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Food and Nutrition Education: A Tool to Help Combat Growing Food Insecurity

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FOOD AND NUTRITION EDUCATION: A TOOL TO HELP COMBAT GROWING FOOD INSECURITY

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Abstract

Food insecurity is an escalating issue often overlooked and stigmatized in the United States, affecting about 1 in 10 households. This issue is a threat that can increase stress and anxiety, which is believed to further negatively impact academic and daily performance. The University of Nebraska-Lincoln community is no exception. To combat local food insecurity, the Husker Pantry has served almost a third of the Husker community, aiming to assist by offering food items, school supplies, personal hygiene products, and additional services. This project was made in collaboration with the Husker Pantry, designed to further help combat the ever-growing issue of food insecurity, by providing basic nutrition information and offering access to simple, cost-effective recipes for those that use the Husker Pantry. The goal of this project is that consumers can improve their eating habits and better sustain and utilize food products, which could curtail the mental and physical strain of insatiety. This project's proposal, research, and approval phases were done with the help of Husker Pantry Director, Dr. Kenji Madison. After thorough and conscious research, the final product yielded a visual model that could be distributed to Husker Pantry consumers. This pamphlet uses the MyPlate, created by the US Department of Agriculture, and includes interactive QR code access providing links for more resources if desired, along with various recipes advocated by the United States Department of Agriculture (USDA).

Key Words: Food Insecurity, MyPlate, Husker Pantry, Satiety, Nutrition Science and Education

Food and Nutrition Education:

A Method to Help Combat Growing Food Insecurity

Introduction

The USDA defines food security as "access by all people at all times to enough food for an active, healthy life" (Coleman-Jensen et al., 2022). In the past year, 89.8% of homes fell under the food secure definition. However, 10.2%, or 13.5 million households were seen as food insecure, raising added concern in households with children (Coleman-Jensen et al., 2022). Nebraska is no exception, with an estimated 237,440 people affected and about 13.9% in Lancaster County, slightly above the national average (Hubbert, 2020). The issue of food insecurity is complex, often appearing different among households and heavily stigmatized resulting in under-reporting. There are six tangible aspects of food insecurity, including availability, accessibility, agency, stability, sustainability, and utilization (Gallegos et al., 2021). These categories are often assessed in a food questionnaire that determines if a household falls under the food insecure description, which is further divided into 4 separate groups. High security households have no issues or any stresses in finding sustainable food. Marginal security houses have minor issues but may have or had issues at times. Low secure households face cuts in quality, variety, and sometimes the desired foods in order to sustain the quantity of food. Very low security houses consistently face disruptions in eating patterns, quantity, and quality in meals (Gallegos et al., 2020). In 2020, 3.8 million households with children fell under the very low secure category and about 274,000 of these households had children that were directly affected (Coleman-Jensen et al., 2022).

Food insecurity can affect anyone but is often seen at unequal rates across the United States. Children have a prevalence rate of about 15.2% (Hubbert, 2020). The main concern of childhood malnutrition is the high likelihood of impacted physical, cognitive, and social development, especially in the classroom setting. 7.3% of seniors are also identified as food insecure, which can be linked to further illnesses and even lead to death (Hubbert, 2020). There is also a distinct inequality of food insecurity when looking through the demographic lens. African Americans have the highest prevalence rate nearing 21.2%, followed by Hispanics, where 16.2% of the population is affected by food insecurity (Hubbert, 2020). One important consideration is these numbers were recorded prior to the COVID-19 Pandemic. Multiple analyses have noted that food insecurity and inequality has sharply risen since 2020, likely because of increased unemployment and inability to utilize support programs in schools. Consistent numbers have yet to be published as the Pandemic continues, but food instability is an increasing and persistent concern that demands more solutions (Gallegos et al., 2021).

One way the University of Nebraska-Lincoln attempts to combat food insecurity is through the Husker Pantry. With two operating locations on campus, the Husker Pantry's mission is to "provide free food and personal items to students enrolled at the University of Nebraska-Lincoln, reduce the stigma around food insecurity, (and) increase access and educate the campus community." (University of Nebraska-Lincoln). From everyday food items to toiletries and even dining hall passes, any student in need can submit requests weekly. In fact, almost 1 in 3 students in the Husker community has experienced some level of food insecurity. The Pantry also offers contacts and other resources including additional food pantries, shelters, and supplies in the greater Lincoln area that are not affiliated with the university (University of Nebraska-Lincoln).

The goal of this project was to work with the Husker Pantry and their operation to further help resolve food insecurity in the community. While volunteering for and collaborating with Dr. Kenji Madison, a major issue was many members using the pantry faced hardships in pairing meals and lacked food preparation knowledge. These issues may seem minor but can lead to an unbalanced diet, unintentional wasting of valuable food items, and even illness. Therefore, this project was constructed with the goal of supplying basic nutrition education, while also offering resources to better understand how to prepare foods and ingredients. This project does not directly enhance food accessibility and availability but offers a unique method of approach by addressing the sustainability and utilization aspects of food insecurity.

Methods

To attain the goal of providing basic nutrition information and access to food resources and recipes, a visual pamphlet was created and distributed to members that used the Husker Pantry. In the Husker Pantry system, volunteers electronically submit order forms to volunteers, where items are placed in a grocery bag upon pick-up. At least one copy of each pamphlet was stapled to the front of the bags. Several aspects were considered throughout the research and creative process to develop a suitable and effective visual aid. The main factors accounted for optimization included appeal, conciseness, cohesiveness, and accuracy.

The biggest obstacle was to develop an effective message that would be appealing for those using the Pantry. From the perspective of households that are food insecure, quality and nutrition composition of food are rarely an area of concern or care because the primary focus lies in finding an adequate amount of food. Therefore, the pamphlet was designed to be simple and brief, while simultaneously being cost aware. Another parameter was to consider the highly

diverse campus population. Initial attempts focused on illustrating calorie-based charts, somewhat resembling the 2000 calorie-based labels seen on food items. However, the highly variable caloric range based on gender, sex, age, lifestyle, and even genetic factors of the community would not be as effective in this model and not all target audiences would be included. People may also not care to consider caloric consumption, which can require lots of time and can preach a dangerous habit in obsessing over food-related numbers. In addition, many have dietary preferances due to allergies, religious beliefs, or personal beliefs that must be accounted for in diet modeling that would not be as inclusive in specific diet-based examples.

As a result, the MyPlate was selected as the primary visual aid for the pamphlet. Created in 2011, the MyPlate was developed to model a simple structure of an everyday plate of food, divided into five basic food groups- fruits, vegetables, grains, dairy, and protein. The main idea is to promote healthy eating by means of consuming a large variety of nutritious foods that does not have to be complicated or resource consuming. By simply following the general guidelines of MyPlate, consumers can receive the calories they need in addition to the key macronutrients, vitamins, and minerals that can contribute to a healthy eating pattern. This message is conveyed with a few ‘guidelines,’ including “half the plate should contain fruits and vegetables,” half of the grains section should be whole grains, and the protein should be sourced from lean meats, such as chicken. The dairy section is the smallest portion on the graphic, placed on the side to help represent low-fat milk, although other low-fat or lactose free dairy products are recommended as substitutes.

Because MyPlate is simple and easy to interpret, incorporated with color coordinated sections based on food group, ideal meal pairings can easily be put together. MyPlate can also be applicable to everyone's caloric needs, rather than giving hard numbers of food amounts, only

estimated ratios are given and can be adjusted depending on personal need. Food allergies or other dietary restrictions are also accounted for by offering alternative food options.

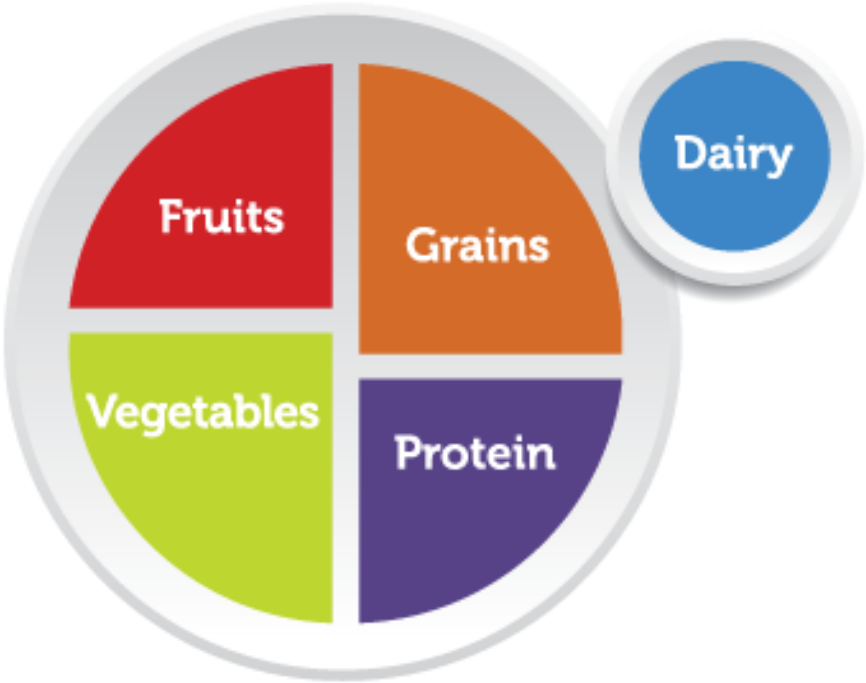

Figure 1: The MyPlate used as the main illustrative model

Furthermore, the pamphlet was supplemented with specific food examples for each of the five food categories. The fruits section included apples, bananas, pears, and berries. The vegetable category advertised broccoli, carrots, and leafy greens. Grains had whole grain pasta, rice, and oats. Protein examples included chicken, fish, beans, and nuts, and low-fat milk displayed for the dairy section. 'MyPlate.gov' gives access to more foods recommended for each category plus a more extensive explanation on why each category is important. However, to keep the pamphlet concise, only these few items were chosen. These examples were not haphazardly

selected but chosen because they can often be ordered in the Husker Pantry. One of the major benefits the Husker Pantry has to offer is the ability to select a range of products, including some perishables such as chicken, apples, and even eggs depending on availability and demand. These specific foods are also frequently found at campus dining halls, which can be accessible by free meal tickets provided by the Pantry.

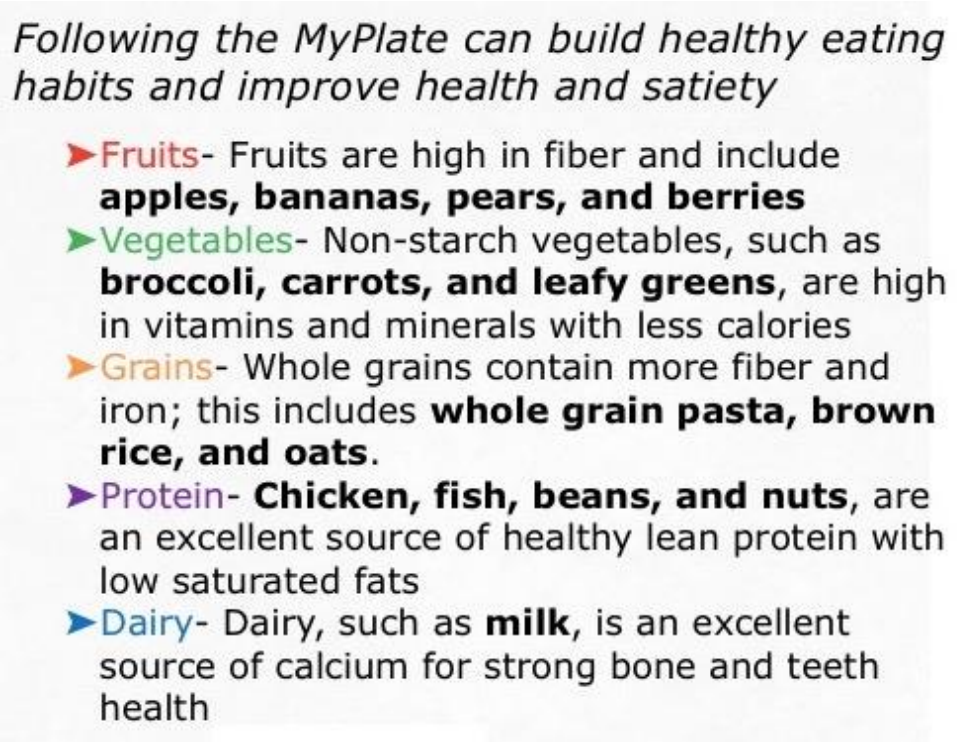

Figure 2: Added food examples with explanations to support the MyPlate model. These foods items are often available in the Husker Pantry.

QR Code Access

The initial goal of this project was to go into extensive depth and explain why everyone should try to eat fruits, vegetables, and whole grains, and supplementing with a visual example.

Unfortunately, a proposed entire packet attached to the handout bags was decided to be too overwhelming and less effective, especially when many consumers may not express any interest at all. As a solution, an interactive quick-response code was created and posted alongside the MyPlate information. This QR code was hyperlinked to the MyPlate recipe webpage, 'https://www.myplate.gov/myplate-kitchen/recipes.' By scanning, the consumer is sent to a recipe website created by the USDA. The main idea behind this was to allow those who are further interested in either the nutrition aspect or want to know more meal combinations.

Despite searching various recipe pages, the USDA published recipe webpage was the most effective recipe source for this pamphlet. First, the resources were consistent with and modeled off the MyPlate, aiming for half the plate composed of fruits and vegetables, a lean protein, and some whole grain options. Filtered searches can also select certain recipes if a specific food group needs to be expanded. For example, if the goal is an increase fruit or fiber-heavy dishes, substituting a simple, sugary carbohydrate dessert for an "Apple Pistachio Crisp" can be a potential course. As seen in figure 3, each dish is presented with cost information, MyPlate components, and nutrition facts (not pictured). Another key benefit of this page was the cost-conscious feature that can be applied when finding recipes. The pricing for each dish is seen on a scale of 1-4, with 506 entries at the lowest cost level, making it possible for everyone to use.

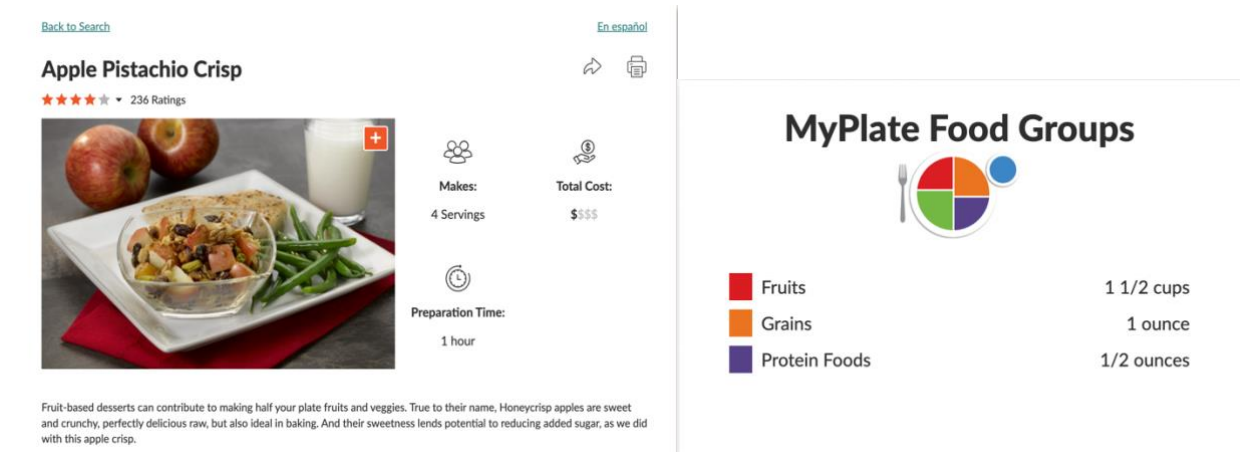

Figure 3: Scanning the recipe access QR code allows access to hundreds or recipes, based on cost, and ingredients, while following the MyPlate structure.

A second QR code was added to further supplement the interaction of the pamphlet. This feature gives direct access to the Husker Pantry order form. Here, customers can submit a detailed order every week via Google Forms, which accounts for food preferences, dietary restrictions, or other specific item requests dependent on the availability. Ideally, customers can immediately place an order after reading about the MyPlate and which food options may be better than others or after finding certain recipes that may sound appealing.

Figure 3: Added QR code access to allow further interaction for recipes and submitting an order to Husker Pantry.

MyPlate Effectiveness

In addition to the visual and functional aspects of MyPlate, the practicality and effectiveness was also considered. Several studies were analyzed to see if the MyPlate-based diet is both affordable and results in improved health and lifestyle as advertised. In 2019, a study done by Clark et al. conducted a trial to see the cost implications when giving up cheap, high sugar, high fat, and high caloric foods, for fresh produce, a staple of the MyPlate message. After controlling for age, sex, BMI, and geographical differences, consumers from the age of 18-30 with, or at risk of, metabolic syndrome spent an estimated $29.00 more each week following the MyPlate protocol, when compared to a control group continuing their regular diet. The purchases include more perishables and varieties of foods that are included in all five categories of MyPlate. While this seems significant, this can be broken down to about 4 dollars a day, or under $1.40 a meal (Clark et al., 2019). This is where the Husker Pantry can make an impact in addition to government aid, such as the Supplemental Nutrition Assistance Program, or SNAP. While produce is sometimes offered, the Pantry can also supplement whole grains, some healthy lean protein options, and even non-food items that can ease the financial burden and allow for more spending on produce.

One downside pertains to the consumer behaviors, discussed in the study, “Supermarket Healthy Eating for Life Trial.” Clark et al. mention this study to discuss a more real-world example, where produce prices were decreased by 20% to observe consumer spending habits. As a result, there was a 35% and 15% increase in vegetable sales for fruits and vegetables, respectively. When prices were returned to the original cost, a decrease in sales followed. The big takeaway- support from the Husker Pantry may be beneficial, but consumer behavior shows to always aim for the cheaper food options that may not be supported by the MyPlate message, even with all the positive health messages conveyed.

Further, several studies were also conducted to investigate these positive messages and overall health benefits of following the MyPlate. The goal was not to see if the diet resulted in the greatest weight loss or change in BMI. Healthy eating does not equal a loss in fat or weight loss, instead, the focus was on changes in metabolic health, based on blood profile chemistry, and other psychological effects, such as satiety and stress levels. Dropout rates within these trials were also considered to observe the possibility and practicality of following the MyPlate diet. Of all the studies selected, there were no significant dropout rates, and rare drops were unrelated to the new diet.

In a 2018 study by Popp et al., a MyPlate-based diet was compared to a trendy Paleo-based diet in young women. With four random groups for Paleo diet and MyPlate diet, further divided to exercise and no exercise testing groups, researchers predicted the Paleo diet would be more effective. However, data, measured by cardiorespiratory fitness, revealed MyPlate dieters and those in the exercise group had a higher peak volume of oxygen consumed. Rel. V_{O2peak} is a strong indicator for cardiovascular health, where a high V_{O2} can indicate a decrease in the likelihood of diagnosing cardiovascular disease, metabolic syndrome, and even type 2 diabetes. The MyPlate diet consumed whole grains, fat-free dairy, fruits, vegetables, lean meats, seafood, and legumes, while also limiting fried foods and added sweeteners (Popp et al., 2018). One potential flaw in the study design was the exercise group was not heavily regulated. Low physical activity compliance was noted; however, this confounder could reflect a more realistic outcome when this diet is applied in a real-world setting.

Further surrogate outcomes were analyzed in 2022 by Zakerkish et al., who conducted a trial for patients with diabetes that followed the MyPlate diet. Here, participants were randomly selected to undergo a MyPlate education program before eating based on the MyPlate, while

compared to a control group after three months. Patients in the control group continued their regular diet, while the MyPlate group focused on increasing whole grains, eating meals higher in fruits and vegetables, lean protein, and low-fat dairy. At a macronutrient level, no significant data in change of carbohydrates, proteins, fats as a percent of total energy intake were observed. However, fiber in the MyPlate group increased by about 4.48 grams, while the control group measured a decrease in fiber by 2.81 grams. Vitamins A, E, and C also reflected similar results, increasing in the MyPlate group, while compared to a decrease in the control group. Further blood testing was done and recorded lower fasting blood sugars, and a lower hemoglobin A1C level in the MyPlate group. In serum lipid analysis, total cholesterol decreased by an average of 9.77 mg/dL, with triglycerides decreasing by 28.27 mg/dL, LDL decreasing by 10.64 mg/dL, and HDL slightly increasing by 1.05 mg/dL (Zakerkish et al., 2022). It should be noted that triglyceride and HDL results had a p-value of 2.99 and 2.60, respectively, marking the results as insignificant because they are outside the acceptable p-value range. Zakerkish et al. also investigated inflammatory factors, finding significant data that reported a decrease in high-sensitive C-reactive protein, tumor necrosis factor, and an increase in adiponectin.

Perhaps a broader appeal of why the MyPlate is promoted is due to the satiating effects. The promotion of a lean protein in the diet is primarily responsible for these effects. This is because protein, comprised of amino acids, is the most satiating macronutrient. When amino acids enter the small intestine and get absorbed into the bloodstream, the body responds by releasing several hormones. Cholecystokinin (CCK), a hormone that regulates digestion and increases satiety, GLP-1, and PYY, which are also sensitive to amino acid presence and decrease appetite, are all released, collectively telling the brain to slow eating and while continuing to stimulate digestion and absorption (Tremblay et al., 2015).

Micronutrients are also suspected of playing satiating roles; however, the evidence is not as strong (Tremblay et al., 2015). One proposed model describes the body's demand to maintain homeostasis, which can trigger hunger signals if not all micronutrient levels are met. When following the MyPlate diet, micronutrient levels and diversity are increased, as measured by Zakerkish et al., and micronutrient deficiencies are less likely to be prevalent. Increased fruits and vegetables also contain high amounts of fiber, which are also satiating in some forms. This is because insoluble fibers, often found in plants, are comprised of carbohydrates with bonds the body does not have enzymes for to naturally digest, slowing motility. Specific fiber types are also able to bind and pull water, which can promote the feeling of being full as it slowly passes through the digestive tract.

Satiety also has been linked to reduced stress, a response the body makes to maintain homeostasis. Chronic stress can be detrimental to health, affecting daily life and performance, while also being linked to cardiometabolic and even autoimmune diseases due to the continual stressors.

Conclusion

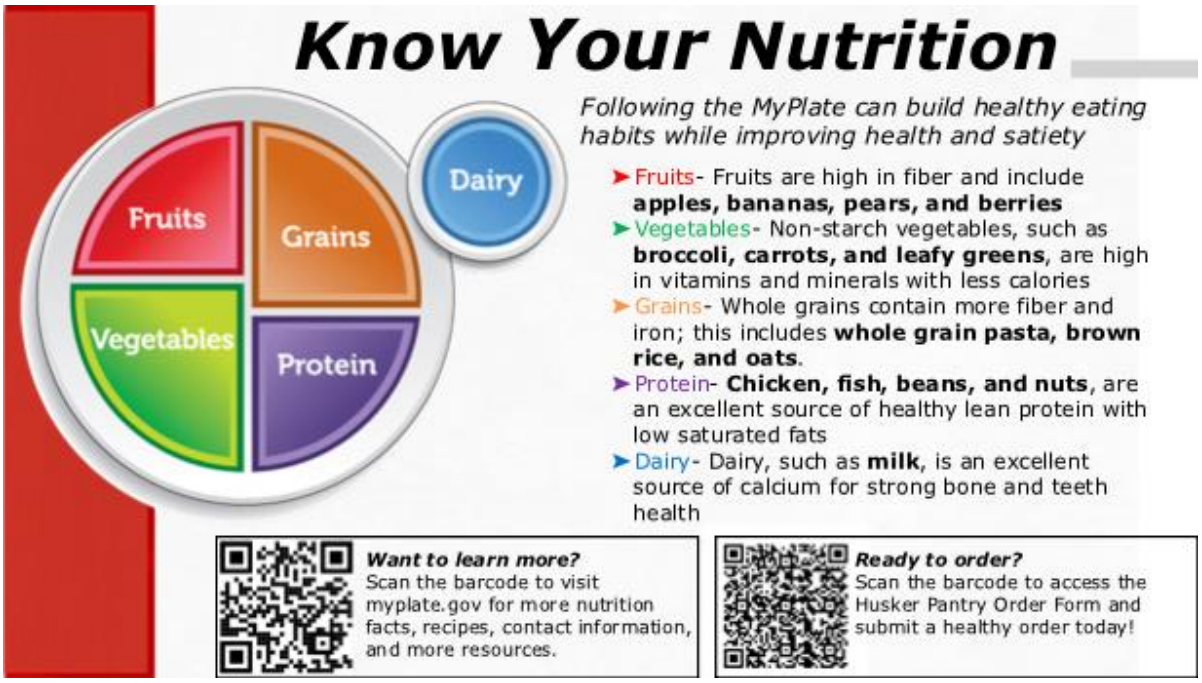

Figure 4: The final pamphlet distributed to costumers. These pamphlets were attached to grocery bags used for costumer pick-up.

By working alongside the Husker Pantry to help provide basic nutrition information and offer access to simple, cost-effective recipes for community members that use the pantry, a visual pamphlet was created for those that use the Husker Pantry. The model used the MyPlate graphic and gave detailed food items that are often accessible at the Husker Pantry. The information provided has created an opportunity for participants to learn more about the five main food groups, gain access to hundreds of MyPlate modeled and cost-conscious recipes, and can re-order through the Husker Pantry through customized QR codes. The process of this project's creation was carefully done by understanding the demands and focus of those that use the Husker Pantry and identifying models supported by a combination extensive research and education models. As a result, a simple, accessible, and effective diagram was created for distribution.

A big takeaway of this project and design process was learning how to apply extensive nutrition science-based knowledge from the classroom into the real world. The current nutrition and health curriculum has focused on the cultural and even biochemical components. Converting these topics to the Husker Pantry setting required lots of problem solving and consideration, especially with food insecurity and dieting being sensitive topics. Throughout this project, a focus was placed on simply providing the opportunity for nutritional related knowledge and access, without forcing or 'shoving' these facts onto someone. While the issue of food insecurity remains at-large, contributions and improvements within the Husker Pantry continue to help the local community. Offering primary nutrition-based education and proposing basic meal strategies can be a simple, financially accessible start to a larger impact in the community.

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