Cornell MenU: Assistive Technology Aimed at Helping People with Food Problems

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Abstract
When arriving on a college campus for the first time, new students are forced to rapidly adapt to their new social and work environment over the course of their study. This task is daunting in its own right, but is made so much more difficult when the student's diet is limited by a GI disease, severe allergy, or other dietary restriction. Students with these conditions may often put their health at risk when they don't have the time or energy to ensure they are maintaining their diet, and may also feel socially limited when they are unable to eat at the same places as their friends. To help these students, we have developed Cornell Menu: a mobile application designed to provide streamlined and filtered menu information about on-campus meal halls based on the user's dietary restriction that will also serve to connect newer students with older students with similar conditions to create an information sharing network.

Author Keywords
Dietary Restriction; Allergy; GI disease; Celiac; Gluten-free; Menu; Meal Hall; Vegan

ACM Classification Keywords
H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous;

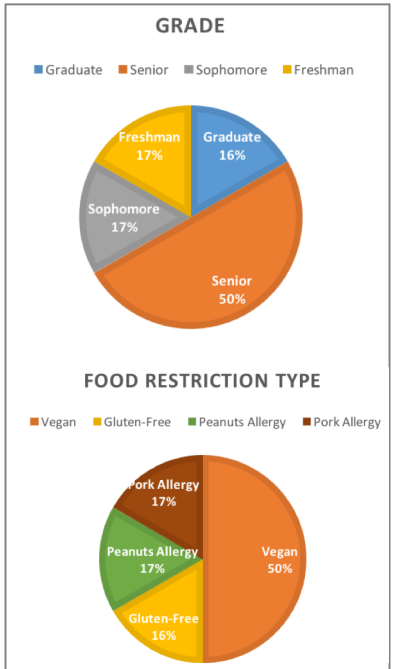

Figure 1 user interview demographics.

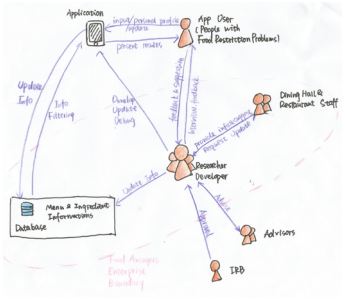

Figure 2 flow model

Introduction

Awareness of food allergies has grown at a rapid pace over the last twenty years. [1] The Center for Disease Control reports an 18% increase in reported food allergies in children under the age of 18 from 1997 to 2007. You can also see this trend in the increase of Gluten-Free products advertised, [2] the International Food Information Council Foundation's Food and Health Survey 2015 found 19% of respondents said they were trying to limit or avoid gluten entirely, which was up from 13% in 2014. Even GI diseases, a much more niche category, are being brought to the public eye [3] as studies show that conditions like Celiac Disease are much more common in the United States than most people are aware. As recognition for these conditions grow, so too does the market of products aimed at benefitting these niche groups, yet as a whole, persons with dietary restrictions make up a surprisingly large percentage of the population. This trend carries over to college campuses, an environment where even students without these conditions may struggle to eat a balanced, healthy diet.

Our research showed that the majority of students with these conditions reported having their dietary routines largely dictated by where they can find the food they need and that this caused a stale, repetitive routine that often brought about uncomfortable social situations when the student was asked to eat out at other locations by their friends. Furthermore, we discovered that most students with these conditions are forced to look first for what they "can eat" before looking for what they "want to eat" providing a more tedious experience than need be. All these discoveries pointed towards a desire for a more streamlined and personalized menu presentation, but we also discovered in our research that Senior students on campus were significantly more aware of their options on campus and expressed higher pleasure with the University's attempts to provide for their condition. This gave us a unique resource of highly knowledgeable students to utilize in our product who were able to provide information beyond the readily available menu information for newer students on campus.

Method

Potential User Interviews

We first contacted Student Disability Services and explained our study goals to them. The assistant director of Student Disability Services, Erin, sent our recruitment letter to students registered with Student Disability Services who fit the criteria we are looking for. After that, we sent emails to the students in the list and invited them to join our study. Through this way, we interviewed six students from different food restrictions backgrounds to understand their expectation for our application and usage habits.

Prototype

After processing our interview data, we built our paper prototype firstly based on our goals and interviewees' expectations. We prototyped our solution using iterative, interaction design methodology and evaluated our paper prototype by ourselves through heuristic evaluation method. After that, we improved upon our prototype based on the insights we gained through the heuristics and created a higher-quality prototype.

Evaluation

We asked our participants to evaluate our prototype by performing five different tasks within our application. Through this process, we collected data about their behaviors and opinions about our applications as well as where our application failed to meet their expectations and standards.

Findings

Little trust on servers

Interviews with people who have food restriction problems indicates that most of them don't trust servers to be knowledgeable about their dietary restriction or specific menu ingredients. On the contrary, they are more likely to trust the chef or other

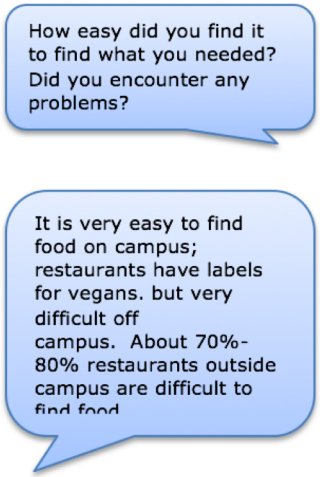

Figure 3 interview quotes

Figure 4 affinity diagram

people with their same condition, and then any "official" menu information in that order. People with food restrictions, especially those with severe food allergy reactions, will always want to find a most professional and reliable way to know what they can eat.

Want more options

Although people with food restriction have less options to choose from, they would like more variety in their diets. They expressed that they feel as if they're eating the same things day after day but don't typically like taking risks where their health in concerned. Because of this, they find themselves falling back to their "safe options" often and rarely discover any new foods to eat.

Don't want to be judged

People with food restrictions have to tell a server or staff about their condition when eating out but expressed feeling uncomfortable or even feeling judged because of it. They feel like others treat them as "just being difficult" at times and would avoid bringing up their condition if they could. Some even told us they would ensure the server knew it was a health issue as the server might not treat it seriously otherwise.

Seniors are much happier with on-campus dining than new students

In contrast to newer students, Seniors have obviously spent a lot more time sampling Cornell's various dining options and have built up a wealth of information about various meal halls and alternative options that may not be obvious to newer students. This information is often gleaned through the grapevine over the years, making senior students and excellent resource for information beyond the readily available menu and nutritional information.

Design Process

Our design process consists of four steps.

Step one

First, we created our flow model and affinity diagram based on our data collected from the interviews. We also created two personas for whom to frame our solution - a junior student who is a vegan and a freshman with an anaphylactic allergy to peanuts. We generated eighty different ideas that would potentially address the persona's goals and selected the best out of them to incorporate into our design.

Step two

Second, we began to create our paper prototype based on ideas we selected above. The paper prototype was a basic demonstration of what our eventual app might look like and served basic testing purposes. The paper prototype also gave us a visual representation of our idea, allowing us to see if we had implemented all the features we had wanted to without producing clutter.

Step three

Third, we created the low-quality prototype on the foundation of paper prototype. After that, we evaluated this low-quality version by ourselves. Each group member listed several problems based on heuristic theory and we combined all the problems into one list, organized by severity. We then proposed solutions to each issue together and selected the issues to work on based on a "User Effect versus Work Required to Implement" model for each solution.

Step four

Finally, we created a high-quality prototype based on all the information we had gained so far, and were ready to recruit participants to evaluate it. Each participant would be asked to complete five different tasks based on our application main goals. The tasks represented basic access to our application's primary features, so having the user struggle to complete any

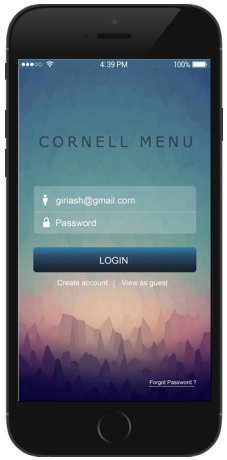

Figure 5 prototype mockup

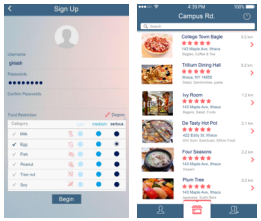

Figure 6 signup and home

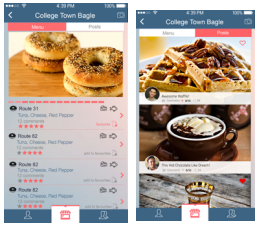

Figure 6 menu and post in specific eating place

one of them was treated as a big issue. In the end, we used them to improve our design once again into our final prototype.

Solution

To help Cornell students with food restrictions, especially new students, we developed Cornell MenU: a mobile application designed to provide streamlined and filtered menu information about on-campus meal halls based on the user's dietary restriction that will also serve to connect newer students with older students with similar conditions to create an information sharing network.

Customized menu

Cornell MenU has a database that contains all the nutritional information of the food served on campus. When users create a profile in the app, they will input their dietary restriction information as well as severity level (light, medium or serious). When they select a dining hall/restaurant, the app will show the dining hall/restaurant's menu, but filtered by user's profile to only show what that user can eat. Users may also select a specific menu item to view its ingredients and also other what other people have to say about that item. By using the customizable menu, users can speed up their ordering process and can get the information they need without having to ask servers or staff, lessening the feeling of being "difficult" or judged.

Updated post information

Menus can't always display everything a customer can order. There simply isn't enough space. In order to find options that aren't on the menu, things like alternative gluten-free options, Cornell MenU also allow users to post their findings based on dinning hall/restaurant, food, or whatever they want. The information can be organized by a certain tag representing the poster's dietary restriction and can help spread information around campus to other people with that same restriction. This should help both new and old students alike to find new and interesting options throughout on-campus dining.

Building an information sharing network

Since senior students will have a lot of information unknown to newer students, the post function of Cornell MenU provides a place to share and communicate. If at any time, a user finds they like the post of another user, they can choose to view that other user's profile and past posts and even choose to "follow" them, alerting them whenever that other user makes a new post. This can help bring to attention more informative posts or just link together users with similar tastes.

Conclusion:

Our application addresses the inconvenience and discomfort felt by new college students with eating restrictions by providing tailored information about on-campus dining to them in an easy-to-access format that adjusts to their particular condition. It further provides information beyond that available on the menu through the posting system, which serves to connect these students with more experienced practitioners of their same diet on campus so that students can share discoveries, ratings, and other information directly on the application. The end result should make finding food to eat on campus a much more convenient and safer experience, allowing these students to branch out their repetitive diets where they previously would have played it safe, while also freeing up their attention to be spent on other aspects of their lives than what food is safe to eat.

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