Research Contribution

Journal of Foodservice Management & Education, Volume 17, Number 1, Pages 26– 34. ©2023
Published jointly by the Foodservice Systems Management Educational Council and the National Association of College & University Food Services

FOOD PRODUCTION COURSES IN ACCREDITED DIETETICS PROGRAMS: IMPORTANCE-PERFORMANCE ANALYSIS OF USING STANDARDIZED RECIPES

Sangwook Kang, PhD, CHE*; Rachel M. Harrington, EdD, LD, RD; Erin K. Eliassen, EdD, LD, RD, CLC
Department of Applied Human Sciences, Eastern Kentucky University, Richmond, KY, USA

ABSTRACT
The purpose of this study was to investigate the importance and performance of the use of standardized recipes in quantity food production (QFP) courses of Accreditation Council for Education in Nutrition and Dietetics programs. A web-based questionnaire was distributed to personnel responsible for teaching and/or overseeing QFP courses in 270 accredited didactic programs. From the total of 51 valid questionnaires returned, the pedagogical setting of the QFP laboratory was investigated. Among the institutions (n=40, 14.8%) that used standardized recipes in the QFP laboratory, standardized recipe use was assessed by importance-performance analysis. Seven attributes emerged from the data and were classified: ensuring food quantity, food quality, and food nutrition were classified as "*keep up the good work*"; sustainability and information as "*concentrate here*"; food safety as "*possibly overkill*"; and adaptability as "*low priority*".

Keywords: Dietetics, importance-performance analysis, quantity food production, standardized recipes

INTRODUCTION

Dietetics Education and Standards

According to the Academy of Nutrition and Dietetics Quality Management Committee, dietetics is defined as "*the integration, application, and communication of practice principles derived from food, nutrition, social, business, and basic sciences, to achieve and maintain optimal nutrition status of individuals and groups*" (2018, p. 18). As described in Standard Three of the Accreditation Council for Education in Nutrition and Dietetics (ACEND) Accreditation Standards for Nutrition and Dietetics Didactic Programs, the accredited program must include *"food science and food systems, food safety and sanitation, environmental sustainability, global nutrition, principles and techniques of food preparation, and development, modification and evaluation of recipes, menus and food products acceptable to diverse population" (*ACEND, 2021, p. 9).

Even though this study was based on the 2017 ACEND standards (i.e., knowledge requirements for dietetics and nutrition programs [KRDN] 4.4., 4.5., and 4.6), the main focus of this study would be aligned with the updated 2022 ACEND standards. Through this study, researchers focused on the use of standardized recipes (SRs) in quantity food production (QFP) courses as one of the key factors in achieving "*food science and food systems, food safety and sanitation, environmental sustainability, global nutrition, principles and techniques of food preparation, and development, modification and evaluation of recipes, menus and food products acceptable to diverse population*" (ACEND, 2021, p. 9). As outlined in Domain Four of 2022 ACEND standards for Didactic Programs (ACEND, 2021, p. 11), the following learning objectives can be achieved within QFP laboratory experiences: "*apply the principles of human resource management to different situations (KRDN 4.4), apply safety and sanitation principles related to food, personnel and consumers (KRDN 4.5), explain the processes involved in delivering quality food and nutrition services (KRDN 4.6), and evaluate data to be used in decision-making for continuous quality improvement (KRDN 4.7).*"

Standardized Recipes

Recipes are important tools in allocating the ingredients, equipment, and preparation plans for cooking (Johnson and Wales University, 2010). The first written recipe that described the process of preparing food was composed around 1,400 B.C. by ancient Egyptians (Johnson and Wales University, 2010). In 1896, the model of the modern recipe book was introduced by Fannie Merritt Farmer, author of the Original Boston Cooking-School Cook Book (Farmer, 1896), who introduced the concept of using standardized measurements. Thereafter, a (SR) was defined by the United States Department of Agriculture ([USDA] 1995, p. 37) as "*one that has been tried, adapted, and retried several times for use by a given foodservice operation and has been found to produce the same good results and yield every time when the exact procedures are used with the same type of equipment and the same quantity and quality of ingredients*." Given that SRs provide consistent quality and yield, many foodservice establishments employ SRs to ensure consistency of food quality and nutritional content (Hussain, 2017).

Benefits and Barriers to Using Standardized Recipes

SRs are extensively used in non-commercial (a.k.a., onsite) foodservice establishments (e.g., healthcare, education, military, and transportation) as well as commercial foodservice establishments (Gregoire, 2017). According to a project funded by the USDA (Institute of Child Nutrition, 2017), the benefits of using SRs include providing consistent food quality, predicting desirable yield, maximizing customer satisfaction, ensuring nutrient content, controlling food cost, facilitating efficient purchasing procedures, overseeing inventory control, planning labor cost, increasing employee confidence, reducing record-keeping, abiding by food safety practices, and participating in sustainability.

While a variety of benefits are recognized, barriers to using SRs have also been identified (Parsa & Kwansa, 2002). For example, even though SRs are used to prepare food items based on the ingredients, such recipes may not be used appropriately due to a lack of kitchen equipment or tools specified within the recipes (Parsa & Kwansa, 2002). A similar barrier to using SRs was identified among schools participating in the National School Lunch Program and School Breakfast Program (Echon, 2014) as the failure to coordinate information among different market forms of ingredients, such as processed or prepared from scratch, resulted in varying product quality when following SRs. Additional arguments against using SRs included the time-consuming nature and the need for employee competence to follow SRs, the lengthy process of constructing an SR along with the need to potentially share "secret" ingredients, and the possibility of expected results. Moreover, SRs can be challenging to review during food production because of wordy information,

*Corresponding Author: Phone: (859) 622-1161; E-mail: sangwook.kang@eku.edu

especially when language barriers exist among users (Dopson & Hayes, 2015). Despite these barriers, using SRs is recognized as one of the best ways to control consistency in the foodservice industry (Gregoire, 2017; Hayes & Ninemeier, 2009).

As no known study has investigated the key performance attributes of using SRs in dietetics education programs, this study aimed to investigate the importance and performance of SRs used in QFP laboratory courses in ACEND accredited didactic programs. Thereby, the specific research objectives of this study were to (1) assess the magnitude of SRs' importance and performance by applying importance-performance analysis (IPA), (2) examine the pedagogical setting of the QFP laboratory in ACEND accredited didactic programs, and (3) investigate the use of SRs in dietetics education programs. The findings of this study would be practically beneficial for reinforcing SRs' effectiveness and students' performance by adding more specific information by adapting the findings from IPA.

METHODS

The target population of this study was comprised of educators in ACEND accredited didactic programs in the US. The study examined ACEND accredited didactic programs because ACEND delineates education standards including specific knowledge requirements for dietetics education programs.

Sample Selection

The Academy of Nutrition and Dietetics website (2019) listed 270 universities having didactic programs in dietetics accredited by ACEND. Contact information for the sample population was obtained from the list of didactic programs in dietetics (The Academy of Nutrition and Dietetics, 2019). The list included the contact information of the director or chair of the program, so direct contact information (email) was obtained from institution websites by searching for appropriate contact persons through related keywords (e.g., QFP laboratory coordinator, QFP instructor, and chef instructor). A description of the study's purpose, an informed consent, and a link to the web-based questionnaire were sent via email to the identified contact at each institution. In order to contact the most appropriate individual, a request to forward the study invitation to personnel responsible for the QFP laboratory in didactic programs in dietetics was included in the email.

Questionnaire Content

The questionnaire was posted on Qualtrics®. The questionnaire was modified from a study by Smith and Costello (2008) to align with the specific purpose of this study and was composed of six sections. The first section contained ten items related to general course information about the QFP laboratory. The second section contained five items related to the environmental setting of the QFP laboratory course for their dietetics program. The third section contained nine items concerning food safety guidelines in the QFP laboratory. The fourth section contained 12 items associated with foodservice procedures offered by the QFP laboratory. The fifth section included 21 items that examined the magnitude of importance and performance of implementing SRs using a five-point Likert-type scale (1=strongly disagree, 2=disagree, 3=neither agree nor disagree, 4=agree, and 5=strongly agree). Its internal reliability was examined using Cronbach's alpha (Ary, Jacobs, & Sorensen, 2010). Finally, the sixth section contained nine demographic items (Dillman, Smyth, & Christian, 2014).

Pilot Study

A pilot test was conducted in two steps to ensure the content, construct, and face validity of the questionnaire (Dillman et al., 2014). In the first step, experts in foodservice management (n=3) and instructors (n=2) of the QFP laboratory in U.S. universities reviewed the questionnaire. In the second step, the questionnaire was reviewed by RDNs (n=2) in didactic programs in dietetics, and graduate teaching assistants (n=2) of a QFP laboratory course. Feedback obtained from these reviewers was used to modify the questionnaire and administrative procedures. From the feedback, the contextual meaning of the questions associated with IPA used to assess the key performance attributes of using SRs in laboratory experiences was revised more clearly to assess the key performance attributes of using SRs in laboratory experiences of QFP management courses. Also, as a result of reviewer comments, questions about the pedagogical setting of the QFP laboratory were added to obtain more precise data. Following modification, the questionnaire and research protocol were approved by the university's Human Subjects Review Board.

Questionnaire Distribution

This study utilized an online survey method due to its ease of distribution, timesaving value, and reduced cost (Dillman et al., 2014). The web questionnaire as distributed to ACEND accredited program personnel followed the guidelines for conducting online surveys outlined by Dillman et al. (2014). The email requested that the recipient complete the questionnaire or forward it to the most appropriate person. Reminder emails were sent for three consecutive weeks. Participants were assured they would be provided a summary of the findings. No other compensation was given. Confidentiality of participant information was ensured during the distribution and collection of questionnaires.

Importance–Performance Analysis

IPA is a technique for assessing the elements of a marketing program (Martilla & James, 1977). Through IPA, the satisfaction levels of customers are connected to the level of their beliefs, which present how each attribute's importance matches with the corresponding expectation (Martilla & James, 1977). IPA uses mean scores to compare and display results in a two-dimensional grid representing high importance/high performance (i.e., "*keep up the good work*"), high importance/low performance (i.e., "*concentrate here*"), low importance/low performance (i.e., "*low priority*"), and low importance/high performance (i.e., "*possible overkill*") (Martilla & James, 1977). On the basis of the influential research of Martilla and James (1977), numerous researchers have employed IPA from various disciplines, such as examining tourists' shopping behavior in a retail environment (Kinley, Kim, & Forney, 2002), exploring tourists' perceptions of Ireland with a pre-and post-visit survey (O'Leary & Deegan, 2005), examining users of tour guide operations in the United States (Duke & Persia, 1996), and investigating perceived satisfaction with a culinary event (Smith & Costello, 2008). In this study, IPA was used to assess the key performance attributes of using SRs in laboratory experiences in QFP management courses in dietetics education programs.

Data Analysis

Data obtained from Qualtrics® were transferred to Microsoft Office Excel® and then to the Statistical Package for Social Sciences version 24.0. The data were coded and entered in accordance with the guidelines outlined by Salant and Dillman (1994). Descriptive statistics including mean, percentage, frequency, and standard deviation were computed to allow for data distribution analysis. Questionnaire scale reliability was assessed using Cronbach's alpha (Ary et al., 2010). As this study included multiple dependent variables, multivariate analysis of variance (MANOVA) test was conducted to examine the overall difference between importance and performance effects. To

examine individual effects, univariate analysis of variance (ANOVA) test was conducted. Finally, a post hoc test was conducted to determine differences within specific groups. A 0.05 level of significance was used for analysis.

RESULTS

Demographic Characteristics and QFP Laboratory Course Information

A total of 270 web questionnaires were distributed to personnel (e.g., instructor and laboratory coordinator) associated with QFP courses in ACEND accredited didactic programs. A total of 51 (18.9%) completed responses were used for the analysis. The number of female and male participants was 39 (95.1%) and two (4.9%), respectively (Table 1).

Of the 51 programs represented, 47 (92.2%) required completion of a QFP laboratory course, while four (7.8%) stated that a QFP laboratory course was not required (Table 2). Thirty-five programs indicated that the QFP laboratory course was offered to a variety of disciplines: "food science" (11.4%, n=4), "hospitality management" (14.3%, n=5), "culinary science" (8.6%, n=3), "nutrition" (42.9%, n=15), and "other" (22.9%, n=8). Fill-in responses for the "other" selection included: "two other concentrations besides dietetics-foodservice management and nutrition and wellness," "four-year culinary degree," "food and nutrition in business and industry degree," and "family and consumer sciences teacher certification."

According to the 51 responses, a majority of the QFP laboratory courses had more than 21 enrolled students (70.6%, n=36), while 11 institutions (21.6%) had 20 or fewer enrolled students in their QFP laboratory course in Didactic Program in Dietetics (DPD) programs. (Table 2). According to the instructors' credentials (Table 2), a majority of the QFP courses (61.2%, n=30) were taught by an RDN with a master's degree, while ten (20.4%) institutions' QFP courses were taught by an RDN with a doctoral degree. The course was taught by professional chef instructors with doctoral degrees (4.1%, n=2) and a non-RD instructor with a master's degree (2.0%, n=1) at other institutions.

Table 1. Demographic Characteristics (n= 51)

Demographic Characteristic	n	(%)
Gender[a]		
Male	2	(4.9)
Female	39	(95.1)
Age[a]		
30 years or younger	1	(2.5)
31-40 years	8	(20.0)
41-50 years	9	(22.5)
51-60 years	13	(32.5)
Over 60 years	9	(22.5)
Highest education level[a]		
High school	0	(0.0)
Associate degree	0	(0.0)
Bachelors	0	(0.0)
Masters	23	(56.1)
Doctoral	18	(43.9)
Official title[a]		
Clinical instructor/lecturer	9	(25.0)
Food production manager/coordinator	3	(8.3)
Adjunct professor	2	(5.6)
Assistant professor	4	(11.1)
Associate professor	5	(13.9)
Didactic Program in Dietetics (DPD) director/professor	13	(36.1)
Total number of years worked in the current department[a]		
5 years or under	8	(20.0)
5-10 years	15	(37.5)
Over 10 years	17	(42.5)
Total number of years worked in the current role[a]		
5 years or under	16	(40.0)
5-10 years	12	(30.0)
Over 10 years	12	(30.0)
Certified food safety educator[a]		
Yes	22	(53.7)
No	19	(46.3)

[a]Totals may not equal 51 due to missing data.

Environment of the QFP Laboratory Course

Of 49 responses to the question of the setting for the QFP course, 37 (75.5%) institutions utilized an industrial kitchen setting (e.g., a kitchen setting found in restaurants, cafeterias, hotels, hospitals, and similar foodservice establishments) for the QFP laboratory courses, while 12 (24.5%) institutions did not have a commercial-type kitchen (Table 3).

In terms of the provision of food safety practices, 45 (93.8%) institutions provided disposable gloves for handling food items (e.g., ready-to-eat food items), while three (6.3%) institutions did not provide disposable gloves for students' hands-on practices in their QFP laboratory (Table 3). To avoid cross-contamination, 30 (76.9%) institutions provided color-coded cutting boards, while nine institutions (23.1%) did not provide color-coded cutting boards. To ensure the pH level of the sanitizing solution, 24 (57.1%) institutions used pH strips, while 18 institutions (42.9%) did not use pH strips to check the pH level of the sanitizing solution. To monitor perishable food safely, 19 (45.2%) institutions used dissolvable day dots or labels, while 23 (54.8%) institutions did not use either (Table 3).

Foodservice Procedures in QFP Laboratory

The majority (69.6%) of respondents' institutions served cooked food items to the public, while the remaining respondents' institutions indicated foods were consumed by internal customers (i.e., enrolled students, teaching assistants, and instructors). Of 32 respondents' institutions that served the prepared food items to the public, most institutions (78.1%) sold the food items. Among the respondents' institutions that prepared food in QFP laboratories, 40 (90.9%) institutions responded to the use of SRs during students' practices (Table 4).

To conduct foodservice operations, 25 (55.6%) respondents' institutions rotated students' job assignments (e.g., kitchen manager, chef, and front-of-house manager), while 20 (44.4%) respondents' institutions did not rotate students' position. Twenty (46.5%) respondents' institutions prepared nutrition labeling or nutrient analysis for all the menus offered, whereas two (4.7%) respondents' institutions prepared it only for the entrée. Twenty-one (48.8%) of respondents' institutions did not prepare any nutrition information for the food made.

Among the respondents' institutions that served food to the public, 19 (65.6%) used a table d'hote menu that was served at a set price, while six (20.7%) respondents' institutions used an a la carte menu with pricing based on the food item. Moreover, four (13.8%) institutions employed both table d'hote and a la carte menu for their QFP laboratory courses. Menus were distributed to customers through various delivery methods. Sixteen (53.3%) institutions

Table 2. QFP Laboratory Course Information (n=51)

QFP Laboratory Course	n	%
Is the QFP laboratory course required for graduation?		
Yes	47	92.2
No	4	7.8
Disciplines offering the QFP laboratory course[a]		
Food science	4	11.4
Hospitality management	5	14.3
Culinary science	3	8.6
Nutrition	15	42.9
Other	8	22.9
Number of enrolled students in DPD program		
10 or less	1	2.0
11 to 20	10	19.6
21 to 30	9	17.6
31 to 40	9	17.6
Over 40	18	35.4
I don't know	4	7.8
Number of enrolled students in a single section [a]		
Less than 10	6	12.2
10 to 15	14	28.6
16 to 20	15	30.6
21 to 25	4	8.2
26 to 30	1	2.0
Over 30	9	18.4
Number of day(s) of meeting per week [a]		
One day	33	66.0
Two days	13	26.0
Three days	2	4.0
Four days	1	2.0
Five days	1	2.0
Length of each section per week [a]		
Up to 2 hours	12	24.5
Up to 3 hours	22	44.9
Up to 4 hours	6	12.2
Up to 5 hours	2	4.1
Up to 6 hours	5	10.2
Over 6 hours	2	4.1
Academic credit(s) per each QFP laboratory course [a]		
1 credit	10	20.8
2 credits	9	18.8
3 credits	13	27.1
4 credits	13	27.1
Other	3	6.3
Instructor's Credential of the QFP laboratory courses [a]		
Registered Dietitian Nutritionist (RDN) with a doctoral degree	10	20.4
RDN with a master's degree	30	61.2
Non-Registered Dietitian Nutritionist (RDN) with a doctoral degree	1	2.0
Non-Registered Dietitian Nutritionist (RDN) with a master's degree	1	2.0
Professional chef with a doctoral degree	2	4.1
Professional chef with a master's degree	2	4.1
Other	3	6.1

[a]Totals may not equal 51 due to missing data

presented information about the menu through a website or social media, while six (20.0%) institutions explained the menu at the table to the customers. Eight (26.7%) institutions required students to prepare a sign or poster to promote and explain the menu to the public.

IPA Analysis of the Use of Standardized Recipes

Participants were asked to rate the degree of the seven attribute items (i.e., production, quality, nutrition, adaptability, food safety, sustainability, and information on the use of standardized recipes) that represented the importance and performance independent variables on a five-point Likert-type scale (1=strongly disagree, 2=disagree, 3=neither agree nor disagree, 4=agree, and 5=strongly agree). By assessing the magnitude of importance and performance of the seven attribute items, the attributes were classified by IPA. For the classification of the seven attributes, this study provided practical suggestions and improvements to reinforce the effectiveness of the use of SRs. The mean score of importance items was 4.16 ± 1.06 on a five-point Likert-type scale with a Cronbach's alpha of 0.91, while the mean score of performance items was 3.07 ± 0.77 with a Cronbach's alpha of 0.74. The mean score for both importance and performance items was 3.41 ± 0.81 on a five-point Likert-type scale, with a Cronbach's alpha of 0.88.

MANOVA for the omnibus test was found to be statistically significant (F-ratio= 17.487 with 6 and 18 df, $p<0.05$), supporting the proposition of a significant difference between importance and performance measures. The results of the ANOVA test (Table 5) presented significant differences between importance and performance items at $p<0.05$ level. For all the seven attribute items identified, importance measures were higher than their subsequent performance (Table 5). This finding could be interpreted as slight dissatisfaction with the performance toward the seven attribute items. Using the identified attributes, recommendations may be made for QFP laboratory instructors to maximize the performance of SRs in the QFP laboratory. However, determining which attribute QFP laboratory instructors should focus on to significantly improve the overall performance of using SRs is difficult. Therefore, Figure 1 presents the practical results by using a graphic of four quadrants to classify dependent variables by comparing the means of performance and importance measures (Deng, 2007).

Quadrant one (i.e., "*concentrate here*") included *sustainability* and *information*. These items related to reducing food waste by using SRs, practicing sustainability in QFP laboratories, and barriers to using SRs such as a lengthy process to follow SRs and wordy information for comprehending SRs. Even though SRs' lengthy process and wordy information were grouped as *information*, both following the SRs' procedures and comprehending the information on SRs are important to ensure food quality and students' performance.

Three IPA attributes emerged in the "*keep up the good work*" (i.e., quadrant two): *production*, *quality*, and *nutrition*. These related to consistency in food quantity, consistency in food quality, timeliness in food production, students' satisfaction with food quality, and ensuring nutrition facts and customer satisfaction.

One attribute was classified in quadrant three (i.e., "*low priority*"). In this quadrant, the *adaptability* attribute, which was about SRs' versatility for any type of kitchen setting, was captured. This can be interpreted as the adaptability of using SRs would be limited by different types of kitchen settings.

One attribute, food safety, emerged in quadrant four (i.e., "possibly overkill"). This attribute was about the importance and performance of food safety practices while using SRs. Even though the information on food safety compliance was stated on SRs, actual food safety practices may not be followed because users of SRs focus more on food production procedures than food safety compliance.

Table 3. Environmental Setting of QFP Laboratory (n= 51)

Environmental Setting of QFP Laboratories	n	%
Industrial kitchen setting for the QFP laboratory[a]		
Yes	37	75.5
No	12	24.5
Existence of handwashing sink in the QFP laboratory[a]		
Yes	44	89.8
No	5	10.2
Number of certified handwashing sink(s) in the QFP laboratory[a]		
Certified by National Science Foundation, Underwriter's Laboratories	24	54.5
Certified by health inspector, local health department	3	6.8
No	9	20.5
I don't know	8	18.2
Number of existing handwashing sink in the QFP laboratory[a]		
One handwashing sink	13	34.2
Two	13	34.2
Three	5	13.2
Four	4	10.5
Over four	2	7.9
Dishwashing equipment in the QFP laboratory[a]		
Industrial dishwasher indicating water pressure and temperature	10	20.4
Three-compartment sink (i.e., washing, rinsing, and sanitizing)	7	14.3
Both industrial dishwasher and three-compartment sink	28	57.1
No	4	8.2
Blast chiller in the QFP laboratory[a]		
Yes	8	18.6
No	35	81.4
Adequate refrigerated space (e.g., a walk-in refrigerator)[a]		
Yes	42	85.7
No	7	14.3
Providing disposable gloves for the QFP laboratory[a]		
Yes	45	93.8
No	3	6.2
Types of disposable gloves provided in the QFP laboratory[a]		
Latex, powdered	8	16.7
Latex, powder-free	13	27.1
Nitrile	13	27.1
Vinyl, powder-free	14	29.1
Required elements of student attire in the QFP laboratory (select all that apply)[a,b]		
Uniform	25	53.2
Apron	26	55.3
Hair restraint	42	89.4
Non-slippery kitchen shoes	41	87.2
Color-coded cutting board(s) in the QFP laboratory[a]		
Yes	30	76.9
No	9	23.1
Number of different types of color-coded cutting board[a]		
Two different types	4	14.9
Three	7	25.9
Four	7	25.9
Five	6	22.2
Six	3	11.1
Over six	0	0.0
Using pH test strips to check the sanitizing solution in the QFP laboratory[a]		
Yes	24	57.1
No, but using hot water	10	23.8
Neither using a pH strip nor hot water	8	19.1

Table 3. Environmental Setting of QFP Laboratory (n= 51) (Cont.)

Environmental Setting of QFP Laboratories	n	%
Using dissolvable day dots or labels in the QFP laboratory[a]		
Yes	19	45.2
No	23	54.8
Placing a first-aid kit in the QFP laboratory[a]		
Yes	45	95.7
No	2	4.3
Presenting a sign for emergency care for choking in the QFP laboratory[a]		
Yes	16	38.1
No	26	61.9
Placing non-slip rubber floor mats in the QFP laboratory[a]		
Yes	25	55.5
No	20	44.5

[a]Totals may not equal 51 due to missing data

[b]Percent is greater than 100, as respondents selected all that applied; thus, multiple responses.

DISCUSSION AND CONCLUSION

Pedagogical Setting of QFP Laboratory: Time Allocations

Different time allocations for QFP laboratory courses were identified in this study. As Gilmore and Robson (1990) claimed, assigning different academic credit-hour settings for QFP laboratory courses can be employed to maximize both educational effectiveness and students' learning satisfaction. Similarly, the institutions participating in this study presented different time allocations (i.e., from a two-credit hour setting to over a six-credit hour setting) in QFP laboratory courses. Given the lack of a widely accepted model for the QFP laboratory course setting, pedagogical settings of QFP laboratory courses could be established by considering methods to achieve course learning objectives and reinforce students' career selection (Gilmore & Robson, 1990). Even though the credit hours of the QFP laboratory course are set by each program's curricula processes, programs could consider adjusting time allocation based on different cooking methods within SRs. For example, leavened bread would take more time to make than unleavened or quick bread; adjusting the time allocation for the QFP allow students to benefit from experiencing the entire process of food production. Educational effectiveness and students' learning satisfaction in QFP laboratory courses could be affected by how students select, prepare, make, and assess the food made from scratch. Thereby, adaptable time allocations as per different cooking methods could be considered. Furthermore, time allocations in QFP laboratory courses could be determined by considering the extent of kitchen facilities, required academic hours, students' class schedules, availability of instructors and staff, and foodservice fulfillment to the public. Therefore, to maximize the effectiveness and achievement of QFP laboratory courses, programs should thoroughly assess the aforementioned factors.

Pedagogical Setting of QFP Laboratory: Management skills

The results of this study found that almost half of the institutions participating in the survey reported rotating schedules to facilitate the student experience of a variety of management skills. Reynolds and Rajagopal (2016) showed that having students experience different roles within QFP is helpful to develop practical thinking for problem-solving. Gilmore and Robson (1990) stated that varied experiences in QFP laboratory courses allow students to develop and hone their skill sets for future careers. Similar to these findings, the current study found that many institutions used education in dining services to improve students' management and problem-solving skills. Practicing technical and conceptual skills through the "real-world" concept of a

Table 4. Foodservice Procedures in QFP laboratory (n= 51)		
Foodservice Setting of QFP Laboratories	**n**	**%**
Using standardized recipes in the QFP laboratory[a]		
Yes	40	90.9
No	3	6.8
I don't know	1	2.3
Serving the cooked foods to the public[a]		
Yes	32	69.6
No	14	30.4
Selling the cooked foods to the public[a]		
Yes	25	78.1
No	7	21.9
Rotating students' schedule to practice foodservice roles[a]		
Yes	25	45.5
No	20	36.4
Providing nutrition information when serving foods[a]		
Yes, for all the menu items	20	46.5
Yes, but only for entrée	2	4.7
No	21	48.8
Types of menu used in the QFP laboratory [a]		
Table d'hote menu (i.e., pre-set menu served at a set price)	19	65.6
A-la-carte menu (i.e., single menus served at different prices)	6	20.7
Both table d'hote and a-la-carte menu	4	13.8
Systems of informing menu information to customers[a]		
Through the web or social media	16	53.3
At the table by a student serving foods	6	20.0
Through a poster/sign made by students	8	26.7
Serving special dietary requests (e.g., gluten-free, lactose-intolerance) [a]		
Yes	26	83.9
No	5	16.1
Teaching table service in the QFP laboratory[a]		
Yes	25	80.6
No	6	19.4
Collecting customers' satisfaction survey[a]		
Yes, from paper-based questionnaires	23	76.6
Yes, from online reviews	3	10.0
Yes, from verbal feedback	2	6.7
Yes, through instructor's feedback	2	6.7

[a] Totals may not equal 51 due to missing data

QFP laboratory course is beneficial for students in foodservice-related as well as dietetics majors. Onsite foodservice at hospitals focuses on improving patient satisfaction through varied services, such as menu selection and spoken menu (Folio, O'Sullivan-Maillet, & Touger-Decker, 2002; Williams, Virtue, & Adkins, 1998). Advanced technology systems in foodservice (e.g., point-of-sale systems, food waste data tracking systems, and recipe software) may also be adopted to enhance educational effectiveness in foodservice management and increase the adaptability of future students' careers by practicing technical and conceptual skills. Chandler, Weber, Finley, and Evans (2007) claimed that technical and conceptual skills should be in the foreground in QFP courses, and educating both technical and conceptual skills beneficial for increasing students' career adaptability.

IPA Analysis of Using SRs: "Keep up the Good Work"

This study explored the magnitude of importance and performance of using SRs in QFP laboratory courses by using IPA. Through the identified IPA attributes, educators practically reinforce SRs to enhance the effectiveness and performance of students' practices. Three IPA attributes that emerged in quadrant one (i.e., "*keep up the good work*") could be interpreted as the use of SRs ensuring consistency in *food production*, *quality*, and *nutrition*. Thus, yields of food products could be accurately converted by the desired numbers of servings, and food quality could be ensured by following SRs. The concept of food quality encompassed service quality because SRs generally describe the best method of serving foods to maximize food quality. Furthermore, this study found that 40 (78.4%) educators of QFP laboratory courses believed that using SRs could ensure accurate nutrition information. Therefore, educators would be able to continue using SRs to comply with rigorous quality and quantity standards, including assurance of nutrition facts.

IPA Analysis of Using SRs: "Concentrate Here"

Two IPA attributes (i.e., *information* and *sustainability*) emerged in quadrant two (i.e., "*concentrate here*"). In terms of the sustainability attribute, educators recognized this as an important subject to teach, however, some practices about sustainability might not be easily conducted, and/or SRs might not contain detailed information for sustainability practices. Even though SRs present detailed information on making foods, SRs might not fully describe the steps needed to reduce food waste or handle perishable foods for leftovers. In particular, students from dietetics or nutrition-related majors would likely abide by the portion size suggested by the SR because not following it strictly would impact the nutrition facts. For example, for SRs that indicate the desired portion size (e.g., 6 oz of cooked pasta per portion), either educators or students would use the SR's suggested portion size even though they might be able to serve a slightly larger serving of pasta (e.g., 6.4 oz or 6.6 oz cooked pasta per portion) to reduce food waste. Thus, educators prioritizing this attribute may be able to develop and utilize a chart that contains nutrition facts reflective of adjusted portion sizes.

Similar to the aforementioned barriers (Abraham et al., 2002; Parsa & Kwansa, 2002), even though using SRs was recognized for ensuring food quality and quantity production, the unwillingness of using SRs may be due to restrictions within the class time allocations. Time spent reading wordy SRs could be one of the barriers. Likewise, to address some of the barriers, educators could make students prepare plans with graphic workflow diagrams based on their comprehension of SRs (Gregoire, 2017). Graphic workflow diagrams would facilitate students following the common information of SRs.

IPA Analysis of Using SRs: "Low priority"

One attribute, *adaptability*, emerged in quadrant three (i.e., "*low priority*"). This study showed a belief that SRs might not work well in a kitchen environment not equipped with SR requirements (e.g., required kitchen tools, equipment, and specific ingredients), therefore, educators responded being reluctant to use SRs when working in a kitchen environment that did not satisfy minimum SR requirements. Also, since brands are not specified on SRs, (Echon, 2014), utilization may not result in consistent quality with different brands of common food ingredients. Therefore, entries of food brands on SRs could be considered to increase the acceptance of using SRs. To address the reluctance of using SRs due to a lack of SR requirements, educators could develop recommended substitutions for tools, equipment, and ingredients. For example, if a big steam-jacketed kettle is required, batch cooking can be used to divide the portions into small batches for preparation in a small steam-jacketed kettle or an appropriate pot on a cooking stove.

Moreover, SRs in QFP laboratory courses were mainly constructed for quantity production (e.g., more than 25 serving yields), so educators may assume that using SRs for small yields would be inappropriate. To overcome this assumption, verified conversion factors for each

Table 5. Mean Scores for Importance and Performance of Using Standardized Recipes (n=40)						
Pull attribute	**Related questions**	**Importance**	**Performance**	**Mean Diff.**	**F-ratio**	**Sig.**
Production	**Consistent quantity & timeliness** • Using standardized recipes is always important to ensure consistent quantities of food production. • Using standardized recipes is always important to keep food production on time.	4.48	3.98	0.50	9.134	0.004*
Quality	**Consistent quality & food satisfaction** • Using standardized recipes is always important to ensure consistent quality of food production • Using standardized recipes always ensures internal customers' (i.e., students) satisfaction.	4.45	3.28	1.17	41.933	0.001*
Nutrition	**Nutrition facts & customers' satisfaction** • Using standardized recipes is always important to ensure the nutrition facts of menu items. • Using standardized recipes always ensures external customers' satisfaction.	4.38	3.35	1.03	42.518	0.001*
Adaptability	**Quantity production & kitchen equipment** • Standardized recipes are always convenient for the commercial kitchen. • Using standardized recipes is always important for any type of kitchen (i.e., home and commercial kitchen).	3.30	1.62	1.68	55.487	0.001*
Food Safety	**Food handling & production procedures** • Using standardized recipes is always important to follow food safety guidelines. • Using standardized recipes is always important for safe dishwashing procedures.	3.88	3.56	0.32	21.341	0.001*
Sustainability	**Saving energy & food waste** • Using standardized recipes is always important for fulfilling sustainability practices (e.g., kitchen equipment schedule to save energy) • Using standardized recipes is always important to reduce and control food waste.	4.18	2.95	1.23	33.348	0.001*
Information	**Lengthy process & wordy information** • Using standardized recipes always takes a long process to follow • Reading and understanding standardized recipes always takes time.	4.56	2.82	1.74	156.623	0.001*

* $p<0.05$

ingredient for SRs could be developed by the educators. Recipe software (e.g., XtraCHEF™, MasterControl®, AVEVA®) could be used to convert the yields of SRs to ensure consistency in food quality and nutrition facts of each modified SR. As seen from the IPA analysis (Figure 1), SRs' adaptability should be practically improved by stating alternative production methods to address kitchen equipment and tools shortages. Also, equivalent ratios for ingredient conversions should be mentioned in the recipe. For example, students may not be familiar with converting the ingredient volume to weight, and vice versa. As one of the practical improvements of this study's findings, either equivalent weight or volume of raw products can be stated on SRs. For example, one large egg in the recipe would be equivalent to two ounces and one clove of fresh garlic would be equivalent to one teaspoon of minced garlic. By conveying more specific information on SRs, students' application and performance would be enhanced. The enhanced SRs that contain more specific information would be beneficial for reinforcing students' hands-on practices by maintaining consistent quality and conversion.

IPA Analysis of Using SRs: "Possibly Overkill"

An unexpected finding was that of the attribute, *food safety*, which emerged in quadrant four (i.e., "*possibly overkill"*) since food safety is one of the most important teaching criteria in foodservice management. According to Martilla and James (1977), the attribute in this quadrant could be interpreted as food safety practices not being performed well because students who were aware of food safety would focus on ensuring food production, rather than rigorously abiding by food safety practices. This was consistent with previous studies (Stein, Dirks, & Quinlan, 2010; Yarrow, Remig, & Higgins, 2009; Sanier & Konaklioglu, 2012), which found that college students might not demonstrate proper food safety practices even though they had sufficient food safety knowledge. It is important for educators to regularly review these practices with hands-on activities to reinforce their significance (McArthur, Holbert, & Forsythe, 2006). Moreover, educators' proper behaviors and leadership can impact students' attitudes and intentions to perform safe food handling practices (Lee et al., 2013). Assessment of safe food handling practices should be performed consistently in QFP courses to provide evidence of students' ability to apply classroom knowledge of food safety information. As students conduct safe food handling practices, they could recognize that food safety should be as important as other attributes that resided in quadrant one, "*keep up the good work*". During the QFP labs, instructions for proper food handling practices should be implemented to reduce the gap between food safety knowledge and actual food safety practices.

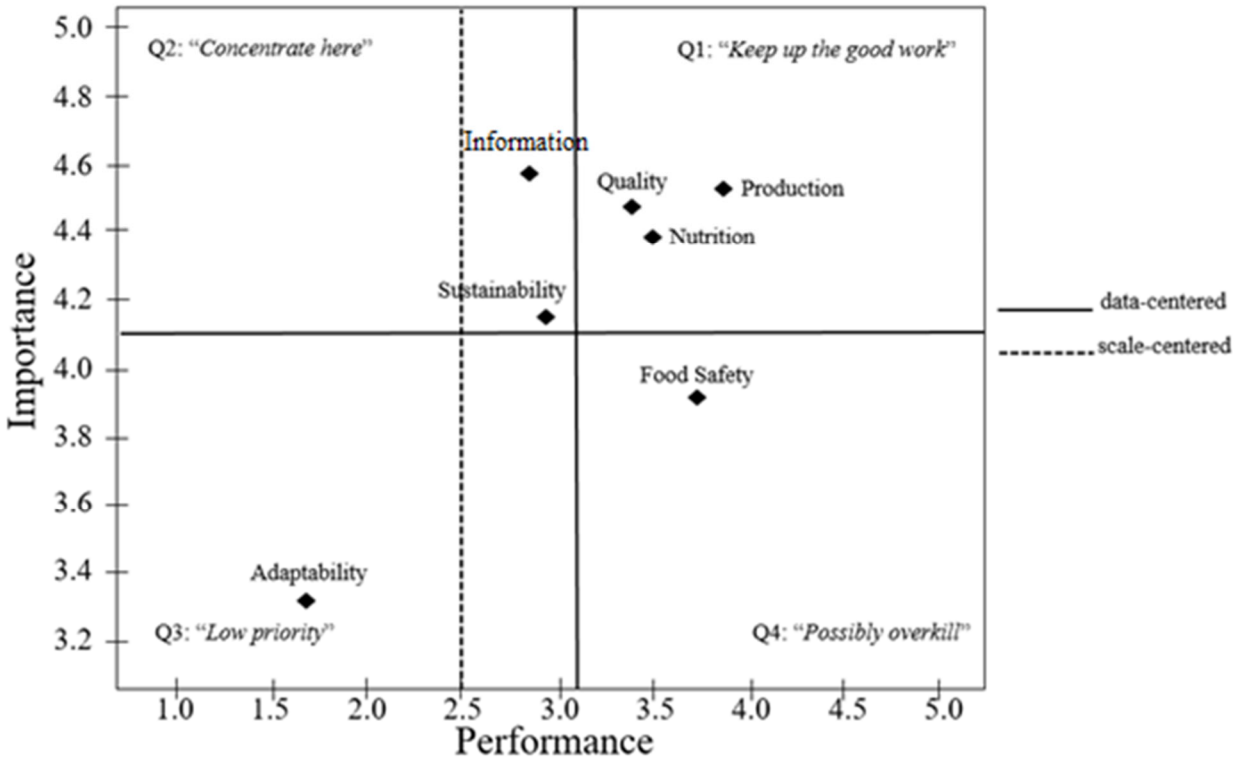

Figure 1. IPA Analysis for Using Standardized Recipes in Quantity Food Production Laboratories (n=40)

Respondents rated their level of importance and performance of using SDs in the QFP laboratory with five-point Likert scale items: 1=strongly disagree to 5=strongly agree.

Limitations and Future Studies

This research had several limitations. Findings from this study associated with IPA analysis could not be generalized to other QFP laboratory courses due to variances in products, services, and yields of SRs. However, IPA analysis of using SRs could be useful to many ACEND accredited didactic programs to reinforce the learning objectives of QFP laboratory courses. The findings of this study contribute to enhancing SRs' importance and performance by adding specific information about food production and guidelines for food safety. This study found that SRs would not adequately describe the information about sustainability practices such as how to handle the leftover food and control portions to reduce food waste. Thereby, despite the limitation in generalization, this study would contribute to SRs' improvement by reinforcing all important aspects such as potion control, food quality, food safety, and food production manuals.

The response rate was another limitation of this study. Future studies could utilize different approaches to access the population (e.g., obtaining contact information from the Food and Nutrition Conference & Expo®). Other educational institutions that use SRs (e.g., culinary schools, hospitality majors) could be considered for future studies to increase sample sizes. Also, future studies could focus on how to share the common and best practices of using SRs to ensure the quantity, quality, and nutrition of foods and services for QFP laboratory courses. Moreover, differences in the environmental settings of QFP laboratory courses could be identified. The last limitation is due to a lack of standards for generally accepted SRs. Despite the use of common SRs, food quality could be inconsistent due to differences in food handlers' level of competency and the variability of convenience food brands, quality in fresh produce, and desired yield of SRs. Therefore, a future investigation could target the identification of specific SR attributes and how they impact food quality and nutrition facts.

REFERENCES

Abraham, S., Chattopadhyay, M., Montgomery, M., Steiger, D.M., Daft, L., & Wilbraham, B. (2002). *The school meals initiative implementation study-third year report*. http://www.fns.usda.gov/sites/default/files/smiyear3.pdf

Academy of Nutrition and Dietetics. (2019). *Didactic programs in dietetics*. https://www.eatrightpro.org/acend/accredited-programs/didactic-programs-in-dietetics

Academy of Nutrition and Dietetics. (2021). *ACEND Accreditation Standards for Nutrition and Dietetics Didactic Programs (DPD)*. https://www.eatrightpro.org/-/media/eatrightpro-files/acend/accreditation-standards/2022standardsdpd-82021.pdf?la=en&hash=5211EDDE999FB860D220DF0227AC573B133A845D

Academy Quality Management Committee. (2018). Academy of Nutrition and Dietetics: Revised 2017 scope of practice for the registered dietitian nutritionist. *Journal of the Academy of Nutrition and Dietetics, 118*(1), 141-165. https://doi:10.1016/j.jand.2017.10.002

Ary, D., Jacobs, L. C., & Sorensen, C. (2010). *Introduction to research in education*. Belmont, CA: Wadsworth.

Chandler, J.A., Weber, M., Finley, D.A., & Evans D.A. (2007). Evaluating teaching effectiveness in a quantity food laboratory setting. *Journal of Hospitality & Tourism Education, 19*(3), 23-30. https://doi:10.1080/10963758.2007.10696894

Deng, W. (2007). Using a revised importance-performance analysis approach: The case of Taiwanese hot springs tourism, *Tourism Management, 28*, 1274-1284.

Dillman, D. A., Smyth, J. D., & Christian, L. M. (2014). *Internet, phone, mail, and mixed mode surveys: The tailored design method* (4th ed.). Danvers, MA: John Wiley & Sons, Inc.

Dopson, L.R., & Hayes, D.K. (2015). *Food and Beverage Cost Control, 6th Edition*. Somerset, NJ: Wiley.

Duke, C., & Persia, M. (1996). Performance-importance analysis of escorted tour evaluations. *Journal of Travel and Tourism Marketing, 5*, 207-224.

Echon, R. M. (2014). Quantitative evaluation of HHFKA nutrition standards for school lunch servings and patterns of consumption. *Journal of Child Nutrition & Management, 38*(1). https://schoolnutrition.org/5--News-and-Publications/4--The-Journal-of-Child-Nutrition-and-Management/Spring-2014/Volume-38,-Issue-1,-Spring-2014---Echon/

Farmer, F. M. (1896). The Boston cooking-school cook book. John Wilson and Son: Boston, MA. https://d.lib.msu.edu/fa/8#page/1/mode/2up

Folio, D., O'Sullivan-Maillet, J., Touger-Decker, R. (2002). The spoken menu concept of patient foodservice delivery systems increases overall patient satisfaction, therapeutic and tray accuracy, and is cost neural for food and labor. *Journal of the American Dietetic Association, 102*(4), 546-548.

Gregoire, M. B. (2017). Foodservice organizations: A managerial and systems approach. 9th edition. Peason: Boston, MA.

Gilmore, S., & Robson, R. A. (1990). Student perception of laboratory experiences in quantity food production management. *The Council on Hotel, Restaurant and Institutional Education Hospitality Research Journal, 14*, 101-115.

Hayes, D.K., & Ninemeier, J.D. (2009). *Human Resources Management in the Hospitality Industry*. Somerset, NJ: Wiley.

Hussain, Z. (2017). Importance of standardized recipes in food service settings. *Mathews Journal of Diabetes and Obesity, 1*(1):005. https://www.mathewsopenaccess.com/scholarly-articles/importance-of-standardized-recipes-in-food-service-settings.pdf

Institute of Child Nutrition. (2017). *Why use standardized recipes?* https://theicn.org/resources/527/food-service-management-skills/107291/why-use-standardized-recipes.pdf

Johnson and Wales University. (2010). *Culinary Essentials. 2nd edition*. Columbus, OH: McGraw-Hill Education.

Kinley, T., Kim, Y.K., & Forney, J. (2002). Tourist-destination shopping center: An importance-performance analysis of attributes. *Journal of Shopping Center Research, 9*, 51-71.

Lee J., Almanza, B. A., Jang, S., Nelson, D. C., & Ghiselli, R. F. (2013). Does transformational leadership style influence employees' attitudes toward food safety practices? *International Journal of Hospitality Management, 33*, 282-293. https://doi:10.1016/j.ijhm.2012.09.004

Martilla, J.A., & James, J.C. (1977). Importance-performance analysis. *Journal of Marketing, 41*, 77-79.

McArthur, L. H., Holbert, D., Forsythe, W. A. (2006). Compliance with food safety recommendations among university undergraduates: Application of the health belief model. *Family and Consumer Sciences Research Journal, 35*(2), 160-170. https://doi:10.1177/1077727X06292932

O'Leary, S., & Deegan, J. (2005). Ireland's image as a tourism destination in France: Attribute importance and performance. *Journal of Travel Research, 43*, 246-256.

Parsa, H.G., & Kwansa, F.A. (2002). *Quick Service Restaurants, Franchising, and Multi-Unit Chain Management*. New York, NY: Taylor & Francis.

Reynolds, J., & Rajagopal, L. (2016). Use of modified problem based learning in an undergraduate quantity food production course. *Journal of Foodservice Management & Education, 10*(2), 35-40. https://fsmec.org/wp-content/uploads/2016/12/10-2-Reynolds.pdf

Salant, P. & Dillman, D. A. (1994). *How to conduct your own survey*. New York: John Wiley & Sons, Inc.

Sanlier, N., & Konaklioglu, E. (2012). Food safety knowledge, attitude and food handling practices of students. British Food Journal, 114, 469-480. https://doi:10.1108/00070701211219504

Smith, S., & Costello, C. (2008). Culinary tourism: Satisfaction with a culinary event utilizing importance-performance grid analysis. *Journal of Vacation Marketing, 15*, 99-110.

Stein, S. E., Dirks, B. P., & Quinlan, J. J. (2010). Assessing and addressing safe food handling knowledge, attitudes, and behaviors of college undergraduates. *Journal of Food Science Education, 9*, 47-52. https://doi:10.1111/j.1541-4329.2010.00092.x

United States Department of Agriculture. (1995). *A tool kit for healthy school meals: Recipes and training materials.* https://files.eric.ed.gov/fulltext/ED423950.pdf

Williams, R., Virtue, K., & Adkins, A. (1998). Room service improves patient food intake and satisfaction with hospital food. *Journal of Pediatric Oncology Nursing, 15*(3), 183-189.

Yarrow, L., Remig, V. M., & Higgins, M. M. (2009). Food safety educational intervention positively influences college students' food safety attitudes, beliefs, knowledge, and self-reported practices. *Journal of Environmental Health, 71*, 30-35. https://www.ncbi.nlm.nih.gov/pubmed/19192742