

# Assessment of Student Experience in a Problem-Based Learning Course Using the Course Experience Questionnaire

Cristen Harris, PhD, RD, CSSD; June Kloubec, PhD

## INTRODUCTION

Problem-based learning (PBL) has been described as “the learning that results from the process of working towards the understanding of a resolution of a problem.”<sup>1</sup> This pedagogical approach, based in the theoretical framework of constructivism,<sup>2</sup> is both a method and a philosophy that aims to build knowledge by working through (in an active, iterative, and self-directed way) a progressive framework of problems via facilitated small-group work and independent study.<sup>3</sup> The PBL approach uses open-ended problems or case scenarios that are considered ill-structured in that they may have multiple solutions or require more information for understanding the problem than is initially available.<sup>4</sup> This compels students to build on prior knowledge, integration, and critical thinking<sup>3</sup> and to practice acting as professionals in seeking solutions. Because the problems in these case scenarios often pose no single correct solution, an atmosphere of cooperative learning can be facilitated.

Because nutrition professionals take on a wide variety of occupations, students require the development of a global skill set that may not be specific to nutrition. A PBL approach may facilitate the development of self-directed learning, reflective thinking,<sup>5</sup> leadership, teamwork, cooperation, self-confidence, critical thinking, resource identification, and knowledge retention.<sup>6</sup> These skills may help nutrition graduates enter the job market.

Although the use of PBL is widespread in the preclinical curricula of US medical schools,<sup>7</sup> there is limited published literature on the use of this approach and outcomes in nutrition curricula. Furthermore, long-term assessments of the perceived effectiveness and satisfaction of PBL—after graduates are in the job market for a year—are lacking. Previous research suggests that a problem-based education may help nutrition professionals respond successfully to their own professional development needs, in addition to those of other health care professionals<sup>8,9</sup> whose training would more likely include a PBL approach.<sup>5</sup> Therefore, the objectives of this project were to (1) uniquely implement a PBL approach in a capstone course in an undergraduate nutrition program; and (2) collect both short-term (eg, grades) and long-term post-course data evaluating students' perceptions and satisfaction with the teaching and learning in such a course.

## IMPLEMENTATION

A capstone course, “Nutrition, Physical Activity and Disease,” was taught using the PBL method during the spring quarter of 2012. Since 2011, this particular course was required of students majoring in 3 undergraduate nutrition programs—Nutrition, Nutrition and Exercise Science, and Nutrition and Culinary Arts—at a private university in the northwestern

US. The learners were primarily young adults and the PBL approach was the basis for the entire 11-week course. At the first class session, the instructors facilitated the development of classroom norms and ground rules for group work, including the establishment of attendance policies and the consequences for rule violation. Each week of the term, students were presented with a different topic, or disease state (Table 1). Instructors created multiple case studies on each topic each week. For each topic, students ( $n = 36$ ) were arbitrarily divided into 6–9 groups of 4–6 students each, and each group was assigned to a specific case. Although there was no expectation regarding where the work was to be done, groups were typically given 2 2.5-hour class periods to complete each assignment, during which time instructors rotated among groups to pose or answer questions and facilitate progress. Assignments for each case varied and included written reports, oral presentations, posters, presentations with added technology (eg, video), and game creation. For each case, students were encouraged to answer the questions “What do I already know?” and “What do I need to find out?” Detailed elements, including nutrition and physical activity prevention and management components, were required for each assignment related to each case study (Table 2). Process and summative assessments that integrated course objectives were adapted for instructor, peer, and self-evaluations.<sup>10</sup> Therefore, each week, students worked on a different topic with a different group of peers; and presented and were evaluated in a different manner (Table 1). Course grades for each student were calculated from instructor, peer, and self-evaluations of assignments throughout the quarter.

Varied evaluation methods meant that students were challenged to interpret and present their results in different formats each week.

Department of Nutrition and Exercise Science, School of Natural Health Arts and Sciences, Bastyr University, Kenmore, WA

Address for correspondence: Cristen Harris, PhD, RD, CSSD, Department of Nutrition and Exercise Science, School of Natural Health Arts and Sciences, Bastyr University, 14500 Juanita Dr NE, Kenmore, WA 98028; Phone: (425) 602-3098; Fax: (425) 823-6222; E-mail: [charris@bastyr.edu](mailto:charris@bastyr.edu)

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**Table 1.** Example Schedule of Topics for an Undergraduate Nutrition Capstone Course

Topic/Disease	Specific Case Topics	Assignment	Evaluation of Student Effort
Cardiovascular disease	Hypertension Congestive heart failure Stroke	Written report	Instructor
Diabetes	Type 1 diabetes Type 2 diabetes Gestational diabetes	Poster	Peer
Lower gastrointestinal disease	Celiac disease Crohn disease Irritable bowel syndrome	Presentation	Self
Upper gastrointestinal disease	Peptic ulcer disease Gastroesophageal reflux Hiatal hernia	Written report	Peer
Food allergies and intolerances	Gluten intolerance Lactose intolerance Shellfish allergy	Game	Instructor, peer, and self

One unique example of this was the creation of a game designed for the food allergies/intolerances topic. Instructors set several parameters for the games students created including (1) number of players (5–6), (2) time to complete the game (10–15 minutes), and (3) integration of multiple terms related to food allergies or intolerances from a list provided (eg, anaphylaxis, food challenge, natural killer T-cells, mast cells). One class period was devoted to game creation and the subsequent class was used to play the games. Each group played the other groups' games and rated them on scientific accuracy and assimilation into the game, as well as creativity, fun, flow of material, and ease of interpretation and play. The professors rated each game according

to scientific accuracy and inclusion of requisite terms. At the conclusion of the second class period, students completed a self-assessment of their performance in their group.

The original course took place between April 2 and June 13, 2012. The Course Experience Questionnaire (CEQ) was administered in an online format 1 year after the start of the course, between March 20 and April 5, 2013. The 23-item, short-form CEQ was chosen for a 1-year, post-course assessment because the items align well with the PBL strategies and outcomes that instructors attempted to facilitate (eg, the ability to be an effective team member, analytic skills, problem-solving skills, research skills, and oral and written communication skills).<sup>11</sup> In addition,

the CEQ is a recommended evaluation tool for PBL, because since a student-centered learning approach logically dictates the evaluation of student experiences and perceptions.<sup>12</sup> The 23-item CEQ, which contains 5 scales, is a validated survey<sup>13</sup> that is administered nationally in Australia in the year after completion of a course of study.<sup>14</sup> The version of the CEQ that has been used in the Australian Graduate Survey since 2010,<sup>15</sup> which is fully labeled and includes the validated Graduate Qualities scale,<sup>16</sup> was used for this study. Five questions were added to facilitate open-ended inquiry (Table 3). The resulting 28-item, adapted CEQ was administered online to all students who took the course (n = 36), using REDCap software,<sup>17</sup> which enabled anonymous

**Table 2.** Required Elements for Each Assignment in an Undergraduate Nutrition Capstone Course

Element	Sub-components of Each Element
Etiology of the disease (Who gets it and why?)	Structure and function of a healthy organ or organ system Incidence, prevalence, and epidemiology of the condition Nutritional and lifestyle risk factors and predisposing conditions—general and case-specific
Prevention (How can it be avoided?)	Nutrition—primary and secondary prevention ideas Physical activity—primary and secondary prevention ideas
Pathophysiology (What went wrong?)	Diagnosis—health history, relevant lab results of the case Clinical findings—signs and symptoms of the case
Management (How can I help?)	Nutrition—case-specific, tertiary prevention ideas Physical activity—case-specific, tertiary prevention ideas Medications—drugs or dietary supplements typically prescribed (Special attention on natural/holistic management methods, because this is aligned with the school's general curricular focus.)

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