation, yielding the following conclusions:

First, the study clarified the three core dilemmas of PBL in financial accounting and their group-specific variation patterns. At the curriculum design level, dilemmas centered on unrealistic task scenarios and insufficient timeliness of accounting standards, with students with no practical experience (34.4%) and those never using accounting software (47.1%) reporting significantly higher dilemma perception. This finding corroborates the view that students with weaker accounting foundations struggle with complex operational tasks, hindering their engagement with key knowledge points (Andalusia et al., 2024). At the classroom implementation level, issues included ambiguous instructor guidance boundaries and student collaboration marginalization, where learners with no practical experience (44.4%) and students with academic practical experience (37.5%) exhibited stronger dilemma perception. This phenomenon aligns with the observed marginalization of students with lower PBL capacity (Loyens et al., 2023; Lee, 2025); however, our study quantifies the gradient impact of task experience on dilemma perception. At the assessment system level, primary pain points were the overemphasis on outcomes over process and the mismatch between peer assessment and actual contribution, with students scoring below 69 points (35.3%) and free-riders (45.5%) demonstrating pronounced high dilemma perception. These students often expressed dissatisfaction, perceiving that the assessment system failed to accurately reflect their actual contributions. This highlights the misalignment between evaluation mechanisms and student roles, underscoring the need for layered assessment tailored to vocational education contexts (Li & Rohayati, 2024). These variations indicate that PBL dilemma perception is not homogeneous but is deeply intertwined with students' practical foundation, learning capacity, and participatory roles.

Second, a "layered adaptation" PBL optimization strategy system was developed. Based on empirical findings, actionable optimization schemes were proposed across three dimensions: (1) At the curriculum design level, layered task packages covering "basic initiation, scenario application, and advanced challenges" were provided according to students' practical foundation and software competency, aiming to personalize instruction. This approach aligns with the differentiated teaching philosophy described by Pan et al. (2023), which emphasizes the necessity of aligning task complexity with learner preparedness, such as software usage frequency. (2) At the classroom implementation level, collaboration modes and guidance strategies were dynamically adjusted based on students' course foundation and task experience, resolving marginalization and process confusion through heterogeneous grouping and experience inheritance, with specific adaptations for financial accounting. This strategy incorporates the design principles of structured collaborative learning outlined by Shiru (2020). (3) At the assessment system level, a differentiated assessment framework was designed around "role-specific contributions and performance levels," ensuring full recognition of all contributions and precise feedback for all students. This framework addresses the limitations of traditional outcome-oriented PBL assessment, resonating with the formative assessment approach advocated by Li and Rohayati (2024). This system transcends the traditional "one-size-fits-all" PBL optimization approach, achieving precise alignment between student characteristics, dilemma pain points, and strategic interventions.

Third, the practical value of PBL optimization was validated. Theoretically, this study supplements empirical evidence on "dilemma-group matching" for PBL in vocational financial accounting courses, enriching PBL research in vocational education. Practically, the proposed optimization strategies are grounded in the real-world context of vocational colleges, which are often characterized by limited resources and diverse student abilities. Specific measures include adopting free accounting teaching software, streamlining assessment processes, and leveraging materials from local enterprises. These strategies offer direct operational guidance for PBL reform in vocational financial accounting education, facilitating the enhancement of students' accounting practical skills and comprehensive application literacy.

Finally, this study acknowledges two primary limitations. First, the generalizability of the conclusions is constrained by the sample, which was drawn solely from three vocational colleges in Shandong Province, concentrating on finance majors in Eastern China. Future studies should seek samples from a wider array of regions (including Central, Western, and Northeast China), institution types (both public and private), and incorporate comparative analysis with undergraduate accounting education. Second, the scope of influencing variables was incomplete, as it centered on student characteristics while overlooking instructor factors (e.g., PBL teaching experience) and institutional resources (e.g., training facilities). Subsequent research should integrate these variables, for example, by employing teacher surveys and resource inventories to assess the impact of factors like instructor training and industry collaboration on PBL efficacy.

**Authors contributions**

All authors read and approved the final manuscript.

**Funding**

Not Applicable.

**Competing interests**

The authors declare no competing interests.

**Data availability statement**

The data that support the findings of this study are available on request from the corresponding author.

**References**

Andalusia, B., Suranto, S., & Haque, F. (2024). Exploring the success of implementing project-based learning model in accounting learning material. *Jurnal Paedagogy*, *11*(2), 238-251. https://doi.org/10.33394/jp.v11i2.10475

Barrows, H. S. (1996). Problem-based learning in medicine and beyond: A brief overview. *New directions for teaching and learning*, *1996*(68), 3-12. https://doi.org/10.1002/tl.37219966804

Bate, E., Hommes, J., Duvivier, R., & Taylor, D. C. M. (2013). Problem-based learning (PBL): Getting the most out of your students-Their roles and responsibilities: AMEE Guide No. 84. *Medical Teacher*, *36*(1), 1–12. https://doi.org/10.3109/0142159X.2014.848269

Chin, L. C., Lin, G. Y., & Lin, K. H. (2022). Exploratory research on the improvement of financial literacy flipped learning effectiveness-based on guiding scaffold via Project-Based Learning approach. *J. Insur. Financ. Manag*, *7*(3), 22-34.

Dochy, F., Segers, M., Van den Bossche, P., & Gijbels, D. (2003). Effects of problem-based learning: A meta-analysis. *Learning and instruction*, *13*(5), 533-568. https://doi.org/10.1016/S0959-4752(02)00025-7

Ebun, A., Darussamin, A. M., & Safihie, S. F. M. (2018). Problem based Learning: A Pedagogical Approach to Learning in Accounting. *International Journal of Academic Research in Business and Social Sciences*, *8*, 729-738. https://doi.org/10.6007/IJARBSS/V8-I10/4775

Fathi Abdollahi, A., Nikbakht, M., Tahriri, A., & Mahmoodi, F. (2022). Effectiveness of problem-based learning on cognitive load and educational achievement in advanced financial accounting II classroom. *Journal of Modern Psychological Researches*, *16*(64), 132-152. https://doi.org/20.1001.1.27173852.1400.16.64.12.1

Gallego, A. C., Anes, J. A. D., Atoche, M. T. D., Borreguero, J. J. H., & López-Gavira, R. (2018). The effectiveness of the project-based learning (PBL) approach in undergraduate

accounting education. *Educade: revista de educación en contabilidad, finanzas y administración de empresas*, (9), 65-83. http://dx.doi.org/10.12795/EDUCADE.2018.i09.05

Gijbels, D., Dochy, F., Van den Bossche, P., & Segers, M. (2005). Effects of problem-based learning: A meta-analysis from the angle of assessment. *Review of educational research*, *75*(1), 27-61.

Henderson, S., Peirson, G., Herbohn, K., & Howieson, B. (2015). *Issues in financial accounting*. AU: Pearson Higher Education.

Huang, W., Li, X., & Shang, J. (2023). Gamified Project-Based Learning: A Systematic Review of the Research Landscape. *Sustainability*, 15(2), 940. https://doi.org/10.3390/su15020940

Kim, M. S. (2016). Development and effect of a Web-based problem-based learning system for an accounting course in engineering education. *World Trans. Eng. Technol. Educ*, *14*, 394-403.

Lee, Y. C. (2025). Changes in learning outcomes of students participating in problem-based learning for the first time: A case study of a financial management course. *The Asia-Pacific Education Researcher*, *34*(1), 511-530. https://doi.org/10.1007/s40299-024-00873-y

LI, J. (2025). *Adaptation of Western Pedagogy in Chinese Higher Education: A Case Study of Project-Based Learning* (Doctoral dissertation, Durham University).

Li, M., & Rohayati, M. I. (2024). The Relationship between Learning Outcomes and Graduate Competences: The Chain-Mediating Roles of Project-Based Learning and Assessment Strategies. *Sustainability*, *16*(14), 6080. https://doi.org/10.3390/su16146080

Li, Z., Zheng, J. & Xiong, J. (2023). Examining Project-Based Governance of Higher Vocational Education in China: A Case Study. *High Educ Policy* **36**, 250–269. https://doi.org/10.1057/s41307-021-00251-z

Liu, Y. (2022). Reconstruction of practical teaching system of accounting major based on the integration of industry, finance and tax. *Curriculum and Teaching Methodology*, *5*(13). https://doi.org/10.23977/curtm.2022.051311

Loyens, S. M., Van Meerten, J. E., Schaap, L., & Wijnia, L. (2023). Situating higher-order, critical, and critical-analytic thinking in problem-and project-based learning environments: A systematic review. *Educational Psychology Review*, *35*(2), 39. https://doi.org/10.1007/s10648-023-09757-x

Mihălţan, D. C. (2019). Bridging the gap between theory and practice in accounting. *SEA-Practical Application of Science, 7*(20), 85-91.

Milne, M. J., & McConnell, P. J. (2001). Problem-based learning: a pedagogy for using case material in accounting education. *Accounting Education*, *10*(1), 61–82. https://doi.org/10.1080/09639280122712

Nguyen, H. T. M., Nguyen, G. T. C., Thai, L. T. H., Truong, D. T., & Nguyen, B. N. (2024).

Teaching Mathematics Through Project-Based Learning in K-12 Schools: A Systematic Review of Current Practices, Barriers, and Future Developments. *TEM Journal*, *13*(3).

Pan, G., Seow, P. S., Shankararaman, V., & Koh, K. (2021). An exploration into key roles in making project-based learning happen: Insights from a case study of a university. *Journal of International Education in Business*, *14*(1), 109-129. https://doi.org/10.1108/JIEB-02-2020-0018

Radianto, W. E. (2013). Using project-based learning (PBL) in management accounting course: lesson and reflection from entrepreneurship education. *Journal of Modern Accounting and Auditing*, *9*(9), 1186-1193.

Saraswati, R. S., Hapsari, D. W., & Budiharjo, R. (2025). Bridging the Gap Between Theory and Practice: A Problem-Based Learning Approach to Management Accounting in Indonesia. *Husnayain Business Review*, *5*(2), 180-189. https://doi.org/10.54099/hbr.v5i2.1491

Shiru, S. A. (2020). *Effects of Blended Learning and E-Learning on Students' Academic Achievement in Financial Accounting in Colleges of Education* (Master's thesis, Kwara State University (Nigeria).

Spraakman, G., & Jackling, B. (2014). A conceptual framework for learning management accounting. *Accounting Perspectives*, *13*(1), 61-81. https://doi.org/10.1111/1911-3838.12024

Stanley, T., & Marsden, S. (2012). Problem-based learning: Does accounting education need it?. *Journal of Accounting Education, 30*(3-4), 267-289. https://doi.org/10.1016/j.jaccedu.2012.08.005

Sugeng, B., & Suryani, A. W. (2020). Enhancing the learning performance of passive learners in a Financial Management class using Problem-Based Learning. *Journal of University Teaching and Learning Practice*, *17*(1), 1-21. https://doi.org/10.53761/1.17.1.5

Wang, S. (2020). Project-based language learning in China: A literature review. *Journal of language teaching and research*, *11*(1), 66-72. http://dx.doi.org/10.17507/jltr.1101.08

Wolcott, S. K., & Sargent, M. J. (2021). Critical thinking in accounting education: Status and call to action. *Journal of Accounting Education*, *56*, 100731.

Xu, X., Shen, W., Islam, A. Y. M., & Zhou, Y. (2023). A whole learning process-oriented formative assessment framework to cultivate complex skills. *Humanities and Social Sciences Communications*, *10*(1), 1-15. https://doi.org/10.1057/s41599-023-02200-0

Xu, Y., & Liu, W. (2010). A project-based learning approach: a case study in China. *Asia Pacific education review*, *11*(3), 363-370. https://doi.org/10.1007/s12564-010-9093-1

Yang, W., Su, X. Influence of family social capital on career calling: moderated mediation effect of family socioeconomic status. *Humanities & Social Sciences Communications* 12, 538 (2025). https://doi.org/10.1057/s41599-025-04851-7

Yang, W., Wang, Y., Choi, M., & Li, Y. (2024). Influence of mentoring on the proactive

behavior of new employees: moderated mediation effect of agreeableness. *Frontiers in Psychology*, *15*, 1370815. https://doi.org/10.3389/fpsyg.2024.1370815