CMSC 20370 GP1

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1 User Group Overview

We are focusing on students with dietary restrictions and allergies at the University of Chicago. Currently, it can be difficult or unreliable to figure out how to comply with certain dietary restrictions, making the dining hall stressful to navigate for students with dietary restrictions. Menu information is currently available online, as well as on tablets in the dining halls, but not in easily searchable or accessible formats. This theoretically allows students to see ahead of time what is being served, but is currently suboptimal due to the format. A technological solution allowing students to view menus through the lens of specific allergies or dietary restrictions would allow them to see ahead of time what their options for a specific meal are, and thus which stations and dining halls would be a good fit. This removes the anxiety of showing up at the dining hall with no idea what would be appropriate to eat, and allows students to safely eat a wider variety of food without having to be concerned about eating something they should not because they were not sure about the ingredients.

Research questions:

- What type of dietary information would help students with food allergies and restrictions know what they can eat?
- How should this dietary information be communicated and/or displayed?

Through these research questions, we aim to learn what needs are not currently being met with respect to eating in the dining halls for those with food allergies or dietary restrictions, and how to communicate the information necessary to make these choices easier.

2 Data Collection Methods

2.1 Online survey

We used Google Forms to create our survey; it can be found here.[1]

We will first be conducting an online survey of students in the target population to get a better sense of their overall thoughts and opinions on the issue of eating in the dining halls with dietary restrictions, as well as specific areas of improvement that they see as compared to the current menu setup.

In this survey, we will collect both basic information to learn more about the dietary restrictions and troubles with dining hall food that our target population has faced, as well as get a better sense of how people use the current setup and what improvements would be welcome.

Using an online survey will allow us to more efficiently collect a broad array of information from a lot of people. Since this is primarily exploratory and to get a diverse span of different ideas as opposed to getting

[1] https://forms.gle/qGbdNLat7Rh252VR7

more detailed information about any single one of them, using a survey is an appropriate and time-effective method.

2.1.1 Advertising

We aim to have approximately 10-15 survey respondents. To recruit respondents, we will post flyers advertising our study with a QR code to our online survey at different popular locations around campus, particularly on bulletin boards or otherwise near the entrances to the three main dining halls. We will also post the survey in the Facebook pages of different dorm houses and class years.

2.2 Semi-structured interviews

Once we have initial prototypes, we will have semi-structured interviews as we iterate over the prototypes in which participants will use the prototype to complete some given tasks, and then answer questions about the experience and about what they would want from it in a more in-depth manner. Through these interviews, we will be able to get open-ended feedback and suggestions for improving our prototype which will inform future iterations of our design and address usability concerns. This will provide us with more valuable and realistic feedback than just a survey without an actual prototype for people to look at and try to accomplish tasks with.

We will spend approximately 30 minutes with each person, having them interact with the prototype then asking questions about the experience. We will develop these questions after gathering data from our survey and developing an initial prototype.

2.2.1 Advertising

We aim to have 5-7 interviewees, who we will recruit from our online survey; participants can select in the online survey that they would be willing to do an in-person interview with us.

2.3 Data Analysis

2.3.1 Handling Data

Survey data will be recorded automatically online. Interviews will be recorded then transcribed, and we will also keep field notes during the interview.

2.3.2 Analyzing Data

We will do thematic coding of the survey data to draw out the main issues of importance and ideas to explore with actual prototypes. We will iteratively go over the various survey responses, and make sure there is consensus on the themes that we are discovering. The multiple choice questions with quantitative data we will be able to use basic statistical methods to analyze.

For the interview data, we will again look at themes that are brought up and particularly the most common areas for improvement and desires for what the system should support in order to integrate those into next prototype. This would thus involve both thematic coding but also attention to the specific details of any suggestions given.

3 User Group Demographics

We are studying students at the University of Chicago who eat or have eaten in the dining halls and who have at least one dietary restriction. Non-exhaustive examples of students in this user group includes students following a vegetarian, vegan, or pescatarian diet, or students who cannot eat gluten or are allergic to other

specific foods such as peanuts.

These students are primarily 18-22 years old, as this is the average age of most undergraduate students at the University of Chicago.

Even though a significant number of students move off-campus as upperclassmen, we are open to receiving feedback from students who no longer eat in the dining halls but did eat in the dining halls as underclassmen because the dining hall system has remained essentially constant over the past four years.

4 User Tasks

4.1 Description of Tasks

When eating in the dining hall, users in our user group must distinguish between food they can eat and food that they cannot eat.

4.2 Description of Task Environment

Currently, our user group can view information about dining hall food on paper cards in the dining hall and on the dining hall's online menu.[2]

Both online and in the dining hall, the given information for each dish includes an ingredient list and meta-labels.[3]

4.2.1 Meta-labels used by the University of Chicago dining hall

1. Labels indicating foods which satisfy certain dietary restrictions
   - Vegan
   - Vegetarian
   - Made without Gluten-Containing Ingredients
   - Halal
   - Kosher
2. Labels indicating information about how the food was prepared or grown
   - Seafood Watch
   - Farm to Fork
   - Vegetarian
   - In Balance
   - Organic
   - Locally Crafted

[2] http://uchicago.cafebonappetit.com
[3] https://uchicago.cafebonappetit.com/#icons

4.3 Targeted User Group Tasks

We intend to focus on users' interaction with the online food menus, not the physical menu cards in the dining hall. We intend to help users determine online which foods they can eat in the dining hall, based on a user's dietary restrictions. We will also help users determine online the foods that they cannot eat and identify the ingredients in those foods that violate their dietary restrictions.

5 Analysis of Existing Solutions to Similar Problems

5.1 Solutions at the University of Chicago

Bon Appétit, the University of Chicago's dining provider, offers both online and in-dining hall menus with ingredients lists and labels. The labels offer quick visual identification of compliance with dietary restrictions. In regards to food allergies, Bon Appétit recognizes the eight major allergens (milk, eggs, peanuts, tree nuts, wheat, fish and shellfish, and soy). They offer a page on their website on allergy management in the dining halls[4] which recommends that students with allergies explore the online menus before coming to the dining hall, speak with the chefs about cross-contamination, and inspect ingredient lists above dishes. The guide states that "our cafés generally include the name of known food allergens in the menu item name and/or through a restaurant-style descriptor."

In regards to non-allergic dietary restrictions, such as vegetarian or vegan, Bon Appétit relies on the icons described above. However, many students have recognized that items are occasionally mislabeled, especially when it comes to identifying vegan options. The vegan icon will be present, while the ingredient list will contain non-vegan ingredients such as dairy. For example, one dish, called "Tomato Basil Cheese Lasagna" was labeled as vegan, despite having cheese in the name of the dish, and both egg and (non-vegan) cheese listed in the ingredients list (Figure 1).

On another day, "Matar Paneer" was served, and also labeled as vegan. However, paneer is a type of cheese, made from dairy. The ingredients list for this dish only listed "paneer cheese" (Figure 2). If students are unfamiliar with paneer cheese, they might incorrectly assume it is a form of dairy-free cheese. This presents a risk for both vegan students and also for students with dairy intolerance who may rely on the vegan label to identify the absence of their allergens.

Bon Appétit encourages students to voice their dietary restrictions to the chefs or servers in the dining hall, especially for allergies. The servers should have knowledge of the ingredients in their dishes, and can use clean utensils and gloves to prevent cross contamination. Additionally, students concerned about managing their dietary restrictions are invited to set up a meeting with a dining hall manager to discuss how to best manage their dietary restrictions in the dining halls, or to voice their concerns.

5.2 Solutions in Other Environments

A problem similar to managing dietary restrictions in dining halls is managing restrictions when dining out at restaurants.

Some websites, such as AllergyEats[5] and HappyCow[6] allow users to search for restriction-friendly restaurants by location. Users can filter by allergens such as wheat, soy, or milk (AllergyEats), or dietary restriction such as vegan or vegetarian (HappyCow) and see restaurants that offer options to accommodate their needs, including reviews and photos from other users, links to websites, and contact information for the restaurants. However, the data on both these sites is limited, and may not always be up to date with current menus, or include details about specials.

[4] https://uchicago.cafebonappetit.com/food-allergens/
[5] https://www.allergyeats.com/
[6] https://www.happycow.net/

One solution prototype by Hsu et al. (2017) is AllergyBot: A Chatbot Technology Intervention for Young Adults with Food Allergies Dining Out. This is "a chatbot that provides restaurants' allergy accommodation information based on users' allergens." The chatbot first creates a profile of the user's allergies and dietary restrictions. Users then chat with the bot to understand if specific restaurants are allergy friendly by analyzing a restaurant's menus and reviews that mention allergens or specific foods. AllergyBot also collects the user's feedback after visiting restaurants to improve its advice and collect more data about dining options. This offers a more natural interface for users, presenting a friendly, conversational guide to dining out.

Additionally, many restaurants, especially national chains, offer allergen and nutrition guides on their websites, listing allergens by dish, or highlighting dishes designed to accommodate different dietary restrictions. The most common variation of this is offering a dedicated "gluten-free" menu for diners avoiding gluten, either by necessity or preference. These menus, allergen guides, and annotations tend to be accurate (though the possibility of cross contamination must still be taken into consideration), but require users to do prior research, or request the special menus/guides once in the restaurant. The burden of dietary management falls mainly on the diner.

6 Description of Relevant Literature on the Problem

6.1 Previous work on allergies and dietary restrictions

Prior work has looked at children and young adults with allergies and identified the most common problems they face. Globally, 200-250 million people are estimated to suffer from food allergies (Henricksen and Viller 2012). Furthermore, there are a wide variety of allergy types, and so a one size fits all solution will not work. In the study by Henricksen and Viller (2012) of 54 families with children with food allergies, it was found that the top challenge was "Dining out with the food-allergic/intolerant child(ren)." The burden of dining out with allergies can be extending to the experience of eating in a dining hall, which is a similar experience, presenting a predetermined menu with limited control over ingredients and little insight into the preparation process.

According to a survey of 2001 college students (CollegePulse 2019), 14% of college students follow a vegetarian, vegan, or plant-based diet. There are a variety of reasons students follow such diets, with the environment (31%), animal rights (25%), and health (21%) being the most common.

6.2 Student management of allergies and dietary restrictions

Some prior research has looked at how students manage dietary restrictions in college. Duncan and Annunziato (2018) looked at allergy self-management behaviors among university students. The authors surveyed 141 undergraduates who reported having a physician-diagnosed food allergy about their allergy management behaviors. The study found that students were hesitant to ask about ingredients in foods on campus, perhaps for either fear of drawing attention to their allergy or because it was inconvenient. Conversely, they found that students were much more likely to read ingredients if they were posted, with 48.5% of participants saying they always read ingredients posted on campus, and 38.9% saying they usually or occasionally do.

6.3 Guidelines for Universities

Guides exist for Universities containing recommendations and best practices for managing student dietary restrictions in dining halls. Allergen Control for College and University Dining Service (Whiteside et al. 2018) contains a variety of recommendations for dining halls in managing allergies, including that "ingredient lists must be accessible to students" and that "standardized recipes with documented ingredients and allergens should be available at every meal." It also contains a section acknowledging that a significant responsibility falls on the students. They have a responsibility to check ingredient lists and read signage to make educated

decisions about what to eat. Allergy management is a collaboration between the students and the dining halls: "ideally, students should have access to the menu prior to entering the dining hall so they can determine what will be available to them and coordinate with dining services if meals free from their allergen are not already available." These guidelines can be extended to non-allergic dietary restrictions, such as appropriately labeling vegan options.

7 Initial Evaluation Criteria

- Effectiveness - We will measure the accuracy of individuals with various allergies and dietary restrictions attempting to determine which stations and dining halls are most suitable for them to eat at.
  To see whether our design meets this criteria, we will have subjects attempt to use our prototype to find where and what to eat, and record the choices made. We will also have subjects attempting to use the current system to accomplish an equivalent task, and make a comparison of the accuracy of the judgments, as well as error rates (in terms of picking foods they actually cannot eat, or picking a place to eat with less optimal options than elsewhere) between these two groups. They will be asked to find food according to their own dietary restrictions as well as put into scenarios to find food based on other restrictions that we give them.

- Efficiency - We will also measure the effort needed to complete the above task to determine how efficient our prototype is vs the existing system. We will measure this both through timing them during the completion of the task, as well as keeping track of the amount of clicks/taps/scrolling and other system interaction to accomplish the task and taking subjective reports of task difficulty and effort needed.

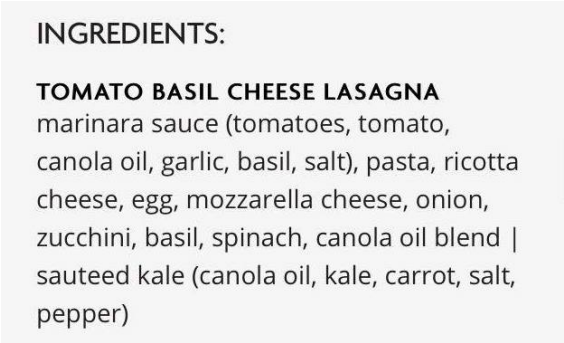
- Satisfaction - We will also look at the satisfaction of users in completing this task with our prototype vs with the existing system. This will be determined by conducting short surveys or asking questions immediately after attempting to do the task that ask about their satisfaction/dissatisfaction with the system and specifically interacting with it and the process of accomplishing the task.

- Learnability - We will measure how easily users are able to pick up how to use the prototype and accomplish the task without being given prior instruction. We want the system to be one you can pick up how to use immediately, and accomplish the tasks without significant effort. To determine whether this criteria is met, we will measure time and error metrics for users first using the system, and compare to averages of users who have been given explanations of how to use it and/or have used it in other tasks already.

- Functionality - We also want to evaluate our system with respect to whether users are satisfied with the functionality that is provided, whether they expect other functionality, did not want some of the functionality provided, etc. To measure this, we will ask after their interaction about their satisfaction with the functionality, what functionality they would want added or did not need, etc. We will also ask beforehand about what functionality they expect or would find helpful in order to get unbiased baseline estimates.

8 Appendix: Images

(a) The dish is labeled with the "Vegan" icon



(b) The ingredients list contains both egg and cheese.

Figure 1: Tomato Basil Cheese Lasagna

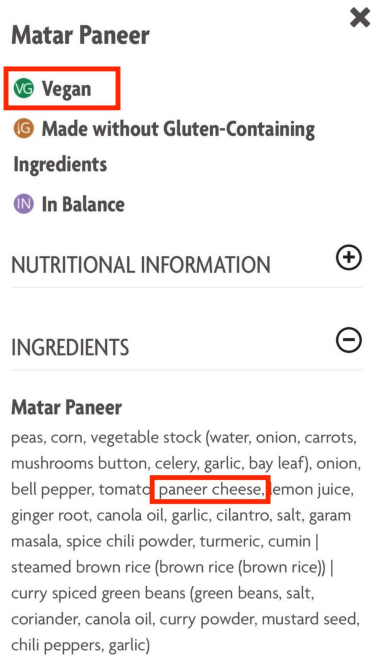


Figure 2: "Vegan" Matar Paneer contains cheese

References

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