Designing purposeful educational interventions and assessments in collegiate dining environments: The Great Plate program

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Abstract

This study explored the interaction between a passive food-based education program and food selection behaviors such as the criteria employed by undergraduate college students when choosing food in an all-you-care-to-eat dining environment, the nutritional information weighed when making choices, rationales for food selection, and consumption of different food groups. Utilizing a pretest-posttest design with a treatment and stratified random control group, the study found a lower incidence level in three food selection strategies in the treatment group at the conclusion of the intervention.

Keywords: Food selection, behavior, educational programs

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Introduction

Anecdotal observations and comments from students utilizing our community dining facilities suggested that many lacked the knowledge and tools to make healthy food choices in an all-you-care-to-eat environment. Our educational mission, coupled with a desire to empirically measure the impact of programs introduced into our daily dining operations, prompted an exploration of the literature with the ultimate goal of implementing a program that would target these deficiencies.

Recent research indicates that college students are likely to have misconceptions about nutrition, utilizing socially-acquired stereotypes that label foods either healthy or unhealthy regardless of their actual nutritional value (Oakes, 2004). This population also is likely to have difficulty estimating appropriate portion sizes, especially in self-serve settings (Bryant & Dundes, 2005). These challenges, coupled with reports of an increasingly overweight adolescent population (Gordon-Larsen, Adair, Nelson, & Popkin, 2004; Kohn et al., 2006), suggest an unwelcome convergence of factors that may increase the prevalence of the traditional "freshman 15."

The aforementioned lack of knowledge is reflected in reports of low fruit and vegetable intake, as shown in the National College Health Assessment. Data from their fall 2004 and spring 2005 reference groups indicated a mere 5.9% and 7% of college students ate five or more servings of vegetables and fruits every day, respectively (American College Health Association, 2005, 2006).

A number of interventions have been introduced to the college-going population in order to increase nutritional knowledge and promote healthier eating behaviors. Studies have explored the impact of a course in nutrition on students' perception of healthy eating (Matvienko, Lewis, & Schafer, 2001), the use of menu labels in a campus restaurant setting (Almanza, Mason, Widdows, & Girard, 1993), and the effectiveness of point-of-choice nutrition information (Aaron et. al, 1995; Bowman et al., 1995). As our dining operations currently use point-of-choice nutrition information, we sought to add an additional programmatic layer to our nutrition education efforts.

Utilizing goals for college student health based on the *Healthy People 2010 Goals* (American College Health Association, 2004; U.S. Department of Health and Human Services, 2005) and the *New American Plate* (American Institute of Cancer Research [AICR], 2000), the Great Plate program was designed and launched with an accompanying assessment program to measure its effectiveness. The Great Plate (Figure 1) is based on the concept of a sample plate, which is a common way to show diners what is available in a food service operation.

Heavily influenced by the *New American Plate* (AICR, 2000), the Great Plate encouraged a proportionally lower consumption of starches and meats in favor of vegetables. Dietetic program interns were introduced to the *New American Plate* and tasked to develop a set of criteria and guidelines that could serve as a framework for healthy eating within our university

dining context. As the primary purpose of this project was to provide undergraduates with a broader and less technical tool to make healthy food choices, interns were directed to avoid using nutrient amounts in their guidelines.

Figure 1. Great Plate Model
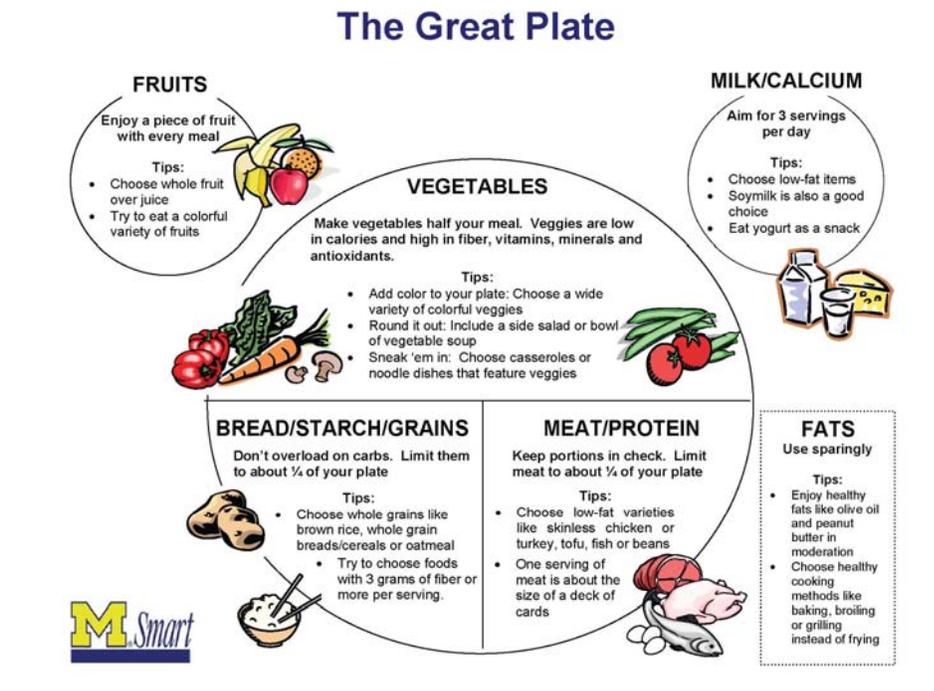
Methodology

Research Design

This study focused on an intervention within one dining hall of a residence hall system housing over 10,000 students. This residence hall housed only female students, but any student with a meal plan could access the dining facility during meal hours. The treatment sample consisted of all female and male students who had a meal plan and ate three or more lunches in the target dining hall every week. A control group composed of a random stratified sample of students who had meal plans that had not eaten in the target dining hall was created to provide a group to which the treatment sample could be compared at the end of the study. This sample was stratified to match demographic characteristics of the treatment group and consisted of students residing in every residence hall housing a dining facility within our system (excluding the residence hall where the intervention was presented). A third sample of students was comprised of all building residents (excluding those who previously included in the treatment group) in which the target dining hall was housed. This project had institutional review board approval and all students were required to e-sign a consent form prior to entering the study.

The Great Plate was designed as a passive educational intervention during weekday lunch periods. As such, it was essential that students be exposed to the program materials immediately upon entering the dining hall. The display area was located directly inside the entrance near the immediately adjacent to the area where students obtained trays and silverware. The exhibit consisted of a large poster and a display of actual food items that modeled a healthy meal based on the offerings of the day (Figure 1). Each lunch, dining staff created a sample plate for the display area. Additional printed materials were sporadically used within the display to highlight certain foods or share additional nutritional information. The educational materials were deliberately limited to this location; no advertising, separate programs, or individual table displays were utilized.

The assessment employed a pretest-posttest design with the purpose of determining if there were any measurable change effects that could be attributed to the treatment. In other words, did treatment group food selection or eating behaviors differ from the control group when taking into account the initial start and end points of each respective respondent? The pretest (Wave 1) was administered during the third week of January and the posttest (Wave 2) was given during the third week of April 2006.

The treatment and control groups were invited to participate utilizing a multistage recruitment process to increase involvement. Each student in the treatment and control groups first received a postcard in their residence hall mailbox informing them they had been selected to participate in a study. The text of the postcard outlined the nature of the research and highlighted the brevity of the survey and their expected time commitment. The title of the forthcoming invitation e-mail was included within this text as well, given our past experience with students deleting e-mails that they would otherwise characterize as spam. The ensuing e-mail invitation provided a link to a web survey designed to capture their nutritional knowledge, food selection criteria, eating behaviors, and outside factors that influenced their food choices. Nonrespondents received two reminder e-mails requesting their participation.

A second questionnaire was developed to capture the perspectives of the building residents at the conclusion of the intervention period. This instrument explored their knowledge of the program, if they used the information to govern their food choices, and what they would change to make it more attractive and useful for themselves and their friends.

Data Analyses

SPSS (v. 11.01) was utilized for all statistical analyses within this study. Descriptive statistics including frequencies, means, and percentages; paired sample t-tests; and chi-square analyses were employed at different stages of this study to examine and evaluate the data.

Sample Composition

Table 1 displays sample size and response rate data. Approximately one third of the sample responded to the first wave. The second wave survey was sent to only the first wave respondents, resulting in an overall response rate of 20.9%. The sample was predominantly female, which was not surprising considering the all-female nature of the building where the

intervention was implemented (Table 2). The race and class year distribution was consistent with our system-wide residence hall population. We also asked students for their academic affiliation, noting that some majors and disciplines include coursework that may influence lifestyle (e.g., Kinesiology, Nursing). Utilizing chi-square analyses, these affiliations were not found to have a significant influence on survey responses.

Table 1. Response Rates

	Number Responding			Response Rate (percent)		
	Treatment	Control	Overall	Treatment	Control	Overall
Initial Sample	246	246	492	---	---	---
Wave 1 Responses	79	81	160	32.1	32.9	32.5
Wave 2 Responses	49	54	103	19.9	22.0	20.9

Table 2. Student Demographics

	Treatment (n=49)	Control (n=54)	Overall (n=103)
Gender			
Female	91.8%	87.0%	89.3%
Male	8.2%	13.0%	10.7%
Class Year			
Freshman	44.9%	44.4%	44.7%
Sophomore	34.7%	31.5%	33.0%
Junior	12.2%	20.4%	16.5%
Senior	8.2%	3.7%	5.8%
Race/Ethnicity			
African-American/Black	8.2%	3.7%	5.8%
American Indian/Alaskan Native	2.0%	1.9%	1.9%
Asian/Pacific Islander	8.2%	11.1%	9.7%
Hispanic/Latino/a	2.0%	---	1.0%
Other	6.1%	14.8%	10.7%
Caucasian/White	73.5%	68.5%	70.9%
Academic Affiliation			
Art	---	1.9%	1.0%
Engineering	16.3%	18.5%	17.5%
Kinesiology	4.1%	3.7%	3.9%
Literature, Science, Arts[1]	77.6%	75.9%	59.2%
Music	2.0%	0.0%	1.0%
Nursing	---	3.7%	1.9%

[1]Largest academic unit housing many of the liberal arts and natural sciences

Food Selection Criteria and Consumption Behaviors

Respondents in the treatment and control groups were asked a number of questions that explored the basic criteria they utilized when choosing food in the dining hall, the nutritional information they weighed when making their choices, the rationales for selecting the foods they did, and reporting how often they consumed food from the different food groups.

Appearance and taste/palatability were the visible criteria most often utilized by survey respondents in both samples (Table 3). The cue most infrequently used was texture, with no more than a third of either sample reporting its use. Nutritional criteria most utilized included information pertaining to calories, portion size, and fat.

Table 3. Food Selection Criteria

Criteria	Treatment Group		Control Group	
	Wave 1	Wave 2	Wave 1	Wave 2
Basic Selection Criteria				
Color	44.9%	49.0%	37.0%	46.3%
Texture	32.7%	30.6%	25.9%	33.3%
Taste/Palatability	85.7%	81.6%	85.2%	90.7%
Appearance	87.8%	77.6%	77.8%	83.3%
Smell	44.9%	42.9%	48.1%	50.0%
Variety	55.1%	34.7%	48.1%	44.4%
Familiarity	63.3%	46.9%*	40.7%	42.6%
Nutritional Value	57.1%	61.2%	75.9%	74.1%
Nutritional Criteria				
Calories	51.0%	49.0%	74.1%	68.5%
Fat	46.9%	44.9%	64.8%	53.7%
Protein	34.7%	42.9%	33.3%	37.0%
Carbohydrates	22.4%	22.4%	24.1%	31.5%
Vitamins and minerals	26.5%	20.4%	33.3%	37.0%
Portion size	49.0%	53.1%	57.4%	53.7%
None of the above	12.2%	16.3%	9.3%	7.4%

Note: Treatment group n=49, Control group n=54.
* Mann-Whitney U test indicated a statistically significant change between waves at the p<.05 level.

Mann-Whitney U tests were run within each sample to determine if there were significant differences between waves. Only one item across both samples was shown to be statistically different as a result of these tests: familiarity of foods/entrees for the treatment sample (*p*=.041). Fewer treatment group respondents utilized these cues as criteria for food selection, opting to use nutritional value and color at higher frequencies.

Table 4 shows food selection strategies utilized by the students. Two of the top three behaviors are shared by the treatment and control groups: selecting food based on personal habits/preferences and choosing one of the entrees from the cafeteria line. Least utilized strategies reported by both groups during both data collection waves were trying to balance

color, texture and variety from all the food groups, returning for seconds, and attempting to put as much food on the tray as possible during the first time through the line. Only one behavior (choosing foods based on cravings or mood) was found to be statistically significant between waves when comparing treatment and control groups.

Table 4. Food Consumption Behaviors

Behavior	Treatment Group		Control Group	
	Wave 1	Wave 2	Wave 1	Wave 2
I look at all the options before choosing what foods I want	40.8%	42.9%	66.7%	59.3%
I pick whatever looks good	65.3%	63.3%	40.7%	40.7%
I select foods based on my personal habits and preferences	79.6%	81.6%	83.3%	77.8%
I usually eat one of the entrees from the cafeteria line	65.3%	67.3%	59.3%	53.7%
I choose foods based on my cravings or mood[1]	49.0%	42.9%	40.7%	48.1%
I read the nutrition signs and pay attention to portion sizes	34.7%	36.7%	44.4%	46.3%
I typically try to select at least one food from each food group	32.7%	32.7%	37.0%	40.7%
I put as much food on my tray as I can during my first time through the line	10.2%	4.1%	3.7%	3.7%
I try to balance my plate with color, texture and variety from all the food groups	22.4%	26.5%	25.9%	31.5%
I typically go back for seconds	16.3%	18.4%	7.4%	9.3%
I choose dessert on most days	30.6%	36.7%	31.5%	35.2%

Note: Treatment group n=49, Control group n=54.

[1]Chi Square testing indicated a statistically significant difference in the change between waves when comparing samples: $X^2 (2)=6.03$, $p<.05$.

Several items in Table 4 are worthy of note. Food choices governed by cravings dipped significantly in the treatment group when compared to the control sample; 18% of the treatment group reported using this strategy in the first wave but not in the second wave, compared to 4% of the control group. While not significant, there was a 6% drop in treatment group respondents who "put as much food on my tray as I can during my first time through the line," versus no change in the control sample.

Students also were asked to document their actual behavior by sharing the number of days per week that various food groupings were selected (Table 5). While no statistically significant differences were discovered during our examination of the data, some trends were apparent. With the exception of one food group (dairy), the frequency of selection for each groups' lunch trays increased. These increases were most pronounced among the treatment sample respondents, who reported large increases in their daily selection of dairy and fruits. Conversely, the control sample reported a larger increase in their fat consumption from wave one to wave two.

Beyond the Treatment and Control Samples

The remainder of the population that resided in the building housing the treatment dining hall received an invitation to take a short survey about their awareness and use of the Great Plate program. Slightly over one third of the women in the all-female residence hall responded (122 of 358 students, 34.1% response rate). As noted earlier, this sample did not include any students in the treatment sample. The results were encouraging: 75.4% of respondents were familiar with the program in their dining hall. Over 1/3 of the respondents reported using the Great Plate guidelines occasionally (37.8%) and frequently (3.7%) during their lunches. When asked if they employed the guidelines during other meals, 29.6% indicated occasional (29.6%) and frequent (3.7%) use. A substantial number of these respondents took the time to write in comments, most of which provided constructive feedback.

Limitations

As with any study, there are a number of limitations that should be kept in mind while reviewing and evaluating the results. First, this pilot study utilized a single site; the clientele, staff, and dining hall layout all have the potential of influencing the treatment sample results in a way that a multiple site study would prevent. Second, the final response rate for this study was slightly over 20%, a relatively small percentage even by social science standards; this limits the generalizability of the results. Third, the research methodology utilized electronic data gathering techniques; such methods have the potential of excluding students who either chose not to use their university e-mail accounts or were unable to access their e-mail during the study period. Fourth, the timing and duration of the intervention may have artificially curtailed the impact of the intervention. This study occurred during the second semester of the school year, meaning students had the prior semester to develop eating habits prior to being exposed to the intervention, and the short (eight week) duration of the program may have likewise limited the effects of the educational materials.

Conclusions and Applications

This study shared the results of an educational intervention housed within one dining facility of a large residence hall system. A pretest-posttest research design discovered several differences between the treatment group and the stratified control group, most notably the diminished use of cravings as a food selection strategy in the treatment group. Other findings indicated students in the treatment group utilized familiarity with foods and entrees at a significantly lower level at the end of the program ($p<.05$).

We learned several lessons that will influence our future use of this educational program. First, our experiment occurred during the second semester, when many food habits and selection patterns had already been set by at least one prior semester in our dining environment. We may achieve greater behavior modification if this intervention is in place when students first arrive at the beginning of the school year. Secondly, the food in the display did not hold up well over the course of the meal. High traffic levels inhibited periodic adjustment of the sample food plates placed next to the educational materials; consequently, we will be more deliberate with our monitoring frequency and replacement of food displays in the future. Additionally, some

students were unhappy with what they perceived as a waste of food by using real entrees in the display plates. Third, students suggested add-ons to the program, such as information on each table in the dining halls for more leisurely reading, seminars, and additional advertising.

The college student population comes to us primed for growth in so many areas; developing healthy eating habits and behaviors is a powerful way in which food service professionals can be involved in the education of the student body. Programs such as the Great Plate can be effective tools at raising awareness of food choices and encouraging more healthful eating behaviors in a group that may be coming to college with a higher prevalence of poor eating habits and obesity.

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