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RESEARCH CONTRIBUTIONS:

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Implementation of International Dysphagia Standards for Food and Drink Modification: A Model Process for Food Service Operations

An Investigation of Competency-based Teaching Methods and Technology Integration in Foodservice Management Courses in Dietetics Programs

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The Impact of a Portion Plate on Plate Waste in a University Dining Hall

University dining facilities generate nearly 3.6 million tons of waste annually with 10-20% estimated as food. The study's purpose was to determine the impact of portion plates on reducing plate waste in a university dining hall. Data were collected in a Midwestern university in two phases. Phase 1 utilized normal service plates, while Phase 2 introduced the choice of a portion plate. Results showed a reduction in edible and aggregate plate waste per person from Phase 1 to Phase 2. Participants who utilized portion plates reported a greater awareness of their food choices and intentionally chose less food while dining.

Implementation of International Dysphagia Standards for Food and Drink Modification: A Model Process for Food Service Operations

The International Dysphagia Diet Standardisation Initiative is a global guide to improve the lives of those with dysphagia. To standardize and improve patient care, Intermountain Healthcare transitioned from the national dysphagia standards to the international dysphagia standards. A five-step process including recipe testing, recipe modification, and updated training and educational materials for foodservice employees and caregivers involved in dysphagia care was used in the transition. Foodservice employees play a vital role in ensuring patient safety by adhering to and implementing current dysphagia standards. Intermountain Healthcare's implementation of the international guidelines provides a transition model for other foodservice operations.

An Investigation of Competency-based Teaching Methods and Technology Integration in Foodservice Management Courses in Dietetics Programs

This study investigated foodservice educators' current teaching methods and technology integration in the classroom. A total of 41 faculty members teaching foodservice management courses in dietetics programs completed the online survey for this research. The findings indicated that the lecture-based method was the most common teaching method used to teach foodservice management competencies, followed by discussions and case-based learning. Most participants perceived themselves as beginners in technology integration. Technology integration in the classroom was infrequent. Technology was mostly used for lecture preparation. This study provides suggestions for using various teaching methods and technology tools to teach foodservice management courses.

College Student Demand for Humanely Raised Livestock Product: Evidence from Vermont

The attribute "humanely-raised" has potential to differentiate animal products in the marketplace. The Real Food Challenge, a program designed to alter purchasing patterns by foodservice operations in colleges and universities, includes increased purchases of humane products as a goal. This paper reports on surveys of students at the University of Vermont (UVM). The surveys were developed, administered, and analyzed as part of a service-learning class project, working in partnership with UVM Dining. The results suggest that despite confusion about the meaning of humane, students place importance on this attribute and a majority state a willingness to pay a premium to include more humane products in campus dining meals. Implications focus on strategies for educating students and meeting their preferences for animal products, as well as for service-learning partnerships with university courses and dining services.

THE IMPACT OF A PORTION PLATE ON PLATE WASTE IN A UNIVERSITY DINING HALL

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ABSTRACT

University dining facilities generate nearly 3.6 million tons of waste annually with 10-20% estimated as food. The study's purpose was to determine the impact of portion plates on reducing plate waste in a university dining hall. Data were collected in a Midwestern university in two phases. Phase 1 utilized normal service plates, while Phase 2 introduced the choice of a portion plate. Results showed a reduction in edible and aggregate plate waste per person from Phase 1 to Phase 2. Participants who utilized portion plates reported a greater awareness of their food choices and intentionally chose less food while dining.

Keywords: Portion Plate, Plate Waste, University Dining Hall, Sustainability

INTRODUCTION

Food waste is an important concern as the annual amount of food eligible for human consumption that is wasted globally is approximated to be 1.3 billion tons. This estimate roughly equates to one third the total amount of food produced for humans annually (Food and Agriculture Organization [FAO], 2018). According to the United States Department of Agriculture (USDA), the United States contributes nearly 30 to 40 percent food waste from the general food supply, which results in an estimated 133 billion pounds and $161 billion worth of waste annually (USDA, n.d.). This considerable percentage of food is wasted before it even reaches the retail or consumer level of consumption (Buzby et al., 2014). Accordingly, in 2017, the Environmental Protection Agency (EPA) estimated that there was 22 percent food placed into landfills and combustion facilities (EPA, 2019).

Furthermore, landfills generate approximately 20 percent of the total methane gas production which negatively affects climate change and the environment (EPA, 2019). In order to help reduce the large amount of food waste within the United States, in 2015, the EPA and the USDA created the 2030 Food Loss and Waste Reduction Goal, stated to decrease food loss and waste by 50 percent over the subsequent 15 years (EPA, 2019).

To further illustrate the significance of elevated levels of food waste, it has been estimated that the energy represented by the wasted food in the United States is around 150 trillion kilocalories per year, which can be broken down to 1,400 kilocalories per person per day (Hall et al., 2009). This analysis has significant implications due to the fact that the United States currently has more than 37 million food insecure

individuals and minimal efforts at food recovery and redistribution (Feeding America, n.d.). Continued levels of uncontrolled food waste will have increasingly negative ramifications for the economy, environment, and society.

According to the National Center for Education Statistics, as of 2016 there were approximately 4,500 degree-granting institutions (United States Department of Education, National Center for Education Statistics, 2019). College and university dining facilities contribute to waste by generating nearly 3.6 million tons of waste per year with 10-20% estimated to be food (Whitehair & Shanklin, 2013). With the ever-growing dialogue revolving around sustainability, foodservice operation managers have discussed approaches to implement sustainable practices into their facilities. A study conducted by Kwon et al. (2012) indicated that many foodservice managers were motivated to implement sustainability methods in their operations because of financial and environmental benefits, however they lacked the resources to implement more serious processes.

It was found by Chen et al. (2010) that recent practices of composting and trayless dining have been implemented into food service facilities and have received positive feedback. When twenty-five Aramark facilities removed trays from their food service operations, there was a reported reduction of 11,505 pounds of food waste, estimated to be 1.2 – 1.8 ounces per person per meal (Aramark Higher Education, 2008). Sodexo food services pulled trays from their dining facilities and propagated similar results. Sodexo approximated that around 200 gallons of water per 1,000 meals would be saved with the removal of trays; at one million meals per day served by the company, it totaled around 200,000 gallons of unused water (Sodexo, 2008).

At an another all-you-can-eat buffet-style dining facility, there was a 25 percent reduction in plate waste using education and awareness alone, however, when trayless dining was implemented in addition to the education, waste reduction increased to 54 percent, indicating the additional benefit of going trayless (Kim & Freedman, 2010). Furthermore, Thiagarajah and Getty (2013) found a significant mean decrease in food waste of 0.81 ounces per person after going trayless. In addition, Sarjahani et al. (2009) also indicated a significant reduction of 1,726 pounds of edible food waste when trays were removed. Reasons for the reduction of food waste given by Whitehair and Shanklin (2013) included students being more aware and focused while making food choices, thus eliminating the wandering around and grazing as previously noted prior to going trayless. Overall, the literature supported the technique of going trayless in food service operations as a primary method of reducing consumer-level plate waste.

One alternative to reduce food waste is the exploration of visual cues and their effects on food waste. A study conducted by Huerta et al. (2014) found that when compared to taste and odor, visual cues of food had the most significant brain stimulation within the higher-order visual cortex rather than traditional locations of food-appetite

regulation, indicating a complex and multi-faceted reaction to food visuals. Considering the visual system produces stronger brain responses in relation to food than taste and odor, anti-waste methods that focus on utilizing visual cues may yield superior results than other methods. A study conducted by Whitehair et al. (2013) researched the basis of the Elaboration Likelihood Model, which illustrates two methods to persuasion: the peripheral route and the central route. The primary difference between these two routes is dependent on how much thinking is required to process the information presented. The peripheral route occurs quicker and requires less thinking to understand the message, while the central route requires thinking about personal influence when processing the information. The researchers utilized a prompt-type message to represent the peripheral route because the message could be gathered via one quick glance over. A feedback message represented the central route because it contained more personal information of significance and required more thought to understand the message. It was found that the prompt-type message led to a 15 percent reduction in food waste in addition to influencing the student's behaviors toward food waste, indicating that in this instance of promoting awareness of sustainability, visual cues utilizing the peripheral route to persuasion demonstrated superior results (Whitehair et al., 2013).

Portion size is an applicable visual cue that may be related to food waste. A study conducted by Freedman and Brochado (2010) found that decreasing the portion size of a single food item resulted in decreased consumption, and subsequently the plate waste of that food item. A threshold of reduced portion size was identified as still being acceptable to consumers and that also decreased consumption and plate waste. A similar study investigated by Vermote et al. (2018) found that a 20 percent reduction in portion size led to a significant 66.4 percent decrease of plate waste. Both studies indicated that a reduction and awareness of portion size led to significant reductions in food waste, indicating the connection between portion size and plate waste. Furthermore, a study conducted by Berkowitz et al. (2015) found that even the simple addition of reduced portion size entrées resulted in decreased plate waste. A significant decrease in plate waste was found when both normal and reduced-size options were available, indicating that consumer awareness increased with the presence of more than one portion size to choose from (Berkowitz et al., 2015).

A concept commonly studied in weight management and obesity research is the use of a portion control plate. A study conducted by Kesman et al. (2011) found that individuals who used the portion control plate had significantly greater weight loss when compared to the control group with normal service plates. Another study by Pedersen et al. (2007) discovered that patients who received portion control interventions had greater success at weight loss when compared to those receiving standard care. Overall, the past literature suggests that portion plates have a significant impact on weight loss due to the increased awareness brought to portion sizes during consumption.

Although the aforementioned studies researched the connection between portioning and consumption, there is a paucity of research evaluating the effects of the portion plate on plate waste. Based upon this dearth of literature, the purpose of this study was to determine if introducing the option of a portion plate in a university dining facility would impact consumer plate waste in that facility. The objectives of this research study were 1) to determine the effectiveness of a portion plate on reducing plate waste in a university dining facility, 2) gain insight into potential contributors of plate waste from the consumer perspective, and 3) pilot test a potential implementation strategy for reducing waste in a university setting.

METHODOLOGY

Study Design

The study was approved by the Institutional Review Board (IRB) at Bradley University, the Committee on the Use of Human Subjects in Research. Permission to use an on-campus residential dining hall at a mid-sized private Midwestern university for data collection was obtained from the General Manager of Dining Services at the university. Approximately 400 students dined at the dining hall between the dinner hours of 5:00 p.m. and 8:00 p.m. each evening during the regular academic year. The dining hall utilized an all-you-can-eat, self-serve, buffet-style of meal service. Data collection occurred in two phases: Phase 1 and Phase 2. Baseline data for Phase 1 was collected using the regular service plates the dining hall owned, including a large 10 ¼ in. service plate. During Phase 2, diners had the choice of using either the regular large 10 ¼ in. service plate offered by the dining hall or a 10 ¼ in. diameter Chinet Paper Dinnerware 3-Compartment Plate (Chinet, De Soto, Kansas), hereafter referred to as a portion plate. Each diner had full autonomy in choosing which plate option they preferred. The decision to continue offering the regular plates along with the portion plates in Phase 2 was based upon guidance from the General Manager of Dining Services. The General Manager emphasized that customer satisfaction in the dining hall was imperative and that diners should have their choice of plates (regular or portion) during Phase 2. Data collection for Phase 2 occurred exactly 28 days after Phase 1, on the same day of the week (Wednesday), using the same menu. The dining hall used a cycle menu that repeated every 28 days, which ensured that menu items were kept consistent. Waste was collected and measured from plates only, with food from bowls and cups omitted. This was to determine if the implementation of the portion plate would alter the amount of plate waste generated.

Participants

Participants were recruited using a convenience sampling of students that had a campus meal plan at the university and who dined at the residential dining hall. Criteria for inclusion in the study were specified on the cover page of the survey instrument; it was required that students be currently enrolled at the university and 18 years of age or older to participate in the research study. Exclusion criteria for the study comprised any non-student person or person under the age of 18.

Survey Instrument Development

Survey questionnaires were developed for Phase 1 and Phase 2 to examine the constructs of this research and were based on pertinent questions from the literature. Survey questions were identical for both Phase 1 and Phase 2, with two additional questions included in Phase 2 to assess participants' feedback while using a portion plate. The survey instruments assessed participants' knowledge and beliefs regarding food/plate waste, sustainability, along with demographic information. The instruments were pilot tested among 25 university students and modifications were made based on relevant feedback. Modifications include grammatical changes and the inclusion of graduate students in the demographics question. This step was taken to ensure that the survey instruments had high content validity for primary data collection. The final version of the survey instruments included demographics questions; questions regarding knowledge or attitude towards nutrition, sustainability, and plate waste; and behavior-related questions related to food selection. For both Phase 1 and Phase 2, participants were invited to write their institution email address on a tear-away slip at the bottom of the completed

survey to be entered into a drawing for gift certificates. Participants detached the emails slips when they submitted their surveys and the slips were stored separately from the completed surveys, which helped protect the confidentiality of survey responses.

Phase 1 Data Collection Procedure

Phase 1 data were collected under normal conditions of the dining hall. All regular service plates were utilized and no portion plates were available for use. Research volunteers were stationed at the entrance doors to the dining hall and offered surveys to diners as they entered. Participants completed the surveys as they ate and submitted them to the research volunteers stationed at the exit doors to the dining hall. A total of 201 (53.6% of all diners) usable surveys were included in data analysis. Surveys were excluded from data analysis if there was missing or incorrect data such as two or more answers filled in for single-answer questions, or surveys that had multiple questions not completed. Plate waste for all diners (n = 375) was collected and discarded into one of two bins in the dish room. One bin was designated for edible plate waste. Edible plate waste in this study included any food item that was still edible (i.e. left-over noodles, sauce, chicken vegetables, etc.). A second bin was designated for inedible plate waste only, including but not limited to: napkins, condiment packaging, and inedible rinds and skins from fresh fruits. Waste bins were weighed during the data collection time frame by the primary researcher at the convenience of the dining hall kitchen employees so as to not disrupt the flow of work and service. Waste from the bins were recorded in ounces of edible and inedible waste.

Phase 2 Data Collection Procedure

Phase 2 data collection introduced the option of using a portion plate for participants. Research volunteers were stationed at the entrance doors to the dining hall and offered a portion plate and survey to diners as they entered. Each portion plate that was distributed automatically came with an accompanying survey instrument that participants were instructed to complete. Participants completed the surveys as they ate and submitted them to the research volunteers stationed at the exit doors to the dining hall. Regular service plates were still available for diners who declined the portion plate option. Diners declining the portion plate option did not receive a survey and thus were not participants in Phase 2 of this study. A total of 278 (61.4% of all diners) usable surveys were included in data analysis. Surveys were excluded from data analysis if there was missing or incorrect data. Plate waste for all diners (n = 453) was collected and discarded into one of two bins in the dish room (edible and inedible plate waste), with waste collection and record-keeping mirroring Phase 1. Plate waste was removed from the portion plates and the portion plates were discarded separately. The weight of the discarded portion plates was not included in the data analysis.

Measurements

Survey instruments were administered to participants and collected by research volunteers. Plate waste was measured as aggregate, edible, and inedible waste. Weight measurements were taken throughout the data collection time period and performed by the primary researcher using a digital food scale.

Data Analysis

Data were analyzed using the SPSS Statistics version 25 (International Business Machines [IBM] Corporation, Armonk, New York). Statistical tests used included descriptive statistics and One Way Analysis of Variance (ANOVA) for the survey instruments. Chi-Square tests were used to measure differences in demographic data. Statistical significance was measured at the $p \leq .05$ level.

RESULTS AND DISCUSSION

Participants

During Phase 1 of data collection, a total of 375 diners ate at the facility during the hours of 5:00 p.m. and 8:00 p.m. Of the 375 total diners, 201 (53.6%) participants (56% females and 44% males) ranging in education level from freshman to graduate students completed the survey instrument (Table 1). During Phase 2, a total of 453 diners ate at the facility between the hours of 5:00 p.m. and 8:00 p.m. Of the 453 total diners, 278 (61.4%) participants (56% females and 44% males) ranging in education level from freshman to graduate students completed the survey instrument. According to Dillman (2014), based on a population of around 400, a sample size of 196 responses was desired for survey data collection. Therefore, sample sizes for Phase 1 (n = 201) and Phase 2 (n = 278) both met this threshold.

Plate Waste

Plate waste was analyzed by aggregate, edible, and inedible plate waste ounces per person. Aggregate waste included both edible and inedible waste from diners. Results indicated that both mean aggregate waste per person and mean edible waste per person decreased as a result of the use of the portion plate intervention during Phase 2.

Mean aggregate waste per person from Phase 1 equaled 3.11 ounces and 2.75 ounces from Phase 2, indicating a reduction in total waste as a direct result of the intervention (Figure 1). It was also noted that the mean amount of edible waste per person decreased from 2.82 ounces per person in Phase 1 to 2.38 ounces per person in Phase 2. There was a very small increase in the mean inedible waste from Phase 1 to Phase 2 from 0.29 ounces per person to 0.37 ounces per person. A possible explanation is that this could have been attributed to slight variances in the foodservice system inputs, transformations, or outputs during Phase 1 and Phase 2. For example, providing cut cantaloupe with or without the rinds removed, differences in condiment packaging, or the availability of seasonal fresh fruit.
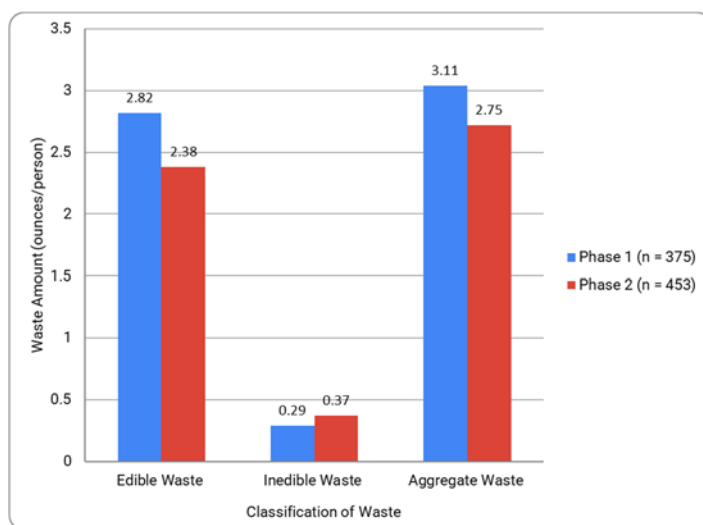
Figure 1: *Comparison of edible, inedible, and aggregate waste per person of diners in a residential dining hall.*

Note: Data collection occurred in two phases: Phase 1 and Phase 2. Phase 2 data collection occurred exactly 28 days after Phase 1, using the same menu. Data for Phase 1 was collected from 375 diners using the regular service plates the dining hall owned, including a large 10 ¼ in. service plate. During Phase 2, 453 diners had the choice of using either the regular large 10 ¼ in. service plate offered by the dining hall or a 10 ¼ in. diameter portion plate.

Survey Instrument

There were no significant differences between the demographics of students in Phase 1 and Phase 2. Identical percentages of female and male students were identified in Phase 1 and Phase 2, $c^2(1, N = 479) = 0.01$, $p = .93$ (Table 1). Likewise, the percentages of each education level were markedly similar, $c^2(4, N = 479) = 5.45$, $p = .24$, along with frequency of dining, $c^2(3, N = 479) = 0.41$, $p = .94$, concluding that there were no significant differences in demographics of participants in either phase of the study.

For both Phase 1 (Table 2) and Phase 2 (Table 3) , the average frequency of dining for males was reported to be five to six times per week, while it was reported for females to be three to four times per week. When comparing gender to the frequency of dining of Phase 1 survey participants, it was found that males dined more frequently at the dining halls than females ($p < .001$) . Results from the Phase 2 survey also showed that males were likely to dine more frequently than females ($p = .015$). When asked about typically finishing all the food on their plates, males indicated they were more likely to typically finish their food than females in both Phase 1 ($p < .001$) and Phase 2 ($p = .003$).

Two additional questions were included in the Phase 2 survey to assess participants' perceptions or behaviors while using a portion plate. The first additional question asked participants about the perceived awareness of their food choices while using a portion plate (Table 4). About half of the participants (52.2%, n = 145) stated that the awareness of their food choices did not change, while 46% (n = 128) indicated that they became more aware of their food choices. Only 1.8% (n = 5) of participants thought they had become less aware of their food choices while using a portion plate. When excluding the participants that indicated that the awareness of their food choices did not change (n = 145), 96.2% (n = 128) thought they had become more aware of their food choices, while only 3.8% (n = 5) thought they had become less aware of their food choices while using a portion plate. This is an important finding, which shows that using portion plates could potentially be a useful tool in promoting food awareness to diners.

The second question included in the Phase 2 survey asked participants about the perceived effect of the use of the portion plate on their actual food choices (Table 5). About half of the participants (49.6%, n = 138) stated that their food choices stayed the same, while 44.6% (n = 124) indicated that they had chosen less food. Only 5.8% (n = 16) of participants responded that they had chosen more food while using a portion plate. When excluding the participants that indicated that their food choices stayed the same (n = 138), 88.6% (n = 124) indicated that they had chosen less food, while only 11.4% (n = 16)

Table 1. Participant Demographics from Phase 1 Survey and Phase 2 Survey		
Characteristics of Participants	Phase 1 (n = 201)	Phase 2 (n = 278)
Gender		
Female	112 (56%)	156 (56%)
Male	89 (44%)	122 (44%)
University Level of Education		
Freshman	119 (59%)	192 (69%)
Sophomore	52 (26%)	57 (21%)
Junior	15 (7%)	15 (5%)
Senior	12 (6%)	10 (4%)
Graduate Student	3 (2%)	4 (1%)
Dining Frequency Per Week		
1-2 times	34 (17%)	51 (18%)
3-4 times	60 (30%)	78 (28%)
5-6 times	55 (27%)	73 (27%)
7 or more times	52 (26%)	76 (27%)

thought they had chosen more food while using a portion plate. This is also an important finding, which shows that portion plates could potentially be used to help reduce plate waste.

In both Phase 1 (Table 6) and Phase 2 (Table 7), participants were asked if they had previously taken a sustainability course. This data was compared with participants' awareness of food waste impact on the environment, economy, and society, as well as participants' awareness of their own contributions to plate waste. Results for both Phase 1 and Phase 2 showed that participants who had taken a sustainability course were more aware of the impact of food waste in the environment, economy, and society than participants who had not taken a sustainability course. Furthermore, participants in both Phase 1 and Phase 2 who had taken a sustainability course were more aware of their own contributions to plate waste than participants who had not taken a sustainability course. It is interesting to note that in Phase 2, responses regarding the awareness of the impact of food waste in the environment, economy; and society and participants' awareness of their own contributions to plate waste were statically significant ($F = 7.60$, $p = .006$; and $F = 4.57$, $p = .033$, respectively), but were not statistically significant in Phase 1. A possible explanation for this could be that the addition of portion plate usage in Phase 2 could have increased participants' awareness to sustainability issues, such as the overall impact of food waste on society, as well as their own personal plate waste.

The purpose of this study was to determine if introducing the option of a portion plate in a university dining facility would impact consumer plate waste generated in that facility. Prior studies

Table 2: Participants' Frequency of Dining and Finishing Food on their Plate during Phase 1 (n = 201)					
	Males n = 89	Females n = 112	Total n = 201		
Survey Question	M (SD)	M (SD)	M (SD)	F (1,199)	P*
How many times a week do you typically eat dinner at the dining hall? 1. 1-2 times 2. 3-4 times 3. 5-6 times 4. 7 or more times	2.92 (0.99)	2.38 (1.03)	2.62 (1.05)	13.91	< .001
Do you typically finish all the food on your plate? 1. Always 2. Often 3. Sometimes 4. Never	1.87 (0.69)	2.26 (0.71)	2.08 (0.73)	15.63	< .001
* Indicates statistical significance at $p ≤ .05$.					

Table 3. Participants' Frequency of Dining and Finishing Food on Their Plate during Phase 2 (n = 278)					
	Males n = 122	Females n = 156	Total n = 278		
Survey Question	M (SD)	M (SD)	M (SD)	*F* (1,199)	*P**

How many times a week do you typically eat dinner at the dining hall?
  1. 1-2 times
  2. 3-4 times
  3. 5-6 times
  4. 7 or more times
	2.80 (1.04)	2.49 (1.08)	2.63 (1.07)	6.05	.015

Do you typically finish all the food on your plate?
  1. Always
  2. Often
  3. Sometimes
  4. Never
	1.99 (0.66)	2.24 (0.71)	2.13 (0.70)	9.09	.003

* Indicates statistical significance at $p \le .05$.

conducted on food waste management and portion control help to elucidate the results from this study. In regards to students' awareness of sustainability issues, Whitehair et al. (2013) found that providing a simple prompt-type message, with a statement to not waste food, resulted in a 15% reduction of food waste in residential dining facilities. The provision of a portion plate could also be viewed as a simple prompt that may provide students with a visual cue to be more aware of their food choices.

A study by Kwon et al. (2010) indicated that foodservice operators in dining facilities were supportive of programs to assist them in sustainable management of food waste. The study also found that there was a need to focus on reducing barriers to encourage foodservice operators to implement sustainable food waste programs in their dining operations. The initial cost of replacing existing service plates with portion plates might be perceived as a financial barrier to a foodservice operator. However, a reduction in plate waste achieved by implementing portion plates in a foodservice operation could be both cost-effective and environmentally sound.

Berkowitz et al. (2015) found a significant decrease in plate waste when both normal-sized and reduced-size entrée options were offered. This parallels the findings of this study, in which both normal plates and portion plates were offered to diners. This is an important observation, because if a foodservice operator chose to offer both portion plates and regular plates to diners, then a reduction in food waste might still likely be the result, as was found in this study.

Freedman and Brochado (2010) found that reducing the portion size of French fries offered in individual paper bags in an all-you-can-eat dining operation had beneficial effects. This included a reduction in plate waste, decreased food production, and overall food cost savings, which could potentially be realized by purchasing portion plates for use in residential dining facilities. A study by Kesman et al. (2011) described weight loss amidst obese patients who participated in a portion control plate intervention within a general medicine practice setting. Portion plates could be beneficial to students for weight loss in a dining hall setting, in addition to reducing plate waste and food waste costs.

CONCLUSIONS AND APPLICATIONS
The study addressed various factors associated with food waste including a) the effects of a portion plate intervention on reducing plate waste in a university dining facility, b) insight into potential contributors of plate waste from the consumer perspective, and c) a pilot test of a potential implementation strategy for reducing waste in a university setting.

The use of a portion plate in a university dining facility may help reduce the amount of plate waste generated by that facility. The results from this study found that on average, the amount of edible food waste per person decreased when using a portion plate. This is important for foodservice operators to consider from a long-term strategic perspective. An investment in portion plates could help to decrease the amount of food chosen by students in a residential dining facility, which would then not subsequently be wasted. Once implemented, portion plates would constantly and continually help with reducing the amount of food needing to be produced and also in decreasing the volume of food waste requiring disposal. Not only would this have a positive impact on the environment, but it would also help to reduce the costs associated with food preparation and solid waste management methods.

In this study, students' awareness of food choices increased and students made more deliberate food choices while using the portion plate. However, not all students may wish to dine using a portion plate, and the option to use a regular plate could be related to students' perceptions of customer satisfaction. Thus, a gradual implementation of portion plates into a dining facility could be performed over time. Foodservice operators could determine the popularity of the portion plate option by tracking the type of plates returned to the dishroom; the edible food waste could be measured as well. During the initial introduction of the portion plates, a simple, prompt-like message or information flyer could help to communicate the reasons for offering portion plates to diners.

It is not surprising that students who had taken a sustainability course were more aware of their own contributions to plate waste than participants who had not taken a sustainability course. Sustainability is important to the current generation of students (Generation Z);

Table 4. Participants' Perceived Awareness of Their Food Choices with the Portioned Plate during Phase 2 (n = 278)			
Participants	Became more aware of food choices	Became less aware of food choices	Awareness of food choices did not change.
Males (**n** = 122)	52 (42.6%)	1 (0.8%)	69 (56.6%)
Females (**n** = 156)	76 (48.7%)	4 (2.6%)	76 (48.7%)
Total (**n** = 278)	128 (46%)	5 (1.8%)	145 (52.2%)

Note: Participants were asked: "*Circle the answer that best describes your level of awareness of your food choices with the portioned plate.*" Participants were given the options of: a) I became more aware of my food choices, b) I became less aware of my food choices, and c) my awareness of my food choices did not change.

Table 5. Participants' Perceived Effect of Using a Portioned Plate on Their Food Choices during Phase 2 (n = 278)			
Participants	Chose more food	Chose less food	Food choices stayed the same
Males (n = 122)	8 (6.6%)	49 (40.2%)	65 (53.3%)
Females (n = 156)	8 (5.1%)	75 (48.1%)	73 (46.8%)
Total (n = 278)	16 (5.8%)	124 (44.6%)	138 (49.6%)

Note: Participants were asked: "*Choose the best option regarding the portioned plate effect on your food choices.*" Participants were given the options of: a) chose more food, b) chose less food, and c) food choices stayed the same.

input regarding sustainable practices in dining facilities could be solicited from students and then used to develop or update sustainability practices in a foodservice operation, including the management of plate waste. Besides a sustainability class, education about sustainability can also come from dining operators themselves, by providing useful materials to students, holding focus groups, or discussing green initiatives at dining advisory meetings with students. Participation in professional organizations can assist foodservice operators by providing access to current and innovative information about sustainability methods that could be implemented in their operations.

The methodology from this study could be applied to other colleges and universities. Disposable portion plates could initially be evaluated to see if they were effective in reducing plate waste in a given foodservice operation. If effective, a cost-benefit analysis could then be conducted to compare the cost of portion plates versus the economic benefits associated with reducing wasted food. One potential benefit for students through better portion control could be better weight control; this could also assist in mitigation of the general societal issue of obesity. Yet other benefits for the environment could be reduced greenhouse gas emissions from food waste sent to landfills, decreased energy costs, and less water waste generated by the dining facility.

Limitations of the study included a sample collected in one mid-sized private Midwestern university; therefore, the results from the intervention cannot necessarily be generalized to a different setting. The data were collected at only two points in time; therefore, the lack of replications was a limitation. Future studies focused on the use of a portion plate could attempt to implement the portion plate intervention in other types of foodservice operations or in other geographic locations with larger sample sizes. Additionally, long-term effects of the use of portion plates could be researched by increasing the number of intervention replications, coupled with an extended data collection time period of six months or longer.

There was practical significance to the study as it was determined that the use of a portion plate decreased the amount of food taken and subsequently wasted in a residential dining hall at a mid-sized university. Findings are in line with the EPA and USDA Food Loss and Waste Reduction Goal of decreasing food waste by the year 2030 and represent a small, yet meaningful step towards developing more sustainable practices in university settings. Sustainability practices such as those measured in this study demonstrate practical application to help reduce the impact of food waste in onsite foodservice operations such as university dining halls.

REFERENCES

Aramark Higher Education. (2008, July). The business and cultural acceptance case for trayless dining. Retrieved from http://docplayer.net/124278154-The-business-and-cultural-acceptance-case-for-trayless-dining.html

Berkowitz, S., Marquart, L., Mykerezi, L., Degeneffe, D., & Reicks, M. (2015). Reduced-portion entrées in a worksite and restaurant setting: impact on food consumption and waste. *Public Health Nutrition, 19*(16), 3048-3054. https://doi.org/10.1017/s1368980016001348

Buzby, J. C., Wells, H. F., & Hyman, J. (2014). The estimated amount, value, and calories of postharvest food losses at the retail and consumer levels in the United States. United States Department of Agriculture, Economic Research Services. Retrieved from www.ers.usda.gov/publications/eib-economic-information-bulletin/eib-xxx.aspx

Chen, C., Arendt, S., & Gregoire, M. (2010). What sustainable practices exist in college and university dining services? *Journal of Foodservice Management & Education, 4*(1), 5-10. Retrieved from https://fsmec.org/wp-content/uploads/2011/09/ChenArendtGregoire2010.pdf

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

Environmental Protection Agency [EPA]. (2019). United States 2030 food loss and waste reduction goal. Retrieved from https://www.epa.gov/sustainable-management- food/united-states-2030-food-loss-and-waste-reduction-goal

Food and Agriculture Organization [FAO]. (2018). Food loss and food waste. Retrieved from http://www.fao.org/food-loss-and-food-waste/en/

Table 6. Participants' Awareness of Food Waste in the Environment, Economy, and Society and Their Own Contributions to Plate Waste Compared with having Previously Taken a Sustainability Course in Phase 1					
Survey Question	Total n = 201 M (SD)	Sustainability Course (Yes) n = 33 M (SD)	Sustainability Course (No) n = 168 M (SD)	F (1,199)	P*
To what extent are you aware of the impact of food waste in the environment, economy, and society? 1. Fully aware 2. Somewhat aware 3. Somewhat unaware 4. Fully unaware	2.07 (0.82)	1.88 (0.74)	2.11 (0.83)	2.18	.142
To what extent are you aware of your own contributions to plate waste? 1. Fully aware 2. Somewhat aware 3. Somewhat unaware 4. Fully unaware	1.76 (0.76)	1.63 (0.55)	1.78 (0.79)	0.99	.322

* Indicates statistical significance at $p \leq .05$.

Table 7. Participants' Awareness of Food Waste in the Environment, Economy, and Society and Their Own Contributions to Plate Waste Compared with having Previously Taken a Sustainability Course in Phase 2

Survey Question	Total n = 278 M (SD)	Sustainability Course (Yes) n = 30 M (SD)	Sustainability Course (No) n = 248 M (SD)	F (1,276)	P*
To what extent are you aware of the impact of food waste in the environment, economy, and society? 1. Fully aware 2. Somewhat aware 3. Somewhat unaware 4. Fully unaware	1.99 (0.76)	1.63 (0.61)	2.03 (0.76)	7.60	.006
To what extent are you aware of your own contributions to plate waste? 1. Fully aware 2. Somewhat aware 3. Somewhat unaware 4. Fully unaware	1.85 (0.76)	1.57 (0.57)	1.88 (0.78)	4.57	.033

Data are represented as M(SD).

* Indicates statistical significance at p ≤ .05.

Feeding America. (n.d.). For people facing hunger, poverty is just one issue. Retrieved from https://www.feedingamerica.org/hunger-in-america/facts

Freedman, M. R., & Brochado, C. (2010). Reducing portion size reduces food intake and plate waste. *Obesity, 18*(9), 1864-1866. https://doi.org/10.1038/oby.2009.480

Hall, K. D., Guo, J., Dore, M., & Chow, C. C. (2009). The progressive increase of food waste in America and its environmental impact. *PLoS ONE, 4*(11), e7940. https://doi.org/10.1371/journal.pone.0007940

Huerta, C., Sarkar, P., Duong, T., Laird, A., & Fox, P. (2014). Neural bases of food perception: Coordinate-based meta-analyses of neuroimaging studies in multiple modalities. *Obesity, 22*(6), 1439-1446. https://doi.org/10.1002/oby.20659

Kesman, R. L., Ebbert, J. O., Harris, K. I., & Schroeder, D. R. (2011). Portion control for the treatment of obesity in the primary care setting. *BMC Research Notes*, 4(346), 1-5. https://doi.org/10.1186/1756-0500-4-346

Kim, T., & Freedman, M.R. (2010). Students reduce plate waste through education and trayless dining in an all-you-can-eat college dining facility. *Journal of the American Dietetic Association, 110*(9), A68. https://doi.org/10.1016/j.jada.2010.06.253

Kwon, S., Bednar, C., Kwon, J., & Butler, K. (2012). An investigation of college and university foodservice administrators' level of agreement on potential influencing factors on sustainable food waste management. *Journal of Foodservice Management & Education, 6*(2), 21-26. Retrieved from http://fsmec.org/wp-content/uploads/2013/12/6-2-S-Kwon.pdf

Pedersen S. D., Kang, J., & Kline, G. A. (2007). Portion control plate for weight loss in obese patients with type 2 diabetes mellitus: A controlled clinical trial. *Archives of Internal Medicine*, 167, 1277-1283. https://doi.org/10.1001/archinte.167.12.1277

Sarjahani, A., Serrano, E. L., & Johnson, R. (2009). Food and non-edible, compostable waste in a university dining facility. *Journal of Hunger & Environmental Nutrition, 4*(1), 95-102. https://doi.org/10.1080/19320240802706874

Sodexo. (2008). Sodexo challenges diners on college campuses to go trayless and go green. Retrieved from https://www.csrwire.com/press_releases/15738-Sodexo-Challenges-Diners-on-College-Campuses-to-Go-Trayless-and-Go-Green

Thiagarajah, K., & Getty, V. M. (2013). Impact on plate waste of switching from a tray to a trayless delivery system in a university dining hall and employee response to the switch. *Journal of the Academy of Nutrition and Dietetics, 113*(1), 141-145. https://doi.org/10.1016/j.jand.2012.07.004

United States Department of Agriculture [USDA]. (n.d.). How much food waste is there in the United States and why does it matter?

Retrieved from https://www.usda.gov/oce/foodwaste/faqs.htm

United States Department of Education, National Center for Education Statistics. (2019). Digest of Education Statistics, 2017. Retrieved from https://nces.ed.gov/fastfacts/display.asp?id=84

Vermote, M., Versele, V., Stok, M., D'Hondt, E, Deforche, B., … Deliens, T. (2018). The effect of a portion size intervention on French fries consumption, plate waste, satiety and compensatory caloric intake: An on-campus restaurant experiment. *Nutrition Journal, 17*(43). https://doi.org/10.1186/s12937-018-0352-z

Whitehair, K. J., & Shanklin, C. W. (2013). Suggestions for implementing trayfree dining in a selected dining unit. *The Journal of Foodservice Management & Education, 7*(2), 1-7. http://fsmec.org/wp-content/uploads/2013/12/7-2-Whitehair.pdf

Whitehair, K. J., Shanklin, C. W., & Brannon, L. A. (2013). Written messages improve edible food waste behaviors in a university dining facility. *Journal of the Academy of Nutrition and Dietetics, 113*, 63-69. https://doi.org/10.1016/j.jand.2012.09.015

IMPLEMENTATION OF INTERNATIONAL DYSPHAGIA STANDARDS FOR FOOD AND DRINK MODIFICATION: A MODEL PROCESS FOR FOOD SERVICE OPERATIONS

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ABSTRACT

The International Dysphagia Diet Standardisation Initiative is a global guide to improve the lives of those with dysphagia. To standardize and improve patient care, Intermountain Healthcare transitioned from the national dysphagia standards to the international dysphagia standards. A five-step process including recipe testing, recipe modification, and updated training and educational materials for foodservice employees and caregivers involved in dysphagia care was used in the transition. Foodservice employees play a vital role in ensuring patient safety by adhering to and implementing current dysphagia standards. Intermountain Healthcare's implementation of the international guidelines provides a transition model for other foodservice operations.

Keywords: dysphagia management, IDDSI implementation, hospital foodservice, healthcare

INTRODUCTION

Foodservice personnel play an important role in dysphagia management as they prepare food and beverages. Dysphagia refers to swallowing difficulties or dysfunction (Minshall & Pownall, 2019). Normal swallowing occurs in three phases: oral, pharyngeal, and esophageal (Baijens et.al., 2016). Swallowing difficulties may occur during any of the phases and may include the inability to chew food or form a bolus properly during the oral phase or inability to clear food or liquid from the mouth or pharynx after swallowing (Baijens et al., 2016; Minshall & Pownall, 2019). Dysphagia is estimated to affect eight percent of the general population and causes are often related to other underlying medical conditions (International, 2016).

Complications of dysphagia include aspiration and malnutrition. Aspiration is foreign matter entering the airway that causes the individual to choke (Gallegos et al., 2017). Repeated aspirations may lead to respiratory infections and other serious complications requiring further medical treatment (Minshall & Pownall, 2019). Individuals with dysphagia often experience malnutrition and dehydration from reduced intake because eating and drinking can be painful and embarrassing, and when aspiration occurs, can be fatal. (Gallegos et al., 2017; Minshall & Pownall, 2019; Taylor, 2019).

Dysphagia Management

Oral nutrition, or feeding by mouth, is the preferred feeding method for patients with dysphagia as it is less invasive and expensive than nutrition support (Leonard et al., 2014). Speech and language

therapists (SLT) strive to prevent aspiration and choking by carefully determining diet and fluid modifications, providing swallow therapy, and educating patients (Minshall & Pownall, 2019). Based on the recommendations of the SLT and the swallowing ability of the patient, thin liquids are thickened, and foods are softened and modified in size to reduce the risk of aspiration (Leonard et al., 2014; Taylor, 2019). If a patient is considered to be at nutritional risk, a registered dietitian nutritionist (RDN) is consulted to help with the dysphagia diet implementation by evaluating the adequacy of the patient's nutrient intake and monitoring for malnutrition (Taylor, 2019). Foodservice employees implement the SLT and RDN recommendations. The training and management of foodservice employees is key in providing appropriate dysphagia care.

Dysphagia Diets and Standards

Since the early 2000s, the National Dysphagia Diet (NDD) standards have provided guidance for dysphagia management (McCullough et al., 2003). The NDD standards provided standardized terminology for dysphagia diets based on a continuum of different foods and textures (McCullough et al., 2003; Zwiefelhofer, 2012). The NDD contained three levels of modified food: level 1, Dysphagia Pureed; level 2, Dysphagia Mechanically Altered; and level 3, Dysphagia Advanced or Soft (McCullough et al., 2003). The NDD also contained three levels of liquid modification: nectar like, honey like, and pudding thick (Gallegos et al., 2017).

Even though the NDD was standardized in terms of food and liquid levels, these standards were not implemented by all dysphagia care teams and healthcare facilities in the United States or internationally (International, 2016; Zwiefelhofer, 2012). This variability in dysphagia management created confusion for patients and caregivers when labels, levels, and terminology did not translate from different facilities, areas, or countries who provided dysphagia care to the same individual (International, 2016). The International Dysphagia Diet Standardisation Initiative (IDDSI) was created in 2013, published in 2015, and updated in 2019 (International, 2016). The IDDSI committee reviewed existing literature on dysphagia and dysphagia care and developed a framework with standardized descriptors for food and drink modifications for individuals with dysphagia (International, 2016). The publication of new dysphagia standards introduced the need for foodservice operations to review and update menus and recipes and train foodservice employees in preparing modified food and drinks to meet the new standards.

IDDSI Framework

The IDDSI framework consists of eight levels (0-7) of food textures and drink thickness on one continuum (See Figure 1). Liquids are levels 0 through 4 with thickness increasing with each level. Level 0 is naturally thin liquids such as water. Level 1 contains liquids that are slightly thicker than water, but can be easily sipped through a straw. Level 2 contains mildly thick liquids that require more effort but can still be sipped through a straw. Liquidized foods and Moderately Thick

liquids share similar consistencies and are on level 3. Level 4 contains extremely thick liquids and shares the same consistency as Level 4 pureed foods (International, 2019). Food textures are contained in levels 4 through 7. Level 4 contains pureed foods. Transitional foods (Levels 5 through 7) are foods that begin as one texture but change into another when moisture or heat is added (International, 2019).

METHODS
Implementation of IDDSI at Intermountain Healthcare: A Model Approach

Intermountain Healthcare (Intermountain) is comprised of 23 major hospitals throughout the Intermountain west. All Intermountain hospitals provide care for patients with dysphagia. Prior to 2020, Intermountain used the NDD standards for their dysphagia management. In 2018, Intermountain made plans to adopt and implement the new IDDSI guidelines. The implementation process covered a two-year period and included the following steps to implementation:

1. Creating an interdisciplinary implementation team
2. Conducting testing procedures on existing dysphagia menu items
3. Standardizing dysphagia recipes across the healthcare system
4. Creating foodservice training and educational materials
5. Implementing foodservice training

The 5-step process used by Intermountain provides a model approach for other foodservice operations.

Creating an Interdisciplinary Implementation Team

Implementation of the IDDSI framework involved the creation of a healthcare systems level interdisciplinary implementation team (team) who defined the processes and tasks needed to transition to the IDDSI guidelines. The team consisted of administrative foodservice dietitians, clinical dietitians, a dietetic intern, chefs, nutrition services directors, and representatives from nursing, speech therapy, pediatric care, and computer systems. The team met monthly to discuss the implementation process. Each representative

Figure 1. IDDSI Framework (International, 2019).

was responsible for keeping their disciplines informed. The director of the team, a RDN and clinical nutrition manager, assigned each team member/workgroup with tasks related to their area of expertise. Workgroups were formed as needed to accomplish tasks. The foodservice/culinary workgroup was comprised of the director of patient meals, the systems-level chef, and the dietetic intern. This workgroup was responsible for all recipe testing, menu modification, and foodservice employee education and training to meet the IDDSI framework guidelines.

Conducting Existing Menu Items Testing to Determine Modification Needs

Intermountain utilizes one adult dysphagia menu across the system and one children's dysphagia menu. Each item (drink and food) on the NDD based dysphagia menu was tested to see if it met the new IDDSI standards or required modification. Testing was completed over a four-month period. The testing methods used to determine the accuracy of food and liquid consistency for each level were referenced from the IDDSI framework, along with descriptions and characteristics of the level and the rationale for each level (International, 2019). Testing methods included the fork pressure test, the spoon pressure test, the spoon tilt test, the fork drip test, and the gravity flow test (International, 2017). Table 1 shows a description of each test and testing method. Additional details are available at https://iddsi.org/resources/ under Framework Documents: IDDSI Framework and Detailed Level Definitions.

Recipe testing occurred at both adult and pediatric facilities. The NDD -based dysphagia menu items and closest corresponding IDDSI level were organized on a spreadsheet with columns for the results of each test (i.e. size, fork pressure, etc.) for both the drink (IDDSI Levels 1-3) and food (IDDSI Levels 4-7) items. Levels 2-4 aligned well with the NDD nectar, honey, and pudding thick levels respectively. Levels 4-6 on the IDDSI framework aligned well with NDD levels 1-3. Level 7 on the IDDSI framework does not have a corresponding level from the NDD. The spreadsheet included a column for notes on how to modify each menu item to meet the IDDSI guidelines.

The workgroup worked with the chef and kitchen manager at each facility to complete the testing. On testing days, food preparation timing was coordinated so that each menu item being tested was cooked in a staggered manner to allow for sufficient testing on each dish and recording of results and notes.

Drink Testing. Each drink item was tested using the methods described in the IDDSI framework for levels 1-3. (see Table 1 for detailed descriptions). Each drink item that met the IDDSI framework requirements was recorded on the testing procedure spreadsheet. For the drinks that did not meet the testing requirements, thickener amount was adjusted until the drink met the framework level requirements. The amount of thickener needed was noted on the spreadsheet. Table 2 lists key findings and recommendations for drink testing.

From the test results, a drink reference preparation chart was created specifying the amount of thickener needed for each drink item and preparation notes such as stirring time and thickening period. This reference chart is used by foodservice employees in the kitchen and by nurses on the patient unit when thickening beverages.

Food Testing. Food testing began at level 4 Pureed/Extremely Thick. Only the food items that were made in house were tested. Intermountain purchases several items as preformed pureed products that meet IDDSI standards for the Pureed level. Each food item for

Table 1. IDDSI Framework Level Descriptors and Accompanying Testing Methods (International, 2017)		
Framework Level	**Description**	**Testing Methods**
Level 0: Thin Liquids	Liquid should flow quickly like water	**Gravity Flow Test** (no liquid in syringe after ten seconds)
Level 1: Slightly Thick	Liquid should be thicker than normal water.	**Gravity Flow Test** (between one and four milliliters (mL) of liquid left in the syringe)
Level 2: Mildly Thick	Liquid should require effort to drink through a standard straw.	**Gravity Flow Test** (between four and eight mL liquid left in the syringe)
Level 3: Moderately Thick/Liquidized	Liquid can be eaten with a spoon but not a fork.	**Gravity Flow Test** (at least eight mL of liquid left in the syringe) **Fork Drip Test** (liquid drips slowly through the prongs of a fork) **Spoon Tilt Test** (pours) easily from a spoon when tilted
Level 4: Extremely Thick/Pureed	Food or drink cannot be sucked through a straw or drunk easily from a cup.	**Fork Pressure Test** (the tines of a fork leave a clear indentation when pressed on the sample) **Fork Drip Test** (does not flow continuously through the prongs of a fork) **Spoon Tilt Test** (hold its shape on a spoon but slip easily off when tilted)
Level 5: Minced and Moist	Food at this level must be soft and moistened throughout. Biting is not required, and minimal chewing is needed.	**Size Check** (particle sizes 4 millimeters (mm) in width and 15 mm in length or less for adults, and 2 mm in width and 8 mm in length or less for children) **Fork Pressure Test** (does not return to original shape and must not make the nail blanch white) **Fork Drip Test** (must not easily fall through the prongs of a fork) **Spoon Tilt** (must be able to hold its shape on a spoon and should slide off easily when tilted)
Level 6: Soft and Bite-Sized	Chewing is required for this level.	**Size Check** (8 mm or less for children and 15 mm or less for adults) **Fork Pressure Test** (must not return to its original shape when pressed. Pressure required to squash food blanches nail white) **Spoon Pressure Test** (side of spoon can cut food into smaller particles, and when pressed with a spoon the sample does not return to original shape)
Level 7: Easy-to-Chew/Regular	Easy-to-Chew: foods are naturally soft and tender in texture and require no further modification. No hard, chewy, crunchy, or stringy foods are allowed on this level. Regular refers to normal foods with no texture requirements.	Testing methods are the same for Easy-to-Chew as Level 6. Testing methods for Regular food are not applicable.

levels 5-7 were tested using the methods described in Table 1. As the NDD menu did not have a food level that corresponded with Level 7 Easy to Chew, the workgroup only tested regular menu items that the head chef determined may be naturally soft and tender without need for food modification. The menu items that met the testing requirements for this level were labeled as appropriate for the Easy-to-Chew diet order. Examples include tuna salad, ham and egg scramble, and blueberry muffins.

Testing Results. Over 300 menu items were tested and approximately 40% failed the initial tests, meaning they would require modification to meet IDSSI standards. Table 2 summarizes the key findings and recommendations from the testing. All the issues were recorded next to the corresponding menu item on the spreadsheet with notes for modification. The head chef reviewed the initial testing results and determined the need for further testing and modification. The testing results were also shared with the other members of the IDDSI implementation team.

Standardizing Recipes

The next step in the IDDSI implementation process was recipe modification and standardization. The former dysphagia recipes were edited and standardized to address the needed changes to meet the IDDSI guidelines found during the testing process. The workgroup standardized the dysphagia recipes to address the issues with each menu item.

The head systems chef created a draft version of the new recipes with modifications on techniques and ingredients based on the initial test results. Each menu item was then prepared by facility chefs following the new recipe and was retested by the workgroup. Recipe revisions were made for clarification based on the retest and feedback from the facility chefs. One example of a revision was to add the fork reference information along with the size requirement to each recipe for levels 5 and 6. This enabled the chefs to easily gauge if the food particles were the correct size for the recipe they were following. For example, on level 6 recipes this information was included after the particle size requirement of 15 mm - "15 mm, approximately the width of a room service fork." These additions were necessary to ensure the recipe yielded the same size particles each time when followed. Prior to these additions, the chefs were not sure what 15 mm looked like and thus the recipes they tested did not consistently pass the size requirements.

The recipes were adjusted for simplicity in terms of equipment and techniques needed to enable the cooks to feel confident in their ability to make each recipe correctly. The chefs provided creative ideas and insights for plating techniques such as arranging food items in rows or shapes. The workgroup refined the plate presentation of the modified foods for visual appeal and took photographs of the final designs as a reference for cooks and other foodservice employees.

At the completion of recipe testing and modification, a product evaluation was held for the IDDSI implementation team. Samples of the updated dysphagia menu items were presented in a taste panel for evaluation of quality, flavor, and presentation. Team members sampled modified food and drink items for each level of the IDDSI framework, along with preformed products for level 4 Pureed. The

Table 2. Key Findings and Recommendations from Recipe Resting	
Drink Modification Findings	**Recommendations**
Oral nutrition supplements thicken inconsistently compared to juice or water. (For example, Ensure Clear requires significantly more thickener and Boost requires less thickener than the recommended amount). Beverages thicken over time	• Test each supplement and specify the amount of thickener needed for each level of modification in the recipe • Do not rely on the manufacturer recommendations based on fluid amount as they will not be consistent across supplements • Amount of thickener will depend on the amount of time it takes to be delivered to patient after thickening • Make note of the average delivery time to allow for adequate thickening and to avoid using too much thickener
Carbonated beverages form high amounts of bubbles when thickened and stirred, causing inaccurate gravity flow test results.	• Shake or stir carbonated beverages prior to thickening to reduce the amount of bubbles • Stir slowly when mixing in the thickener to prevent further bubble formation • Reducing the bubble amount significantly reduces the palatability of the carbonated beverage
Beverages are offered in different sizes.	• A recipe for thickening needs to be created for each beverage size offered at the facility
Food Modification Findings	
Particle sizes of foods can be too large for IDDSI guidelines.	• For Level 5 Minced and Moist meats use a food processor to meet size requirements • Use couscous for all pasta dishes on Level 5 to meet size requirements (chopping pasta creates a gummy texture inappropriate for this level)
Estimating particle size in millimeters may be difficult.	• Add size requirement with references (such as width between fork tines) to each recipe so the cooks know what the size should look like
Liquid separates from the food. (IDDSI guidelines state that foods with separately liquid cannot be served unless the patient can tolerate thin liquids safely).	• Drain the liquid if possible (example: fruit cups). If not possible remove from the dysphagia menu
Some foods have hard or tough textures.	• Increase cooking time to tenderize • Steam instead of bake or roast to soften • Steam fibrous meats then pulse in a food processor
Some foods have an unappetizing appearance once modified.	• Develop new plating arrangements • Use scoops to shape foods on Levels 4 and 5 if possible (example: use #60 scoop to shape Level 5 meatballs to resemble unmodified meatballs) • Pediatric menus should especially strive for appetizing plating
Sandwiches/bread items fail the pressure test and require moistening to pass.	• Remove sandwiches from menu, replace with softened wraps (tortillas soften easier than bread) • Freeze pancakes and waffles, chop to meet size requirements, heat to temp and stir in melted butter and syrup to soften
Soups with chunks don't pass the size requirements for Level 5.	• Puree or blend soup prior to service

workgroup answered questions from the implementation team about the menu modification process and received feedback on the items. The team members were pleased with the new recipes and products, and were especially complementary of the palatability of each food item. No further modifications were made as a result of the product evaluation.

Creating Foodservice Training and Education Materials

Communicating, orienting, and training foodservice personnel involved in dysphagia care was an important piece of the IDDSI implementation process. A dysphagia diet curriculum for training foodservice staff was developed. The curriculum included lesson plans, a skills pass-off sheet, and a reference flipbook. Two lesson plans were created for managers to use in training foodservice staff, one on preparing foods on the dysphagia menu and a second on performing IDDSI testing for food and drinks. These lesson plans were used as a template by the other disciplines on the IDDSI team to create profession and area specific training. The skills pass off sheet was designed for managers to assess foodservice employees' knowledge of the IDDSI levels and competency in preparing foods and conducting testing methods (see Figure 2). The flipbook was developed as a visual guide for foodservice employees to reference

when preparing modified food and drinks. The Theory of Planned Behavior (TPB) was used to develop foodservice curriculum and training. The TPB states that peoples' beliefs predict behavior, and that intention to act is shaped by belief (Bosnjak, Ajzen, & Schmidt, 2020). The TPB allows educators to learn what motivates their audience to perform certain behaviors. This knowledge can then be used to help the audience become aware of their own beliefs that influence and direct their behavior (Bosnjak et al., 2020).

Implementing Foodservice Training

Previously, dysphagia diet training was performed at the facility level but as part of the IDDSI implementation process, training will be provided at the system level and implemented by each facility. A foodservice champion for each facility was selected from nutrition service managers by the IDDSI implementation team. Champions were selected from each involved discipline to receive the system-level training for their profession and to lead the training at their facility. Each champion was provided with the skills and resources to train foodservice employees on the implementation of the IDDSI framework at their facility. A train the trainer event was facilitated by the foodservice workgroup where champions were instructed on using the curriculum described above to train foodservice employees.

Behavioral Objectives (Complete all applicable skills or write "n/a" and explain in Comments)	Competency Verification (see key above*)		Comments (Please initial and date comments)
	Method*	Initials	
Levels 1-4 Tests (Slightly, Mildly, Moderately, and Extremely Thick/Pureed) • Correctly performed a gravity flow test for liquids on levels 1, 2, 3, and 4 • Correctly performed a fork drip test for liquids on levels 3 and 4 • Correctly performed a spoon tilt test for liquids on levels 3 and 4 • Correctly performed a fork pressure test for liquids on level 4 • Correctly performed a fork pressure test for foods on level 4 • Correctly performed a fork drip test for foods on level 4 • Correctly performed a spoon tilt test for foods on level 4	D		
Levels 5 Tests (Minced and Moist) • Identified the correct particle size requirement for level 5 for adults • Identified the correct particle size requirement for level 5 for children (if applicable) • Correctly performed a particle size check for foods on level 5 • Correctly performed a fork pressure test for foods on level 5 • Correctly performed a fork drip test for foods on level 5 • Correctly performed a spoon tilt test for foods on level 5	V&D		
Level 6 Tests (Soft and Bite-sized) • Identified the correct particle size requirement for level 6 for adults • Identified the correct particle size requirement for level 6 for children (if applicable) • Correctly performed a particle size check for foods on level 6 • Correctly performed a fork pressure test for foods on level 6 • Correctly performed a spoon pressure test for foods on level 6	V&D		
Liquids • Explained the different properties of hot and cold thickened liquids • Identified when thickened liquids should be tested (after thickening and prior to serving to patient) • Identified where to find directions on liquid thickening (IDDSI flipbooks or Computrition)	V		
Modified Foods • Explained the characteristics of foods on level 4 (Pureed) • Explained the characteristics of foods on level 5 (Minced and Moist) • Explained the characteristics of foods on level 6 (Soft and Bite-sized)	V		

*Competency Verification Method Key:
D = Demonstrated/observed in simulation or actual patient care; **V** = Verbalized; **R** = Reviewed supporting documents; **O** = Other/see comment e.g. **N/A** Not Applicable in this clinical area

Figure 2. Excerpt from IDDSI foodservice Skills Pass Off: part of the IDDSI implementation training and educational materials

CONCLUSIONS AND APPLICATIONS

Intermountain successfully implemented the IDDSI guidelines by following a five step process. Managers of foodservice operations in healthcare facilities can successfully transition to the IDDSI guidelines by first, creating an interdisciplinary implementation team that includes representation from those involved in dysphagia care. Clearly defined responsibilities for each team member/workgroup will enable an effective implementation of the IDDSI guidelines. Second, complete initial testing of current dysphagia menu items to identify where each item lies on the IDDSI framework with the current recipes. This data collection will provide guidance on the amount of recipe modification required to meet the IDDSI framework guidelines. Third, modify and standardize recipes. Based on the initial testing results, alter dysphagia recipes and standardize to ensure they meet the corresponding descriptors for each level of the framework. This step also should include product evaluation by those involved (chefs, foodservice staff, patients with dysphagia etc.). Fourth, develop foodservice training and educational materials. This step may include the creation of lesson plans and reference materials to be used by foodservice employees and other professionals involved in dysphagia care. Fifth, implement foodservice training. Training should include educating employees in both knowledge of and the ability to prepare dysphagia menu items that meet the IDDSI guidelines.

Facilities implementing the new IDDSI guidelines will need to continually update their recipes as new items are added to the dysphagia menu. Regular evaluation of dysphagia items will ensure compliance with the new recipe guidelines. Various methods can be used to gauge the outcomes of the transition to IDDSI, including patient safety reports from aspiration incidents, skills evaluations of employees who prepare and test the dysphagia menu items, and evaluations of food products.

The IDDSI website provides all the resources for the food and drink guidelines and testing methods. IDDSI resources can be accessed here: https://iddsi.org/resources/. Collaboration with all disciplines involved in dysphagia care is vital to successfully making the transition. Adequate time should be given to complete all steps of implementation, and regular communication across the implementation team is essential for success.

REFERENCES

Baijens, L. W., Clavé, P., Cras, P., Ekberg, O., Forster, A., Kolb, G. F., Leners, J. C., Masiero, S., Mateos-Nozal, J., Ortega, O., Smithard, D. G., Speyer, R., & Walshe, M. (2016). European society for swallowing disorders - european union geriatric medicine society white paper: Oropharyngeal dysphagia as a geriatric syndrome. *Clinical Interventions in Aging, 11*, 1403–1428. https://doi.org/10.2147/CIA.S107750

Bosnjak, M., Ajzen, I., & Schmidt, P. (2020). The theory of planned behavior: Selected recent advances and applications. *Europe's Journal of Psychology, 16*(3), 352-356. doi:10.5964/ejop.v16i3.3107

Gallegos, C., Brito-de la Fuente, E., Clavé, P., Costa, A., & Assegehegn, G. (2017). Nutritional aspects of dysphagia management. *Advances in Food and Nutrition Research, 81*, 271–318. https://doi.org/10.1016/bs.afnr.2016.11.008

International Dysphagia Diet Standardisation Initiative. (2016). *Our goals.* Retrieved from https://iddsi.org/our-goals/

International Dysphagia Diet Standardisation Initiative. (2017). *IDDSI framework testing methods 2.0.* Retrieved from https://ftp.iddsi.org/Documents/Testing_Methods_IDDSI_Framework_Final_31_July2019.pdf

International Dysphagia Diet Standardisation Initiative. (2019). *IDDSI framework and detailed level definitions.* Retrieved from https://ftp.iddsi.org/Documents/Complete_IDDSI_Framework_Final_31July2019.pdf

Leonard, R.J., White, C., McKenzie, S., & Belafsky, P.C. (2014). Effects of bolus rheology on aspiration in patients with dysphagia. *Journal of the Academy of Nutrition and Dietetics, 114*(4), 590-594. https://doi.org/10.1016/j.jand.2013.07.037

McCullough G., Pelletier C., & Steele C. (2003). *National dysphagia diet: What to swallow? ASHA Wire.* Retrieved from https://leader.pubs.asha.org/doi/full/10.1044/leader.FTR3.08202003.16

Minshall, S., & Pownall, S. (2019). Management of swallowing problems in community settings. *British Journal of Community Nursing, 24*(7), 323–327. https://doi.org/10.12968/bjcn.2019.24.7.3235.

Taylor C. (2019). Dysphagia and malnutrition in older adults. *British Journal of Community Nursing, 24* (Sup7), S26–S28. https://doi.org/10.12968/bjcn.2019.24.Sup7.S26

Zwiefelhofer D. (2012). Making dysphagia easier to swallow. *Nutrition and Foodservice Edge*, 16-21. Retrieved from https://www.anfponline.org/docs/default-source/legacy-docs/members/articles/2012_03_dysphagia.pdf

AN INVESTIGATION OF COMPETENCY-BASED TEACHING METHODS AND TECHNOLOGY INTEGRATION IN FOODSERVICE MANAGEMENT COURSES IN DIETETICS PROGRAMS

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ABSTRACT

This study investigated foodservice educators' current teaching methods and technology integration in the classroom. A total of 41 faculty members teaching foodservice management courses in dietetics programs completed the online survey for this research. The findings indicated that the lecture-based method was the most common teaching method used to teach foodservice management competencies, followed by discussions and case-based learning. Most participants perceived themselves as beginners in technology integration. Technology integration in the classroom was infrequent. Technology was mostly used for lecture preparation. This study provides suggestions for using various teaching methods and technology tools to teach foodservice management courses.

Keywords: Foodservice Management, competency, teaching methods, technology integration, dietetics programs

INTRODUCTION

The number of registered dietitians/nutritionists (RDNs) who work in foodservice management is far lower than other practice areas within dietetics (Griswold & Rogers, 2020). Data from the Compensation and Benefits Survey 2019 showed that 60% of the RDNs (n = 7,092) worked in a clinical setting, for instance acute care, inpatient, ambulatory care, and long-term care, while only about 9% worked in food and nutrition management (Griswold & Rogers, 2020). A similar trend was observed in Australia, where only 3% of dietitians were in the foodservice management workforce (Wright, 2017). These discrepancies may be a result of foodservice management being perceived as less interesting compared to clinical nutrition (Cluskey et al., 2012; Kuhn, 2014). Additionally, a career as a foodservice dietitian is challenging due to its ever-expanding roles (Hussain, 2017). A foodservice dietitian is expected to demonstrate excellent communication skills as well as understand financial and sustainability management, food production, and procurement systems (Lafferty & Dowling, 1997).

As the accrediting body for the Academy of Nutrition and Dietetics (The Academy), the Accreditation Council for Education in Nutrition and Dietetics (ACEND) outlines various standards and competencies to ensure students learn, master knowledge, and develop skills to work as entry-level dietitians while still in college (ACEND, 2016). Among these ACEND standards, Domain 4: "Practice Management and Use of Resources: Strategic application of principles of management and systems in the provision of services to individuals and organizations" encompasses various knowledge/competency

areas (e.g., management theories, budgeting, principles of human resource management, food safety principles, etc.) that are commonly taught in foodservice management courses (ACEND, 2016). In line with this development, competency-based education has emerged as a common approach in the foodservice management courses to produce competent graduates.

Competency-based education can be described as an approach which maps competencies to courses, teaching methods, and learning outcomes (Carraccio et al., 2002; Johnstone & Soares, 2014), with the objective of enhancing the students' knowledge and skills to achieve specific competencies and curricular goals (Frank et al., 2010). Previous literature has found that competency-based education has positive impacts on the professional practice of students. For example, Ash et al. (2018), found that competency-based education improved graduate dietitians' competencies in the areas of communication, scientific inquiry, critical thinking, scientific argumentation, and professionalism. To achieve the goals of competency-based education, various teaching methods should be used to enhance the students' exposure to these competencies (ACEND, 2016).

Teaching methods are a set of principles, procedures, and practices implemented by educators to achieve intended learning goals (Westwood, 2008). Mocinic (2011) defined teaching methods as teaching practices that can be systematically organized to improve learning outcomes. It is believed that the educators will be directly involved in selecting and implementing a teaching method, after a careful consideration of the fields of study and target groups (Henson, 1980). In particular, active teaching methods have been proven to encourage reflective learning, improve hard and soft skills among students, and develop students' competencies in a subject area (Mocinic, 2011). Seminars, service-learning, workshops, case-based learning, problem-based learning, collaborative learning, and game-based learning (Bierne, et al., 2017; Mocinic, 2011; Winter et al., 2002) are some examples of active teaching methods.

Workshops involve training of practical skills and presenting individual or joint project to enhance students' competencies (Bierne et al., 2017). In case-based learning, students do research and analyze a case, identifying its roots causes, influencing factors, barriers and possible solutions (Bierne et al., 2017). Problem-based learning focuses on exploration of real-world challenges, where students investigate and solve problems (Bierne et al., 2017). In dietetics programs, problem-based learning has been found to improve dietetic students' clinical competencies, such as reading medical records and managing diet plans (Winter et al., 2002). On the other hand, service-learning allows students to achieve the learning goals of a course through participation in activities that fulfil the needs of a community partner (Daugherty, 2015). In foodservice management courses, service-learning involves purposeful integration of content

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knowledge and practice, theories and real-life career-oriented learning experience to develop students' competencies (Bringle & Hatcher, 1995). For example, in a research by Honeycutt and Sillivan (2003), students learned how to create vegan recipes based on the knowledge competencies of the dietetics programs when they underwent service–learning in a campus dining facility.

Despite continuing critics and efforts to call for active teaching methods, lower retention and faculty-driven teaching methods still dominate competency-based education (Calhoun et al., 2011; Mocinic, 2011). The aforementioned active teaching methods were seldom implemented in classrooms (Calhoun et al., 2011). To date, research that investigates different methods used in teaching competency-based foodservice management courses is limited. Therefore, the first objective of this study was to explore current teaching methods used by foodservice management instructors in dietetics programs to teach various competencies in foodservice management courses. In this context, teaching methods was defined as teaching practices, including technology-assisted practices, used by foodservice management instructors in the classroom.

Technology has transformed many aspects of education and provided a means to reenergize student engagement (Gould, 2016). Technology integration in classrooms has been showed to enhance students' skills and stimulate their interest in scientific activities in competency-based education (Shoikova et al., 2019). Technology is integrated in the classroom to serve three main functions. First, technology is used for instructional preparation. Educators use technology for a wide array of class-related activities, such as preparing for instructional materials, designing lesson plans, and communicating with students. Second, as a delivery method, technology has been used by the educators to present course content via different channels, such as Zoom, Microsoft Teams, and course management platforms. Third, technology also serves as a leaning tool for students (Inan & Lowther, 2010). For example, virtual reality simulation support student learning by adding vitality to the classroom (Plump & LaRosa, 2017). Additionally, game-based learning can stimulate students' thinking and develop their problem-solving skills (Plass et al., 2015). In foodservice management courses, educators have used different software (e.g., Computrition, Nutricomp) to teach students about inventory management, production planning, and employee scheduling (Shah et al., 1999).

Despite the prevalent use of technology, research related to technology integration in foodservice management was published nearly two decades ago (Shah et al., 1999). Thus, the extent to which foodservice management instructors in dietetics programs have followed this paradigm and incorporated technology into their teaching approaches remains unknown. This led to the second objective of this study, which was to explore technology integration in foodservice management courses, in the three function as previously stated.

METHODS
Prior to conducting the study, the research protocol was approved by the Institutional Review Board of a university located in the southern region of the U.S.

Participant Selection
The participants of this study were faculty members teaching foodservice management courses in dietetics programs of a higher education institution in the U.S. To recruit the participants, the researchers first visited the ACEND website to identify universities that offer Didactic Programs in Dietetics (DPD) and/or Coordinated Programs in Dietetics (CP). Next, the researchers identified the specific departments that offered such programs, reviewed each faculty member's biography or resume (if available) to identify the specific educators teaching the foodservice management courses. Their contact information, including names, job titles, email addresses, and mailing addresses, was then compiled into a database. If the researchers could not identify the foodservice instructors, the contact information of the dietetic program directors was included. Additionally, the researchers obtained a roster of current Foodservice Systems Management Education Council (FSMEC) members to expand the participant population. This list was carefully examined to exclude those who were ineligible (i.e., hospitality management program faculty, retired faculty members, etc.) and duplication within the existing database. The final database contained contact information for 285 potential participants, including 252 from DPD or CP and 33 from the FSMEC roster.

Instrument Development
An online questionnaire was developed based on the review of the literature (Gu et al., 2013; Okeiyi et al., 1994; Reid, 2014). The questionnaire included a screening question to identify the participants currently teaching a foodservice management course in an institution of higher education in the U.S. The rest of the questionnaire was divided into three sections. Section 1 collected the demographic information of the participants (e.g., gender, age, classes taught, and years of teaching in an institution of higher education, etc.). Section 2 required the participants to select one or more teaching methods (e.g., lecture, service-learning, role play, case study, simulation, and independent learning, etc.) they used to teach each competency in the foodservice management courses. One open-ended question asked the participants to further describe the teaching methods or projects they used to teach these foodservice competencies. Section 3 asked the participants to self-report their perceived skills and frequency of integrating technology in foodservice management courses. The perceived skill in technology integration was measured using a 5-point Likert scale, ranging from Novice (1) to Expert (5). The frequency of using technology was also measured using a 5-point Likert scale, ranging from Never (1) to Always (5).

The initial questionnaire was reviewed by a panel of four experts for content validity. These experts either had extended experience teaching in the foodservice management fields or had been directors of DPD, and therefore, were familiar with topics related to competency standards. Feedback was received from these experts in terms of the wording of certain items, length of the questionnaire, and relevance of the questions. The online questionnaire was revised based on the experts' suggestions.

Pilot Study
The online questionnaire was pilot-tested with 16 instructors teaching food-related classes, who were not part of the final sample, to evaluate the clarity of the questionnaire. The participants of the pilot study made several comments regarding the clarity and formatting of some questions (e.g., multiple selections versus single selection). The questionnaire was revised based on these comments.

Data Collection
The questionnaire was uploaded to an online survey site (Qualtrics survey system). The invitation email that explained the purpose of the study and provided the survey link was emailed to each of the contacts in the database. If the email recipient was not currently teaching a foodservice management course, it was requested that the invitation be forwarded to the colleague who took over teaching the course. To increase the participation rate, two reminder emails were sent to the participants over the course of one month, with a two-week gap between each reminder email (Dillman et al., 2014).

Data Analysis

IBM® SPSS, version 25.0 was used for data analyses. Descriptive statistics were used to describe the demographics, teaching methods, frequency and perceived skills of integrating instructional technology, and types of technological support used. The Pearson correlation coefficient was used to investigate the relationship between frequency and perceived skills of using instructional technology. A p value of <.05 was considered statistically significant. Responses to open-ended questions were coded, organized, and analyzed based on foodservice knowledge/competencies and teaching methods. The data was first coded independently by two researchers involved in this study to ensure coding reliability (Kurasaki, 2000). The codes were then compared against each other to identify areas of agreement and disagreement. Any disagreements in coding were discussed until a consensus was achieved.

RESULTS AND DISCUSSION

Demographics and Job Profiles of the Research Participants

A total of 285 invitation emails were sent to the potential participants. After eliminating ineligible participants and incomplete surveys, 41 usable surveys were used for data analysis, resulting in a response rate of 14.4%.

The majority of the participants were female (n = 34, 82.9%) and Caucasian (n = 36, 87.8%). More than one-third (n = 14, 34.1%) of the participants were years of age or older. An approximately equal number of participants had master's (n = 20, 48.8%) and doctoral degrees (n = 19, 46.3%). Most participants indicated their current position to be assistant professor (n = 10, 24.4%), followed by instructor (n = 7, 17.1%) and associate professor (n = 6, 14.6%). One participant who selected the "other" option indicated a position of assistant professor of practice. Thirty-nine percent of the sample (n = 16) had been in their current position for less than five years. Close to 80% (n = 34) of the participants held the RDN credential. The participants were members of a wide variety of professional organizations, for instance, The Academy (n = 32, 74.4%), Foodservice Systems Management Education Council (FSMEC, n = 14, 32.6%), School Nutrition Association (SNA, n = 7, 16.3%), and National Restaurant Association (NRA, n = 7, 16.3%). Tables 1 and 2 present additional details describing participant demographics and their job profiles.

DPD (n = 36, 83.7%) was the most common program offered at the participants' institutions, followed by Dietetic Internship (n = 23, 53.5%), CP (n = 7, 16.3%), and Individualized Supervised Pathway Program (n = 4, 9.3%). Nearly half of the programs were offered entirely on campus (n = 20, 48.8%) and the remainder as a combination of on-campus and online instruction (n = 21, 51.2%).

Methods for Teaching Foodservice Competencies

For the fall and spring semesters, the participants taught two to three foodservice management courses per semester; for summer, they taught up to two of these courses. The average class size of each course was 26.47 ± 13.60, ranging from 8 to 65 students.

The participants were asked to indicate one or more teaching methods (i.e., lecture, service-learning, role playing, case study, group discussion, and instructional technology) used to teach each foodservice competency category: management theories; budget and financial data; regulatory system related to billing and coding, principles of human resource management, safety principles related to food, personnel, and consumers, and sustainability, waste reduction and environmental protection (Table 3). Additionally, a total of 30 comments related to examples of the assignments used to

Table 1. Demographics of the participants (N = 41)		
Items	Frequency (n)	Percentage (%)
Sex		
Female	34	82.9
Male	7	17.1
Ethnicity		
Caucasian/White	36	87.8
African/Black	1	2.4
Hispanic/Latino origin	1	2.4
Asian	1	2.4
Prefer not to respond	2	4.9
Age group		
Less than 30	0	0
30-39	12	29.3
40-49	4	9.8
50-59	10	24.4
60 and above	14	34.1
Prefer not to respond	1	2.4
Highest degree earned		
Master's Degree	20	48.8
Doctoral Degree	19	46.3
Other	2	4.9

teach various foodservice competencies were collected through the open-ended question (Table 4).

Management Theories

Lectures (n = 38, 92.7%) was the most common teaching method used to introduce management theories to students. The participants also used case-based learning (n = 18, 43.9%), group discussion (n = 19, 46.3%), and service-learning (n = 4, 9.8%) to teach this particular competency category. Two participants explained that service-learning gave the students an opportunity to put their foodservice management theories into practice. One participant wrote, "Our students run a restaurant, allowing hands-on practice for all management skills." Another participant explained, "The students complete laboratory work with University Dining Services. In upper level Foodservice Management courses, students complete service-learning ."

Budget and Financial Data

The participants integrated a few methods, including lecture (n = 41, 100%), case study (n = 22, 53.7%), and group discussion (n = 19, 46.3%) to teach courses on budget and financial data. One participant explained, "I used worksheets (quizzes) and lectures that lead to a case study scenario, which each student team work on, then they discuss as a class." Another participant also commented that "I have them (the students) complete a personal budget (for an industry kitchen). I utilize the discussion board to report findings and interact with other students." Besides, only seven participants used technology to teach this competency.

Regulatory System Related to Billing and Coding

A total of 27 (65.9%) participants indicated that they did not teach the competency related to regulatory system and billing, mainly because this topic was covered in Medical Nutrition Therapy. Of those who taught this competency, the use of lectures (n = 13, 31.7%) was the most common teaching method. One participant used service-learning and another used technology to teach this competency.

Principles of Human Resource Management

Similar to other competencies, the participants used lectures (n = 39, 95.1%) most frequently to teach the principles of human resource management. Furthermore, 26 participants (63.4%) selected case

Table 2. Job Profile of the Participants (N = 41)

Items	Frequency (n)	Percentage (%)
Current position		
Full Professor	2	4.9
Associate Professor	6	14.6
Assistant Professor	10	24.4
Instructor	7	17.1
Clinical Professor	5	12.2
Lecturer/ Senior Lecturer	5	12.2
Adjunct faculty	5	12.2
Other	1	2.4
Years of instructing courses in post-secondary education		
3 or less	5	12.2
4 – 9 years	14	34.1
10 – 12 years	8	19.5
13 - 15 years	2	4.9
16 - 19 years	4	9.8
20 years or more	8	19.5
Years in current position		
5 years or less	16	39
6-10 years	13	31.7
11-15 years	5	12.2
16-20 years	3	7.3
20 years or more	4	9.8
Professional credential[ab]		
Registered Dietitian Nutritionist (RD or RDN)	34	82.9
I don't have any professional credentials	5	12.2
Other	4	9.8
Membership of professional organization(s)[ab]		
Academy of Nutrition and Dietetics (The Academy)	32	78
Foodservice Systems Management Education Council (FSMEC)	14	34.1
School Nutrition Association (SNA)	7	17.1
National Restaurant Association (NRA)	7	17.1
School Nutrition Dietetic Practice Group	6	14.6
Food and Culinary Professionals Dietetic Practice Group	6	14.6
Institute of Food Technologists (IFT)	2	4.9
Association of Nutrition and Foodservice Professionals (ANFP)	1	2.4
Other: International Council on Hotel, Restaurant, and Institutional Education (ICHRIE), World Food Travel Association (WFTA), Institute of Food Technologists, (IFT), Nutrition and Dietetic Educators and Preceptors (NDEP), Society for Nutrition Education Behavior (SNEB), Food Service Management Dietetic Practice Group, and Dietetics in Health Care Communities Dietetic Practice Group	8	19.5

[a]Total number of responses (n) was more than 41 as multiple selections were allowed.
[b]The total percentage was more than 100 as multiple selections were allowed.

study as the method of teaching for this competency. In the open-ended question, one participant stated, "[I] *use job descriptions, schedules, and discipline documents to develop a case for human resources."* Additionally, role playing (n = 14, 34.1%) was identified as a popular teaching method for human resource management, as explained by one participant, *"Human Resource Directors were invited to class to guest lecture and to provide role-playing opportunities*."

Safety Principles Related to Food, Personnel, and Consumers
Lectures (n = 39, 95.1%), group discussion (n = 21, 51.2%), and case study (n = 21, 51.2%) remained the most common teaching methods for the competency pertaining to safety principles related to food, personnel, and consumers. In addition, service-learning (n = 15, 36.6%) was widely used. One participant provided an example how service-learning was used to teach this competency: *"Students do rotations at the local food bank kitchen to learn food safety principles."*

Sustainability, Waste Reduction, and Environmental Protection
Most participants used lectures (n = 39, 95.1%) and group discussion to teach sustainability, waste reduction, and environmental protection. Role play (n = 5, 12.2%) was less commonly used compared to other teaching methods. A total of eight participants integrated instructional technology to teach this competency. Two of them provided specific examples of how technology was used. For instance, one of them explained, "Students used an infographic tool to prepare a group presentation on sustainability and present their findings to their classmates.*"* Another participant stated, "For sustainability in foodservice, we visit a local university who is an area leader in sustainability in foodservice. We see the technology in use and discuss the impact on the environment. We also discuss facilitators and barriers to implementation.*"*

Other Teaching Methods for Foodservice Competencies
The participants provided brief descriptions of other methods used to teach the foodservice management competencies. These methods

Competency	Lecture	Service-learning	Role Playing	Case-based Learning	Group Discussion	Instructional Technology	I did not teach this competency
Management theories	38 (92.7)	4 (9.8)	7 (17.1)	18 (43.9)	19 (46.3)	2 (4.9)	4 (9.8)
Budget and financial data	41 (100.0)	5 (12.2)	3 (7.3)	22 (53.7)	19 (46.3)	7 (17.1)	0 (0)
Regulatory system & billing	13 (31.7)	1 (2.4)	3 (7.3)	4 (9.8)	2 (4.9)	1 (2.4)	27 (65.9)
Human resource management	39 (95.1)	4 (9.8)	14 (34.1)	26 (63.4)	23 (56.1)	6 (14.6)	3 (7.3)
Safety principles related to food, personnel and consumers	39 (95.1)	15 (36.6)	12 (29.3)	21 (51.2)	21 (51.2)	7 (17.1)	1 (2.4)
Sustainability, waste reduction and environment protection	39 (95.1)	9 (22.0)	5 (12.2)	14 (66.7)	18 (85.7)	8 (19.5)	1 (2.4)

Table 3. Teaching Methods Used by the Participants to Teach Foodservice Knowledge/Competency (N = 41) — Teaching methods (n, %)

Percentage was calculated by frequency of teaching method used to teach each category of foodservice competency divided by the total number of participants (N = 41)

included worksheets, reflective papers, seminars, project-based learning, and problem-based learning. Worksheets were used during lectures to teach lessons on budget and financial data (n = 2, 4.9%) and to introduce the foodservice management terms to students (n = 1, 2.4%). Reflective papers (n = 1, 2.4%) were used to help students learn various management theories and identify their own management style. Two participants explained that they hosted seminars and guest speaker sessions to expose students to real-world practice in foodservice and human resource management. Project-based learning was used to teach a combination of competencies. For example, participants who used this approach explained: "I assign a problem related to starting a new food-related business where two students work together to create a proposal to addresses this problem" and "I use problem-based leaning, which allows students to think more critically and enhance their abilities to analyze and solve real-world problems." Furthermore, flipped classroom was also used as explained by one participant: "I utilize the flipped classroom, where lectures are recorded via Panopto and Voice Thread and students attend class with an activity to reinforce the learning." Tables 3 and 4 illustrate the methods used to teach various foodservice competencies and the direct quotes from the participants.

Technology Integration in Foodservice Management Courses
The majority (n = 36, 97.8%) of participants agreed that an in-class policy for using electronic devices depended on the types of classroom activities. For instance, laptops were allowed for note taking only and cell phones were used for online games and polls. Seven participants indicated having no in-class policy for using electronic devices, and another two participants only allowed students to use electronic devices based on special accommodation requests.

For the types of technology used in the classroom, the participants indicated that they either always (n = 26, 63.4%) or often (n = 12, 29.3%) used presentation software, such as PowerPoint and videos. Online collaboration tools (e.g., Google classroom), simulation, student assessment tools (e.g., Kahoot! online quiz), and lecture capturing tools (e.g., Panopto) fell into the categories of being used "rarely" or "sometimes". Meanwhile, gamification (e.g., Minecraft), digital field trips, clickers and smartphone apps, and social media were almost "never" or "rarely" used.

The participants were also asked to indicate their skill levels for integrating technology in the classroom. Overall, the participants perceived their skills as being "proficient" only when using presentation software (4.00 ± 0.73). Online collaboration tools (2.55 ± 0.93), clickers and smartphone apps (2.26 ± 1.04), simulation (2.38 ±

1.02), online student assessment tools (2.95 ± 1.18), lecture capture tools (2.23 ± 1.25), and social media (2.10 ± 1.31) all had "beginner" to "competent" scores. The two instructional technology tools the participants felt the least skillful in integrating were gamification (1.38 ± 0.67) and digital field trips (1.67 ± 0.84). Results from Pearson correlation showed that there was a statistically significant positive relationship between perceived skills and frequency of use for each type of instructional technology (r values ranged from .319 to .764), with the exception of social media (r = .301, p = .063). Those with higher perceived skill levels used technology more frequently (Table 5).

Discussion
RDNs play important roles not only in clinical settings, but in foodservice management as well (Hussain, 2007). ACEND® established various competencies that ensure entry-level RDNs are knowledgeable in various areas of foodservice management. Most of the articles related to teaching initiatives in foodservice management were published decades ago (Fellers & Weese, 2001; Fraser & Rock, 1996; Honeycutt & Sullivan, 2003). Very few studies have been conducted in recent years to identify teaching methods and technology integration in foodservice management courses in dietetic programs. This current study closes the gap in the literature by providing empirical data in these research fields.

The results of this study indicated that lectures, group discussion, and case studies, dominated classroom practices. These findings were similar to the research by Vickery and Cotugna (2005) that showed that lectures (n = 67) and case studies (n = 26) were favorable forms of instruction to teach lessons on human genomics in dietetics curriculum. The participants in this study also complemented their lectures with group discussion. In addition, the study by Lieux (1996) that compared lecture-based and problem-based methods in quantity food production classes indicated that students gained more factual knowledge from lecture-based teaching methods, but problem-based learning stimulated higher intellectual efforts. Group discussions allowed instructors to monitor their students' progress and encourage them to be active learners (Goubeaud & Yan, 2004).

Service-learning was also found to be a common teaching method among the participants. The participants explained that this method provided opportunities for students to gain professional knowledge and skills by doing community service in the industry. Service-learning can enhance students' professional experience and self-reflective skills through their involvement in practical opportunities (Chabot & Holben, 2003).

Table 4. Quotes from Participants related to Various Teaching Methods Used to Teach Foodservice Competencies

Knowledge/Competencies	Teaching Methods	Direct Quotes
Budget and financial data	Worksheets	*"I use a Healthcare Worksheet to practice billing with appropriate diagnosis code and CPT codes. I also created a financial calculations worksheet with 25 problems that allow the practice of foodservice calculations such as ratios, meals per employee hour, etc."* *"For financial competencies I typically lecture on the topic which includes some examples that we work through together as a class. I then have a worksheet for students to complete during class."* *"I use worksheets for them to learn terminology and uses of the practices."*
Management theories	Reflective papers	*"Students write a reflective paper of past experience with managers using the management theories and develop their own management theory of what type of manager they hope to be."*
Human resource management	Seminars/ Guest Speaker Sessions	*"I also have guest speakers visit the class and present their area of expertise such as National School Lunch Programs (NSPLs), Human Resource (HR) recruitment, HR management, HR scheduling and productivity, and Accessibility and American Disability Act (ADA)."*
Sustainability, waste reduction and environment protection	Assessment	*"Assessment of definitions of marketing terms used to promote biodegradable/ compostable service.*
Safety principles related to food, personnel and consumers	Problem-based learning	*"Students complete a HACCP plan for a menu planning project."*
Combination of competencies	Problem-based learning	*"Foodservice Operations and Management courses have a project that builds upon all the competencies involved with food management. Students have to build a business from start to finish. Choices for establishments include hospital foodservice, school foodservice, private nutrition consulting and restaurant development. The components include business plan, mission, vision and values, menu development, purchasing, cost analysis, income statements, operating budget, facility design and marketing."* *"I use problem-based leaning, which allows students to think more critically and enhance their abilities to analyze and solve real-world problems. By the end of the semester student should develop skills in gathering and evaluating information as well as acquiring versatile and effective communication skills. I use teams to problem solve and present case studies so student can gain experience working cooperatively working in teams/small groups."* *"The students were asked to design a cafeteria of their choice with a physical layout of the kitchen; create operating budget, write policies and procedures; develop work schedules, job descriptions, job specifications and organizational chart. The students were asked to create an innovative idea other than the traditional way of running the facility."*

Consistent with the previous literature, problem-based learning was frequently used in class, enabling students to learn and practice a few competencies for solving a task (Harman et al., 2014; Winter et al., 2002). Project-based learning could increase students' enthusiasm and interest in concepts taught in foodservice management courses (Fellers & Weese, 2001). As indicated by a few participants (n = 3), this typically included creating a foodservice operation that involved multiple components and steps, such as menu planning, menu modification to fit various therapeutic needs, nutrient analysis of menus, layout and facility design, food preparation and demonstration, and marketing. An interesting finding from this study was that a large number of participants used technology to teach competencies related to sustainability, waste reduction, and environmental protection. A plausible reason is that sustainability is a trendy topic and online resources are available for use, such as videos like Healthy Land, Healthy Food & Healthy Eater: Dietitians Cultivating Sustainable Food Systems (Tagtow & Harmon, 2009).

This study found that most participants perceived their skill levels for integrating various instructional technology to be "novice" or "beginner", which might explain why the participants only integrated basic technological tools into their teaching. They adopted technology mostly for preparing their lecture presentations. Occasionally, technology was used to capture lectures, assess students' performance, and encourage collaborative learning among students. These findings were consistent with a previous study that showed some common instructional technology adopted in foodservice courses were course management tools, online quizzes, online homework, online videos, and lectures with slides (Goubeaud & Yan, 2004). The participants rarely used technology for the purpose of game-based learning or to provide virtual learning experiences to students. Social media was used infrequently in the classroom. This finding was contrary to a study conducted by Moran, Seaman, and Tinti-Kane (2011) that showed close to two-thirds of the 1,920 faculty members used social media in their classrooms and students were asked to read or review social media posts for class assignments (Moran et al., 2011). The differences in results maybe because social media is not a viable learning platform for every discipline (Tess, 2013). Additionally, whether social media is a tool that should be used to deliver formal education is still questionable and therefore, its use

Types of Instructional Technology	Frequency of use (n, %)					M ± SD	Skills in integrating (n, %)					M ± SD	Person Correlation
	Never	Rarely	Sometimes	Often	Always		Novice	Beginner	Competent	Proficient	Expert		r
Presentation software (e.g., PowerPoint,	0	0	3 (7.3)	12 (29.3)	26 (63.4)	4.55 ± 0.63	0	0	11 (26.8)	19 (46.4)	11 (26.8)	4.00 ± 0.73	0.319*
Student assessment tools (e.g., Kahoot!, online quiz)	9 (22.0)	6 (14.6)	9 (22.0)	12 (29.3)	5 (12.1)	2.98 ± 1.34	7 (17.1)	4 (9.8)	17 (41.4)	10 (24.4)	3 (7.3)	2.95 ± 1.25	0.774**
Online collaboration tools (e.g., Google classroom)	15 (36.5)	7 (17.1)	9 (22.0)	8 (19.5)	2 (4.9)	2.37 ± 1.29	7 (17.1)	8 (19.5)	23 (56.1)	2 (4.9)	1 (2.4)	2.55 ± .93	0.484**
Simulation (e.g., P.E.D.R.O)	19 (46.3)	4 (9.8)	15 (36.6)	2 (4.9)	2 (4.9)	2.14 ± 1.20	13 (31.7)	4 (9.8)	19 (46.3)	3 (7.3)	1 (2.4)	2.38 ± 1.02	0.754**
Lecture-capture tools (e.g., Panopto)	18 (43.9)	6 (14.6)	11 (26.8)	4 (9.8)	2 (4.9)	2.14 ± 1.24	16 (39.0)	6 (14.6)	13 (31.7)	4 (9.8)	2 (4.9)	2.23 ± 1. 25	0.753**
Clickers and smartphones apps (e.g. GroupMe, Poll Everywhere)	24 (58.6)	7 (17.1)	8 (19.5)	1 (2.4)	1 (2.4)	1.74 ± 1.03	12 (29.3)	9 (22.0)	17 (41.5)	2 (4.8)	1 (2.4)	2.26 ± 1.04	0.764**
Digital field trips	30 (73.2)	8 (19.5)	3 (7.3)	0	0	1.33 ± 0.06	23 (56.0)	9 (22.0)	9 (22.0)	0	0	1.67 ± 0.08	0.641**
Social Media (e.g., Twitter hashtags, Facebook group)	35 (85.4)	2 (4.9)	3 (7.3)	1 (2.4)	0	1.26 ± 0.69	20 (48.8)	7 (17.1)	8 (19.5)	3 (7.3)	3 (7.3)	2.10 ± 1.31	0.301

**p < 0.01
*p < 0.05

is dependent on the instructors (Friesen & Lowe, 2011; Tess, 2013). The use of simulation among faculty teaching foodservice management courses was not prevalent. Similar results were reported in the study conducted by Schlein (2011) among dietetic educators (n = 141). Schlein (2011) reported that less than 3% used patient simulators in the classroom, although they were open to this option.

CONCLUSIONS AND APPLICATIONS

Due to the frequently changing working environment in foodservice management, teaching methods need to be constantly analysed and modified to prepare students for their future professions (Bierne et al., 2017). The results of this study revealed that a wide variety of teaching methods are currently being used to teach the foodservice management competencies, with lecture being the dominant approach. Lecture is an efficient method to deliver a substantial amount of information. This is especially important as 14% of the questions covered in the RD credential exam pertain to foodservice systems and another 21% of the questions relate to management. (Commission on Dietetic Registration, 2020). Foodservice faculty are encouraged to continue exploring teaching methods that will build upon or diversify their current methods of teaching. For example, discussions on the effects of meal production projects on the environment can be used to teach sustainable competencies (Harmon et al., 2011). In addition, students can gain management and human resources knowledge/competencies by working with practitioners (e.g., human resources directors, Child Nutrition Professionals, etc.).

Overall, the use of technology to teach foodservice competencies is not prevalent among foodservice instructors in the dietetics programs. When used, instructional technology is limited to PowerPoint presentations and videos. Although it is not always necessary to use technology to teach foodservice competencies, as mentioned by one participant, this option is worth considering due to its well-established; benefits (e.g., improves engagement and knowledge retention, Miller & Petrillose; 1992; Plump & LaRosa, 2017; Shoikova et al., 2019). Furthermore, online teaching tools, such as Zoom and Panapto (lecture capturing tools), Google Docs and Piazza (online collaborative tool), Poll Everywhere (audience participant apps), Socrative and Nearpod (gamification) have became increasingly popular in the academia (Evans, 2020). Therefore, it is recommended that foodservice educators adopt various kinds of technology tools in teaching.

One drawback to this recommendation is that the availability of technology software and tools specific to the foodservice management in dietetic programs appear to be underdeveloped. For instance, simulation in dietetics education is mostly used in clinical settings to assess and enhance communication and counseling, documentation, and care planning skills (O'Shea et al., 2020). Simulation programs in foodservice management are still limited and, when available, are mainly designed for hospitality management fields (e.g., Student Hotel and Restaurant Enterprise Simulations). Faculty members and vendors can collaborate to explore the possibilities of developing competency-based foodservice management simulations for students to practice various skills and competencies.

The results of this study showed that participants mostly perceived their skill levels for integrating technology to be "novice" and "beginner". Perceived skill has a direct positive relationship with frequency of using technology (Gorder, 2008). Therefore, increasing foodservice educators' skills and abilities to use technology tools may be crucial for encouraging its incorporation into classrooms (Gorder, 2008). Given that the participants held membership in various professional organizations, the results are useful for suggesting opportunities for professional organizations or organizers of national conferences to consider hosting pre-conference workshops to increase educators' information technology literacy. Conferences could also incorporate round table discussions, which allow educators to exchange information on various teaching approaches and resources.

This study has several limitations. First, even with two follow-up emails sent to potential participants, the response rate (14.4%) was not optimal. A study conducted by Webber and Sarjahani (2011) among 237 dietetic internship directors had a response rate of 34% with two follow-up emails. Similarly, the study by Vickery and Cotugna (2005) among 232 DPD directors reported a response rate of 35% (n = 82). Therefore, the results may not represent all foodservice educators and should not be used for generalization.

The low response rate may be result of the survey invitations not reaching the entire target population. Some participants might not have forwarded the invitation emails to their colleagues who taught foodservice management courses. Furthermore, the surveys were distributed at the beginning of the COVID-19 pandemic when universities nationwide were transitioning into online instruction. Many of the potential participants may have been preparing for the new teaching modality and did not have time to respond to this survey.

For future studies, the researchers could recruit participants through multiple channels, such as FSMEC's Facebook page, LinkedIn discussion groups, and other professional organizations. Snowball sampling, which pertains to the referrals to other colleagues/friends in the same professional circle as the foodservice educators who responded to this survey, may also be helpful for recruiting more participants (Johnson, 2014).

The second limitation was related to the survey instrument. Only one optional open-ended question was included in the questionnaire to allow participants to elaborate on and explain the various approaches and assignments used to teach foodservice management competencies. Because this study was among the few studies published in the area of foodservice management in dietetics , it will be beneficial to incorporate a few more follow-up questions to gain deeper insights to various topics. For instance, the participants who "never" or "rarely" integrate technology could be led to answer open-ended or multiple-choice questions to explain why this approach was not used in their classrooms. Regardless of these limitations, this study provided a glimpse into teaching methods and technology integration in the foodservice management courses in the dietetics programs and opens avenues for future studies that could advance foodservice education.

REFERENCES

Accreditation Council for Education in Nutrition and Dietetics. (2016, October 5). *ACEND® standards update.* https://www.eatrightpro. org/-media/ eatrightpro-files/acend/monthlystandards updates/standardsupdate october2016.pdf?la=en&hash=1DE26107274D3548AA01F187141500FA659 56AEB

Ash, S., Palermo, C., & Gallegos, D. (2018). The contested space: The impact of competency-based education and accreditation on dietetic practice in Australia. *Nutrition and Dietetics, 76*(1), 38-46. https:// doi.org/10.1111/1747-0080.12430

Bierne, J., Titko, J., Cerkovskis, E., & Lasmane, A. (2017). *Advanced teaching methods for students' competencies development.* Proceedings of the International Scientific Conference, *1*, 63-72. http://journals.ru.lv/ index.php/SIE/article/view/2349/2284

Bringle, R. G., & Hatcher, J. A. (1995). A service-learning curriculum for faculty. *Michigan Journal of Community Service Learning, 2*(1), 112-122.

Calhoun, J. G., Wrobel, C. A., & Finnegan, J. R. (2011). Current state in U.S. Public health competency-based graduate education. *Public Health Reviews, 33*(1), 148-167. https://doi.org/10.1007/BF03391625

Carraccio, C., Wolfsthal, S. D., Englander, R., Ferentz, K., & Martin, C. (2002). Shifting paradigms: From flexner to competencies. *Academic Medicine, 77*(5), 361-367.

Chabot, J. M., & Holben., D. H. (2003). Integrating service-learning into dietetics and nutrition education. *Topics in Clinical Nutrition, 18*(3), 177-184.

Cluskey, M., Gerald, B., & Gregoire, M. (2012). Management in dietetics: Are we prepared for the future? *Journal of the Academy of Nutrition and Dietetics, 112*(5), Supplement, S34-S37. https://doi.org/10.1016/j.jand.2012.03.015

Commission on Dietetic Registration. (2020). *Registered examination for dietitians: Handbook for candidates*. https://admin.cdrnet.org/vault/2459/web///RD%20Handbook%20September[1].pdf

Daugherty, J. (2015). Impact of service-learning experiences in culinary arts and nutrition science. *Journal of Public Scholarship in Higher Education, 5*, 61-78.

Dillman, D. A., Smyth, J. D., & Christian, L. M. (2014). Mail questionnaires and implementation. In D. A. Dillman, J. D. Smyth, & L. M. Christian (Eds.), Internet, phone, mail, and mixed-mode surveys: The tailored design method (4th ed, pp. 351-397). John Wiley & Sons.

Evans, D. (2020, April 4). *How Zoom became so popular during social distancing*. CNBC. https://www.cnbc.com/2020/04/03/how-zoom-rose-to-the-top-during-the-coronavirus-pandemic.html

Fellers, R. B., & Weese, J. O. (2001). Problem-based learning improves teaching evaluations in a foodservice management course. *Journal of the American Dietetic Association, 101*(9), A67. https://doi.org/10.1016/S0002-8223(01)80214-5

Frank, J. R., Mungroo, R., Ahmad, Y., Wang, M., Rossi, S. D., & Horsley, T. (2010). Toward a definition of competency-based education in medicine: a systematic review of published definitions. *Medical Teacher, 32*(8), 631-637. https://doi.org/10.3109/0142159X.2010.500898

Fraser, A. M., & Rock, C. L. (1996). An innovative approach to teaching foodservice management: Emphasis on community-based programs. *Journal of the American Dietetic Association, 96*(12), 1282-1283. https://doi.org/10.1016/S0002-8223(96)00335-5

Friesen, N., & Lowe, S. (2011). The questionable promise of social media for education: Connective learning and the commercial imperative. *Journal of Computer Assisted Learning, 28*(3), 183-194. https://doi.org/10.1111/j.1365-2729.2011.00426.x

Griswold, K., & Rigers. D. (2020). Compensation and benefits survey 2019. *Journal of the Academy of Nutrition and Dietetics, 120*(3), 448-464. https://doi.org/10.1016/j.jand.2019.12.015

Gorder, L. M. (2008). A study of teacher perceptions of instructional technology integration in the classroom. *Delta Pi Epsilon Journal, 50*(2), 63-76.

Goubeaud, K., & Yan, W. (2004). Teacher educators' teaching methods, assessments, and grading: A comparison of higher education faculty's instructional practices. *The Teacher Educator, 40*(1), 1-16. https://doi.org/10.1080/08878730409555348

Gould, S. M. (2016). Potential use of classroom response systems (CRS, Clickers) in foods, nutrition, and dietetics higher education. *Journal of Nutrition Education and Behavior, 48*(9), 669-674. https://doi.org/10.1016/j.jneb.2016.06.004

Gu, X., Zhu, Y., & Guo, X. (2013). Meeting the "digital natives": Understanding the acceptance of technology in classrooms. *Educational Technology & Society, 16*(1), 392-402.

Harman, T., Bertrand, B., Greer, A., Pettus, A., Jennings, J., Wall-Bassett, E., & Babatunde, O. T. (2014). Case-based learning facilitates critical thinking in undergraduate nutrition education: Students describe the big picture. *Journal of the Academy of Nutrition and Dietetics, 115*(3), 378-388. https://doi.org/10.1016/j.jand.2014.09.003

Harmon, A., Lapp, J. L., Blair, D., & Hauck-Lawson, A. (2011). Teaching food system sustainability in dietetic programs: Need, conceptualization, and practical approaches. *Journal of Hunger and Environmental Nutrition, 6*(1), 114-124. https://doi.org/10.1080/19320248.2011.554272

Honeycutt, L. P., & Sullivan, S. S. (2003). Collaborating with campus dining services on a student project in foodservice management. *Proceedings of the Journal of the American Dietetic Association, 103*(Supp-S9). https://doi.org/10.1016/S0002-8223(08)70236-0

Hussain, Z. (2017). Role of dietitian in a food service industry. *Nutrition Food Science International Journal, 3*(1), 555604. https://doi.org/10.19080/NFSIJ.2017.03.555604

Inan, F. A., & Lowther, D. L. (2010). Factors affecting technology integration in K-12 classrooms: a path model. *Educational Technology Research and Development, 58*, 137-154. https://doi.org/10.1007/s11423-009-9132-y

Johnstone, S. M., & Soares, L. (2014). Principles for developing competency-based education programs. *Change: The magazine of higher learning, 46*(2), 12-19. https://doi.org/10.1080/00091383.2014.896705

Kurasaki, K. S. (2000). Intercoder reliability for validating conclusions drawn from open-ended interview data. *Field Methods, 12*(3), 179- 194. https://doi.org/10.1177/1525822X0001200301

Kuhn, L. (2014). *The perspectives of advanced practice dietitians in foodservice director roles: An exploratory investigation.* [Unpublished master's thesis]. Ohio State University.

Lafferty, L., & Dowling, R. A. (1997). Position of the American Dietetic Association: Management of health care food and nutrition services. *Journal of the Academy of Nutrition and Dietetics, 97*(12), 1427-1430. https://doi.org/10.1016/S0002-8223(97)00345-3

Lieux, E. M. (1996). *The effect of teaching method on student knowledge of quantity food production and service, course evaluations, and propensity for participative management* (Publication No. 9710956) [Doctoral dissertation, Virginia Polytechnic Institute and State University]. ProQuest Dissertations Publishing.

Miller, J., & Petrillose, M. (1992). Computer simulations: an important supplement to the practical experience requirements of hotel operations courses. *Hospitality Education and Research Journal, 4*(2), 61-64. https://doi.org/10.1177/109634802237486

Mocinic, S. (2011). Learning and teaching strategies for competence development. In N. Popov, C. Wolhuter, B. Leutwyler, M. Mihova & J. Ogunleye (Eds.), *Comparative Education, Teacher Training, Education Policy, School Leadership and Social Inclusion* (pp. 2243-250). Bureau for Educational Services.

Moran, M., Seaman, J., & Tinti-Kane, H. (2011). *Teaching, learning, and sharing: How today's higher education faculty use social media*. Pearson Learning Solutions. https://files.eric.ed.gov/fulltext/ED535130.pdf

O'Shea, M.-C., Palermo, C., Rogers, G. D., & Williams, L. T. (2020). Simulation-based learning experiences in dietetics programs: A systematic review. *Journal of Nutrition Education Behaviour, 52*(4), 429-438. https://doi.org/10.1016/j.jneb.2019.06.015

Okeiyi, E., Finley, D., & Postel, R. T. (1994). Food and beverage management competencies: Educator, industry, and student perspectives. *Hospitality & Tourism Educator, 6*(4), 37-41. https://doi.org/10.1080/23298758.1994.10685615

Plass, J. L., Homer, B. D., & Kinzer, C. K. (2015). Foundations of game-based learning. *Educational Psychologist, 50*(4), 258–283. https://doi.org/10.1080/00461520.2015.1122533

Plump, C. M., & LaRosa, J. (2017). Using Kahoot! in the classroom to create engagement and active learning: A game-based technology solution for e-learning novices. *Management Teaching Review, 2*, 151-158. https://doi.org/10.1177/2379298116689783

Reid, P. (2014). Categories for barriers to adoption of instructional technologies. *Education and Information Technologies, 9*(19), 383–407. https://doi.org/10.1007/s10639-012-9222-z

Shah, Z., George, V. A., & Himburg, S. P. (1999). Computer-assisted education for dietetics students: A review of literature and selected software. *Journal of Nutrition Education, 31*(5), 255-261. https://doi.org/10.1016/S0022-3182(99)70461-9

Shoikova, E., Nedeltcheva, G. N., & Nikolov, R. (2019). Competence-based education by advanced technologies. *Proceedings of the 12th annual International Conference of Education, Research and Innovation* (pp. 8004-8012). https://library.iated.org/view/SHOIKOVA2019COM

Tagtow, A. M., & Harmon, A. H. (2009). *Healthy land, healthy food & healthy eaters: Dietitians cultivating sustainable food systems* [White paper]. The American Dietetic Association Food and Nutrition Conference and Exhibition. https://scholarworks.montana.edu/xmlui/bitstream/handle/1/3029/HillerHarmon_HLHFHE_2009.pdf?sequence=1&isAllowed=y

Tess, P. A. The role of social media in higher education classes (real and virtual) – A literature review. *Computers in Human Behavior, 29*, A60-A68. https://doi.org/10.1016/j.chb.2012.12.032

U.S. Bureau Labor of Statistics. (2018). *Occupational Employment and Wages, May 2018: 29-1031 Dietitians and Nutritionists.* https://www.bls.gov/oes/2018/may/oes291031.htm#ind

Vickery, C. e., & Cotugna, N. (2005). Incorporating human genetics into dietetics curricula remains a challenge. *Journal of the American Dietetic Association, 105*(4), 583-588. https://doi.org/10.1016/j.jada.2005.01.007

Webber, C. B., & Sarjahani, A. (2011). Fitting Sustainable Food Systems Into Dietetic Internships—A Growing Trend. *Journal of Hunger & Environmental Nutrition, 6*(4), 477-489. https://doi.org/10.1080/19320248.2011.627304

Winter, J., Matters, H., & Nowson, C. (2002). A problem-based approach to clinical education in dietetics. *The Journal of the Dietitians Association of Australia, 59*(1), 23-28.

Wright, O. (2017). Foodservice management returns: The need to rejuvenate the superhero contribution of dietetics. *Nutrition & Dietetics, 31*(5), 260-261. https://doi.org/10.1111/1747-0080.12349

COLLEGE STUDENT DEMAND FOR HUMANELY RAISED LIVESTOCK PRODUCT: EVIDENCE FROM VERMONT

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ABSTRACT

The attribute "humanely-raised" has potential to differentiate animal products in the marketplace. The Real Food Challenge, a program designed to alter purchasing patterns by foodservice operations in colleges and universities, includes increased purchases of humane products as a goal. This paper reports on surveys of students at the University of Vermont (UVM). The surveys were developed, administered, and analyzed as part of a service-learning class project, working in partnership with UVM Dining. The results suggest that despite confusion about the meaning of humane, students place importance on this attribute and a majority state a willingness to pay a premium to include more humane products in campus dining meals. Implications focus on strategies for educating students and meeting their preferences for animal products, as well as for service-learning partnerships with university courses and dining services.

Keywords: Survey, Real Food Challenge, labels, university, humanely raised livestock products, service-learning

INTRODUCTION

Differentiated food products permit consumers to express their values in the marketplace and earn price premiums. One product attribute that has drawn the attention of consumers and scholars is the humane treatment of animals (Verbeke, 2009; Spain, 2018; Cornish et al., 2016). Products claiming improved animal welfare are available in the marketplace and sold with a number of complementary and competing claims (Wiseman, 2018). One possible outlet for humanely raised products is institutional foodservice, including colleges and universities. Institutional foodservice is a large and growing market in the US. In 2017, consumers spent more than $68 billion at schools and colleges, increasing by about 50% from the previous decade (U.S. Department of Agriculture, 2019).

One program with the potential to impact how colleges procure food is the Real Food Challenge (RFC). The RFC is a national student-led project which encourages the foodservice operations of colleges and universities to shift their food purchasing behaviors in order to "create a healthy, fair, and green food system," (University of Vermont RFC, n.d.). One category of food the RFC encourages is "humane", which they define as "animals can express natural behavior in a low-stress environment and are raised with no added hormones or non-therapeutic antibiotics." (University of Vermont RFC, n.d.).

In 2012, the University of Vermont (UVM) became the fifth school and first Land Grant University to sign the Real Food Campus Commitment, pledging to purchase 25% real food (real is defined as local, sustainable, humane, or fair) by 2020, after meeting the original 20% goal in 2017 (RFC, n.d.). Purchasing more humane products will help the university meet its goals; understanding student perceptions

and demand for humane products will help guide UVM Dining's efforts.

This paper reports on exploratory research conducted at UVM. It is the result of a partnership between UVM Dining and an upper-level Service-Learning class taught in the College of Agriculture and Life Sciences. The course instructor was contacted by the Sustainability Manager of UVM Dining, who sought help in understanding student perceptions around the concept of "humanely-raised", as this is one of the attributes of "Real" food.

Service-learning is a pedagogy with two broad aims. Academically, it follows an experiential-learning methodology intended to strengthen students skills by presenting them with meaningful issues that challenge them to apply the skills they learn in the classroom to real world problems (Jacoby, 1999). As such, service-learning is a High-Impact Educational Practice that elevates student performance across several levels of engagement and outcome levels, ranging from academic skills to personal attributes like persistence (Kuh, 2008). The second broad aim of service-learning is to provide a benefit to community partners (Lima & Oakes, 2006). These two objectives are framed through "structured opportunities intentionally designed to promote student learning and development" (Jacoby, 1999). The current study sought to address practical questions faced by the Sustainability Manager in meeting the objectives of the Real Food Challenge.

The goal of the research was to better understand student perceptions and demand for humane products and is an exploration of these queries. Results can be used to guide UVM's and other RFC schools' efforts to purchase and serve humane products as well as being broadly applicable to other foodservice operations' efforts. Furthermore, results can also guide marketing efforts towards young consumers soon to fully enter the marketplace. The following section will review literature on perceptions of and demand for humane products; the methods, results, and implications of the research study will follow.

As a point of departure, it is important to note that many observers believe, for example, that all animal products in the US are humanely raised and that current regulations and practices ensure humane treatment. Some scholars (e.g., Sumner, 2015) see these additional claims as "non-sense," distracting consumers or worse, disparaging legitimate mainstream products and costing consumers money for no reason. This is an important perspective to keep in mind; however, the purpose of this research was to respond to a stakeholder's perceived needs. Its value is to guide practices of foodservice operations engaged in the Real Food Challenge or who otherwise wish to respond to demand for products with these attributes.

In a recent U.S.-based study, 77% of consumers stated that they are either somewhat or very concerned about animal welfare (Spain et

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al., 2018). However, there is a wide range of perspectives regarding humanely raised animal products amongst consumers (Spain et al., 2018). Therefore, it is important to understand the term 'humanely raised' as it applies to livestock across the United States. A report by the Animal Welfare Institute (2014) noted there is currently no legal definition for the term, rather the USDA Food Safety and Inspection Service consideration of the term regards the efficiency and speed of the slaughter and not to animal rearing (USDA, 2018). This separation of humanely raised and humanely slaughtered is an example of the inconsistency that contributes to the unclear standard meaning of "humane" (Animal Welfare Institute, 2014).

Research by Cornish et al. (2016) revealed that various demographic factors are statistically significant determinants of preference for humanely raised livestock, but overall, knowledge is the strongest predictor of preference. Toma et al. (2011) found that factors including education, understanding of animal welfare, family size, and product cost were statistically significant factors for predicting purchasing behavior and preference of European consumers. Further, Cornish et al. (2016) found that animals with higher intelligence are given more empathy by consumers, and thus are given a preference for higher welfare standards.

Currently, the "cage-free" label is the only USDA label dealing with animal welfare. However, the American Humane Association and Certified Humane both have created welfare certification programs in the U.S. (Wiseman, 2018). Although this is a step towards certifying humanely-raised products and changing consumer perceptions, it is not supported by the USDA. Studies suggested that increased requirements for food producers, along with federal and state regulations regarding animal welfare, would increase information availability and influence U.S. consumer perceptions and awareness (Wiseman, 2018; Heng et al., 2013).

Willingness to Pay

Willingness to pay measures are used to determine the value that consumers place on certain goods. Willingness to pay premiums for animal welfare are significantly affected by demographics (Bernard & Bernard, 2009; Clark, Stewart et al., 2017; Lagerkvist & Hess, 2010; Spain et al., 2018; Taylor & Signal, 2009) and concern for animal welfare issues (Carlucci et al., 2009; Vanhonacker et al., 2007). In addition, willingness to pay for farm animal welfare can vary depending on the species concerned (Byrd et al., 2018; Chilton et al., 2006; Erian & Philips, 2017). Taylor & Signal (2009) found that in Australia the respondents with a higher level of concern for animal welfare reported a higher willingness to pay. Taylor & Signal (2009) also found that women had a marginally higher willingness to pay for humanely raised animal products than men. Finally, the findings of Lama et al. (2017), demonstrated that having knowledge of the supply chain's role in animal welfare, such as caging conditions and slaughter methods, significantly impacted consumers' willingness to pay.

Research suggested that consumers' willingness to pay for humane products varies by type of animal product and found discrepancies among consumers' willingness to pay for humanely raised chicken, cattle, pigs, eggs, and dairy products (Chilton et al., 2006; Erian & Philips, 2017). Spain et al. (2018) found that almost 70% of their 1,000 respondents in the United States were willing to pay >$0.50 extra for a dozen eggs or for one pound of chicken breast if the welfare of the chickens were verified under a trustworthy welfare certification. However, the proportion of those willing to pay extra declined as the price premium increased (Spain et al., 2018). Data from a study in Great Britain found that people were willing to pay an increased price for eggs in exchange for increased animal welfare standards (Bennett, 1996). In this case, willingness to pay increased by £0.43 per dozen on the price of eggs (including those with zero willingness to pay). Similarly, in a US-based study, about 80% of respondents from a nationwide poll claimed that they were willing to pay more for eggs to ensure that hens are treated more humanely (Swanson & Mench, 2000).

With regard to dairy products, the results vary from studies about consumers' willingness to pay . Napolitano et al. (2008) found that European consumers expressed a higher willingness to pay for yogurts with labels indicating high welfare standards when compared to yogurts with labels reporting lower welfare standards. For dairy, willingness to pay varies by product type. Elbakidze and Nayga (2012) found that consumers in the U.S. were willing to pay a premium price for some humane animal care-labeled dairy products, such as ice cream. In contrast, their subjects were unwilling to pay a premium price for humane animal care-labeled cheese at any quantity (Elbakidze & Nayga, 2012).

Several European studies demonstrated that there is significant consumer demand for humanely raised meat products (Bennett, 1997; Bennett et al., 2012; Napolitano et al., 2010). Risius and Hamm (2017) found that the reported values of willingness to pay suggested that consumers were willing to pay premium prices for animal-friendly husbandry systems involving beef. Dransfield et al. (2005) found intent to pay was higher for products obtained using animal-friendly raising techniques: respondents were prepared to pay an average 5% extra for pork from outdoor raised pigs, with one-fifth of consumers willing to pay 20% more. Additionally, Glass et al. (2005) found that consumers had a positive willingness to pay for various pig welfare improvements, such as increases in space allowance, environmental enrichment, and research into improved pig housing design.

The previous literature suggests that many European and some U.S.-based consumers are interested in humanely-raised animal products despite the lack of a universal definition, and many are willing to pay a premium for humane products. Institutional foodservice operations, especially university programs participating in the RFC, are potential buyers of these products, and therefore, it is important to understand the perspectives of their main consumers, college students. College students are an important demographic segment due to their patronage of foodservice operations as well as their future entrance in the workforce and consumer marketplace.

This study aims to examine college students' awareness, perceptions, and preferences for humane products. The research questions addressed are: How do college students define humane? How important is the attribute humane to college students? Are they willing to pay a premium for humane products? How is information about this attribute best communicated? The following sections discuss the methods and results used to address these questions.

METHODS
This research was conducted as part of the Applied Research Methods course in the Department of Community Development and Applied Economics at UVM, taught as a service-learning class in partnership with UVM Dining's Sustainability Manager. The Sustainability Manager provided the class with general research objectives: understanding student perceptions of and demand for humane products as part of their efforts to comply with the Real Food Challenge. Students worked in teams of four or five to conduct a literature review, observations of dining facilities, and individual interviews. The results of these activities were included in team research reports and guided the composition of an online survey, the results of which are the focus of this paper. The UVM's Institutional

Review Board deemed this project not to be Human Subject Research, due to its primary focus on program improvement.

The observations took place at UVM Dining retail facilities, to increase the student researchers' understanding of current product availability, labeling, presentation, etc. The Sustainability Manager attended class after the observations were submitted as homework assignments: the class discussed the major themes of the literature review and observations and brainstormed interview questions to better understand UVM student and community's perceptions around UVM Dining facilities, animal product consumption and the concept of humanely raised, respectively. Each student conducted 10 interviews and utilized inductive coding methods (Braun & Clarke, 2006) to reveal key themes and pattern in the interview data. Then in teams of four or five, the students submitted a homework assignment where they highlighted interview themes. Once these assignments were submitted, the Sustainability Manager returned to class: the students briefed the Sustainability Manager and instructor on important interview results, then collectively, the students, Sustainability Manager and instructor developed survey questions to measure the prevalence of these themes in a larger population. The survey had thirteen questions that included demographics, food and dining preferences, willingness to pay for humane products, and their preferred means of getting information about food. There was also one open-ended question ("What does the term 'humanely raised' mean to you?"). The open-ended question was placed after questions about animal product consumption in general but before questions about "humanely-raised" to minimize biasing previous responses. Three demographic questions were included, in collaboration with the Sustainability Manager. Given the rather narrow demographic and geographic attributes of the population (UVM students), demographic questions focused on sub-segments which could be identified for outreach and education: college affiliation, class year and residence (on- or off-campus). In general, in order to minimize bias , the questions were ordered from general to specific and demographics were placed last. The survey instrument was reviewed by the Sustainability Manager and piloted by about 20 students, who measured the time it took to complete and checked for any unclear questions or typographical errors. Modest revisions were made based on results of pilot test. Copies of the interview and survey instruments are available on request.

Data Collection

Questions were uploaded in LimeSurvey and a link to the survey was created. The class conducted the surveys between October 31st and November 7th, 2018, by sending the link to friends, soliciting responses at student club meetings and visiting places where students gather (student center, library, dining halls) with a tablet or laptop and requesting their participation. A total of 1,007 surveys were collected. This convenience sampling strategy was used because the class did not have access to a comprehensive list of student emails. It is important to note that given the convenience sampling method used, the results of this research are not generalizable beyond the scope of the sample.

Qualitative Data Analysis

The responses to the open-ended question were then coded by two authors using a thematic analysis approach, a method for identifying, analyzing, and reporting themes and patterns within a data set (Braun & Clarke, 2006). Open-ended responses were uploaded into Excel for analysis.

Open-ended responses were read multiple times before coding and identifying themes in order to be familiarized with the data. In the initial analysis following the familiarization of the data, the responses

were read multiple times by two authors who each independently developed an individual list of preliminary codes. These preliminary codes were then shared and discussed amongst authors, combining codes that were related to each other. These codes were then analyzed independently in order to identify the overarching themes and sub-themes that emerged from the data. As was done with the codes, authors then shared and discussed the themes that were identified. This analysis was an iterative process that was continued until there were no new codes or themes (Braun & Clarke, 2006).

Quantitative Data Analysis

All data were uploaded into SPSS version 26 for analysis. Frequencies and descriptive statistics were calculated for selected variables. For questions cross-tabulations and comparisons of means were conducted, comparing how attitudes and behaviors differed by demographic groups.

RESULTS

Sample Description

A total of 1,007 students were surveyed for this project and consisted of respondents from both undergraduate and graduate programs. In comparison, during the fall of 2018 there were 10,612 undergraduates and 1,552 graduate students enrolled, making the total number of students enrolled 12,164 (UVM, 2018). Most of the sample were juniors or seniors, with the largest group being seniors. In comparison, the UVM undergraduate student body at the time was composed of 23% juniors and 26% seniors (UVM, 2018).

The highest percentage of respondents from the sample were affiliated with the Colleges of Arts and Sciences (32%) and Agriculture and Life Sciences (26%). In comparison to the university as a whole, 37% of students were in Colleges of Arts and Sciences, while only 11% in College of Agriculture and Life Sciences in Fall 2018 (Table 1). The majority (55%) of respondents live off-campus. This compares closely to the total percentage of students that live off-campus at the university which sits at approximately 53% (UVM, 2018). More than half (52%) have no campus meal plan, while 34% have an unlimited dining plan and 14% have a pre-paid "points" plan which allows them to buy a la carte items at various UVM Dining retail locations.

This project relied on convenience sampling in order to gather responses and therefore does not allow for generalization beyond the scope of the sample. Additionally, due to the methods used by students in collecting survey responses, the number of students who refused to take the survey is unknown and therefore it was not possible to calculate and report an accurate response rate. However, the data provided by this exploratory research can serve as a jumping off point for future research to build upon in order to best serve both the UVM and potentially other institutional foodservice providers.

Table 1. College Affiliation of Sample		
College	% of Sample	% of University
Agriculture and Life Sciences	26	11
Arts and Sciences	32	37
Business	11	7
Education and Social Services	7	6
Engineering and Mathematical Sciences	7	12
Environment and Natural Resources	5	6
Graduate	1	2
Medicine	0	
Nursing and Health Sciences	10	8
None of these	2	6

Qualitative Results

A total of 807 respondents answered the open-ended question. Students mentioned a wide range of characteristics that they perceived to constitute humanely raised animal products. Two overarching themes emerged throughout the coding of the open-ended responses, the first being the *treatment* of the animals and the second being the *conditions* in which the animals lived.

Theme 1: Animal treatment. Within the overarching theme of animal treatment, responses for what could be defined as "humanely raised" ranged from conceptual descriptions to more concrete qualifications. Some respondents (n=66) simply restated the question, defining "humanely raised" as animals that were "treated humanely." Other respondents clarified their definitions by referencing ethical treatment (n=86) and/or respectful treatment (n=41). Several subthemes emerged from the responses that referenced the treatment of the animals including (1) being treated well, (2) treatment that was harmless, (3) limited or no pain when killed, and (4) quality of life.

Nearly 20% of respondents (n=159) stated that in order to be humanely raised, the animals had to have been treated "well." This response was the most common subtheme regarding treatment of the animals, and it was often accompanied by a further elaboration on specifics of animal treatment and conditions. For example, one respondent stated, "To me it means that the animals were treated well (at least cage-free, or even better, free range) before death."

This response also illustrates additional subthemes that emerged from the overarching animal treatment theme. A lack of harm, or cruelty-free animal treatment (n=147) was the second most frequently mentioned subtheme among respondents. There is a range of views among the respondents around whether humanely raised animal products are defined as being without negative behavior or with positive behavior. The "lack of harm" response suggests that a lack of negative treatment is the condition for humanely raised, whereas the "treated well" response suggests the presence of positive behavior. There were other examples of this distinction within the treatment theme. Six percent (n=48) of respondents mentioned that animals should experience no pain when they are killed, and almost five percent (n=37) referenced "happiness," "quality of life," or a "full life."

Theme 2: Animal living conditions. The idea of humane living conditions was the second overarching theme to emerge from thematic coding. The living conditions of the animals and the environment in which they are raised were important indicators of humane animal products for the majority of respondents. There were five main subthemes to emerge regarding what constituted humane living conditions for animals. These five subthemes were (1) that animals were raised in natural living conditions, (2) animals were raised in a healthy and safe manner, (3) animals had the freedom to move around, (4) animals were fed "good" food, and (5) animals were not raised in a factory farm setting.

Of the 807 participants that responded to the open-ended question, 63 respondents explicitly mentioned natural conditions or natural environments. For instance, one student described it as "animals are taken care of and live in humane conditions...basically mimicking natural conditions." These respondents typically equated the idea of a natural state for the animal as the ideal living conditions and held it as the standard for what humane conditions should strive for. Another student responded; "Animals that are able to live their life as naturally as possible. So, without cages, lots of room to roam, food that is most similar to what the animals natural diet would look

like, and free from abuse or violence." The broad idea of natural conditions encapsulated the other recurring subthemes regarding the conditions of the animals.

The second subtheme focused on health and safety of the animals; students (n=85) mentioned that humanely raised meant that animals were raised in a healthy and safe environment. For instance, one respondent stated, "to me this means the animals were raised in a safe and healthy way." Another respondent additionally mentioned the idea of health certifications, stating, "Animals raised in good conditions, preferably certified to ensure health and safety of the animal." The third subtheme mentioned by students was the freedom to move around (n=99). Some examples of the conditions regarding space and movement were described as "having sufficient room to move", "not crowded", "room to live comfortably", and "cage-free." The fourth subtheme was that humane conditions should include the provision of quality food. Respondents (n=93) explicitly included this in their response, describing appropriate food as "proper feed", a "balanced diet", "well fed", "natural nutrition", and "grass-fed without growth hormones or antibiotics". The last subtheme was to distinguish that these animals were not raised in a factory farm setting. Respondents (n=33) explicitly mentioned factory or industrial farming, and their answers tended to highlight many of the aforementioned subthemes. For example, one respondent connected all five subthemes describing it as "Good and healthy conditions for animals, such as enough space, good food, no antibiotics, no mass production." There were also multiple responses that highlighted the perceived negative impact of large factory farms and offered the idea of smaller, more sustainable farming practices, "humanely raised to me means the animals were treated in a more sustainable and kind way than in a big factory farm...smaller local farms maybe."

Although this question specifically asked about the respondents' definitions of humanely raised, a significant number of responses (n=103) mentioned concepts that had been identified independently at other points in the survey. Some of these included references to local production (n=10), food quality (n=10), organic or pesticide-free products (n=22), regulations and certifications (n=4), and hormone free food (n=57). The overlap between distinct concepts in the survey responses suggests limited understanding of how concepts, from locally grown to organic to humanely raised, differ.

Further, there was a group of respondents that noted in their responses that the label "humanely raised" had no meaning when applied to animal products. In these definitions, respondents mentioned multiple reasons for this claim. Some respondents argued that the term was too vague to have significant meaning, whereas others argued that it was a contradiction to claim that any animal that was killed had been treated humanely.

Overall, the respondents defined humanely raised based on the treatment and conditions of the animals. It is important to note that of the 1008 students that participated in the survey, 201 of them (almost 20%) did not answer this question. An additional 21 students responded that they did not know the definition.

Quantitative Results: Univariate Analysis

When asked how often they eat on campus, almost three-fourths of respondents reported eating at least once a week or more, while almost half ate on campus one meal a day or more. Respondents were asked how often they eat each of the following products, red meat, poultry, dairy and eggs. More than half (60%) eat dairy once a day or more, and 39% eat eggs daily or more. One-fourth never eat

red meat, and another fourth only eat it a few times a week. Only 8% never eat dairy or eggs, respectively.

When asked what attributes are most important in the foods they purchase and eat (Table 2), the majority ranked taste, nutrition and price as their top three choices. Worker welfare was only ranked in the top 2 by 8% of the respondents. Results were similar when respondents were asked to rank the importance of attributes for animal products and animal welfare was added to the list of options. Taste, price and nutrition had the greatest number of first or second ranks, but animal welfare was fourth, more than any remaining concerns (i.e., locally produced, worker welfare or environmental sustainability).

Next, respondents reported on how important "humanely raised" is when purchasing various animal products, on a four-point scale (1=not at all, 2=somewhat important, 3=important, 4=very important). For each of the four products, the mean was approximately 3, with red meat (3.10) and poultry (3.09) scoring slightly higher than dairy (2.96) or eggs (2.95).

Respondents shared their perspective on how effective a variety of methods would be in communicating information about humanely-raised livestock, using a four-point scale (1=not at all effective, 2=slightly effective, 3=effective, 4=very effective). The use of icons on menus had the highest mean score of 3.20, followed by labels on the food (M = 3.07). Both of these methods received mean scores that fell between being effective and very effective. Ingredient lists (M = 2.84), digital screens around campus (M = 2.73), and brochures (M = 2.14) had mean scores that all fell between being slightly effective and effective. Websites (M = 2.07) and newsletters (M = 1.87) were rated as the least effective methods of communication.

Finally, respondents were asked about the highest premium they would be willing to pay for meals at UVM Dining if *all* animal products were humanely raised (See Tables 3 and 4). Although UVM has already surpassed the mark of having 20% of campus food be "real food", as defined by the Real Food Challenge, only 14% of the real food on campus is humanely-raised (UVM RFC, n.d.). The main food product that falls under the humane category in UVM Dining are humanely raised eggs, meaning that although some of the meat and dairy products are local or organic, the majority of animal products throughout campus dining are not humane (UVM RFC, n.d.). Since certified humanely raised products can cost considerably more than products that are not (Spain et al., 2018), it is reasonable to consider

that a significant shift in the level of humane food procurement could result in increased dining and meal-plan costs. Almost three-fourths were willing to pay some premium, with the greatest percentage (39%) willing to pay 5% more. Only 29% said they would not pay any premium, while 14% indicated they would pay more than 10% premium.

Bivariate Analysis

Willingness to pay premium was compared with class standing; results of a Chi Squared test found significant differences (p ≤ .000) were observed (Table 3). On average, juniors were more likely to pay no premium. Seniors were most likely to pay a 10% premium. Graduate students were most likely to pay 5% or more than 10% more, and least likely to pay no premium.

Responses to willingness to pay a premium for humanely raised products also differed significantly by college of affiliation, as measured by a Chi Square test (p = .000) (Table 4). Those in Business, Engineering and Medicine were overall less likely to pay any premium than the overall sample. Those in Agriculture and the Environment and Natural Resources schools were generally more likely to pay a premium.

When comparing willingness to pay with meal plan type, a Chi Squared test found significant differences (p = .000) (Table 5). Those with unlimited meal plan were slightly less likely to pay any premium, but more likely to pay 5% or more than 10% more than the overall sample.

DISCUSSION

As a whole, previous studies have shown that many consumers show an interest in humanely-raised animal products and many are willing to pay a premium for humane products (Spain et al., 2018; Bennett, 1997; Bennett et al., 2012; Napolitano et al., 2010; Elbakidze & Nayga, 2012; Glass et al., 2005). This exploratory research is able to both complement and contribute to this overarching body of literature by specifically examining the perceptions and attitudes of a sample of college students at UVM, a demographic segment not included in the literature previously discussed. Universities and other institutional foodservice operations represent a large pool of potential buyers of humane products and in order to better understand the potential for increased purchases of humane products, it is important for research to examine the preferences and demand of college students, the main consumers at these institutions. By investigating this specific

Table 2. Ranked Attribute Importance in Food Purchasing Decisions

Rank these attributes - how important is each to you when making decisions about what to purchase	Ranked first (all foods)	Ranked second (all foods)	Ranked first (animal products)	Ranked second (animal products)	Mean Rank (all foods)	Mean Rank (animal products)
Animal welfare	n/a	n/a	15%	11%	n/a	3.87
Environmental sustainability (e.g. USDA Organic label)	7%	8%	11%	12%	4.10	4.22
Locally produced	7%	7%	9%	10%	4.24	4.37
Nutrition	28%	24%	18%	20%	2.54	3.38
Price	25%	26%	21%	19%	2.79	3.52
Taste/flavor	29%	31%	22%	24%	2.42	3.11
Worker welfare (e.g. Fair-Trade label)	4%	4%	3%	11%	4.87	5.49

Note. Respondents were given a list of 6 attributes and asked how important each was to them when making decisions about what to purchase and eat for all foods (not just animal products) by ordering them from 1-6. Next respondents were given the same list of attributes with "Animal welfare" added and asked how important each was to them when making decisions about what to purchase and eat *specifically* regarding animal products by ordering them from 1-7. Columns 2 and 3 illustrate the percentage of respondents that ranked each attribute as the first (highest level of importance) or second (second level of importance) when thinking about all food. Columns 4 and 5 illustrate the percentage of respondents that ranked each attribute as the first (highest level of importance) or second (second level of importance) when thinking about *only* animal products. Column 6 shows the mean rank for each attribute when respondent was considering all foods. Column 7 shows the mean rank for each attribute when respondent was specifically considering only animal products.

Table 3. Cross-tabulation, Willingness to Pay by Class Standing				
Class Standing	None (zero)	5% more	10% more	More than 10% more
First year	28%	42%	15%	15%
Sophomore	29%	38%	18%	16%
Junior	31%	38%	17%	14%
Senior	28%	39%	20%	13%
Graduate student	20%	40%	15%	25%
None of these	50%	33%	17%	0%
Overall %	**29%**	**39%**	**18%**	**14%**

Note. Respondents were asked about the highest premium they would be willing to pay for products or meals at UVM if the animal products were humanely raised. A response of "none" (or zero) indicates that the respondent would not be willing to pay any premium for humanely raised animal products. A response of "5% more", "10% more", or "more than 10% more" indicates that the respondent would be willing to pay a 5%, 10%, or more than 10% premium for animal products that are humanely raised.

demographic group, this study is able to add a layer of specificity to the overall discussion surrounding humanely raised animal products and provide a jumping off point for further institutional foodservice research.

Consistent with previous studies, it was found that respondents value and are willing to pay for humanely raised products; importance varies somewhat by the species of animals or type of animal product under consideration (Byrd et al., 2018; Chilton et al., 2006; Erian & Philips, 2017; Elbakidze & Nayga, 2012). Similar to data from a report by Spain et al. (2018), the percentage of respondents willing to pay a premium decreased as the price premium increased. Both of these points would be especially important for UVM Dining or other institutions to consider when making purchasing decisions regarding humane products.

Results found a relationship between a students' willingness to pay and college affiliation. For instance, when looking at individuals willing to pay more than 10% more, 20% of students from the Rubenstein School of Environment and Natural Resources chose this option, as did 40% of graduate students, while only 7.9% of students from the Grossman School of Business did. These results are very similar to results from two previous studies conducted in this same course as a class service-learning research project. Students in the College of Agriculture and Life Sciences and the School of Environment and Natural Resources were more likely to pay more for "Real Food" and have greater awareness and concern for sustainability issues compared to other students (Redacted). It is not clear whether students with greater concern for sustainability, local food and animal welfare self-select into these majors, or of the course content of these majors instills these values, or a combination of both.

Although the majority of respondents expressed that the attribute of humanely raised was important to them, respondents lacked a consistent and coherent definition of humanely raised, which mirrors the findings of previous literature such as Spain et al., (2018). Findings from studies such as Wiseman (2018) and Heng et al. (2013) suggest that this may be in part due to a lack of information availability, which if addressed, may increase interest and demand for these products. This is another aspect that both UVM and fellow institutions could consider when determining marketing strategies for food products that fall under the category of humane. Similarly, students may not have a clear understanding of the various standards and processes that producers must navigate when facing the decision to label products as organic, humanely raised, etc. As noted by Wiseman (2018), compliance with certain labelling standard and certifications are often voluntary and some producers choose to use terms that don't require certification or validation, further complicating the issue of reliable labelling information and consumer confusion. Further efforts to educate consumers on these procedures could improve information availability and ultimately allow consumers to make more informed purchases.

Overall, the results of this study echo many of the preferences, attitudes, and understanding of humanely raised animal products referenced in previous studies. Based on both the responses from our sample and the overarching body of literature presented in this report, there is the possibility of a potential market for UVM Dining to expand its use of humanely raised products, and the possibility of targeting marketing of humane products towards those who are already more likely to prefer humane products. These implications are only based on these results as this is a non-representative sample but offer an informed starting point for future research and practice.

Table 4. Cross-tabulation, Willingness to Pay by College Affiliation.				
College of Affiliation	None* (zero)	5% more	10% more	More than 10% more
Agriculture and Life Sciences	24%	42%	14%	20%
Arts and Sciences	28%	41%	20%	11%
Business (Grossman)	42%	35%	16%	8%
Education and Social Services	33%	35%	22%	9%
Engineering and Mathematical Sciences	41%	33%	11%	14%
Environment and Natural Resources (Rubenstein)	10%	38%	33%	20%
Graduate	40%	20%	0%	40%
None of these	36%	29%	29%	7%
Nursing and Health Sciences	23%	42%	16%	19%
Overall %	**29%**	**39%**	**18%**	**14%**

*p ≤ .000

Note. Respondents were asked about the highest premium they would be willing to pay for products or meals at UVM if the animal products were humanely raised. A response of "none" (or zero) indicates that the respondent would not be willing to pay any premium for humanely raised animal products. A response of "5% more", "10% more", or "more than 10% more" indicates that the respondent would be willing to pay a 5%, 10%, or more than 10% premium for animal products that are humanely raised.

Table 5. Cross-tabulation, Willingness to Pay by Meal Plan				
Campus Meal Plan	None (zero)	5% more	10% more	More than 10% more
None	28%	39%	19%	14%
Points Plan	29%	37%	21%	13%
Unlimited Plan	30%	41%	14%	15%
Overall %	29%	39%	18%	14%

Note. The Unlimited Meal Plan allows an unlimited number of meal entries into the traditional dining halls across UVM campus and includes 150 retail points (1 point = 1 dollar) that can be used at any UVM Dining retail location each semester. Alternatively, the Points Plan gives the student 1,425 retail points and 25 meal entries into traditional dining halls each semester. Respondents that listed no meal plan consist of students that live off-campus and graduate students.

As demonstrated in the results, respondents noted a strong relationship between humanely raised, sustainable, local, and organic. Students perceived these connections as having a positive impact on health, the environment, animals, and overall sustainability. Responses such as these highlight the opportunity for UVM Dining to promote the positive connections between humane products and sustainability demonstrated by our sample. If further representative research reached similar conclusions, then there are a number of practical implications for both foodservice outreach and service-learning partnerships.

Implications for Foodservice Outreach

As aforementioned, this is a non-representative sample that was gathered through convenience sampling, therefore these implications are only based on the results of our sample and are not able to be generalized. However, if further research was conducted and these responses were borne out of a more representative sample, then the three following implications could be practical next steps for UVM Dining to consider.

First, given a lack of understanding of the meaning of "humane", it is important to choose clear standards and definitions, preferably adopting established certifications, and provide clear information around this attribute. Caution must be used to avoid conflating "humane" with "local" or "healthy," although products with these attributes bundled together would likely be desirable to many consumers.

Second, create point of purchase materials for humane products in the form of labels and icons. This will both highlight products that fall under the standards set by the Real Food Challenge by creating an easy to read system that denotes which criteria each product meets and build on and reinforce the aforementioned education efforts.

Third, implement different strategies for different segments: there was a clear difference in willingness to pay between different college affiliations. Students from the schools of Agriculture and Natural Resources were most likely to pay more: there is an opportunity for collaboration with those students (e.g., through service-learning or student clubs) who can help educate peers about this issue.

Implications for Service-Learning Partnerships

One of the perennial challenges of service-learning is identifying meaningful community projects that could benefit from student engagement (Tryon et al., 2008; Stoeker et al. 2010, Mills, 2012; Suckale et al, 2018). An additional concern is ensuring that service-learning programs return more than they take from community partners, and that the promise of reciprocal benefits is real (Larsen, 2016). The success of this project was based on the partnership in which the Sustainability Manager brought clear research objectives and was engaged throughout the process, while the class brought capacity and the instructor brought research expertise in ways that met the community partner's needs and provided hands-on experience for the class (Jacoby, 1996; Mason & Dunens, 2019) . Student engagement and motivation was increased by assurances that the results would be used by UVM Dining in tangible ways.

Specifically, the research project illustrates how practical problems faced by institutional foodservice providers seeking more sustainable practices can utilize service-learning courses to identify consumer preferences and refine marketing strategies. This effort is widespread; a study of colleges and universities in 2017 found that 95% purchased local food and spent more than $57 million on local food purchases the previous year (Farm to Institution New England, 2017). Replicating this research on student perceptions of humane practices at other institutions can guide institutional food purchasing while also providing a model for instructors seeking out accessible, applied projects for their students.

CONCLUSION

This research finds that this sample of college students values the attribute "humane" but the decisions would be better informed by clearer information and more effective promotion. The results from this exploratory research project mirror many of the reported perceptions, awareness, and preferences demonstrated in the current literature regarding general consumer relationships with humanely raised livestock and animal products. Our research was able to add to this body of knowledge as our objectives focused on a more specific demographic and provided preliminary insight into student preferences that had been previously unexamined by other studies. It also provided insights into service-learning partnerships between university foodservice and academic classes.

In order to strengthen this work, continued research should be completed that would allow the university to use generalizable claims regarding student preferences and humanely raised livestock. In responding to the open-ended question, students were able to stray from the specific label of humane and instead talked about local, sustainable, and environmental topics more broadly. This has the potential to provide the university with a more reliable scope of what the needs, preferences, and perceptions of the general student body is in regard to humane animal products. Another limitation to our research is the fact that our information on willingness to pay is all self-reported and hypothetical, therefore it may not accurately represent how student stakeholders would act in the market when faced with an actual 10% premium for humane animal products.

To move forward with the aforementioned practical next steps on the part of UVM Dining, future research must delve further into actual student behavior when faced with differently priced animal products in order to gain a deeper understanding of how these self-reported ideals might play out in the real world. The overarching themes that emerged included student behavior in reaction to price changes, the frequency with which students consume animal products, and the intersections between student demographics and student market behavior. These intersecting ideas and behavior should serve as the overall framework for the next stage of future research either on the part of the UVM or fellow institutions participating in the Real Food Challenge, as well as those marketing humane products to young adults in the near future.

REFERENCES

Animal Welfare Institute. (2014). Label confusion: how 'humane' and 'sustainable' claims on meat packages deceive consumers. *AWI Publications*. http://www.fao.org/ag/againfo/themes/animal-welfare/news-detail/en/c/231881/

Bennett, R. M. (1997). Farm animal welfare and food policy. *Food Policy*, *22*(4), 281–288.

Bennett, R., Kehlbacher, A., & Balcombe, K. (2012). A method for the economic valuation of animal welfare benefits using a single welfare score. *Animal Welfare, 21*(1), 125–130.

Bernard, J. C., & Bernard, D. J. (2009). What is it about organic milk? An experimental analysis. *American Journal of Agricultural Economics, 91*(3), 826-836.

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, *3*(2), 77-101.

Byrd, E. S., Widmar, N. J., & Wilcox, M. D. (2017). Are consumers willing to pay for local
chicken breasts and pork chops? *Journal of Food Products Marketing*, *24*(2), 235-248.

Carlucci, A., Monteleone, E., Braghieri, A., & Napolitano, F. (2009). Mapping the effect of information about animal welfare on consumer liking and willingness to pay for yogurt. *Journal of Sensory Studies, 24*(5), 712-730.

Cornish, A., Raubenheimer, D., & McGreevy, P. (2016). What we know about the public's level of concern for farm animal welfare in food production in developed countries. *Animals, 6*(11), 74.

Chilton, S. M., Burgess, D., & Hutchinson, W. G. (2006). The relative value of farm animal welfare. *Ecological Economics, 59*(3), 353-363.

Clark, B., Stewart, G. B., Panzone, L. A., Kyriazakis, I., & Frewer, L. J. (2017). Citizens, consumers and farm animal welfare: A meta-analysis of willingness-to-pay studies. *Food Policy, 68*, 112-127.

Dransfield, E., Ngapo, T. M., Nielsen, N. A., Bredahl, L., Sjödén, P. O., Magnusson, M., & Nute, G. R. (2005). Consumer choice and suggested price for pork as influenced by its appearance, taste and information concerning country of origin and organic pig production. *Meat Science, 69* (1), 61-70.

Elbakidze, L., & Nayga, R. M. (2012). The effects of information on willingness to pay for animal welfare in dairy production: Application of nonhypothetical valuation mechanisms. *Journal of Dairy Science, 95*(3), 1099-1107.

Erian, I., & Phillips, C. C. (2017). Public understanding and attitudes towards meat chicken production and relations to consumption. *Animals, 7*(3), 1-28.

Farm to Institution New England. (2017, March 16). Campus dining 101: Benchmark study of farm to campus in New England. https://www.farmtoinstitution.org/blog/new-fine-report-reveals-local-food-buying-stats-colleges-universities

Glass, C. A., Hutchinson W. G., & Beattie, V. E. (2005). Measuring the value to the public of pig welfare improvements: A contingent valuation approach. *Animal Welfare, 14*(1), 61-69.

Heng, Y., Peterson, H., & Li, X. (2013). Consumer attitudes toward farm-animal welfare: The case of laying hens. *Journal of Agricultural and Resource Economics, 38*(3), 418-434.

Jacoby, B. (1996). Service-learning in today's higher education. In Jacoby & Associates (Eds.), *Service-learning in higher education: Concepts and practices (*pp. 3-25). San Francisco: Jossey-Bass.

Kuh, G. D. (2008). High-impact educational practices: What they are, who has access to them, and why they matter. *Association of American Colleges and Universities*. https://provost.tufts.edu/celt/files/High-Impact-Ed-Practices1.pdf

Lagerkvist, C. J., & Hess, S. (2010). A meta-analysis of consumer willingness to pay for farm animal welfare. *European Review of Agricultural Economics, 38*(1), 55-78.

Lama, G. M., Estévez-Moreno, L., Sepúlveda, W., Estrada-Chavero, M., Rayas-Amor, A.,
Villarroel, M., & María, G. (2017). Mexican consumers perceptions and attitudes towards farm animal welfare and willingness to pay for welfare friendly meat products. *Meat Science, 125*(1), 106-113.

Larson, M. (2016). International service learning: Engaging host communities. In Larson, M (Ed.), *International service learning: Engaging host communities.* Routledge, New York.

Lima, M., & Oakes, W. (2006). *Service learning: Engineering in your community.* Great Lakes Press: St. Louis.

Mason, M., & Dunens, E. (2019). Service-learning as a practical introduction to undergraduate public health: Benefits for student outcomes and accreditation. *Frontiers in Public Health*, *7*(63).

Mills, S. D. (2012). The four furies: Primary tensions between service-learners and host agencies. *Michigan Journal of Community Service Learning*, *19*, 33–43.

Napolitano, F., Girolami, A., & Braghieri, A. (2010). Consumer liking and willingness to pay for high welfare animal-based products. *Trends in Food Science & Technology, 21*(11), 537-543.

Real Food Challenge. (n.d.). *Signatory schools*. https://www.realfoodchallenge.org/signatory-schools/

Risius, A., & Hamm, U. (2017). The effect of information on beef husbandry systems on consumers' preferences and willingness to pay. *Meat Science, 124*, 9-14.

Spain, V. C., Freund, D., Mohan-Gibbons, H., Meadow, R.G., & Beacham, L. (2018). Are they buying it? United States consumers' changing attitudes toward more humanely raised meat, eggs, and dairy. *Animals, 8*(8), 128.

Stoecker, R., Loving, K., Reddy, M., & Bollig, N. (2010). Can community-based research guide service learning? *Journal of Community Practice*, *18*(2-3), 280-296.

Suckale, J., Saiyed, Z., Hilley, G., Alvisyahrin, T., Muhari, A., Lou Zoback, M., & Truebe, S. (2018). Adding a community partner to service learning may elevate learning but not necessarily service. *International Journal of Disaster Risk Reduction, 28*, 80-87.

Sumner, D. (2015, July 28). The Economic Consequences of Food Non-Sense AAEA Fellows Address. In *Agricultural and Applied Economics Association Annual Meeting*, San Francisco, CA.

Swanson, J.C., & Mench, J.A. (2000). Animal welfare: Consumer viewpoints. *Kansas State University, University of California (Davis),* 1-5.

Taylor, N., & Signal, T. D. (2009). Willingness to pay: Australian consumers and "on the farm" welfare. *Journal of Applied Animal Welfare Science, 12*(4), 345-359.

Toma, L., McVittie, A., Hubbard, C., & Stott, A. W. (2011). A structural equation model of the factors influencing British consumers' behaviour toward animal welfare. *Journal of Food Products Marketing, 17*(2/3), 261-278.

Tryon, E.; Stoeker, R., Martin, A., Seblonka, K., Hilgendorf, A., & Nellis, M. (2008). The challenge of short-term service-learning. *Michigan Journal of Community Service-Learning, 14*, 16-26.

U.S. Department of Agriculture. (2019). *Nominal Food and Alcohol Expenditures, with Taxes and Tips, for All Purchasers,* [Food Expenditure Series]. USDA Economic Research Service. https://www.ers.usda.gov/data-products/food-expenditure-series/

U.S. Department of Agriculture. (2018). *Humane Methods of Livestock Slaughter Act.* http://www.fsis.usda.gov/humane_methods_of_slaughter

University of Vermont. (2018). *Catamount Data – Student Enrollment*. UVM Office of Institutional Research. https://www.uvm.edu/oir/enrollment

University of Vermont. (2018). *UVM Facts*. https://www.uvm.edu/uvm_facts

University of Vermont. (n.d.). *Real Food Challenge*. https://www.uvm.edu/realfood/about

Verbeke, W. (2009). Stakeholder, citizen and consumer interests in farm animal welfare. *Animal Welfare*, *18*, 325-333.

Vanhonacker, F., Verbeke, W., Van Poucke, E., & Tuyttens, F. (2007). Segmentation based on consumers' perceived importance and attitude toward farm animal welfare. *International Journal of Sociology of Agriculture and Food, 15*(3), 91-107.

Wiseman, S. R. (2018). Localism, labels, and animal welfare. *Northwestern Journal of Law and Social Policy, 13*(2), 66-83.