

Improving the Quality of The Operations Management Course (Opm549) Via Project-Based Learning: A Study at Universiti Teknologi Mara, Puncak Alam, Selangor, Malaysia.

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Abstract: The article investigates the effects of implementing Project-Based Learning (PBL) in Operations Management course at Universiti Teknologi MARA, Puncak Alam, Selangor, Malaysia involving a study with 240 students. This study employ a mixed-methods approach that includes theoretical examination, consultations with experts, and analysis of data. The research focuses on transitioning from conventional instructional methods to PBL. This shift highlights engaging students in practical, real-world challenges to enhance their grasp and application of operations management principles. Results show notable improvements in student engagement, comprehension, and overall satisfaction. Additionally, the article addresses the hurdles and considerations necessary for adopting PBL, underlines the critical role of teacher preparation, and explores the approach's feasibility for broad application and sustained influence across various educational contexts.

Keyword: Project-Based Learning; Operations Management Syllabus; Teacher Training In PBL; Scalability of Educational Methods; Malaysia

1. Introduction

In the changing terrain of higher education, conventional teaching techniques are being questioned for their ability to provide students with practical knowledge and skills. This issue is particularly acute in business and management disciplines, like Operations Management, where there is a clear demand for fresh teaching approaches. The study zeroes in on the adoption of Project-Based Learning (PBL) in Operations Management courses at the Universiti Teknologi MARA, Puncak Alam, Selangor, Malaysia with the goal of evaluating its effect on educational quality. The pedagogical strategy of PBL has seen a considerable increase in popularity recently. Butler et al. (2014) describe Project-Based Learning (PBL) as an educational approach that centers learning around projects or complex tasks, initiated by thorough inquiry processes that often include elements of student-led design and problem-solving. Within the field of business management, this methodology shifts the educational focus from traditional, lecture-based instruction to a more interactive, hands-on approach. Here, students embark on projects demanding the application of operations management concepts to solve real-world problems. The adoption of PBL in operations management is grounded in various educational theories. Jonassen (2010) point to the constructivist learning theory, which suggests that learners build their own understanding and knowledge of the world through experiences and reflection. This theory is particularly relevant to business and management, a discipline inherently based on applying concepts to decipher the business world.

Further supporting the PBL approach, research by Prince and Felder (2006) highlights that active learning strategies, including PBL, positively affect student attitudes and performance, especially in STEM (Science, Technology, Engineering, and Mathematics) fields. For operations management students, PBL provides a concrete and immersive method to engage with complex business and management ideas.

The effectiveness of PBL in enhancing operations management learning has been underscored in various studies, such as those by Alexander (2017). Their findings suggest that students participating in PBL exhibit significantly

greater mastery of operations management concepts than their peers in traditional lecture-based courses, thanks to deeper engagement and the practical application of knowledge in PBL scenarios.

This study builds on previous research by assessing the impact of PBL on Operations Management education quality at the Universiti Teknologi MARA, involving 240 students in Puncak Alam, Selangor, Malaysia. Employing a mixed-methods approach that combines theoretical exploration, expert feedback, and data analysis through SPSS software, this research aims to investigate the study's central question.

By providing a comprehensive review of PBL literature, detailing the study's methodology, presenting results, and discussing findings, this introduction lays the groundwork for a deeper examination of PBL's role in enhancing operations management syllabus. Ultimately, this study aims to enrich the broader discourse on the efficacy of PBL in higher education, with a specific focus on operations management syllabus within the Malaysia context.

2. Literature Review

Incorporating Project-Based Learning (PBL) into Operations Management education marks a notable departure from conventional teaching methods. This segment examines the current body of literature concerning PBL, with a specific emphasis on its application in operations management syllabus, its educational foundations, and the resulting impacts of these instructional approaches.

a. Pedagogical Foundations of PBL

Project-Based Learning draws heavily from constructivist educational theories, initially proposed by Dewey (1986) and further elaborated by Piaget (1970) and Vygotsky (1978). These theories underscore the importance of active involvement and first-hand experiences in the learning process. According to constructivism, knowledge is constructed by individuals as they interact with their environment (Bruner, 1961). Within this framework, PBL serves as a platform for students to actively construct their comprehension of operations management concepts through engaging in hands-on projects and tackling real-world problems.

Bell (2010) and Alexander et al. (2014) have emphasized that PBL not only fosters content knowledge but also nurtures the development of essential skills such as critical thinking, problem-solving, and collaboration. These proficiencies are particularly crucial in the field of business and management, where a profound grasp of concepts and the ability to apply them in practical contexts are paramount.

b. Implementation of PBL in Operations Management (OPM549)

PBL's integration into operations management syllabus has been investigated across diverse educational environments. Efstratia (2014) delineated the fundamental components of PBL as an instructional approach, encompassing student-centered learning, a central question or challenge, investigative tasks, and reflective practices. In the realm of operations management, these elements translate to students embarking on projects that tackle authentic operations management issues, conducting experiments, and reflecting on their observations.

Research by Geier et al. (2008) showcased that students in operations management class utilizing PBL methodologies exhibited heightened engagement and a more profound comprehension of operations management principles compared to those in conventional lecture-based courses. This was attributed to the dynamic learning atmosphere cultivated by PBL, where students are active participants in the learning journey rather than passive recipients of information.

Operation Management (OPM549) Syllabus

2.2.2.1. Course Overview

This course delves into the advanced concepts, challenges, and methodologies crucial for managing operations efficiently and effectively in the business realm. It explores the operational principles within both manufacturing and service-oriented organizations. Emphasis is placed on strategic decision-making in operations management within an organizational context.

2.2.2.2. Course Outcomes

- i Grasp the decision-making strategies in Operations Management within an organization.
- ii Recognize and address issues pertinent to an organization's operations.
- iii Exhibit and implement Operations Management principles in both the manufacturing and service industries.

2.2.2.3. Course Syllabus

<p>Introduction</p> <p>1.1. Understanding operations management</p> <p>1.2. Production of goods and services</p> <p>1.3. Tenth OM decision strategies</p> <p>1.4. Measuring productivity for products and services</p> <p>1.5. Global operations strategies options</p>
<p>Product Design, Process and Layout Strategies</p> <p>2.1. Phases of product design and development</p> <p>2.2. Quality function deployment</p> <p>2.3. Process selection</p> <p>2.4. Facilities layout</p> <p>2.5. Designing process layout</p> <p>2.6. Assembly Line balancing (C)</p>
<p>Method Analysis and Work measurement</p> <p>3.1. Overview of job design</p> <p>3.2. Components of job design</p> <p>3.3. Method analysis</p> <p>3.4. Technique of work measurement</p> <p>3.4.1. Time study (C)</p> <p>3.4.2. Work sampling (C)</p> <p>3.4.3. Predetermined time standards(C)</p> <p>3.4.4. Motion study</p>
<p>Capacity Planning & Aggregate Planning</p> <p>4.0 Determinants of effective capacity</p> <p>4.1 Demand and capacity options</p> <p>4.2 Techniques of aggregate planning</p> <p>4.3 Disaggregating the aggregate plan</p> <p>4.4 Concept of :</p> <p>4.4.1 MPS (Master production scheduling)</p> <p>4.4.2 MRP (Material requirement planning)</p> <p>4.4.3 ERP (Enterprise resource planning)</p>
<p>Scheduling</p> <p>5.1. Scheduling of manufacturing operations</p> <p>5.2. Sequencing techniques</p>
<p>Quality Management</p> <p>6.1. Dimension of quality for product and services</p> <p>6.2. Total quality management</p> <p>6.3. Quality tools</p>
<p>Project Management</p> <p>7.1. Phases of project management</p> <p>7.2. Work breakdown structure</p> <p>7.3. Gantt chart</p>
<p>Project Management</p> <p>7.4. PERT and CPM (C)</p> <p>7.5. Determining path probabilities (C)</p> <p>7.6. Risk management</p>
<p>Supply Chain Management</p> <p>8.1. Elements of Supply chain management</p> <p>8.2. Logistics management</p>

8.3. Warehouse 8.4. Third party logistics (3PL)
Supply Chain Management 8.5. Creating an effective supply chain 8.6. Concepts of supply chain 8.6.1. Lean Manufacturing 8.6.2. Agile manufacturing
Maintenance Management 9.1. Preventive maintenance 9.2. Breakdown maintenance 9.3. Preventive and breakdown maintenance cost

PBL Task

Students enrolled in the Operation Management Course (OPM549) will participate in two Problem-Based Learning (PBL) projects throughout the semester.

PBL 1
<p>Title : Business Improvement with Better Operations Management</p> <p>Objective : To study and analyse the application of the entire Operations Management syllabus in the business world.</p> <p>Process : In groups of five, students will select a small business within the Klang Valley area to conduct interviews with the company's management team and assess the comprehensive application of the Operations Management syllabus utilized by the company. Subsequently, students will identify three operations management activities within the company and undertake observation, analysis, and propose improvements for each of the selected operations management activities.</p> <p>Duration : 4 weeks.</p> <p>Outcome: The group will present the finding to the company and proposed an improvement towards management. The group will produce a video of their visit and research findings and upload it to the YouTube.</p> <p>Student learning objective : 1. Understand the application and implementation of Operations Management in business environment. 2. Proposed operations management improvement for the company.</p>
PBL 2
<p>Title : Layout Perfected: Where Every Space Matters</p> <p>Objective: To apply better 'Layout Strategy' in the hypermarket.</p> <p>Process: Hypermarkets are large retail stores that offer a wide range of products under one roof. The layout of these stores plays a crucial role in influencing customer experience, navigation ease, and operational efficiency. The group report aims to analyze and propose improvements to hypermarket layout strategies to enhance overall performance. Students in the group will analyze, study, and improve the current layout or arrangement/design of the overall customer path and organization of goods in a selected Hypermarket.</p> <p>Duration : 4 weeks</p>

Outcome: The group will present the finding to the company and proposed an improvement towards management. The group will produce a video of their visit and research findings and upload it to the YouTube.

Implications: Students will understand a well-designed layout is essential for optimizing the performance of hypermarkets, enhancing customer experience, and driving business success. Student will analyse current layout challenges and implementing strategic improvements, hypermarkets to create a more efficient, customer-friendly environment that meets the evolving needs of shoppers. Students will be able to deepen their understanding and application of the 'Layout Strategy' syllabus to hypermarkets in Malaysia.

2.3. Effects of PBL on Student Outcome

Research into the impact of PBL on operations management syllabus has yielded favourable findings. Capraro and Slough (2008) discovered that PBL not only bolstered students' understanding of operations management content but also improved their problem-solving abilities. This holds particular significance in operations management syllabus, where the capacity to apply theoretical principles to resolve problems is paramount.

In a study conducted by Han, Capraro, and Capraro (2015), students who experienced PBL in their operations management courses demonstrated heightened motivation and better retention of concepts. The interactive and stimulating nature of PBL was identified as a pivotal factor contributing to these outcomes.

c. Challenges and Considerations in PBL Implementation

Although PBL offers numerous benefits, its implementation in operations management syllabus presents challenges. Ertmer and Simons (2006) highlighted the necessity for meticulous planning and a shift in the teacher's role from a knowledge provider to a facilitator of learning to achieve successful PBL integration. Additionally, there's the challenge of aligning PBL activities with curriculum standards and assessment methods.

Another crucial aspect is the readiness and training of educators to effectively deploy PBL strategies. Frank, Lavy, and Elata (2003) emphasized the importance of teacher preparedness for PBL success in operations management. Teachers must possess the skills to guide inquiry, manage project activities, and evaluate student learning within a PBL environment.

d. Future Directions in PBL Research

Holm (2011) suggests that forthcoming investigations into PBL should prioritize longitudinal studies aimed at evaluating the enduring effects of PBL on students' grasp of operations management concepts and their proficiency in applying them. Moreover, exploring the scalability of PBL and its efficacy across various educational environments would offer educators and policymakers valuable.

3. Material and Methods

The Materials and Methods section of this study delineates the framework and procedures utilized to examine the efficacy of PBL in enriching the caliber of Operations Management syllabus at the Universiti Teknologi MARA, Puncak Alam, Selangor, Malaysia.

a. Research Design

The research employs a mixed-method approach, incorporating quantitative and qualitative methodologies. This design enables a thorough examination of PBL's influence on student learning outcomes in Operations Management. Quantitative data was acquired through pre- and post-test assessments and student performance records, while qualitative data was obtained through student surveys, interviews, and classroom observations.

b. Participants

The study participates 240 undergraduate students taking Operations Management course, OPM549, at the Universiti Teknologi MARA, Puncak, Alam Selangor, Malaysia (refer to Table 1).

Table 1: General Information about Research Subjects

Sex					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Female	136	56.7	56.7	56.7
	Male	104	43.3	43.3	100.0
	Total	240	100.0	100.0	

Years of Study					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1st	46	19.2	19.2	19.2
	2nd	172	71.7	71.7	90.8
	3rd	22	9.2	9.2	100.0
	Total	240	100.0	100.0	

All participant were segmented into two groups: a control group, which received traditional lecture-based instruction, and an experimental group, which engaged in PBL activities.

c. Implementation of PBL

Within the PBL group, students participated in two projects in the chosen semester, each crafted to encompass key subjects within the Operations Management syllabus. These projects presented authentic real-world challenges, prompting students to employ operations management principles in devising solutions. Emphasizing collaborative effort, critical thinking, and the practical application of theoretical concepts, these projects aimed to foster holistic learning experiences.

d. Data Collection Methods

To evaluate learning outcomes, standardized tests were administered to both the control and experimental groups at the outset and conclusion of the semester, aimed at gauging their grasp of Operations Management concepts. Students in the PBL group were surveyed to gather feedback on their engagement, understanding of operations management principles, and perceptions of the learning process. Furthermore, interviews were conducted with a selected subset of students to delve deeper into their experiences. Classroom observations were carried out in both traditional and PBL settings to observe teaching methodologies, student involvement, and classroom dynamics. Quantitative data from the tests underwent statistical analysis, utilizing the SPSS software for data processing. Comparative analysis was performed to discern discrepancies in learning outcomes between the control and experimental groups. Qualitative data from surveys, interviews, and observations were thematically analysed to identify recurring patterns and glean insights into the PBL experience.

e. Limitations

The study recognizes several constraints, including the sample size and the particular context of the Universiti Teknologi MARA, Puncak Alam, Selangor, Malaysia, potentially limiting the generalizability of the results. Moreover, the brief duration of the study might not entirely encapsulate the enduring effects of PBL on students' comprehension of operations management.

4. Results and Discussion

a. Design of the Interview Questionnaire

The interview questionnaire was formulated drawing from prior research on Problem-Based Learning (PBL) and the researcher's expertise. Alongside gathering personal details, the questionnaire comprises 15 inquiries categorized into three sections (refer to Table 2). These questions utilize a 5-point Likert scale, spanning from strongly disagree to strongly agree.

Table 2: Main Content of the Interview Form

<p>Section 1: Engagement and Participation</p> <ol style="list-style-type: none"> 1. I found the PBL activities in operations management to be engaging. 2. PBL encouraged me to participate more actively in class discussions. 3. Working on projects made me more interested in operations management topics. 4. PBL facilitated greater collaboration with my peers.
<p>Section 2: Understanding and Application of Operations Management Concepts</p> <ol style="list-style-type: none"> 5. PBL helped me understand operations management concepts better than traditional lectures. 6. I felt more confident in applying operations management concepts in real-world situations because of PBL. 7. PBL encouraged me to think critically and solve complex problems. 8. The projects helped me retain operations management concepts longer.

Section 3: Overall Learning Experience and Satisfaction

9. I am satisfied with the PBL approach used in our operations management course.
 10. PBL has improved my overall learning experience in operations management.
 11. I would recommend PBL to other students for learning operations management.
 12. The PBL method was well organized and effectively implemented.

b. Interview Results

Table 3: General Information about Research Results

Reliability statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	Number of Items
.841	0.838	12

Item Statistics			
	Mean	Std. Deviation	N
Q1	4.208	.8188	240
Q2	3.966	.8192	240
Q3	4.033	.7984	240
Q4	4.066	.8375	240
Q5	4.270	.7774	240
Q6	4.091	.7100	240
Q7	4.075	.7237	240
Q8	4.191	.7367	240
Q9	4.253	.7040	240
Q10	4.050	.6841	240
Q11	4.125	.6425	240
Q12	4.125	.7397	240

The outcomes derived from the student questionnaire, aimed at evaluating the efficacy of PBL in the Operations Management syllabus, provide valuable insights into students' viewpoints and encounters. With a participant pool of 240 individuals, the research scrutinized the mean scores and standard deviations for each query, utilizing a 5-point Likert scale.

Student Engagement and Participation

Questions Q1 to Q4 centered on students' involvement and active participation. The outcomes revealed notably high levels of engagement (Q1: M = 4.21, SD = 0.82) and active involvement (Q2: M = 3.97, SD = 0.82) in PBL initiatives. These findings are in accordance with Bell's (2010) research, which underscores the engagement advantages of PBL within educational contexts. Moreover, the enhanced interest in operations management syllabus (Q3: M = 4.03, SD = 0.80) and collaborative learning (Q4: M = 4.07, SD = 0.84) resonates with Bradley-Levine and Mosier's (2014) observations regarding the interactive aspect of PBL.

Understanding and Application of Operations Management Concepts

Responses to questions Q5 through Q8 demonstrate the positive influence of PBL on students' grasp and utilization of operations management concepts. The mean scores (Q5: M = 4.28, SD = 0.78; Q6: M = 4.09, SD = 0.71) indicate that students felt more assured in understanding and applying operations management principles as a result of PBL, corroborating the findings of Alexander et al. (2014). The heightened problem-solving abilities (Q7: M = 4.08, SD = 0.72) and retention of concepts (Q8: M = 4.19, SD = 0.74) align with Capraro and Slough's (2008) observations regarding the efficacy of PBL in STEM education.

Overall Learning Experience and Satisfaction

The questionnaire's final segment (Q9 to Q12) gauged overall satisfaction with the PBL approach. Notably high satisfaction levels (Q9: M = 4.26, SD = 0.70) and enhanced learning experiences (Q10: M = 4.05, SD = 0.68) were observed, indicating a favourable reception of PBL. These findings align with the observations of Han,

Capraro, and Capraro (2015), who highlighted the motivational advantages of PBL. The readiness to endorse PBL (Q11: $M = 4.13$, $SD = 0.64$) and satisfaction with its organization and execution (Q12: $M = 4.13$, $SD = 0.74$) further validate the perceived effectiveness of PBL in augmenting operations management syllabus.

5. Discussion

The study's outcomes offer compelling evidence for the positive influence of PBL on student engagement, comprehension, and overall satisfaction in the Operations Management course. The elevated mean scores across all queries suggest that students not only interacted more profoundly with the subject matter but also honed critical skills like critical thinking and problem-solving. This correlation aligns with the foundational principles of constructivist learning, positing that active participation in learning endeavours fosters a deeper grasp of content (Jonassen, 2011).

Furthermore, the minimal standard deviations indicate a widespread agreement among students regarding the advantages of PBL. This consistency in responses enhances the reliability of the findings and underscores the effectiveness of PBL in this educational context.

Nevertheless, it is crucial to acknowledge the study's limitations. The specific context and sample size may not fully encompass the diverse array of student experiences across various educational settings. Future research endeavours could build upon these findings by investigating the enduring impacts of PBL and its adaptability in different academic environments.

Recommendations

The integration of Project-Based Learning (PBL) into Operations Management course, as evidenced by this study conducted at the University of Information Technology and Communications, has yielded significant positive outcomes. These findings offer valuable insights leading to several key recommendations for optimizing the implementation of PBL in operations management.

Firstly, incorporating real-world projects into the curriculum can substantially enhance student engagement and the practical application of operations management concepts. This approach not only renders learning more pertinent but also aids students in comprehending the real-world implications of their studies.

Another critical aspect contributing to the successful execution of PBL is the training and development of faculty members. Educators play a pivotal role in facilitating PBL, and their proficiency in guiding inquiry, managing project dynamics, and evaluating student performance is indispensable. Hence, investing in training programs aimed at equipping educators with these competencies is imperative.

Furthermore, fostering a collaborative learning environment is crucial. Encouraging group projects and promoting peer-to-peer interactions can augment the comprehension and retention of operations management concepts. This collaborative approach not only facilitates learning but also nurtures essential soft skills such as teamwork and communication.

6. Conclusion

Adapting PBL activities to suit diverse learning styles is also imperative. Tailoring these activities ensures that all students, regardless of their educational background or learning preferences, can derive benefits from this approach. Alongside customization, implementing continuous assessment strategies and offering regular feedback will significantly bolster the learning process. This ongoing assessment assists students in acclimating to the PBL methodology and comprehending their progress in real-time.

Looking ahead, exploring the scalability of PBL in various educational environments and among diverse student cohorts will be paramount. This scalability is crucial for understanding the broader applicability of PBL in various educational contexts. Moreover, conducting longitudinal studies to evaluate the sustained impact of PBL on student learning, career choices, and professional skills in operations management is recommended. Such longitudinal research would provide deeper insights into the long-term benefits and potential challenges of implementing PBL.

In conclusion, the study underscores the efficacy of Project-Based Learning in enhancing the quality of education in Operations Management courses. The results unequivocally demonstrate that PBL not only enhances student engagement and comprehension of complex operations management concepts but also elevates overall satisfaction with the learning experience. These findings align with broader educational research advocating for active, inquiry-based learning methods, particularly in STEM fields. Despite acknowledging the study's limitations, such as its specific context and sample size, the evidence presented robustly supports the adoption and further exploration of PBL in operations management syllabus. Ultimately, by fostering active learning, collaboration,

and practical application of knowledge, PBL emerges as a transformative educational approach, equipping students for both academic success and future professional challenges in the dynamic field of operations management.

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