

Human-centered and Inclusive Conversational Design Report

Group 1

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| | |
|---|----|
| Introduction..... | 3 |
| Project idea | 4 |
| Wireframe | 4 |
| Literature | 5 |
| Use cases and user stories | 6 |
| User Persona: Chloe | 6 |
| Requirements..... | 8 |
| Use cases | 9 |
| Use case diagram | 10 |
| User story's | 11 |
| Reflection..... | 11 |
| Persona and sample dialogs | 13 |
| Describe the chatbot persona | 13 |
| Provide sample dialogues | 13 |
| Exception flows..... | 15 |
| Reflection..... | 17 |
| Conversation flow and early implementation..... | 18 |
| Observation notes..... | 19 |
| Preliminary implementation | 20 |

Introduction

Project idea

How do Dutch students experience the balance between affordable food and healthy food?

Our Purpose is Recommending affordable healthy food for students to get better health and well-being. Healthy food is mostly about balance and does not have to break the bank.

Impact: This problem is important because students do not eat healthy if food is not affordable (Rota et al., 2024; Amore et al., 2019). Also, this is one of the sustainable development goals: good health and well-being. Students will benefit from this chatbot.

Functionality we want in our chatbot:

- Determining and recommending a varied diet
- Promoting self-cooked meals and demote packaged and fast food

Originality:

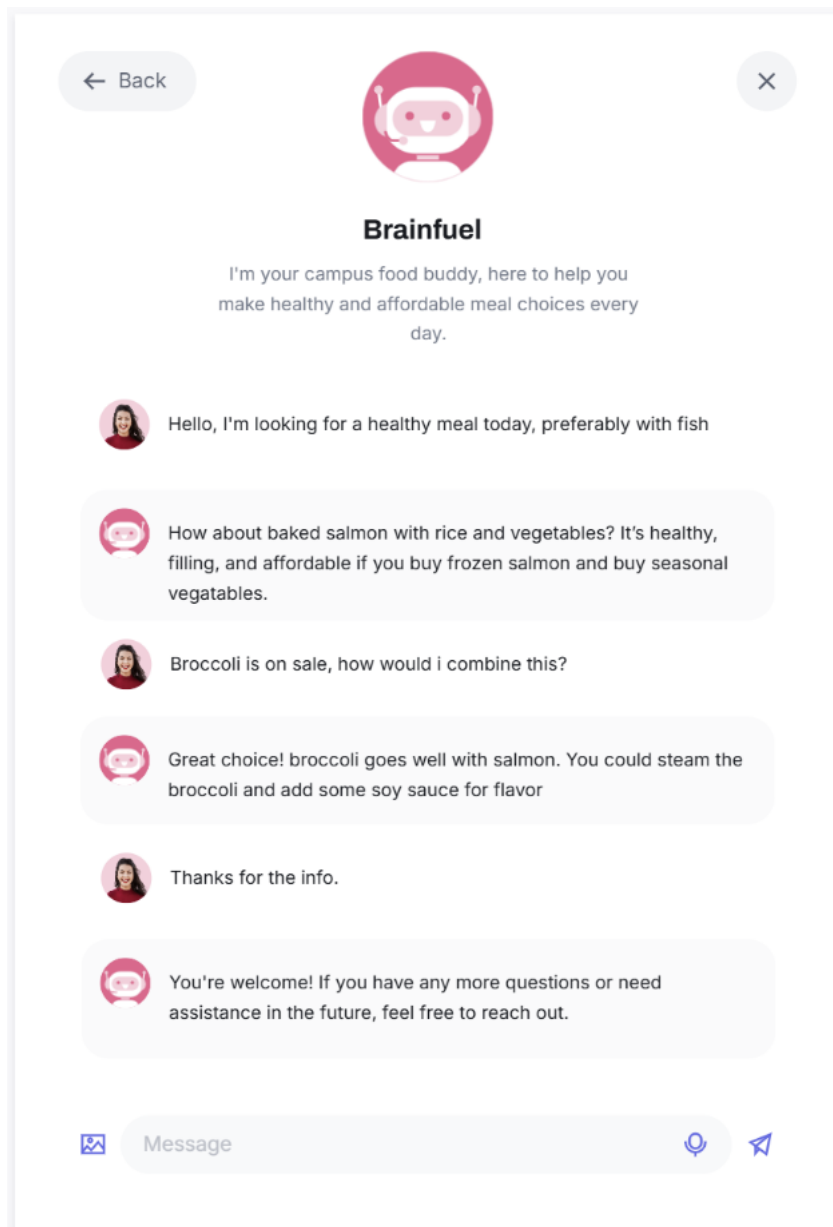
- Ease of use: Easy to use whilst in the kitchen or on the fly.
- Diverse roles: The chatbot can both act as a guide, a judge and as inspiration source.
- Info spearfishing: People often want direct answers to their food questions instead of browsing the web.

Goals

- Student health is a social good, having more healthy students allows for a more productive and participatory society.
- Our solution with conversational user interface had as advantage over traditional GUI. The diversity of roles the chatbot takes in guiding, judging and inspiring food choices. These diverse capabilities allow the user one place for their specific food questions and recommendations. The handsfree capability in the kitchen is also a clear advantage.
- Text based recommendations are possible, especially text input from previous dishes and foods eaten.
- What food should I eat -> recommendations,
- Recommendations, advice and inspiration can be done with 2 – 4 turns.

Wireframe

Wireframe showing an example of the 'brainfuel' chatbot helping with cooking healthy and giving affordability tips.



Literature

Amore, L., Buchthal, O. V., & Banna, J. C. (2019). Identifying perceived barriers and enablers of healthy eating in college students in Hawai'i: a qualitative study using focus groups. *BMC Nutrition*, 5(1). <https://doi.org/10.1186/s40795-019-0280-0>

Rota, F. S., Bollani, L., Lucia, M. G., & Bonadonna, A. (2024). Food Quality and Risk Perception: An Empirical Study Based on the Opinion of University Students. *Sustainability*, 16(18), 8116. <https://doi.org/10.3390/su16188116>

Use cases and user stories

User Persona: Chloe



(Sashaborm, 2021)

Background:

- Chloe is a 25-year-old master student who lives alone in an apartment who doesn't have a lot of time to cook.
- She wants to eat healthier and save money, but she doesn't have much experience or confidence in the kitchen.

Challenges:

- Finds it hard to keep track of what meals she ate.
- Has a hard time distinguishing healthy and unhealthy foods.
- Does not have a lot of time

Values

- Human welfare 7/10
- Environmental sustainability 3/10
- Trust 3/10
- Cost effectiveness 8/10

Goals and motivations

- Saving money
- Making it faster and easier to make healthy meals

Requirements

| # | Requirement | MoSCoW |
|---|---|--------|
| 1 | A user must be able to ask if a food item is healthy | Must |
| 2 | A user must be able for ask for an affordable recipe based on ingredients they already have | Must |
| 3 | The chatbot must provide tips about cheaper ingredients | Must |
| 4 | The chatbot should be able to provide a healthy alternative to an unhealthy food item | Should |
| 5 | The chatbot should be able to reference to a certain recipe | Should |
| 6 | The chatbot could provide information about why certain foods are healthy | Could |
| 7 | The chatbot must be able to provide a small explanation for the recommendation | Could |

Use cases

Use Case 1: Get an Affordable and Healthy Recipe

| | |
|---------------------------|---|
| Goal | Provide students with healthy and affordable recipes |
| Actors | Student, Recipes Database |
| Description | <p>A student asks the chatbot for a recipe containing the ingredients the student has.</p> <p>The chatbot responds with recipes containing all of some of these ingredients. These recipes are coming from the recipes database.</p> <p>The student can also ask for another recipe</p> <p>The chatbot will respond with another healthy recipe</p> |
| Entry in use case diagram | <ol style="list-style-type: none">1. Find healthy and affordable recipes2. Find another recipe |

Use Case 2: Assess a Food Item's Healthiness

| | |
|---------------------------|--|
| Goal | Provide students with information about the healthiness of the food item |
| Actors | Student |
| Description | <p>A student asks about a specific food item.</p> <p>The chatbot responds with information about the healthiness of the product and what healthier alternative there is.</p> |
| Entry in use case diagram | <ol style="list-style-type: none">3. Inform about the food choice |

Use Case 3: Learn About Food Choices

| | |
|---------------------------|--|
| Goal | Provide students with educational information and justification for a food recommendation |
| Actors | Student, Food Healthiness Database |
| Description | <p>(continuing use case 1) the student asks more information about why the choice is beneficial</p> <p>The chatbot responds with information about the healthiness of the product. This information is coming from the food healthiness database</p> |
| Entry in use case diagram | <ol style="list-style-type: none">4. Informed why this is a healthy choice |

Use case diagram



Recipes and Food Healthiness Database

At this moment in time, we know very little about how we want to shape our database structure. The assumption right now is that there will be two databases, one for handling all the recipes queries and one for handling all the healthiness related queries.

User story's

1. As a student on a budget.
I want to find recipes to eat and cook dinner without breaking the bank.
So that I can save enough money to do fun things with friends.
2. As an independently housed student.
I want to find healthy recipes with lots of nutrients in it and.
So that I can cook dinners that provide me with the nutrients and energy and strength I need.
3. As a busy student.
I want healthy recipes quickly and in an easy way, which use ingredients I already have at home if possible.
So that I can spend less time and worries about cooking and can use that energy to put towards my study.
4. As a skeptical student.
I want to be persuaded why the food and ingredients I am about to eat are healthy or not.
So that I can decide to eat it or not and even when i eat it, decide to not buy the same food next time and slowly become a healthier eater.
5. As a curious student

I want to get information on how to put together my own healthy meals and what factors are at play.

So that I can learn and later have the knowledge to cook healthy without use of the chatbot.

Reflection

Since our last submission (initial idea), we have discussed our ideas and goals about the chatbot and took the feedback from the professor into account.

We came up with requirements, use-cases and user stories, these were formed and guides by our initial idea and the feedback.

The chatbot was initially presented as a chatbot for students, it is still heavily targeted towards students, but the chatbot is not only limited to students. The chatbot could benefit low-income individuals who also need to save money while eating healthy as well.

Another important aspect of the feedback was the implementation, we have come to realize that building a chatbot for food recommendations is a challenge upon itself, as the "domain of food" is immense. Therefore, the decision to limit the chatbot capabilities, and thus limit long and complex conversations as this would be too ambitious. The chatbot will be information-rich and will be based on the "info spearfishing" principle, where: question > answer. It should be able to handle multiple

questions, but it might not relate a new question to earlier parts of the conversation (unless it is obvious, like “find me another recipe”).

Persona and sample dialogs

Describe the chatbot persona

The chatbot is called 'BrainFuel' and is designed to help address the need for healthy and affordable food. Brainfuel is targeted towards students, thus its tone is rather informal but information rich.

Interaction goals

The overarching goal is to be information rich and helpful and empower students/young adults to make better food choices. The main interaction goal is 'information spearfishing' where a simple question leads to a complete answer without too much hassle. The aim is to provide an answer within 1 to 4 turns.

Level of personification

- Medium, interact pleasurable enough for solo cooks.
- Best for Quick information
- Build trust via high quality and clear/efficient information
- Name: Brainfuel
- No use of I.

Power dynamics

The power sits almost completely by the student itself. Brainfuel is designed as a knowledgeable assistant which is supportive towards healthy choices. It can judge certain choices, and give advice towards healthiness and affordability, but will never dictate one's choice.

Character traits

- Friendly
- Formal
- Helpfull
- Encouraging

Tone

Brainfuels' tone is rather friendly and helpfull, but it's keypoint is to be very formal.

Key behaviors

- Listen and repond with relevant answer based on usecases
- Offers alternatives
- Makes sure the user is content with a last question

Provide sample dialogues

Usecase 1: Get an Affordable and Healthy Recipe

| Speaker | Chat | Strategy Used |
|---------|---|----------------|
| Chatbot | Hi! You want to live a more healthy live on a budget. Do you want an affordable and healthy recipe? | prompting |
| User | yes / no | Acknowledgment |

| | | |
|---------|--|--|
| Chatbot | You got it! << gives recipe >> Do you want another healthy recipe on a budget? | acknowledgement, prompting |
| User | yes / no | Acknowledgment |
| Chatbot | Nice recipe! You have a recipe now. Do you want to know why it is healthy? | Acknowledgement , implicit confirmation, prompting |
| User | yes -> <i>usecase 2</i> / no | Acknowledgment |
| Chatbot | Ok. You have a recipe now. Would you like to know why this recipe is healthy? | acknowledgement, implicit, confirmation, prompting |
| User | yes -> <i>usecase 3</i> / no | Acknowledgment |

Usecase 2: **Assess a Food Item's Healthiness**

| Speaker | Chat | Strategy Used |
|--------------------|---|----------------------------------|
| Chatbot (from UC1) | Lentils are very healthy, they are rich in antioxidants and the compound asparagine. Would you like to know which specific vitamins are in lentils, or how they contribute to your daily nutrient intake? | Implicit confirmation, prompting |
| User | What about the vitamins? | Acknowledgment , Prompting |
| Chatbot | Lentils are a source of Vitamin K, B9 (Folate), C, A, and E. Do you want to learn more about a specific vitamin's function? | Implicit confirmation, prompting |
| User | No, I'm good for now. | Acknowledgment |
| Chatbot | (Alternative start for UC2) You've switched topics, that's fine! I'm here to help. Which food item or ingredient do you want to know about? | Acknowledgment , Prompting |
| User | Are asparagus healthy? | Prompting |

| | | |
|---------|--|---|
| Chatbot | Yes, asparagus are very healthy! They are rich in Vitamin K, B9, C, A, and E. If I don't recognize a vegetable, I'll direct you to an external resource. Do you want to see how these vitamins contribute to your daily nutrient intake? (Connects to Usecase 3) | Acknowledgment Implicit confirmation, prompting |
|---------|--|---|

Usecase 3: Learn About Food Choices

| Speaker | Chat | Strategy Used |
|----------------|--|--|
| Chatbot (>UC1) | <i>Got it. You have a recipe now. Would you like to know why this recipe is healthy?</i> | <i>Implicit Confirmation, Prompting</i> |
| User | Yes, why is it healthy? | Acknowledgment, Prompting |
| Chatbot | Alright, this dish contains <<the amount minerals/vitamins, low in fat etc. >> these are good for <<thinking, growing or energy>> Good luck cooking! | Acknowledgment, Implicit Confirmation |

| Speaker | Chat | Strategy Used |
|----------------|--|---|
| Chatbot (>UC2) | <i>Hi, Nice that you have asparagus at home. Asparagus are very healthy, they are rich in vitamin K, B9, C, A, E, rich in antioxidants and asparagine. Do you want to know more about vitamins, antioxidants or asparagus?</i> | <i>Acknowledgment, Implicit Confirmation, Prompting</i> |
| User | Yes, why is it healthy? | Acknowledgment, Prompting |
| Chatbot | Alright, focusing on daily nutrient intake: Vitamin B9 (Folate) in the asparagus you have supports growth and cell function! This one serving covers about 30% of your recommended daily B9 intake. Good luck with your next meal! | Acknowledgment, Implicit Confirmation |

Exception flows

*Based on “Wizard of Oz” conversations

The decision has been made to limit the chatbot in its capability, capabilities have been taken into account in the example dialogs and use-cases. Everything outside of this scope will be answered to provide correct user expectations.

Exception mapping

| | | |
|----|--------|-------------------|
| UC | Prompt | Negative feedback |
|----|--------|-------------------|

| | | |
|-----|--|--|
| UC1 | I have an allergy for peanuts | Unfortunately I don't provide information on allergies |
| UC1 | What's the molecular structure of Vitamin K? | That's a very detailed question! I can tell you about the health benefits and food sources of vitamins, but I don't provide detailed molecular biology information. |
| UC1 | Can you help me find a restaurant for tonight? | My focus is currently on providing affordable home recipes for students. I cannot help you find restaurants, sorry! |
| UC2 | I have a very cheap recipe, how can I make it healthier? | I am designed to assess the healthiness of single ingredient or existing recipes. I cannot help with these questions, you can always ask me if a specific ingredient is healthy. |
| UC2 | I have (unknown item in database) is this healthy? | I am sorry, I don't know this food item yet. Can you maybe give me comparable item? |
| UC3 | How many calories should I eat to lose weight? | My purpose is to help you learn about food choices and nutrient values, but I am not a substitute for a personalized dietary plan or medical advice. Please consult a doctor or nutritionist for weight loss guidance. |
| n/a | Is the sun shining? | I specialize in recipes, and nutrition! I can't look up general information. How about we talk about the health benefits of food instead? |

Wizard of Oz testing results

- should be asked the first time a person opens the app. (production 1)
- Vegetarisch of niet. (production 2)
- ~~clarify affordable:~~
 - o We are not taking this into action, all our recipes are under <set amount> and directed for students
- specifieke ingredienten in recept.
- omgedraaid vitamine naar ingredient.
- ~~groenten die niet herkend worden doorverwijzen~~
- Daily intake of nutrition value.
- Vitamins in a recipe.
- Say goodbye and goodluck with your meals/cooking.

WTTT

- Database capped on 100 recipes.

Reflection

During the design of the use cases for the ai chatbot BrainFuel, we discovered that there is a lot of exceptional behavior for our use cases. Adding these exceptions has helped us to better understand the working of the flow what a user can encounter in their questioning.

Additionally, there are small choices like offering an alternative or asking on last check question that can make the conversation feel more natural and trustworthy. This behavior could support students by focusing on affordability and health in a more fluent and less robotic way.

Use case three can now use the output of use cases one and two in its answer. It is crucial for use case three to have a more supporting role in the system. This is the case because use case one and two have the more initial starting role, while use case three is more about supporting the answers already generated by use case one and two with more information.

Conversation flow and early implementation

Converstation flow diagram

https://www.canva.com/design/DAG1xW_3gSI/dOdGOWbknEYOMvGuikqy-g/edit?utm_content=DAG1xW_3gSI&utm_campaign=designshare&utm_medium=link2&utm_source=sharebutton

Observation notes

Preliminary implementation