

# Implementation of Outcome-Based Education in the Accounting Program for Undergraduate Engineering Students

Yuanyuan Cao<sup>1,2</sup>, Jinwen Lai<sup>1</sup>, Yitao Liu<sup>1,2\*</sup>, Di Yao<sup>1,2</sup>

<sup>1</sup>School of Economics and Management, Beijing Institute of Petrochemical Technology, Beijing, China

<sup>2</sup>Development Research Centre of Beijing New Modern Industrial Area, Beijing, China

Email: yuanyuancao@bipt.edu.cn, \*liyitao@bipt.edu.cn

**How to cite this paper:** Cao, Y. Y., Lai, J. W., Liu, Y. T., & Yao, D. (2024). Implementation of Outcome-Based Education in the Accounting Program for Undergraduate Engineering Students. *Creative Education*, 15, 1195-1209.

<https://doi.org/10.4236/ce.2024.156072>

**Received:** May 31, 2024

**Accepted:** June 24, 2024

**Published:** June 27, 2024

Copyright © 2024 by author(s) and Scientific Research Publishing Inc. This work is licensed under the Creative Commons Attribution International License (CC BY 4.0).

<http://creativecommons.org/licenses/by/4.0/>



Open Access

## Abstract

This study examined the implementation of the Outcome-Based Education (OBE) model in accounting courses for undergraduate engineering students. Data were collected through questionnaires and student feedback. Initially, societal needs and the specific demands of engineering students regarding accounting education were analyzed. Based on these insights, training objectives and learning outcomes were designed. Course content was then developed to align with these objectives, and teaching methods were outlined across pre-class, in-class, and post-class phases. Evaluations revealed significant improvements in student performance and engagement, with average scores rising from 78.2 to 90.93. Most disciplines showed substantial improvements following the implementation of OBE. Feedback from students and peers highlighted areas for continuous improvement in classroom interaction, including optimizing interaction frequency, methods, technologies, and scenario design. This study confirms the effectiveness of OBE in interdisciplinary teaching and the positive impact of interactive teaching strategies on student learning outcomes. By prioritizing student needs and real-world applications, OBE significantly enhances engagement and academic performance. The findings offer valuable insights for course designers and policy-makers, emphasizing the importance of diverse teaching methods and the support of interdisciplinary courses to meet educational and societal demands.

## Keywords

OBE Concept, Accounting Curriculum, Undergraduate Engineering Students

## 1. Introduction

New Engineering Education (NEE) is an educational reform initiative that has gained significant momentum globally, particularly in China. It aims to cultivate future engineering talents through educational innovation, addressing the needs of the new technological revolution and industrial transformation (Koh & Zhuang, 2020). NEE emphasizes not only the depth and specialization of engineering disciplines but also focuses on interdisciplinary integration and innovation, aligning closely with contemporary technological advancements and industrial demands (Beemt et al., 2020). This approach promotes a transition from traditional engineering education to a more open, comprehensive, and flexible model, enhancing the practical application and cultivation of innovative abilities.

Incorporating accounting disciplines into NEE has several significant implications (Rugarcia et al., 2000). It enhances project management capabilities, enabling students to manage costs and budgets more effectively. It strengthens financial decision-making skills, allowing for informed decisions regarding investments, cost control, and resource allocation. Additionally, it enriches the knowledge base by providing a necessary financial and economic background for interdisciplinary teamwork. This integration fosters business awareness and entrepreneurship, promoting innovative thinking and facilitating the commercialization of technological achievements. Furthermore, it helps students understand and adapt to economic changes, managing potential economic risks. Overall, incorporating accounting into NEE enhances the professional capabilities of engineering students, promotes comprehensive development, and increases their competitiveness and innovative abilities.

Despite these benefits, accounting education for engineering students faces several significant challenges (Mudaa et al., 2013). There is a disconnect between theory and practice, with traditional education focusing primarily on theoretical knowledge and lacking real-world application training. Additionally, accounting is often taught in isolation, limiting its integration with engineering disciplines. Traditional teaching methods, which rely heavily on lectures and written exams, lack interactivity and innovation, failing to engage students effectively. Furthermore, essential soft skills such as communication, teamwork, and critical thinking are often overlooked. Addressing these issues requires comprehensive reform and innovation in accounting teaching strategies, including updating content, adopting interactive teaching methods, strengthening interdisciplinary course design, and linking teaching outcomes to practical engineering practice.

The student-centered reform of the accounting curriculum for engineering students within the NEE framework is highly significant (Draz, 2017). This reform enhances the quality of education and student learning outcomes through practice, case analysis, and project-based learning. It promotes the integration of accounting knowledge with engineering disciplines, stimulating innovative thinking and problem-solving skills. Additionally, it helps students acquire financial and management skills, aligning with industry demands for versatile talents and

increasing their market competitiveness. Overall, this reform aligns accounting education with the evolving needs of engineering students and industry trends, ensuring comprehensive development and preparedness for future career challenges.

## 2. Literature Review

### 2.1. Student-Centered Teaching Paradigm Reform

The concept of Outcome-Based Education (OBE) was first proposed by American scholar Spady in 1991, after reflecting on the practicality of education and the importance of educational outcomes. It refers to designing and implementing the teaching process around student learning outcomes, ensuring that students can actively participate, independently explore, and ultimately achieve the established learning objectives. The OBE demonstrates characteristics such as being student-centered (Yasmin & Yasmeen, 2021), employing backward design (Liao, 2022), and flexibility (Xu et al., 2021).

Literature indicates that Outcome-Based Education (OBE), as an emerging educational development concept, has achieved significant results in guiding instructional design, curriculum setup, learning objectives, and faculty development (Zhang, 2023). From an instructional design perspective, applying the OBE teaching concept to fields such as medicine (Huang et al., 2023; Feng et al., 2022) and English (An, 2022; Jin, 2021) enriches learning diversity (Wang, 2023). This approach enhances the educational experience by incorporating diverse teaching methods and materials tailored to specific disciplines. In terms of curriculum setup, improving the curriculum system with clear objectives, relevant content, effective methods, and thorough evaluation focuses on cultivating students' problem-solving abilities. This modular approach builds both soft and hard skills, further enhancing the competitiveness of specialized students (Lou & Ouyang, 2021). Regarding learning objectives, implementing OBE-based teaching makes these objectives clear and aligns them with the skills needed in the job market (Wang, 2023). This ensures that classroom teaching is relevant and directly applicable to students' future careers. From the perspective of faculty development, OBE-based teaching measures strengthen the construction of professional practice faculty teams (Zhang, 2023), promoting the maturation and effectiveness of the teaching staff (Zou & Nie, 2022).

To make the OBE concept more compatible with teaching content and better align with instructional design, it is essential to integrate the Internet with the OBE concept. By combining online and offline learning methods, a more flexible and personalized learning experience can be provided (An, 2022). Additionally, strengthening professional development through a student-centered integrated teaching method that combines OBE and BOPPPS (Bridge-in, Objective, Pre-assessment, Participatory Learning, Post-assessment, and Summary) can improve teaching effectiveness (Niu, 2023). Moreover, expanding multidimensional evaluation models, focusing on needs, and establishing an emergency im-

provement system are necessary to ensure the continuous enhancement of teaching quality and effectiveness (Zhang et al., 2022).

This comprehensive approach to integrating OBE into educational practices ensures that teaching methods are relevant, effective, and adaptable to the evolving needs of students and the job market.

## 2.2. Enhancing Accounting Education for Engineering Students

Accounting education for engineering students encounters several significant challenges. Non-accounting students often receive low-quality accounting instruction due to insufficient emphasis on the subject (Mudaa et al., 2013) and a lack of foundational understanding. Engineering students, in particular, find it difficult to grasp accounting concepts and achieve satisfactory results in these courses (Draz, 2017).

Tan and Laswad (2006) highlighted the necessity of differentiating the teaching approach for accounting based on students' major. While accounting majors are typically driven by personal interest, non-accounting students are primarily motivated by external factors (Owusu et al., 2019).

To address these challenges, Adebisi et al. (2023) recommend that policymakers in accounting education develop curricula that effectively integrate Science, Technology, Engineering, and Mathematics (STEM) concepts into accounting courses. This approach could make the curriculum more engaging for students from various backgrounds. Additionally, accounting faculty in tertiary institutions should play a pivotal role in promoting STEM integration and inclusivity. This can be achieved by conducting training sessions focused on STEM-related skills, inclusive teaching methods, and cultural sensitivity.

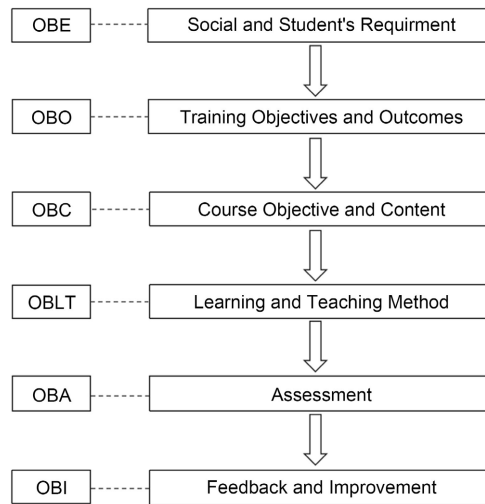
Incorporating these strategies can help bridge the gap between engineering and accounting education, ensuring that non-accounting students receive the necessary support and resources to succeed in accounting courses.

## 3. Accounting Curriculum Design Based on OBE Concept

The OBE (Outcome-Based Education) teaching process starts by identifying the needs of both society and students (OBE). Based on these needs, we establish training objectives and expected outcomes (OBO), along with specific course goals and content (OBC). The next step involves selecting and developing appropriate teaching methods and resources, and designing instructional activities that support students in achieving their learning outcomes (OBLT). To evaluate whether students have met these expected outcomes, we use both formative and summative assessments (OBA). The results from these assessments are then fed back into the teaching process, allowing for timely adjustments and improvements. Finally, based on the evaluation results and feedback, the teaching design and implementation are continuously optimized to enhance teaching quality (OBI).

This iterative process embodies the principles of outcome-based education, ensuring that teaching activities effectively develop students' skills and qualities

to meet the expectations of both society and students. The specific approach is shown in **Figure 1**.



**Figure 1.** OBE-based teaching model.

### 1) Societal Needs and the Demand for Accounting Education among Engineering Students

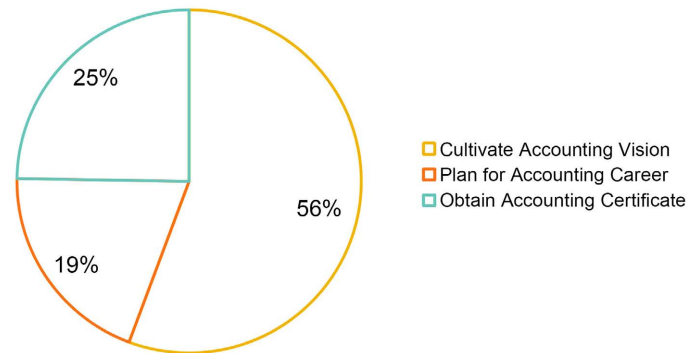
The expanding responsibilities of engineering professionals underscore the growing importance of accounting education for engineering students. To navigate modern project management and market competition effectively, engineers need a wide range of skills, including technology, project management, budget control, and financial decision-making. In today's rapidly changing socio-economic environment, engineers are increasingly taking on roles in project management, budget control, and financial decision-making, beyond their traditional technical duties. Financial and accounting knowledge has become crucial, as professionals are now expected to understand financial statements, perform cost-benefit analyses, engage in budget planning, and manage risks. These skills are essential for adapting to complex project demands and remaining competitive in the market.

The demand for accounting education among engineering students is both urgent and varied. The accounting course, which accommodates 100 students, consistently reaches full enrollment each year. At the beginning of the course, we conducted a survey to understand their motivations for studying basic accounting. From the 97 questionnaires collected (**Table 1** and **Figure 2**), 55.67% of students indicated they chose accounting to broaden their perspectives and become versatile professionals with an accounting background. Additionally, 19.59% planned to switch careers to accounting, while 24% aimed to obtain an accounting certificate to enhance their employment competitiveness.

These insights highlight the growing importance of integrating accounting education into engineering curricula to prepare students for the multifaceted challenges of their future careers.

**Table 1.** The motivation of engineering students for accounting education.

Students' Motivation	Count	Percentage
Cultivate Accounting Vision	54	55.67%
Plan for Accounting Career	19	19.59%
Obtain Accounting Certificate	24	24.74%



**Figure 2.** The motivation of engineering students for accounting education.

## 2) Training Objectives and Learning Outcomes

Following the OBE (Outcome-Based Education) teaching concept and the requirements for cultivating financial and accounting literacy, the course is designed with three major objectives: knowledge objectives, skill objectives, and value objectives (Table 2). Knowledge Objectives: Master the fundamental theories, principles, and methods of finance and accounting, familiar with the composition and analysis methods of financial statements, and understand the basic concepts of budget control and cost management. Skill Objectives: Develop students' abilities in financial statement analysis, budget preparation and execution, cost-benefit analysis, and the application of financial knowledge in project management. Value Objectives: Establish correct financial management concepts, understand the importance of financial decision-making in business and project management, cultivate students' professional ethics and teamwork spirit, and enhance students' adaptability and innovation abilities in complex economic environments.

**Table 2.** OBE-based course objectives.

Course Objectives	Learning Outcomes
Knowledge Objectives	Master the fundamental theories, principles, and methods of accounting
	Familiar with the composition and analysis methods of financial statements
	Understand the basic concepts of budget control and cost management
Skill Objectives	Develop students' abilities in financial statement analysis
	Improve students' budget preparation and execution skills
	Enhance students' cost-benefit analysis capabilities
Value Objectives	Strengthen students' ability to apply financial knowledge in project management
	Understand the importance of financial decision-making in project management
	Cultivate students' professional ethics

### 3) Course Content Based on Objectives

The OBE based accounting course design is specifically tailored for engineering students. It encompasses three objectives: knowledge objectives, skill objectives, and value objectives. **Table 3** shows the course content in detail. The knowledge objectives focus on enabling students to master fundamental accounting theories, understand the composition and analysis of financial statements, and gain proficiency in budget control and cost management. The skill objectives aim to develop students' abilities to perform financial statement analysis, prepare and execute budgets, conduct cost-benefit analyses, and apply financial principles in project management scenarios. The value objectives emphasize the significance of financial decision-making within project management, underscore the importance of professional ethics, and foster a spirit of teamwork. To achieve these objectives, the course employs a combination of online and off-line learning modalities, interactive teaching methods, practical exercises, and case analysis. By integrating these methods, the course design aspires to enhance students' comprehensive abilities, ensuring they can effectively apply theoretical knowledge to practical contexts and meet the evolving demands of their future careers.

**Table 3.** OBE based course content.

Objective	Content	Teaching Methods
Knowledge Objectives	<b>Fundamental Accounting Theory</b> Definition, objectives, and basic assumptions of accounting Accounting equation and basic accounting principles Structure and function of accounting information systems	<b>Blended Learning:</b> Online course videos and materials, offline seminars, and case studies <b>Interactive Teaching:</b> Classroom Q&A and real-time feedback
	<b>Financial Statement Composition and Analysis</b> Structure of the balance sheet, income statement, and cash flow statement Financial statement analysis methods (ratio analysis, trend analysis) Key items and indicators in financial statements	
	<b>Budget Control and Cost Management</b> Basic processes and methods of budget preparation Concepts and classifications of costs Basic strategies for cost control and management	
	<b>Financial Statement Analysis Ability</b> Case studies: Interpreting company financial statements Ratio analysis exercises: Current ratio, quick ratio, asset turnover ratio, etc. Interpretation and application of financial data	
	<b>Budget Preparation and Execution Ability</b> Project budget preparation and management Common issues and solutions in budget execution Budget variance analysis and adjustment strategies	
	<b>Cost-Benefit Analysis Ability</b> Project budget preparation and management Common issues and solutions in budget execution Budget variance analysis and adjustment strategies	
Skill Objectives	<b>Financial Applications in Project Management</b> Basic concepts and processes of project management Preparation of project financial plans Project performance evaluation and financial risk management	<b>Blended Learning:</b> Online course videos and materials, offline seminars, and case studies <b>Practical and Case Analysis:</b> Hands-on case analysis and exercises, corporate financial simulation and internship opportunities

Continued

<b>Value Objectives</b>	<b>Importance of Financial Decision-Making in Project Management</b>	<b>Interactive Teaching:</b>
	Case studies on the impact of financial decisions on project success	Group discussions and project collaboration
	Identification and analysis of key financial decision points	
	Ethics and responsibility in financial decision-making	<b>Multidimensional Evaluation:</b>
	<b>Professional Ethics and Teamwork Spirit</b>	Assignments and class participation, periodic exams and final exams, project reports and case analysis
	Basic principles of financial professional ethics	
	Importance of teamwork in financial work	
	Case discussions: Conflicts and resolutions in professional ethics	

**4) Learning and Teaching Method**

Learning and teaching of accounting course is divided into three stages: pre-class, in-class, and post-class (Table 4).

**Table 4.** Learning and teaching method in different stage.

Stage	Students' Perspective	Teachers' Perspective
Pre-Class	Utilize online and offline resources to preview material	Upload learning materials (chapter slides, cases, exercises) to the cloud classroom platform
	Summarize content by drawing mind maps	
	Leave comments when encountering difficulties	
In-Class	Participate in flipped classroom and interactive discussions	Employ cooperative teaching methods with information technology tools to enhance interaction Address questions from online learning and explain key and difficult points Guide students in exploring topics and presenting findings Organize activities such as selecting students to answer questions and quick response contests
	Engage in group discussions on cases	
	Participate in activities like answering questions and quick response contests	
Post-Class	Complete exercises	Use data from the cloud classroom platform to track students' learning progress Provide personalized tutoring for students with poor learning outcomes Conduct targeted teaching to help students consolidate knowledge and deepen understanding
	Receive personalized tutoring if learning outcomes are poor	
	Identify gaps in knowledge and engage in targeted learning	

**Pre-Class Stage: Online Preview**

In this stage, students engage in self-directed learning. Teachers upload learning materials, such as chapter slides, cases, and exercises, to the cloud classroom platform. Students utilize both online and offline resources to preview the material, summarize content by drawing mind maps, and leave comments when encountering difficulties. This approach fosters self-learning and problem-solving abilities.

**In-Class Stage: Flipped Classroom and Interactive Discussion**

Cooperative teaching methods are employed, utilizing information technology tools to enhance interaction. Teachers address questions arising from online learning and explain key and difficult points. Through group discussions on cases, teachers guide students to explore topics and present and evaluate their findings. Activities such as selecting students to answer questions and quick response contests enliven the atmosphere, enhance analytical and problem-solving

skills, and shift the focus from teacher-centered to student-centered learning.

#### Post-Class Stage: Consolidation and Deepening

Students complete exercises, and teachers use data from the cloud classroom platform to track their learning progress. For students with poor learning outcomes, personalized tutoring is provided to identify gaps and conduct targeted teaching. This stage ensures that students consolidate their knowledge and deepen their understanding of the material.

#### 5) Assessment of Learning Outcomes

The assessment and grading scheme aims to provide a comprehensive evaluation of students' knowledge, skills, and values by combining continuous assessment (formative) and final assessment (summative). The specific weight of each component is determined based on the course's key points and the students' overall situation.

The assessment for the OBE-based accounting course for engineering students is structured to ensure a comprehensive evaluation of their knowledge, skills, and engagement (Table 5). Participation and engagement contribute 10% to the final grade, assessing students' involvement in online discussions, group activities, and classroom interactions. Another 10% is allocated to mind maps and reflective journals, which evaluate students' ability to summarize their learning progress and develop critical thinking. Online quizzes and assignments also account for 10%, providing regular monitoring of ongoing learning and immediate feedback. Similarly, case studies and project reports, which make up another 10%, are used to evaluate students' ability to apply theoretical knowledge to practical scenarios. Presentations and group discussions, contributing 10%, assess communication skills and collaborative efforts. Finally, the weightiest component, the final exams, constitutes 50% of the total grade, comprehensively assessing students' understanding of key concepts, theories, and applications.

**Table 5.** OBE-based accounting course assessment for engineering students.

Assessment Component	Type	Weight	Description
Participation and Engagement	Formative	10%	Assessment of participation in online discussions, group activities, and classroom interactions
Mind Maps and Reflective Journals	Formative	10%	Evaluation of mind maps and reflective journals summarizing learning progress and critical thinking development
Online Quizzes	Formative	10%	Regular quizzes and assignments to monitor ongoing learning and provide immediate feedback
Case Studies and Project Reports	Summative	10%	Detailed evaluation of students' ability to apply theoretical knowledge to practical scenarios
Presentations and Group Discussions	Summative	10%	Assessment of communication skills and collaborative work through presentations and discussions
Final Exams	Formative	50%	Comprehensive exams assessing students' understanding of key concepts, theories, and applications

#### 6) Assessment of OBE Teaching Effectiveness

There are 99 students enrolled in this course, most of whom are from engineering disciplines, including Safety Engineering, Materials Science and Engi-

neering, Oil and Gas Storage and Transportation Engineering, Big Data Management and Application and others (see **Table 6**).

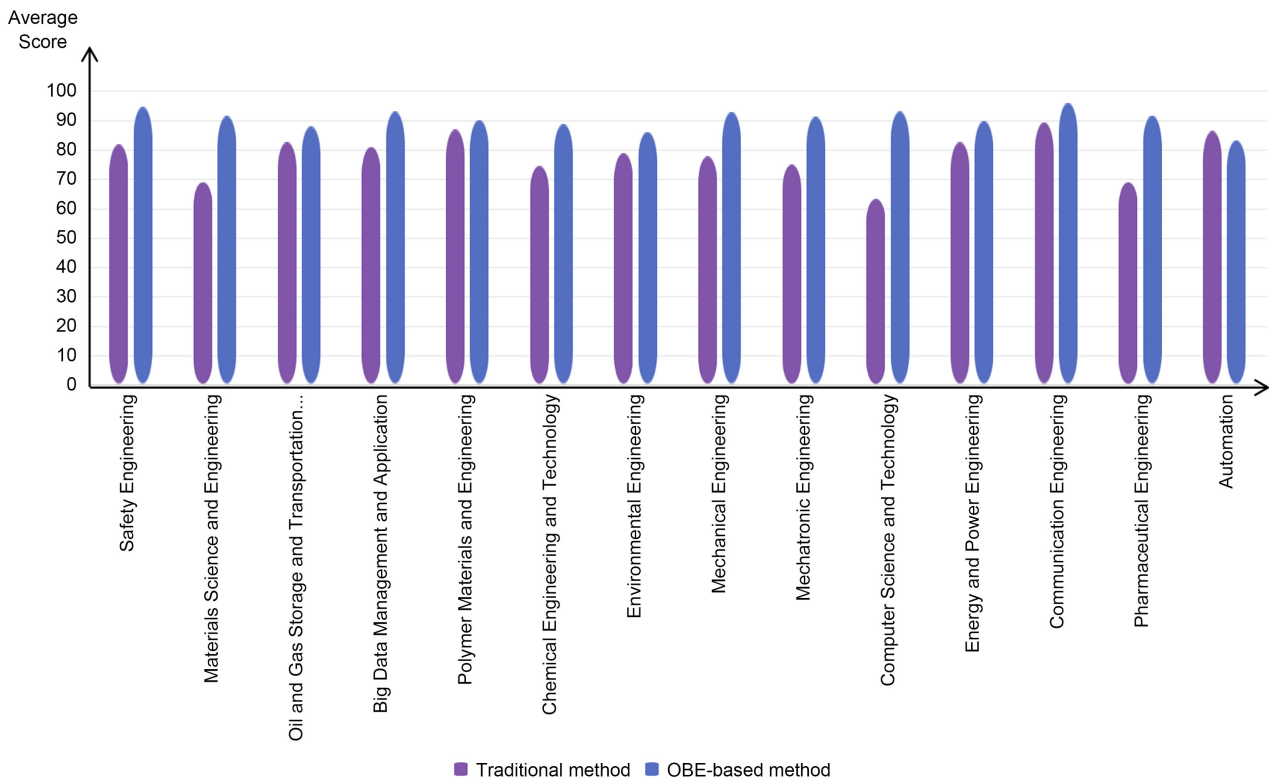
**Table 6.** The impact of OBE on student performance.

Major	Traditional method				OBE-based method			
	N	≥60 pass	<60 failure	Average Score	N	≥60 pass	<60 failure	Average Score
Safety Engineering	8	8	0	81.83	8	8	0	94.63
Materials Science and Engineering	9	7	2	69.03	3	3	0	91.50
Oil and Gas Storage and Transportation Engineering	6	5	1	82.62	1	1	0	88.00
Big Data Management and Application	4	3	1	81.00	2	2	0	93.00
Electrical Engineering and Automation	0	0	0	0.00	1	1	0	96.00
Polymer Materials and Engineering	3	3	0	86.92	11	11	0	90.17
Chemical Engineering and Technology	2	2	0	74.50	4	4	0	88.75
Environmental Engineering	8	6	2	78.87	4	4	0	86.08
Exhibition Economy and Management	2	2	0	78.63	3	3	0	85.50
Mechanical Engineering	8	7	1	77.75	10	10	0	92.90
Mechatronic Engineering	10	8	2	74.95	3	3	0	91.25
Computer Science and Technology	4	2	2	63.25	4	4	0	93.00
Tourism Management	7	6	1	83.63	7	7	0	93.87
Energy and Power Engineering	3	3	0	82.58	5	5	0	89.83
Human Resource Management	9	9	0	74.54	8	8	0	92.19
Communication Engineering	2	2	0	89.37	1	1	0	96.00
Internet of Things Engineering	0	0	0	0.00	6	6	0	87.67
New Energy Science and Engineering	0	0	0	0.00	3	3	0	84.17
Pharmaceutical Engineering	1	1	0	69.00	11	11	0	91.68
Automation	2	2	0	86.38	4	4	0	83.17
Biopharmaceuticals	5	5	0	79.30	0	0	0	0
Robotics Engineering	5	5	0	79.38	0	0	0	0
Applied Statistics	1	1	0	83.75	0	0	0	0
Total	99	87	12	78.20	99	99	0	90.93

The feedback on the results (**Table 6**) indicates a significant improvement in student performance following the implementation of the OBE method. Prior to implementation, the average score was 78.2, with 12 students failing the examination. After the OBE method was introduced, the average score rose to 90.93, an increase of 16.27%. Notably, there were no failing students under the new method, and the number of students scoring above 90 increased by 46.6%.

We conducted a comparative analysis of the learning outcomes of students across various engineering disciplines following the implementation of OBE.

**Figure 3** visually represents the effectiveness of OBE teaching, focusing exclusively on engineering disciplines that had a non-zero student count both before and after implementation. The findings indicate that most disciplines experienced significant improvements in student learning outcomes post-OBE implementation. However, an exception was observed in the Automation discipline, where a slight decline in average student scores occurred. This decrease may be attributed to variations in student enrollment numbers.



**Figure 3.** The impact of OBE on student performance in engineering majors.

Overall, the OBE-based teaching model has clearly enhanced student outcomes, created a more dynamic and interactive learning environment, and better prepared students to address complex accounting challenges.

#### 7) Continuous Improvement

The goal of continuous improvement and optimization is to ensure that the teaching methods and learning outcomes remain effective and relevant, adapting to the evolving needs of students and the educational environment.

**Student feedback and improvement:** Collect regular feedback from students through surveys for improving the class interaction. From the survey data, it is clear that students have a preference for moderate levels of interaction in the classroom, with most favoring 3 - 5 interactions per class (**Table 7**). When it comes to the method of interaction, the data shows that group discussion is the most commonly used interaction method, accounting for the highest proportion at 34.72%. This is followed by random selection at 31.94%. Volunteering to an-

swer and buzzing in are relatively less common, accounting for 23.61% and 9.72%, respectively. This indicates that in classroom interactions, students are more inclined to participate in group discussions, and teachers also more frequently use group discussions and random selection to promote student engagement (Table 8).

**Table 7.** How frequently should teachers interact with students during class?

Interaction frequency	Count	Percentage
3 - 5 times	37	51.39%
5 - 7 times	25	34.72%
7 - 10 times	7	9.72%
More than 10 times	3	4.17%

**Table 8.** Which method of interaction do student prefer?

Method	Count	Percentage
Random Selection	23	31.94%
Volunteering to Answer by Raising Hand	17	23.61%
Buzzing in	7	9.72%
Group Discussion	25	34.72%

These insights suggest that teachers should aim to balance their interaction frequency to around 3 - 5 times per class, using a variety of methods, with an emphasis on group discussion and random selection. This approach could enhance engagement and participation, catering to the preferences of the majority of students.

Peer feedback and improvement: Gather suggestions from educational expert regarding the improvement of engagement techniques. To enhance classroom engagement, it is essential to use interactive tools such as clickers, online polls, and educational apps for quick responses and random selection. Incorporating visual aids and practical examples can simplify abstract accounting concepts, making them more relatable and easier to understand. Additionally, introducing gamified elements, such as competitive quizzes and team challenges, can make learning more enjoyable and motivating.

#### 4. Conclusion and Implications

This study successfully revamped the general accounting course for engineering students by adopting a student-centered, outcome-based education (OBE) model. This approach effectively addressed the gap between traditional accounting education and the unique needs of engineering students and industry trends.

The study began by analyzing societal needs and the specific demands of engineering students regarding accounting education. Based on these insights, we designed training objectives and learning outcomes that integrated teaching

content with practical engineering applications, ensuring relevance and direct applicability to students' future careers. We developed course content aligned with these objectives and outlined teaching methods from three perspectives: pre-class, in-class, and post-class. The use of diverse interactive teaching methods created a more engaging and dynamic learning environment. Evaluations of student learning outcomes revealed significant improvements in both performance and engagement, with the average score increasing from 78.2 to 90.93. Feedback from students and peers highlighted areas for continuous improvement in classroom interaction.

To further enhance student engagement, we plan to refine various aspects of interaction, including frequency, methods, technology, and scenario design. Specifically, we aim to maintain an interaction frequency of about 3 to 5 times per class, focusing on group discussions and random selection. Introducing gamified elements such as competitive quizzes and team challenges will make the learning process more enjoyable and motivating. We will utilize interactive tools like clickers, online polls, and educational apps to facilitate quick responses and random selection. Additionally, incorporating visual aids and practical examples will simplify abstract accounting concepts, making them more relatable and easier to understand. Overall, this reform has laid a solid foundation for students to navigate the complex economic environment and meet future career demands.

This paper makes two significant contributions to the research on Outcome-Based Education (OBE) theory. Firstly, our study confirms the effectiveness of OBE theory in interdisciplinary teaching practices. By prioritizing student needs and real-world application scenarios in course design, we found that this approach significantly enhances student engagement and academic performance. This finding provides empirical support for the efficacy of OBE theory in educational practice. Secondly, the paper explores the role of interactive teaching strategies within the OBE framework. Through the analysis of student surveys, we identified a strong demand for diversity and improvement in teaching interactions. This research further validates the positive impact of diversified teaching methods on student learning outcomes, reinforcing the core principles of OBE theory.

On a practical level, this study offers valuable insights for both course designers and policymakers. For course designers, the findings suggest that they should prioritize student needs and real-world applications in course design. Incorporating a variety of teaching methods and interactive tools can significantly enhance educational effectiveness. For policymakers, the study highlights their crucial role in advancing educational reform. This includes encouraging and supporting the development and implementation of interdisciplinary courses and providing the necessary resources and technological support to meet the educational demands and expectations of both industry and society.

Additionally, the findings of this paper offer both theoretical and practical

references for educational reforms, aiding in the enhancement of education quality to adapt to the constantly evolving social and economic environment.

### Supporting Projects

Key Projects of Educational Teaching Reform and Research of Beijing Institute of Petrochemical Technology: Research on the reform of “General Accounting” Course under the New Engineering Education Background Based on OBE Concept (ZDFS GG202104003).

Key Project of Education Reform of Beijing Institute of Petrochemical Technology: Student-centered curriculum development for the “Financial Consumer Education Program” (ZDFS GG202104001).

Key Projects of Educational Teaching Reform and Research of Beijing Institute of Petrochemical Technology: Research on the Student-centered Teaching Reform of International Logistics Course (ZDFS GG202104004).

### Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

### References

- Adebisi, O. O., Olabanji, S. O., & Olaniyi, O. O. (2023). Promoting Inclusive Accounting Education through the Integration of Stem Principles for a Diverse Classroom. *Asian Journal of Education and Social Studies*, *49*, 152-171. <https://doi.org/10.9734/ajess/2023/v49i41196>
- An, J. (2022). Excellent English Writing Performance Cultivation Mode of Three-Type-Oriented Talents Based on OBE Concept. *Advances in Education, Humanities and Social Science Research*, *1*, 175-180. <https://doi.org/10.56028/ae hssr.1.1.175>
- Draz, M. U. (2017). Teaching Accounting to Engineering Students and the Use of Concept Mapping: A Preliminary Review. In 2017 7th World Engineering Education Forum (WEEF) (pp. 765-767). IEEE. <https://doi.org/10.1109/weef.2017.8467049>
- Feng, L., Liang, R., Xu, Y., & Deng, J. (2022). Reform and Innovation of Teaching Mode of Prosthodontics Guided by OBE Concept. *International Journal of Education and Humanities*, *6*, 1-4. <https://doi.org/10.54097/ijeh.v6i1.2937>
- Huang, Y., Guo, H., & Li, Y. (2023). Study on the Construction and Practice of Blended Teaching Mode of Emergency First Aid Specialty Based on OBE Concept. *Medicine*, *102*, e34252. <https://doi.org/10.1097/md.00000000000034252>
- Jin, F. (2021). Exploring the Blended Teaching Mode under the Guidance of OBE Theory—Taking the Course of English Newspaper Reading I in Zhejiang Yuexiu University as an Example. *Open Journal of Modern Linguistics*, *11*, 511-519. <https://doi.org/10.4236/ojml.2021.114038>
- Koh, A., & Zhuang, T. (2020). “New Engineering Education” in China: A National Technological Imaginary of the Chinese Dream. *Asia Pacific Education Review*, *22*, 31-40. <https://doi.org/10.1007/s12564-020-09651-z>
- Liao, H. (2022). Research on Teaching Reform of Business Majors in Chinese Higher Vocational Colleges—Based on the Concept of OBE. *Journal of Advanced Research in Education*, *1*, 22-30. <https://doi.org/10.56397/jare.2022.12.02>

- Lou, J., & Ouyang, Q. (2021). Exploration of Extracurricular Practice Teaching Mode of Mechanical Innovative Design Based on OBE Concept. *Advances in Educational Technology and Psychology*, 5, 106-114.
- Muda, S., Hussin, A. H., Johari, H., Sapari, J. M., & Jamil N. (2013). The Key Contributing Factors of Non-Accounting Students' Failure in the Introduction to Financial Accounting Course. *Procedia-Social and Behavioral Sciences*, 90, 712-719.  
<https://doi.org/10.1016/j.sbspro.2013.07.144>
- Niu, K. (2023). Research on "Mixed" Teaching Results Based on OBE Concept and BOPPPS Teaching Mode. *Journal of Education and Educational Research*, 2, 79-81.  
<https://doi.org/10.54097/jeer.v2i2.6445>
- Owusu, G. M. Y., Bekoe, R. A., Okyere, S. A., & Welbeck, E. E. (2019). What Influences the Course Major Decision of Accounting and Non-Accounting Students? *Journal of International Education in Business*, 12, 26-42.  
<https://doi.org/10.1108/jieb-02-2018-0004>
- Rugarcia, A., Felder, R. M., Woods, D. R., & Stice, J. E. (2000). The Future of Engineering Education: Part 1. a Vision for a New Century. *Chemical Engineering Education*, 34, 16-25.
- Tan, L. M., & Laswad, F. (2006). Students' Beliefs, Attitudes and Intentions to Major in Accounting. *Accounting Education*, 15, 167-187.  
<https://doi.org/10.1080/09639280600787194>
- van den Beemt, A., MacLeod, M., Van der Veen, J., Van de Ven, A., van Baalen, S., Klaassen, R. et al. (2020). Interdisciplinary Engineering Education: A Review of Vision, Teaching, and Support. *Journal of Engineering Education*, 109, 508-555.  
<https://doi.org/10.1002/jee.20347>
- Wang, Q. (2023). Discussion on Mixed Teaching Mode of Foundation of Mechanical Control Engineering under OBE Concept. *Advances in Education, Humanities and Social Science Research*, 8, 17-20. <https://doi.org/10.56028/aehtsr.8.1.17.2023>
- Xu, G., Shi, L., Xiao, P., & Zhang, Z. (2021). Exploration of E-Commerce Talents Training Mode Based on CDIO-OBE Concept. *European Journal of Education and Pedagogy*, 2, 20-24. <https://doi.org/10.24018/ejedu.2021.2.4.156>
- Yasmin, M., & Yasmeen, A. (2021). Viability of Outcome-Based Education in Teaching English as Second Language to Chemical Engineering Learners. *Education for Chemical Engineers*, 36, 100-106. <https://doi.org/10.1016/j.ece.2021.04.005>
- Zhang, H. (2023). Construction of Application-Oriented Practical Teaching System in Private Undergraduate Colleges Based on OBE Concept. *International Journal of Education and Humanities*, 8, 213-219. <https://doi.org/10.54097/ijeh.v8i3.8729>
- Zhang, Y., Wen, X., Feng, Z., Zhao, J., & Wang, K. (2022). Influence on the Training Mode of Talents in Fire Engineering Colleges Based on OBE. *International Journal of Learning and Teaching*, 8, 108-114. <https://doi.org/10.18178/ijlt.8.2.108-114>
- Zou, Q. and Nie, F. (2022) Research on the Innovation of Teaching Mode of "Freshman Seminar" in Applied Universities under the Concept of OBE Based on the Change of Emotional Behavior—Taking Physical Education Major Of Nanchang Normal University as an Example. *International Journal of Neuropsychopharmacology*, 25, A49.  
<https://doi.org/10.1093/ijnp/pyac032.067>