

USE OF MODIFIED PROBLEM BASED LEARNING IN AN UNDERGRADUATE QUANTITY FOOD PRODUCTION COURSE

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ABSTRACT

Problem-Based Learning (PBL) is a case-driven, student-centered, small group instructional strategy that encourages learning through the use of “real-world” examples. PBL was implemented in an undergraduate quantity food production course (n=75) to enhance student understanding of basic foodservice management principles while developing students’ soft skills such as problem solving and critical thinking. Overall, PBL was perceived as an engaging and collaborative learning environment. When implemented properly, students agreed that PBL can reinforce course learning outcomes. Group time management and group communication were identified as challenges with completing the PBL assignment.

Keywords: Problem based learning; foodservice education; problem solving; critical thinking

INTRODUCTION

The foodservice industry is one of the largest employers in the United States (US), accounting for over 10% of all US jobs (National Restaurant Association [NRA], 2015). The NRA (2015) forecasts over 1.7 million new foodservice jobs in the US alone by 2025. The need for qualified foodservice professionals continues to increase as the industry grows. Additionally, the foodservice industry is facing critical operational challenges with a reduction in the supply of qualified employees transitioning into the workforce, coupled with an increase in the number of baby boomers retiring (Richardson & Thomas, 2012).

Foodservice companies review knowledge, skills, abilities, and previous experience of applicants in the hiring process (Alonso & O'Neill, 2011; Kwok, Adams, & Price, 2011). To ensure graduating foodservice professionals are prepared for the workplace, hospitality programs must review prerequisite hard and soft skills for employment in the foodservice industry as well as review their teaching methods to facilitate learning these skills (Chacko, Williams, & Schaffer, 2012; Gursoy, Maier, & Chi, 2008). Though companies often have training programs in place for hard skills, soft skills are a prerequisite required to be successful in the foodservice industry (Weber, Crawford, Lee, & Dennison, 2013). Soft skills, such as critical thinking and problem solving, are defined as the interpersonal or behavioral skills needed to apply hard skills on the job (Kantrowitz, 2005).

Research has shown a disconnect between the skills hospitality employers seek and the skills hospitality graduates perceive they possess (Maier & Thomas, 2013). Bridging the gap of skills needed by the foodservice industry and the skills foodservice graduates possess can be achieved in part through the use of “real-world” situations and collaborative learning in the classroom. “Real-world” situational collaborative learning is the foundation of the instructional method, Problem-Based Learning (PBL) (Zwaal & Otting, 2015).

PBL can be used to bridge the gap between lecture-based learning (teacher-centered) and real-world situational learning (student-centered). PBL was developed in the 1960s as an educational approach used to help medical students apply knowledge learned through practical “real-world” situations (Barrows & Tamblyn, 1980; Schmidt, 1982; Taylor & Mifflin, 2008). PBL guides students’ existing knowledge and inquiry process toward discovering meaningful solutions to “real-world” issues. Additionally, learning collaboratively through problem-based situations is much more effective than memory-based learning because it creates a more easily retained functioning body of knowledge (Goto & Bianco-Simeral, 2009).

Since its introduction over five decades ago PBL has received positive recognition in university settings (Barrows & Tamblyn, 1980; Taylor & Mifflin, 2008), especially within the realm of medical education. Previous research has shown the value of PBL in the following courses of study: food & beverage (Kivela & Kivela, 2005), food safety (Rajagopal, Bernstein, & Trost, 2012), food science (Liceaga, Ballard, & Skura, 2011), nutrition (Lee, 2015), hospitality management (Zwaal & Otting, 2015), and tourism (Huang, 2005). However, PBL has not gained widespread use as a teaching method in hospitality management education. This could be attributed to the lack of knowledge on how to incorporate PBL into hospitality courses.

Zwaal and Otting (2015) summarized that the success of a PBL assignment relies on three factors: 1) students’ prior knowledge, 2) the ability of the facilitator/tutor/instructor, and 3) the quality of the PBL assignment. One of the challenging aspects of incorporating PBL into a course of study is the instructor’s ability to act as a facilitator of learning. Yew and Yong (2014) identified three major attributes of an effective facilitator: 1) use of expertise, 2) social congruence, and 3) cognitive congruence. The use of expertise is displayed through content knowledge, such as being able to demonstrate theoretical and practical knowledge, as well as stretching students’ learning by raising challenging questions (Yew & Yong, 2014).

Social congruence, such as communication and emotional skills, is essential in the facilitation of PBL. Yew and Yong (2014) identified five significant themes that emerged within social congruence: facilitator personality, the ability to relate to students, professionalism, the ability to motivate students, and the ability to create a positive learning environment. Cognitive congruence is the ability to explain concepts in a manner that is easily understood by students (Cornwall, 1979).

An effective PBL assignment starts with a flawed open-ended scenario with no single correct answer (Gallagher, 1997). First, the problem must be developed and tailored to course objectives while remaining realistic to situations students will encounter in the “real-world.” This will strengthen the realism of the assignment within the hospitality context. The task assigned can reference past experiences or current situations found in the hospitality field. Most importantly, the assignment must be interesting and engaging in nature so as to

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facilitate peer discussions and increase students' line of inquiry (Blake, Hosokawa, & Riley, 2000).

The format and length of the PBL assignment can vary depending upon the targeted learning objectives. Previous studies have shown several formats to be effective: multiple classes (Duffrin, 2003), half semester (Lee, 2015), full semester (Chng, Yew, & Schmidt, 2011) and the entire academic curriculum (Kivela & Kivela, 2005; Otting & Zwaal, 2011). The purpose of this study was to demonstrate the use of PBL in an undergraduate quantity food production course and assess student feedback on PBL as a teaching method. The quantity food production course was selected for this study because students need to employ all aspects of foodservice management concepts learned during the semester in order to solve the PBL problem. A PBL assignment was used during the second half of the semester during lecture periods.

METHODOLOGY

The University Institutional Review Board of the Office of Research Compliance approved the study. Students completed informed consent forms before beginning the study.

Population

Eighty-two undergraduate hospitality students enrolled in the Quantity Food Production course at a Southern US university in Spring 2015 were invited to participate in this study.

Course Format

The Quantity Food Production course is a lower-level foodservice prerequisite for upper-level courses in the hospitality management degree program. The main objective of the course is to introduce and educate students on foodservice management concepts. The three-credit course required 50-minute class sessions twice a week over a 14-week period. The course also contained a lab component that met once a week for three hours, however, this portion of the course was not altered by the inclusion of PBL. The first eight weeks of class sessions were used for lecture-based instruction to build background knowledge about the history and origins of world cuisines, food safety, recipe development, menu planning and pricing, food costing, scheduling, management, finance, etc.

The second half of the semester's class sessions were used to implement PBL into the course. One session each week was devoted strictly to group collaboration, while the other weekly session continued to be used for traditional lectures. The PBL for this study was structured to facilitate the application of management concepts in the development of quantity food production critical thinking and "real-world" problem solving skills. During the implementation of the PBL assignment, the instructor would check-in with each group and facilitate group problem solving. Students were also encouraged to collaborate outside of the classroom to enhance their learning.

Similar to other teaching methods, the learning outcomes of PBL assignments need to be reviewed and aligned with the course learning objectives. Because this study occurred in a lower-level course, learning outcomes based on Bloom's Taxonomy (Bloom, Englehart, Furst, Hill, & Krathwohl, 1956) focused on comprehension and application. Upon completion of the PBL assignment, students were expected to apply various methods of recipe and menu planning, recipe development, develop accurate menu pricing and food cost; demonstrate critical thinking, problem solving, and self-directed learning skills; and exhibit group-based collaborative learning skills. The PBL scenario required students to identify components of a failing restaurant and detail how to improve these failing components as illustrated below:

You have just been hired as the general manager of a failing independent restaurant in Columbia, South Carolina. Your goal is to improve aspects of the failing restaurant and create a profitable restaurant. The restaurant only has 60 seats. The owner is open to any changes, starting with a new restaurant name. However, before these changes can be implemented, you must prepare a presentation for the owner detailing your plan to improve the restaurant. Develop a financially sound and practical proposal. The presentation must be between 8-10 minutes. You will also present the owner with a hard copy of your proposal.

The 200-point PBL assignment was worth 20% of the students' overall grade in the course. Students were required to work in groups of four to prepare a 150-point written proposal and a 50-point, 8-10 minute presentation on how to "turn around" a failing restaurant. The written portion of the PBL assignment consisted of several parts: introduction of the new restaurant concept (40 points), development of recipes/cost control (30 points), menu design/pricing (30 points), staffing schedule (30 points), and sufficient group-collaboration (20 points). To determine the group-collaboration score, each student was asked to evaluate themselves and the other members of their group from 0 (weak) to 5 (strong) on the amount of effort those members displayed while working within a group setting.

Once the PBL scenario is developed, it should be pilot tested with a small group of students to ensure the quality and relevance of the assignment and to be certain the assignment encourages group-based collaboration. The assignment should also be reevaluated after the completion of the pilot test to guarantee the course learning objectives are being met (Zwaal & Otting, 2015). Prior to this study, the PBL assignment was pilot tested with a similar group of students (n=54) during the 2014 Fall semester. The PBL assignment was also reviewed by two experts in foodservice management for content validity. Based on results of the pilot test and feedback from foodservice experts, it was determined that students needed more specific guidelines in order to complete the assignment successfully. With the addition of these specific guidelines, the assignment became a modified PBL assignment, as traditional PBL is open-ended without specific guidelines (Gallagher, 1997). The following additional guidelines were added to the PBL assignment:

- Form groups of 4 students
 - Define member roles: leader, scribe, researcher, speaker
- Rename restaurant
 - Determine style of cuisine
 - Identify meal period(s) serving
- Design menu layout
 - Minimum of 3 appetizers, 5 entrées, 5 side dishes, and 3 desserts
 - Assign a selling price for menu items
- Write recipes
 - Use standardized format for each menu item
- Cost each recipe
- Consult a major food distribution vendor website for pricing (i.e. US Foods, Sysco)
- Develop staffing schedule (two week period for lunch or dinner service)
 - 1-week current guest numbers
 - 1-week projected busy guest numbers
- Write minimum 5-page proposal
- Present an 8-10 minute standup group presentation using PowerPoint™

Implementation of PBL

During the 2015 Spring semester, the PBL assignment was incorporated and structured as a final assignment. The first eight weeks of class sessions utilized lecture-based instruction to build foodservice management background knowledge. At the beginning of week seven, the PBL scenario and assignment criteria was introduced. Students formed self-assigned groups of four for the PBL assignment. No specific direction for solving the assignment was given by the instructor. During the next six weeks of class sessions, the instructor acted as a facilitator for student questions and provided additional clarification. Different approaches toward solving the scenario were expected, as this is a key result of the open-ended PBL scenario – allowing for student analysis and synthesis.

A previously validated survey instrument developed by Rajagopal et al. (2012) was used to assess student perceptions of PBL as a teaching method. Completing the PBL assignment survey was an optional extra credit assignment worth 15 points and consisted of three sections: one item on demographics, 14 items assessing student perceptions of PBL on a 5-point Likert scale (1 = *Strongly Disagree*, 5 = *Strongly Agree*), and two open-ended questions which assessed the strengths and challenges of PBL as a teaching method. The survey was administered during final exams after all PBL presentations were completed. The electronic-based questionnaire was distributed using Qualtrics™, an online survey management program.

RESULTS AND DISCUSSION

Eighty-two students were enrolled in the course and completed the PBL assignment. Seventy-five students (92%) completed the optional survey. Participants were sophomores (n=18) (24%), juniors (n=41) (54%), and seniors (n=16) (22%). The high response rate could be due to extra credit that was offered for completing the optional survey assessing PBL as a teaching method. However, the sample size was too small to analyze the results using advanced statistical analysis that could be generalized.

Student Perceptions of PBL

Student perceptions of PBL as a teaching method are shown in Table 1. Overall, PBL was perceived by students as an engaging process (4.24 ± 0.73). This could be attributed to the appeal of small group collaboration centered on solving a “real-world” problem. Students also perceived an increase in their critical thinking (4.24 ± 0.74) as a result of the use of PBL. These findings align with previous research on PBL which showed students perceived the PBL experience as one with an interesting learning environment and an effective format that

promoted collaboration in small group settings facilitated by a tutor/instructor (Loyens, Rikers, & Schmidt, 2006; Zwaal & Otting, 2004).

Students agreed that PBL can reinforce course material covered during lectures (4.24 ± 0.80). This was accomplished through providing lectures on the material being assessed in the PBL assignment and asking questions that facilitate group collaboration and scaffolding on prior knowledge. Providing feedback throughout the assignment helps students achieve positive learning outcomes (Goto & Bianco-Simeral, 2009; Lee, 2015). This is important to note as in the current study, PBL was used only during the second half of the semester to reinforce management topics introduced in the initial part of the course. Additionally, students agreed the lectures provided them with sufficient background knowledge to comprehend and solve the PBL case (4.30 ± 0.78). These results imply a need for some lecture-based learning (teacher-centered) before the introduction of PBL (student-centered).

The majority of students (n=57) (76%) in this study were juniors or seniors and perceived PBL as an interesting way to learn course content (4.24 ± 0.90). While sophomores (24%) had slightly less interest in PBL as a way to learn course content (3.99 ± 0.90). The high percentage of interest in PBL from upper classman could be due to a lack of exposure to PBL as a learning method in lower level courses and the appeal of “real-world” situations. One student explained: “I enjoyed creating a company and making the menu. It was nice to use creativity in a project instead of just writing about facts and statistics.” In a recent study, Otting and Zwaal (2011) showed that hospitality management students’ perceptions of teaching and learning methods shifted dramatically from freshman year to senior year.

Students did not view this project as a burden, unlike students who participated in a study by Levitt and Desbrow (2013). Students in the current study explained, “It was very helpful to have lecture times allotted for [PBL project] discussion.” Another student stated, “Having more than one week to complete the project was ideal.” The dissatisfaction of students in the Levitt and Desbrow’s study could be attributed to the amount of time students were given to complete the PBL assignment. In previous studies, little to no class time was allotted for PBL assignment work. However, in this study, students were allotted time during lecture periods to collaborate with their groups and obtain guidance from the facilitator, as needed. Additional time was also spent to work on the PBL outside of the classroom.

Table 1: Student’s Evaluation of PBL Assignment (n =75)

Items	Mean	SD
The lectures provided me with sufficient background knowledge to understand and solve the PBL case.	4.30	0.78
If given a choice, I would prefer to participate in similar types of PBL exercises in the future in other classes.	4.28	0.91
PBL engaged me in the learning process.	4.24	0.73
PBL reinforced course material covered during the lectures.	4.24	0.80
PBL is an interesting way to learn course content.	4.18	0.90
PBL helped me to understand the realities of solving real-world problems.	4.16	0.82
PBL taught me how to think critically about the subject matter.	4.14	0.74
PBL helped me to view the relationships between complex content.	4.09	0.79
PBL helped me to think differently about the content.	4.08	0.77
PBL encouraged me to make learning connections with other students.	4.00	0.97
PBL helped me to develop my reasoning skills about the subject matter.	3.99	0.95
PBL increased my ability to effectively work in a team.	3.89	1.03
I would prefer the PBL format of learning over lecture to understand the content.	3.89	0.96
I would have been able to understand and solve the PBL case without the lectures.	3.45	1.05

Scale: (1 = Strongly Disagree, 5 = Strongly Agree)

Our findings showed similar results to Loyens et al. (2006) in which students positively perceived PBL experiences as containing an interesting learning environment. In the current study several students explained: “[PBL provided] *Real life applications of our learning objectives*” and, “*It gave me a hands-on learning experience so I could better understand the way a restaurant is run, rather than just listening to lectures about it that gave me no personal experience.*” Overall, students found the assignment to be enjoyable. “*This class was not like others I have taken before. We as students were directly immersed into the subject matter.*” Similar to previous findings by Lee (2015), the majority of students did not find the assignment to be overwhelming, as it was incorporated into several weeks of the course. This is important to note as the length of the PBL assignment should be in line with the allotted time to complete the assignment. In this study, the PBL scenario required students to identify components of a failing restaurant and detail how to improve these failing components, this process could not be completed in one or two classes.

Strengths and Challenges of PBL

Student feedback highlighting the strengths and challenges of PBL as a teaching method was analyzed using the inductive data analysis procedure (Thomas, 2006). The researchers gained an understanding of the feedback from students through commonalities that emerged from the initial coding. Table 2 shows these commonalities of students’ perceptions of the strengths and weakness of PBL as a teaching method.

Similar to Duffrin (2003), some challenging issues dealt with group time management: “*I think that fitting all the pieces of this project were challenging, there are many parts that all have to fit together.*” Also, there were breakdowns in group communication: “*Sometimes working with a group can be challenging when communication becomes a problem.*” This was largely due to scheduling group meeting time outside of the course time period. Additionally, students identified a need for more structure within the PBL assignment, conflicting with results of a previous study (Wijnia, Loyens, & Derous, 2011): “*Provide more structure to the group assignment.*” The desire for more structure and guidelines could be attributed to a lack of experience with PBL as a teaching method, as well as feeling more comfortable with traditional group assignments. All of these challenges are common in recent PBL literature. Many studies, including this one, attribute these challenges to the unfamiliarity of students with this teaching method. These challenges can be reduced with the inclusion of PBL in more hospitality courses to allow students to gain understanding and feel more comfortable with PBL as a teaching method. However, it is not encouraged to incorporate this teaching method when introducing new concepts, as students need a strong base knowledge before PBL can be effective by scaffolding on previous knowledge.

Gielen, Dochy, and Onghena (2011) recommended incorporating a self- and peer- evaluation at the end of the assignment to help assess group member outcomes and collaboration. Additionally, when adopting a new teaching method, it is important to gather student feedback to help strengthen future results (Duffrin, 2003). Student

feedback reinforced PBL assignment learning outcomes of incorporating “real-world” situations, increased critical thinking, and student-centered self-directed learning. As one student explained: “*It gave me a hands-on learning experience so I could better understand the way a restaurant is run, rather than just listening to lectures about it that gave me no personal experience.*”

CONCLUSIONS AND APPLICATIONS

The purpose of this study was to demonstrate the use of PBL in an undergraduate quantity food production course and assess student feedback on PBL as a teaching method. Incorporating PBL into the quantity food production course allowed students to investigate “real-world” situations, develop their own synthesis of the problem, and apply critical thinking and problem solving skills. Prior to incorporating PBL into this course a group project was used which had a structured format detailing specifically what topic to research, and how results should be displayed. The same conclusions were always presented by students without any creativity or self-directed learning; it seemed that there could be a more engaging and influential way to cover the same material.

The main difference between the two teaching methods is, with PBL, the learning outcomes are within the student’s control, deciding what to research as well as how and what to present. PBL is characterized by its focus on contextual, collaborative, constructive and self-directed learning (Otting & Zwaal, 2011). The resulting PBL assignment presentations were far superior in quality and diversity than the previous group projects. Using the same PBL scenario students’ “restaurant concepts” varied dramatically (e.g. fast food, food truck, and fine dining); this creativity differed greatly from prior semester’s standard group-project.

During allotted PBL class sessions, students were more engaged with group discussions than in prior group project semesters. Students also initiated more discourse with the facilitator and asked questions of a higher-order thinking caliber. This differed greatly from previous semesters where students used class time to ask the instructor for answers, not for a higher-level discussion. These changes are similar to the findings presented by Zwaal and Otting (2015) who showed evidence that PBL is effective in improving students’ problem solving and critical thinking skills through connecting theories with “real-world” problems.

Overall, the success of a PBL assignment can be attributed to three factors: students’ prior knowledge, the facilitator/tutor, and the quality of the PBL design (Zwaal & Otting, 2015). First, ensuring students have prior knowledge of the content being incorporated into the PBL assignment is crucial. In this study, background knowledge was strengthened through lecture-based instruction prior to completing the PBL assignment; this prior knowledge is needed to scaffold upon when learning new concepts during the PBL assignment. This was shown in a recent study by Yew and Yong, (2014) who recognized scaffolding learning and communication skills as important for increasing interpersonal skills and problem solving.

Table 2: Students’ Perceptions of the Strengths and Weakness of PBL as a Teaching Method

Strengths	Challenges
<ul style="list-style-type: none"> Encouraged group collaboration Provided “real-world” experience in a classroom setting Encouraged creative thinking Stimulated problem solving skills 	<ul style="list-style-type: none"> Communicating with group members Managing/Finding time to work together as a group Inadequate structure of the PBL scenario Oral presentation of PBL findings

Facilitating students' independent learning and guiding critical-thinking is critical for PBL to be effective. When acting as a tutor/facilitator, it is imperative to be an expert on the content of the PBL assignment while also having the cognitive congruence to explain concepts in ways that students can easily understand. A facilitator does not simply provide answers to student's questions, but guides the student to synthesize the answer themselves. Additionally, the facilitator must create a nonthreatening collaborative environment and develop a rapport with the students in order to promote positive group collaboration. This was done in the current study during PBL designated lectures, the facilitator would "check-in" with each group and ask open-ended questions to stimulate group creativity. Previously, Papinczak (2010) showed medical students and facilitators perceived an ideal PBL facilitator as displaying high student-teacher rapport.

Finally, successful implementation of PBL also relies on a flawed open-ended "real-world" scenario which engages students and develops the soft skills of critical thinking and collaboration. To improve the study, interviewing or conducting focus groups with students could provide in-depth information on students' perceptions of PBL. This study design only used a survey instrument to collect student perceptions that may not gather rich narrative content to further describe the PBL assignment.

Using PBL as a teaching method needs further research through implementation in other areas of hospitality management including marketing, finance, and human resources. Similar to Lee (2015), the implementation of the PBL assignment was conducted over half of the semester and used as a final project. However, PBL can be used during a single class period, for the duration of one week, or for an entire semester. It is encouraged for a novice of PBL to start with a single PBL assignment until comfortable with the flow and style of this teaching method.

PBL has previously been shown to be an effective teaching method in foodservice (Lee, 2015; Liceaga et al., 2011; Rajagopal et al., 2012) and this study has added to this body of literature. Future research could focus on developing PBL assignments for easy implementation into a variety of hospitality courses. Instructors could incorporate PBL throughout the semester after completion of different modules to assess student comprehension of material taught. PBL can also be utilized in other courses (e.g. cost controls, nutrition, food science, and dietetics courses) within foodservice education to reinforce course concepts. The PBL assignment was shown to be successful in engaging students and incorporating "real-world" experiences, which is not possible through lecture alone. The inclusion of PBL as a teaching method should be reviewed by foodservice instructors to increase students' critical thinking, problem solving, and group collaboration skills in their courses. If the strategies used in this study are followed, successful implementation of PBL into any course is possible.

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Appendix A

Quantity Food Production PBL Assignment

Read the scenario and guidelines below. Form groups of 4 members. Each Wednesday lecture will now be used for group-collaboration to work on your PBL assignment. During these lecture times the instructor will be available to facilitate problem solving. However, this time will not be used to ask questions and except answers from the instructor. Additionally, group-collaboration outside of the course time is encouraged. The PBL scenario requires you to identify components of a failing restaurant and detail how to improve these failing components. During the final week of the semester each group will submit a minimum of a 5-page proposal and present an 8-10 minute standup group presentation.

PBL Scenario

You have just been hired as the general manager of a failing independent restaurant in Columbia, South Carolina. Your goal is to improve aspects of the failing restaurant and create a profitable restaurant. The restaurant only has 60 seats. The owner is open to any changes, starting with a new restaurant name. However, before these changes can be implemented, you must prepare a presentation for the owner detailing your plan to improve the restaurant. Develop a financially sound and practical proposal. The presentation must be between 8-10 minutes. You will also present the owner with a hard copy of your proposal.

PBL Guidelines

- Form groups of 4 students
 - Define member roles: leader, scribe, researcher, speaker
- Rename restaurant
 - Determine style of cuisine
 - Identify meal period(s) serving
- Design menu layout
 - Minimum of 3 appetizers, 5 entrées, 5 side dishes, and 3 desserts
 - Assign a selling price for menu items
- Write recipes
 - Use standardized format for each menu item
- Cost each recipe
- Consult a major food distribution vendor website site for pricing (i.e. US Foods, Sysco)
- Develop staffing schedule (two week period for lunch or dinner service)
 - 1-week current guest numbers
 - 1-week projected busy guest numbers
- Write minimum 5-page proposal
- Present an 8-10 minute standup group presentation using PowerPoint™