

Original Research



Effects of campus dining sustainable practices on consumers' perception and behavioral intention in the United States

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Conflict of Interest

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ABSTRACT

BACKGROUND/OBJECTIVES: Sustainability has become one of the top priorities in the foodservice industry. With an increase in consumer interest in sustainability and educational opportunities in higher education, it is important to know what sustainable practices are implemented in campus dining and how sustainable practices affect consumers' responses. This study aims to identify the key sustainable practices in the campus dining context, and investigate the relationship by applying the stimulus-organism-response framework to determine whether the key sustainable practices influence consumers' perception and behavioral intentions.

SUBJECTS/METHODS: The self-administered online survey was distributed to college students in 8 dining halls at a large southeastern university in the United States from September 20–October 10, 2019. A total of 382 valid questionnaires were collected, and factor analysis and multiple regressions were utilized to test the research model.

RESULTS: This study identified 4 dimensions of campus sustainability with a total of sustainable practices: sustainable food, waste management, energy/water conservation, and recycling/reuse. Three dimensions of sustainable campus practices (i.e., sustainable food, waste management, recycling/reuse) played a significant role in consumers forming a perceived value while energy/water conservation did not significantly influence the consumers' perceived value toward the campus dining. Waste management was identified as the most important practice to enhance consumers' perceived value ($\beta = 0.330$). Using sustainable food and recycling/reuse were ranked second and third, respectively ($\beta = 0.262$, $\beta = 0.154$). The findings confirmed the significant positive relationship between perceived value and revisit intentions.

CONCLUSIONS: The findings support the inclusion of dining sustainability as a critical component in explaining college students' perceived value and revisit intention toward campus dining. Furthermore, this study provides practical implications for university administrators and foodservice operators to consider the key sustainable practices to meet the consumers' value and revisit intentions.

Keywords: Sustainability; food service; students; perception; consumer behavior

Author Contributions

Conceptualization: Yoon B; Methodology:
Yoon B, Jun K; Investigation: Yoon B, Jun K;
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INTRODUCTION

In recent years, there has been a growing interest in sustainable diets and dining among both academics and the general public. This interest is driven by a recognition that the food system plays a significant role in environmental, social, and economic sustainability [1]. According to the United Nations Food and Agriculture Organization, the food system is responsible for around 30% of global greenhouse gas emissions and food waste and 20% of water pollution. While the food system is a major employer and economic driver in many regions and countries, it also contributes to food insecurity and inequality [2].

The movement towards sustainable diets and dining has influenced the foodservice industry by promoting the adoption of more sustainable practices and promotion of more sustainable food choices [3-5]. In fact, sustainability has become an obligatory option in the foodservice industry due to its hazardous impact on the environment [3]. Foodservice has been criticized for its environmental impact, including excessive energy and water consumption, massive food waste, and greenhouse gas emissions [4]. As consumers have shown an increasing interest in green food, sustainable consumption, and eco-friendly practices, the adoption of sustainable practices in foodservice operation has accelerated [6].

As the green initiative has become one of the key strategies that the foodservice and restaurant industry embrace [5,7,8], an increasing number of campus dining services in higher education have implemented green practices to meet the demand of the young generation who are environmentally conscious [9-11]. For example, Yale University was one of the first higher-education institutions that started sustainable dining initiatives by providing seasonal and locally grown food in the campus dining menu [7]. In addition, Harvard University dining services have donated uneaten food and ingredients to local shelters and food banks in the local community, which has helped to reduce campus food waste and food insecurity [12]. Given that the sustainable initiatives in higher education institutions provide various educational opportunities for students to participate in sustainable consumption [13], campus policies and campaigns have led students to reflect on and implement the values of sustainability.

Several studies were conducted to investigate sustainable practices implemented in dining facilities in higher education in the United States [9,11,14,15]. With this movement, South Korea also has been actively implementing sustainability in dining areas [16]. For example, the “zero food waste” initiative was implemented by the government to reduce food waste by promoting efficient food management practices and encouraging consumers to reduce food waste at home. Studies have found that the initiative has been effective in reducing food waste in dining facilities and increasing awareness of the issue among consumers [17,18]. Another example is the promotion of plant-based menu options in dining facilities. South Korea has seen a growing interest in vegetarian and vegan diets in recent years, and dining facilities have responded by offering more plant-based menu options. A study [19] found that offering vegetarian and vegan options in a university dining facility increased sales of these options and reduced the environmental impact of the menu.

While sustainability in dining facilities has gained recognition among foodservice scholars, the sustainability dimension in university dining facilities has been relatively overlooked. Despite students being the primary customers of university dining facilities, previous research has predominantly examined the intentions of administrators to adopt sustainable practices [14,15]. As a result, there may be a gap between the sustainability initiatives

implemented by administrators and the preferences and behaviors of the target audience. To effectively promote sustainable practices in university dining facilities, it is important to gain a better understanding of the attitudes and behaviors of students towards sustainability. In addition, there is a noticeable lack of research on the link between sustainable practices and their impact on customer value and repeat business-outcomes that are critical for the success of any foodservice facility.

Few studies have explored the impact of sustainability in campus dining facilities on consumers' perceptions and intentions to revisit such facilities. More recently, scholars [20,21] have explained the decision-making process of consumers with regard to sustainable consumption, using the stimulus-organism-response (S-O-R) framework proposed by Jacoby [22]. This theory suggests that individuals' attitudes and/or behavioral intentions are influenced by their internal states/evaluations when they are exposed to external stimuli.

To address the gaps in the existing research, this study aims to identify sustainable practices in campus dining facilities from the perspective of college students, who comprise the primary customer group for such services. Additionally, the study seeks to identify the key sustainable practices that influence consumers' perceived value and behavioral intentions, using the S-O-R theory as a framework.

SUBJECTS AND METHODS

Participants and data collection

The current study targets college students, who are the primary customer group of campus dining services. The self-administered online survey was distributed to undergraduate and graduate students in 8 dining halls at a large southeastern university in the United States from September 20–October 10, 2019. Out of 423 questionnaires collected, a total of 382 responses were analyzed after deleting questionnaires with incomplete responses. The study was approved by the Institutional Review Board of The University of Tennessee, Knoxville (UTK IRB-18-04665-XM).

Measurements

The survey consisted of 3 sections: (a) perception of sustainable practices in campus dining programs; (b) customers' perceived value and revisit intention toward the campus dining services; and (c) demographic information, including sex, age, and frequency of university dining out. The questions related to sustainable practices were adopted from the relevant literature of sustainable practices in foodservice management [8,9,11,15,16,23].

For the questions about the perception of sustainable practices in campus dining programs, question items were derived from an extensive review of the literature. First, this study reviewed published articles, campus/university reports, and university websites to see their interest in sustainability and what they have been doing for sustainability on campus [9-12,15]. While sustainability can be linked to many ecological, green, and environmental protection practices that are applied in a friendly manner [8,23], sustainable practices usually incorporate a manner of environmental, economic, and social sustainable practices in the university dining context, including water reduction, efficient water and energy usage, use of sustainable food, waste reduction, recycling, use of eco-friendly products, and engagement with the local community [9-11,15,16]. Therefore, there are 4 major themes with a 16-item

scale found in campus dining sustainability: food sustainability, waste reduction, recycle/reuse, and energy/water conservation (**Table 1**).

Second, one university dining manager and 2 hospitality faculty members who are familiar with the subject area were consulted to improve the face validity of campus dining sustainability. After the meetings, minor wording changes were made throughout the questionnaire and 2 items were deleted. The statements regarding “use of seasonal food” and “use of automatic thermostats program in campus dining” were deleted because these were not commonly applied in university dining services. Thirdly, researchers checked the university dining website for sustainability [24] in order to properly reflect the sustainable practices implemented in a campus dining service so respondents could evaluate the attributes as accurately as possible. After the review process, all of the 14 items were identified as being appropriate to measure the sustainable practices in campus dining services. The respondents were asked to indicate how the campus dining operations performed in each of the listed sustainable practices using a 5-point Likert-type scale (1 = never perform to 5 = always perform). Cronbach's alphas for the sustainable practices in campus dining were calculated to ensure internal consistency, and the Cronbach's alpha coefficients of all factors were greater than the cutoff value of 0.70 [25].

This study adopted previously validated items, and the wording of the measures was slightly modified to better fit this study. Consistent with prior studies [26,27], the perceived value of the campus dining was assessed with 3 items (sample item: “It is a good deal to dine at this university restaurant as compared to other restaurants”). Revisit intentions were also assessed with 3 items (sample: “I intend to revisit this university restaurant in the near future”). All items were measured using a 5-point Likert-type scale from 1 (strongly disagree) to 5 (strongly agree). Cronbach's alpha values for perceived value and revisit intentions were 0.83 and 0.93, respectively. All constructs were shown to have acceptable levels of internal consistency with Cronbach's alpha estimates [25].

Statistical analysis

SPSS ver. 25.0 for Windows (Statistical Package for Social Science; SPSS Inc., Chicago, IL, USA) was used for the statistical analysis. Descriptive statistics were used to identify respondents' demographic information. Exploratory factor analysis with the principal

Table 1. Themes of campus dining sustainability

Major themes	Sub-themes	Sources
Food sustainability	Use of local food	[8-10,16]
	Use of organic food	
	Use of seasonal food	
	Use of environment friendly produce	
	Use of on-site food produce	
Waste reduction	Food donation	[9-12]
	Composting food	
	Disposable product reduction	
	Operating trayless	
Recycle/reuse	Use of reusable dishware	[9-11,15,16]
	Use of recycled materials	
	Use of recycling bins	
Energy/water conservation	Use of energy efficient lighting	[9-16]
	Use of water efficient system	
	Use of automatic thermostats program	
	Water usage reduction	

components was conducted to examine the dimension of sustainable dining practices. To understand the relative impact of each dimension of sustainable practices on consumers' perceived value and behavior intention, a series of multiple regressions were performed with P -value < 0.05 as the criterion for statistical significance.

RESULTS

Profile of the respondents

As shown in **Table 2**, the respondents of this study were comprised of 33% male and 66% female college students. About 64.4% of the respondents were between the ages of 18–20 followed by the age groups 21 to 25 and 26 to 30, which accounted for 34.3% and 1.3%, respectively. Most of the respondents were Caucasian (88.2%). About one-third (32.2%) of respondents purchased meals 1–2 times a week at their campus dining facilities.

Dimensions of the campus dining sustainable practices

Two variables (i.e., use of on-site food produce and using trayless dining system) were deleted, because they had a high level of cross-loading on 2 factors [28]. This can probably be related to the ambiguity inherent in the wording of the variables. **Table 3** shows the results of factor analysis of campus dining sustainable practices with a total of 12 variables. As the result, campus dining sustainable practices were classified into 4 dimensions: sustainable food, waste management, recycling/reuse, and energy/water conservation. The 4-factor model explained 72.5% of the total variance. Cronbach's alpha coefficients were calculated to ensure internal consistency within the factors. Cronbach's alpha coefficients of all factors were greater than the cutoff value of 0.70 [25].

Items including “reduce food waste,” “reduce disposal product,” and “donate leftover food to the community” loaded highly on the first factor, which was named as waste management. Three items (i.e., “use organic food,” “use environmentally friendly fed meat,” and “use local food”) were grouped and presented as sustainable food. Three items such as “use reusable dishware,” “use recycled materials,” and “use recycling bins” were grouped together under the factor named recycling/reuse. The last factor was comprised of “reduce water usage,” “energy-efficient lighting,” and “water-efficient equipment” that present the factor named energy/water conservation.

Table 2. Profiles of respondents (n = 382)

Characteristics	Category	Frequency	Percentage (%)
Sex	Male	127	33.3
	Female	251	65.7
	Missing	4	1.0
Age (yrs)	18–20	246	64.4
	21–25	131	34.3
	26–30	5	1.3
Ethnicity	Caucasian	337	88.2
	African American	11	2.8
	Hispanic	13	3.4
	Asian	18	4.8
	Native American	3	0.8
Dine-out frequency	1–2 times a month	109	28.5
	1–2 times a week	123	32.2
	3–4 times a week	88	23.0
	> 5 more times a week	62	16.3

Table 3. Exploratory factor analysis of campus dining sustainable practices

Factors (Cronbach's α)	Mean \pm SD	FL	EV	Variance (%)
Factor 1: Waste management ($\alpha = 0.79$)			5.086	42.383
Reduce food waste (e.g., composting)	3.26 \pm 1.02	0.915		
Reduce disposal product	3.38 \pm 1.07	0.822		
Donate leftover food to the community	3.08 \pm 1.08	0.648		
Factor 2: Sustainable food ($\alpha = 0.81$)			1.704	14.197
Use organic food	3.36 \pm 0.97	0.925		
Use environment friendly fed meat	3.28 \pm 0.99	0.825		
Use local food	3.49 \pm 1.02	0.791		
Factor 3: Recycle/reuse ($\alpha = 0.78$)			1.166	8.883
Use reusable dishware	3.32 \pm 1.05	0.845		
Use recycled materials	3.30 \pm 1.01	0.819		
Use recycling bins	3.36 \pm 1.06	0.802		
Factor 4: Energy/water conservation ($\alpha = 0.77$)			1.066	7.088
Reduce water usage	3.85 \pm 1.03	0.962		
Use energy-efficient lighting	3.43 \pm 0.95	0.626		
Use water-efficient equipment	3.38 \pm 0.92	0.549		
Total % of variance				72.551

Kaiser-Meyer-Olkin = 0.892, Bartlett's test: $\chi^2_{(66)} = 2,029.550$, $P < 0.001$. Deleted items are "use of on-site food produce" and "using Trayless dining system."
FL, factor loading; EV, eigen value.

Effect of campus dining sustainability on consumers' perceived value and revisit intention

Multiple regressions were used to identify the relationship between campus dining sustainable practices and consumers' perceived value. **Table 4** shows that 3 of the 4 sustainable practices played a significant role in consumers forming a perceived value. Waste management was identified as the most important practice to enhance customers' perceptions of a dining value ($\beta = 0.330$). Using sustainable food and recycling/reuse related practices were ranked second and third, respectively ($\beta = 0.262$, $\beta = 0.154$). However, energy/water conservation was not statistically significant.

To explore the impact of perceived value on consumers' revisit intention, a simple regression analysis was conducted. The result showed that 73.1% of the variance in intention to adopt was explained by the model (adjusted $R^2 = 0.731$). Thus, the perceived value had a significant positive association with college students' revisit intentions (**Table 5**).

Table 4. Regression analysis for campus dining sustainability affecting perceived value

Variables	Unstandardized coefficient (b)	SE	Standardized coefficient (β)	t-value	P-value
(Constant)	0.465	0.231		2.015*	0.045
Waste management	0.354	0.053	0.330	6.672***	< 0.001
Recycle/reuse	0.173	0.056	0.154	3.115**	0.002
Energy/water conservation	0.050	0.064	0.042	0.782	0.435
Sustainable food	0.285	0.056	0.262	5.067***	< 0.001

Adjusted $R^2 = 0.301$, $F = 40.673$, Significance $F < 0.001$.

* $P < 0.05$; ** $P < 0.01$; *** $P < 0.001$.

Table 5. Regression analysis for perceived value affecting revisit intentions

Variables	Unstandardized coefficient (b)	SE	Standardized coefficient (β)	t-value	P-value
(Constant)	0.527	0.090		5.839***	< 0.001
Perceived value	0.888	0.028	0.855	32.167***	< 0.001

Adjusted $R^2 = 0.731$, $F = 1,034.715$, Significance $F < 0.001$.

*** $P < 0.001$.

DISCUSSION

As sustainability gains greater attention among consumers and educational institutions, it has become a critical priority for the foodservice industry. It is important to understand the sustainable practices employed in campus dining and how they impact consumer behavior and responses. Although there is a growing number of studies on consumers' behavior in green and sustainable consumption, there is limited literature on campus dining sustainability in higher education. Prior studies have focused heavily on administrators' intention to adopt campus dining sustainable practices [14,15]. This study attempted to capture the comprehensive pictures of campus dining sustainable practices from the college students, which is the primary customer group of campus dining services. The study also identified key sustainable practices that influenced consumers' perceived value and behavior intention based on the S-O-R theory. The research, therefore, developed and tested the research model on the relationship between sustainable practices and consumers' perceived value and revisit intention toward campus dining service.

Following the literature review [9,11,16,17], the study categorized 12 items with 4 dimensions of sustainable practices in campus dining service (e.g., sustainable food, waste management, energy/water conservation, and recycle/reuse). Kim and Hall [29] identified sustainable restaurant practices as focusing on waste management and sustainable food, and Jang [30] developed 4 sustainable restaurant practices, such as food sustainability, energy/water efficiency, reuse/recycle, and socially responsible activities.

The results indicated that 3 dimensions of sustainable practices (i.e., sustainable food, waste management, recycling/reuse) have significant influence on the formation of consumers' perceived value while energy/water conservation did not have a direct influence on customers' value perception toward the campus dining. This result is consistent with previous studies [16,30] that show that using water-efficient equipment showed no significant impact on perceived green image. This is because water/energy efficiency-related practices might be difficult for customers to observe when they dine out compared to the other 3 dimensions of dining sustainability. This result implies that campus dining sustainable practices, which might be closely connected with produce consumption and easily seen practices occurring in the dining area, would influence consumers' perception.

The results of the study show the positive relationship between consumers' perceived value and revisit intention toward the campus dining experience. This is consistent with the previous study explaining consumers' value perception is a critical factor for their purchase decision [31]. Referring to the S-O-R theory, the assumption that an external stimulus (campus dining sustainability) affects the organism (perceived value), which in turn influences response (revisit intention). Therefore, this study contributes to the literature on consumer dining behavior and supports the theoretical framework of the present study.

Campus dining sustainability is expected to play a critical role in educating the future leaders for environmental protection. Additionally, college-aged people are the largest and most environmentally conscious consumer group in the United States [32] and the primary customer group of the university dining service. Therefore, it is crucial to understand their perceptions in sustainable practices and their decision-making process toward campus dining services. Our findings provide campus dining administrators with meaningful implications. First, some sustainable practices take place in the back of the house (e.g.,

water efficiency equipment), So customers can't know and see these practices. Therefore, noticeable green activities as well as providing information might help consumers to recognize and see the sustainable practices. For example, dining managers should put in effort for their dining service to be visualized and promoted for sustainable practices in their facilities via social media, bulletins, and newsletters. Second, given that waste management has the strongest impact on perceived value, dining may continue to promote waste reduction participation. For instance, universities keep encouraging students to participate through the mug project, which is a campus-wide initiative to eliminate single-use containers and bottles by encouraging and incentivizing the use of reusable bottles and mugs.

Although the current study has contributed significantly to the literature, this study has limitations. First, participants were recruited from a single university in the United States. The findings may not be applicable for generalizing across all university dining services in the United States. It is strongly recommended that future research expand the sample by adding university dining programs from both across and outside of the United States. In addition, the study relied on self-reports of behavioral intention instead of actual behavior to measure consumers' sustainable campus dining visits. To better understand consumer behaviors associated with sustainable dining experiences, it is recommended to verify whether the reported behavioral intentions lead to subsequent actual behaviors in the future.

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