TACKLING COOKING: COOKING EDUCATION AND VR INTERFACE DESIGN RESEARCH

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ABSTRACT

The final report investigates the interface design of a VR environment for simulating a virtual kitchen and its impact on the education on cooking. Moreover, it illustrates the process from ideation to prototyping to usability testing of the aforementioned VR interface. At its core, the interface design is constructed based on design methodology (i.e. define, ideate, prototype, test and empathize) and analyzed based on quantitative and qualitative data sampled locally. Evaluation of the interactive prototype (constructed in Balsamiq) is based on three main factors: (1) intuitiveness of the UI; (2) usefulness of each feature (i.e. tool/recipe/ingredient information presentation, customizing loadout, assisted cooking); and (3) efficacy of design choices. The report describes the problems and limitations that come with prototyping a beginner-friendly but also informative VR interface–namely, the intrinsic nonlinear user experience for building a kitchen loadout and cooking in the kitchen and, in turn, consequences of simulating a pre-set features for sake of convenience. It explores how usability testing can be leveraged for a better user experience with improvements in icons, user flow, and more effective information presentation. Ultimately, the most important conclusion is the need for assisted cooking and the importance of binary user decisions through design clarity and feature discoverability.

INTRODUCTION

Cooking is an extremely important skill to have, especially now that more adults than ever are living on their own. Despite that, cooking skills are not always taught at a young age, and so adults with inadequate cooking skills usually resort to eating takeout or premade meals, which tend to be less healthy than home cooking. Conversely, research has shown that adults who know how to cook tend to be healthier. Our project was aimed at beginner cooks who would need a guide to show them around the kitchen and explain how to prepare certain foods and use common cooking techniques. Our interface takes the form of an educational virtual reality program which would simulate working in an actual kitchen and provide step-by-step instructions for different recipes, allowing users to learn how to cook by themselves without some of the safety risks involved in a real kitchen.

LITERATURE REVIEW

With the rise of virtual technology, many studies have emerged as a result of the promising intrigue in the potential of VR in many facets of our lives. Here, our team's research honed in on VR in educational forms and the benefits of instructional teaching for cooking in the kitchen.

Research on VR in Education

Some studies explored the potential of VR in a classroom setting but primarily as an instructional tool. In "Developing a Virtual

Reality Game for Manufacturing Education", Zhao et al (2019) discuss developing VR software to help teach manufacturing skills. The manufacturing process described in the article is similar to the process of cooking in a kitchen and can be easily adapted. For example, the requirements station is analogous to picking a recipe, the lego pieces selection stage is analogous to choosing your ingredients, and assembly is like the action of putting the ingredients together properly (mixing, baking, stirring, etc). In "Virtual and augmented reality effects on K-12, higher, and tertiary education students' twenty-first century skills", Papanastasiou et al. (2019) present the research that has been done into the effects of VR education on school-age children. The results show that these programs improved effectiveness with memory, motivation, and visuospatial skills, among others. In "Using virtual reality to enhance food technology education", Gorman et al. (2022) develop and test a virtual reality classroom in order to teach students about food. The participants reported a high degree of engagement and satisfaction, and the results from this article influenced us to include more educational and informative content in our app.

Research on Assisted Cooking and Mixed Reality

Our team looked into studies investigating the value of assisted cooking and its effect on an individual's cooking skill. In "Self-perceived cooking skills in emerging adulthood predict better dietary behaviors and intake 10 years later: A longitudinal study", Utter et al. (2018) show findings of a study which indicate that adults who self-report as having "adequate" or better cooking skills often prepared their own food and ate healthily more often than those who didn't. This showed the importance of food education, which we integrated into our initial proposal. In "Mixed Reality Cooking Support System Using Content-Free Recipe Selection", Fadil et. al (2006) designed a cooking support system with features including recipe selection, human action recognition, and action suggestion. The last two features in particular are relevant to our topic as they are what we want to implement in our guided cooking interface. One of the limitations of their support system was the necessity of cameras and markers to identify ingredients and actions; a VR game might actually be able to improve on this project idea. In "Cooking navi: assistant for daily cooking in kitchen", Hamada et al. (2005) develop navigation software for cooking in which users determine the order of actions taken. The ease of use and satisfaction reported by users was something that we took note of when designing our own system.

PROBLEM STATEMENT

Our game addresses four distinct elements of the kitchen: tools and appliances (eg. oven, knives, hand mixer), ingredients, cooking techniques (eg. chopping, frying), and recipes. Whereas in a traditional learning setting, certain tools and ingredients may be expensive or inaccessible, a VR environment would allow those of interest to freely explore and "use" inaccessible ingredients and tools due to budget, local access, etc.

Moreover, another key problem that our team noticed is that many who want to cook don't know where to start. Existing solutions such as cooking classes can be time-consuming and very expensive whereas cooking for yourself can be very dangerous if you do not know your way around the kitchen. In addition, the current main forms of education on cooking are boring due to its non-interactive nature. Furthermore, our prototype that was developed as part of the

design process aims to tackle these key issues.

GATHERING USER REQUIREMENTS

To inform our forms of data gathering, we first constructed four personas to model possible users we thought might want to use our interface.

Personas

Persona 1: Charles is a video game streamer. Charles' main motivation for playing the game would be for entertainment as well as to entertain his audience. He would not necessarily be interested in the educational aspects of the software.

Persona 2: Warren is a high school student who cooks as a hobby. He has some cooking knowledge and wants to learn more complex recipes but is not able to due to lack of educational resources at school and at home. Warren's primary motivation for playing the game would be to explore more difficult recipes and techniques.

Persona 3: Jerome is a working adult who is married with one child. Due to his previous job, Jerome was not able to put much time into cooking and cleaning. He is a beginner chef whose primary motivation for using the software would be to learn basic recipes and skills in order to be able to help his wife now that he has quit his previous job.

Persona 4: Therese is a student who wants to someday become a professional chef but is unable to practice due to her living situation. Therese would use the program for its educational and instructional capabilities.

Surveys, Questionnaires and Interviews

To gather user requirements, our group created a Google Forms survey and distributed it to users we thought fit the personas we created. Our main goal with the survey was to get an idea of how and when users cooked, what they thought about cooking, and the kinds of things they would like to learn from a program like ours. We distributed the link through social media and direct messages. The survey/questionnaire included closed questions, as they would be easier to analyze statistically. Nevertheless, our short-answer questions also provided valuable insight into the problems with learning how to cook.

In addition to the surveys, we performed semi-structured in-person interviews with potential users. We drafted a detailed medium-fidelity prototype in Balsamiq to compensate for the complex nature of our interface. Our interview questions mainly asked the interviewees what they found intuitive about the prototype, as well as what they would like to see in a fleshed-out version of our prototype. In the interviews, our team recorded valuable insight that would better inform our design features and choices in the high-fidelity prototype.

Feedback

Our survey results helped paint a general picture of our potential user base. What we found was that most of the respondents enjoyed cooking but did not usually have the time to cook every week. Additionally, the majority of those surveyed felt that they were only slightly experienced or had no experience with cooking. Furthermore, we found that there was also a large group of those surveyed who do have cooking experience but would still be interested in our interface. From our survey feedback, we compiled three main takeaways. First, the interface must be informative and provide as realistic an experience as possible to be helpful to users who want to learn more about cooking. Second, there should be options for both beginners and experienced users. Lastly, some interviewees were

confused at parts of our interface, so we decided to focus on making the user experience as intuitive as possible.

PROTOTYPE

Ingredient and Tool Selection

The user can now choose a recipe to cook. If the user selects the icon in the right corner of the recipe, the user can learn more details about this tool and ingredient (see Appendix G (A)). As shown, when the user clicks the icon, we learn more about the recipe for a balloon whisk and bell pepper, respectively. The additional information for the tool gives a description of the tool, its main function, other tools similar to it and more. Suppose we now proceed to ingredients (see Appendix G (B)). Once again, the user can select ingredients and click the corner button for the ingredient to learn more about it. The additional info about the ingredient would include information on how the ingredient tastes, its nutritional value, where it originates and more. In Appendix G (C), we see in the assisted cooking stage of the interface, users can still learn about a tool or ingredient by clicking on the "i" tooltip.

Customizing Loadout

Another task we created was customizing cooking loadout. Once again, from the "Choose Recipes" page, the user can choose to cook with a recipe. The user can now look through recipes in the catalog and select all the recipes they want to add to their loadout by clicking on it, which adds it to the loadout (see Appendix H (A)). When choosing tools, the user can once again, browse tools and add more to their selected tools, as wanted. The user will already have preselected tools added for their recipes, but the user has the option to add more if they want to explore. Similarly, for ingredients, the user can browse ingredients and add more to their loadout as wanted (see Appendix H (B)). Before the user goes into the kitchen to cook, they can view everything they added. If the user wants to add more, the user can go back in the directory to return to the page they would like and add more (see Appendix H (C)).

Assisted Cooking

Our main feature is the assisted cooking phase. We note that these instructions are specifically for following the "fried egg recipe". For more complicated recipes, users may need to follow more instructions, visit more areas, use more ingredients, etc. However, they are guided in the same manner. The user is brought to the virtual kitchen menu. From here, the user is asked whether or not they want to be guided (see Appendix I). If the user has chosen that they did not want to be guided, then all the next steps will be skipped. The guided cooking toggle will be turned off. The user can press the "Stove" button or click the stove image (see Appendix I). The user is brought to the stove menu. Various pop-ups will indicate what steps need to be done at the stove menu – that is, crack fried eggs on the pan and plate the egg. The user can press the "Next" button to go from step to step. If the user makes an error, a pop-up will give the user an option on whether or not to start over (see Appendix I). If the user presses "Continue", then the user is brought to the completed recipe menu. A pop-up will give the user an option on whether or not to view feedback (see Appendix I).

USABILITY STUDY

Our usability study took the form of one-on-one interviews wherein the interviewer would observe the participant demoing the high-fidelity prototype on Balsamiq. We first would ask participants to sign an informed consent form presented to

and signed by each of them prior to the usability study (see Appendix D). During the demo process, the interview would collect information pre-demo, during the demo, and post-demo (see Appendix E). This format was specifically chosen so that the interviewer would be in charge of recording data concerning time usage and also be able to present questions and accompanying explanations about specific areas of concern. Interviews were also a preferred method of data gathering because of our concern of acquiring sufficient participants, and this method was chosen over focus groups since each of the investigators conducted interviews separately and not at the same time or location.

Each study was conducted in an informal home environment. The participant would sit in front of a computer with our Balsamiq prototype opened up, and the investigator right beside them with a clear view of both the screen and the participant's actions. Prior to the demo, the investigator would briefly explain what our prototype was (i.e. a mockup design of an educational VR game about cooking) and provide a very brief overview of features that they could expect to encounter (i.e. learning about ingredients, customizing loadouts, and cooking with or without assistance). After this overview, two short pre-demo questions were asked, focusing on the participant's expectations of the prototype and usefulness. Usefulness was framed in the context of both educational and entertainment takeaways from the game. These pre-demo questions were included in the design of our study as we wanted to evaluate the change in perceived usefulness after having used our prototype.

Afterwards, investigators would ask their participant to begin the game in the prototype. Participants were asked to explore the prototype on their own without input from the investigator, unless absolutely necessary. Stopwatches were used to record the time spent during three main phases of the game process: (1) learning about an ingredient, (2) customizing their kitchen's loadout, which involved selecting or deselecting tools, and (3) assisted cooking (see Appendix F). Phases (1) and (2) constituted the "pre-game", that is, the part of our prototype prior to the main cooking gameplay. This data recording was included in our design so we could qualitatively compare the relative time spent between portions of our prototype and also infer user problems if there were extremely unexpected time usage data.

In addition, investigators also were to note if their participant performed certain actions. These primarily concerned non-obligatory features of the game: adding additional customizations to the loadout, selecting assisted cooking when prompted, and clicking on informational buttons in different phases of the prototype. We also had criteria on whether the participant got stuck on a certain process, being defined as if they were unable to figure out how to proceed for any amount of time after trying; whether they repeated an action or went backwards in a process; and finally, if they expressed confusion or anger at any process. For the last three criteria, the process(es) where issues occurred were also jotted down if they occurred (see Appendix F). This part of our study was designed so we could evaluate which parts of our game were appreciated, or rather, underappreciated, as well as which parts were badly designed and caused user issues.

Finally, after the completion of the demo, the investigator would pose several questions to determine the participant's thoughts. The interview method also was advantageous here since users could

explicitly express areas of confusion for them during the demo, and investigators could ask for clarifications too. We recorded ratings on a scale of 1-10 about our prototype regarding how useful it was (the same question as presented in the pre-demo); how easy and intuitive the interface was; how helpful were the in-game instructions; and enjoyability as a prototype for a VR game (see Appendix F). An open-ended question was also presented asking if the participant would prefer using our interface over a YouTube video for learning a recipe, and why. This question was to help us further gauge where our current prototype is in terms of perceived usefulness (see Appendix F).

ANALYSIS AND RESULTS

We had a total of 5 participants on which we conducted our interviews to test our interface.

Quantitative Data

We analyzed several quantitative factors, including time spent on each section, number of users who used different features, and perceived usefulness.

We measured the average proportion of time spent on our main features of assisted cooking. The user took 5 minutes on average to complete the demo. From analyzing average time spent on each feature, we see that the average user spent about 50% of their time on the assisted cooking feature, 25% of their time learning about an ingredient, and 25% of time to customize their loadout (see Appendix A). Looking closer at the data, we can also see that not all participants used all three features. For example, some skipped learning about an ingredient feature. This information shows that most users prefer using assisted cooking over cooking by themselves, showing users do prefer help when cooking and want to learn to cook correctly.

We also observed the number of users who used each feature and plotted the data (see Appendix B). All users opted for assisted cooking while only 60% of users used the tool selection and learned more about an ingredient. In conjunction with the pie chart above, we see that users spent less time on learning about an ingredient and customizing loadout, leading us to speculate that the users either did not understand or care for the loadout customization page. Another possible conclusion is that this feature might be pointless and too complex for users to find value in.

Another quantitative measure was the perceived usefulness of the interface. We asked users before and after testing our prototype about how useful they felt the prototype was. As shown in Appendix C, users felt the interface was less useful after the usability study. This indicates that there is definitely room for improvements and better features moving forward. The amalgamation of our quantitative data highlights key pain points of our high fidelity prototype, namely the additional tool/ingredient selection. We speculate that replacing or removing the additional tool/ingredient selection can reduce the complexity and improve the perceived usability of our interface.

Qualitative Data

Commonalities in participant confusion were concerning the tool/recipe/ingredient selection. Some users did not know where to click to add an item to loadout. We also noted that users were confused about some non-programmed and pre-programmed features and the word choices for some of the buttons. Although this could be prevented outside of Balsamiq, this design violates a golden rule, which is design

dialogs to yield closure. For example, some participants expressed confusion on why they could not crack an egg. In response to asking them about the confusion, they suggested adding visual cues in the confirming cooking loadout page and assisted cooking phase. Finally, some users noted they would have seen more value in our proposed interface if it was a high-fidelity prototype simulated in a VR environment or something adjacent. From our qualitative data, we conclude there are many unclear design indicators and lack of instructional modules that ultimately downgraded the demo experience for many of our participants.

LIMITATIONS

There are three main kinds of limitations that have impacted our research.

Balsamiq Feature Limitations

Balsamiq Wireframe was the tool used to create all iterations of our prototype but lacked certain technical capabilities that would have conveyed our vision better in the high-fidelity prototype.

To begin, Balsamiq lacked the ability to simulate dynamic visual and auditory cues, limiting the amount of information observed by participants. To elaborate, with this software, we were unable to implement animated pop-ups that would emerge onto the screen with audio reiterating the text shown, as well as images that would appear as a cursor hovers over an icon. This limitation potentially misguided users, as seen in our results, where some participants were initially confused on what pressing the recipe/tool/ingredient icon would do.

Furthermore, Balsamiq lacked features that would fully capture our vision for assisted cooking. Firstly, Balsamiq does not have a feature where users can drag-and-drop items, which is detrimental to our design. Our results show that some participants were confused as to why they were unable to simulate cracking eggs or put the pan onto the stove, or pick up the eggs with the spatula via dragging. Moreover, Balsamiq is not an effective tool to simulate nondeterministic gameplay. With Balsamiq, our interface conceptually would require unfeasibly many wireframes to simulate the various different choices a user can make. Thus, the loadout brought into the kitchen is preselected and actions are preprogrammed, making for a linear experience. Our results show that this limitation diminished participant enjoyment, as participants may have expected our interface to have unique loadouts and experiences during the demo.

Lastly, Balsamiq is not an effective tool used for VR interface design and testing, making our vision more difficult to convey to participants. As shown in the results, this affected the participants' enjoyment and perception of the interface's usefulness.

Sampling Limitations

A larger interviewee sample size would have represented our target audience more accurately and better informed their need for our interface. Furthermore, although we primarily targeted individuals who matched our personas, our study would have also been improved if we had also interviewed those outside of our target audience and outside of the greater Toronto area. It would have informed us if our interface had a broader appeal to other demographics and potential users.

Data Collection Bias

Moreover, there may be bias present in the data due the relationship between the interviewer and the interviewee. Participants were not randomly selected. Most interviewees are acquainted with the

interviewer and knew their involvement with the prototype. This could have possibly had an effect on how honest interviewees felt about the prototype.

Another potential bias may be found in participant expectation and experience. Some interviewees were shown a version of the prototype in both the gathering user requirement and usability testing phases. Therefore, some interviewees already had some understanding of our interface, possibly affecting their answers for what they expected, how intuitive the interface was, how useful the interface was, etc.

FUTURE WORK

UI Clarity

From our usability testing results, we took various quantitative measurements to evaluate our design. One of which was rating the intuitiveness of the UI on a scale from 1 to 10; the average intuitiveness score was 6. To rationalize participants' rating, we pinpoint sections of our design that we feel are unintuitive. All participants (5) had at least one frustration about the prototype and repeated at least one action. A common one was the ingredient/tool/recipe selection pages. After reviewing some select screen-recorded footage of participants' interacting with the prototype, we found that most users completely ignored the help text (i.e. did not click on the icon).

In the future, an improvement to the UI would be to make the clickability of these items more accessible by adding symbols and icons. Conventionally, when we are allowed to select or add an element, we associate a plus symbol to the action. Hence, including an (+) icon could help with cognitive recognition and indication that users can add more ingredients and tools. Alternatively, we can raise these clickable elements by adding a background shadow effect, which is commonly done to show that an element is a button. Additionally, we would change the help text to be a popup that is initiated on each section (i.e. selecting tools/ingredients, customizing kitchen loadout, assisted cooking) to add another onboarding option for users. This potential solution could help improve closure on each section by introducing a logical start (popup) and then ending with the proceed button.

A common complaint was the lack of images on our prototype due to our decision to de-prioritize adding images to the high-fidelity prototype. Understandably, without images as context, participants expressed how it became more difficult to understand what a section was trying to convey. By adding more pictures and context, users can become more immersed into the interface.

Exploration of Features

From our quantitative data findings, we found that there were some participants that did not explore all features. Currently, to learn more about a tool/ingredient/recipe, users would have to click on a small "i" tooltip on the recipe selection page or a small question mark icon on assisted cooking phase. Moving forward, we would like to make this feature more discoverable and rewarding. We would explore design solutions, such as unobtrusive popup "bubbles" that would provide a quick summary of what a certain feature or icon is for. To make features, such as learning about an ingredient/tool more rewarding, we could consider adding a catalog of tools/ingredients/recipes in which the user can see which ones they have mastered or learned.

VR Prototyping

As noted in the limitations section, Balsamiq was not able to model nuances that would

apply in VR, such as 3D elements and interactions. Since our interface requires a VR environment, our next step would be to transition to a VR prototyping tool, such as Sketchbox or ShapesXR, to construct a more immersive high-fidelity prototype. Tools like these allow for better prototypes in which the user can better interact with our interface like how they would in VR. Features like loadout selection can be the same in terms of design, but as for the assisted cooking feature, a 3D space would allow the demo experience to be more accurate to our team's final vision, in turn, allowing for more precise usability testing.

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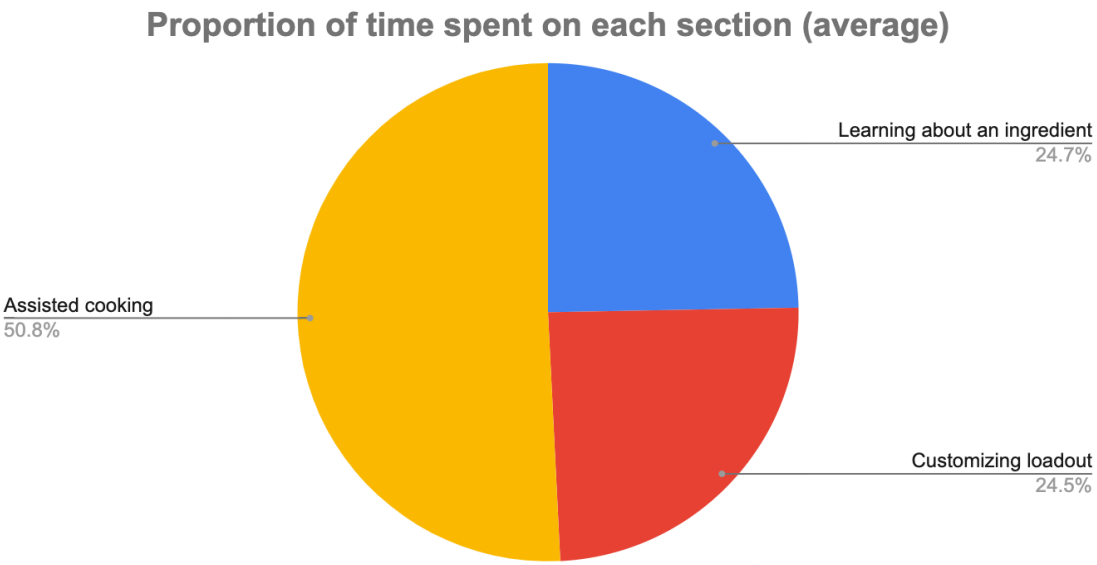
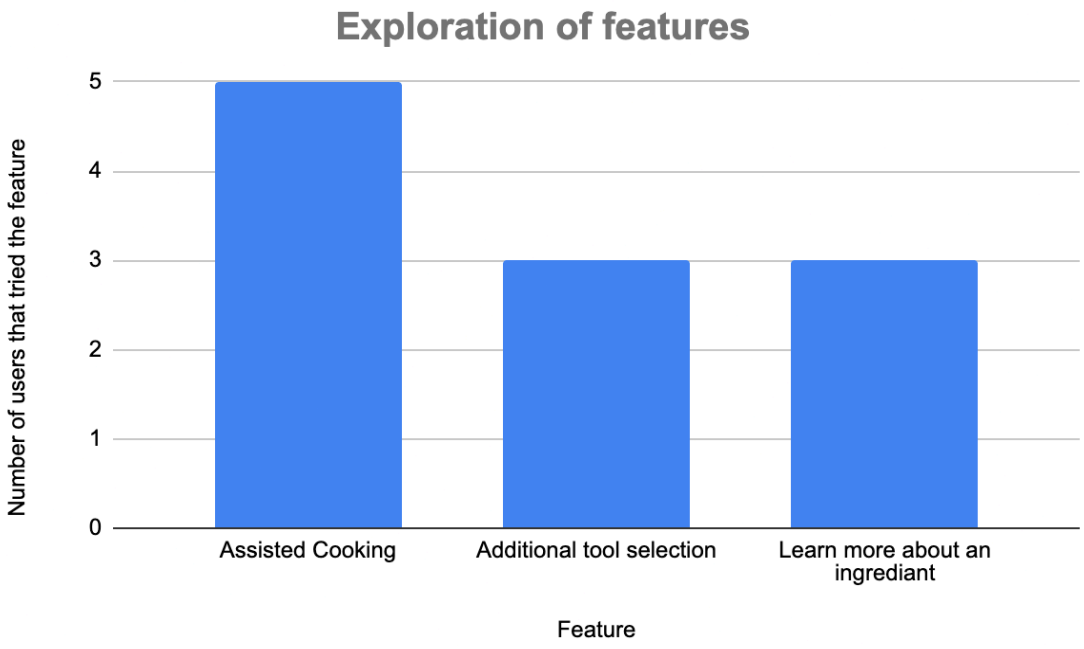
Appendix A

Proportion of Time Spent on Each Section (On Average)



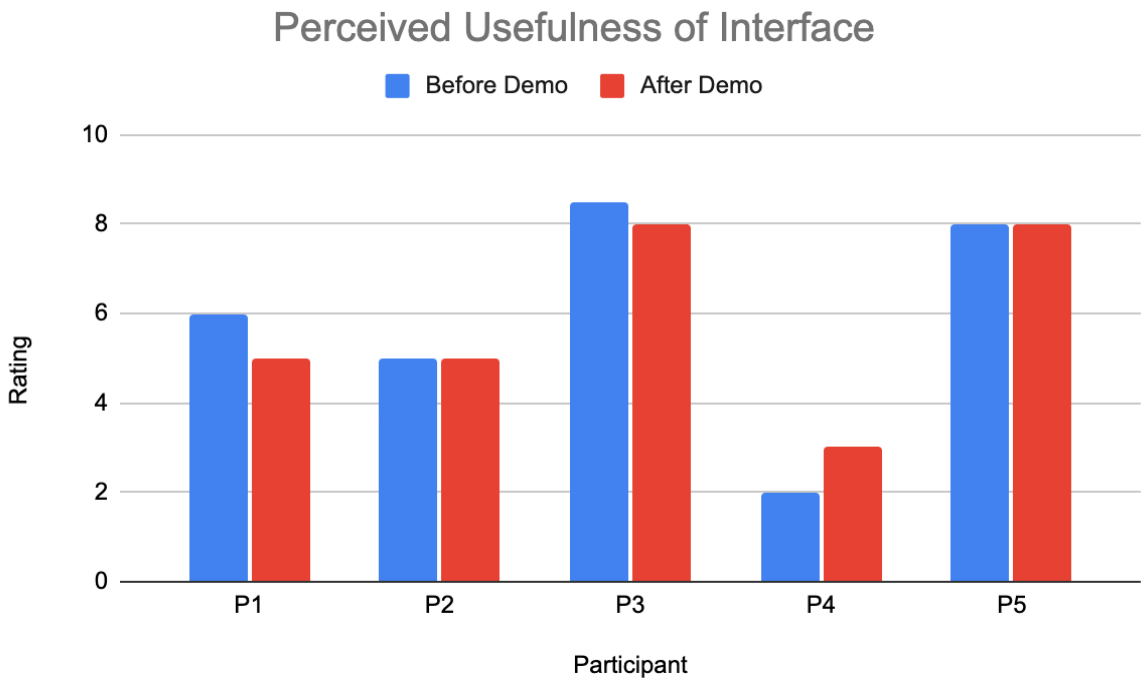
Appendix B

Number of Users that explored Interface Features



Appendix C

Perceived Usefulness of Interface



Appendix D

Sample Informed Consent Form

Usability Study – Informed Consent Form

Title: Team On Fire! Usability Study on VR Assisted Cooking Interface
Investigators: Ashtian, Irene, Jack, Keerthiha, Kelvin, Matthew

I _____ hereby consent to participate in a usability study conducted by the Investigators (listed above) as part of a Fall 2022 project for CSCC10, Human-Computer Interaction, a course offered by the Department of Computer & Mathematical Sciences at the University of Toronto Scarborough.

I agree to participate in this study and the purpose of this study is to analyze users' experiences with our prototype VR interface.

I understand that:
- The procedures to be used are opening a laptop, signing informed consent agreement, and demoing our interactive prototype using Balsamiq wireframes.
- The risks incurred by participating are minimal to nothing (if anything, confusion).
- I will receive no compensation for my participation.
- I am free to withdraw at any time during the study without the need to give any explanation or penalty.
- All materials and results will be kept confidential, and, in particular, that my name and any identifying or identified information will not be associated with the data.
- I can contact the course instructor, Naureen Nizam (nnizam@cs.toronto.edu) with any questions or concerns.

PARTICIPANT
Name (please print) _____

Signature _____

Date: _____

INVESTIGATOR(s)
Name _____

Signature_____

Date: _____

Appendix E

Sample Interview Sheet

PRE-DEMO:

What are you expecting to see from the interactive prototype?

- Response:

On a scale 1-10, how useful do you find this interface to be from the description?

- Number:

DURING DEMO:

How much time did the user spend on each task?

- Learning about an ingredient:
- Customizing loadout:
- Assisted cooking:

Did the user choose assisted cooking?

- ☐ Yes
- ☐ No

Did the user add more tools than the ones recommended?

- ☐ Yes
- ☐ No

Were accessory buttons (e.g. the “i” tooltip) clicked for each task?

- Learning about an ingredient:
  - ☐ Yes
  - ☐ No
- Customizing loadout:
  - ☐ Yes
  - ☐ No
- Assisted cooking:
  - ☐ Yes
  - ☐ No

Did the user appear confused/frustrated on a certain part(s) of the prototype?

- ☐ Yes
  - If yes, what part(s) was it and what was it for?
    - Answer:
- ☐ No

Did the user repeat an action?

- ☐ Yes
  - If yes, what action(s) was it and what was it for?
    - Answer:
- ☐ No

Is there a point where the user couldn’t move on?

- ☐ Yes
  - If yes, what section(s) was it and what was it for?
    - Answer:
- ☐ No

POST-DEMO:

On a scale 1-10, how useful do you find this interface to be after playing with our interactive prototype?

- Number:

On a scale from 1-10, how helpful did you find the instructions?

- Number:

On a scale from 1-10, how easy and intuitive did you find the interface?

- Number:

On a scale of 1-10, how much did you enjoy the interactive prototype as a simulation for a VR game?

- Number:

Would you prefer this interface over learning a recipe with a Youtube tutorial?

- Yes
  - If yes, why?
    - Answer:
- No
  - If no, why?
    - Answer:

Appendix F

Compiled Interview Notes (5)

PRE-DEMO:

What are you expecting to see from the interactive prototype?

- Response: i'm expecting to see a dish to be made, ingredients to rinsed and cut and prepped, see an oven; ideally, have a class on each different type of ingredient
  Response: Various cooking related tasks, food
- Response: A cooking game that is fun to play and has a lot of recipes.
- Response: Overview of what the game looks like, clicking things works
- Response: I'm expecting something like the McDonald's DS Training game

On a scale 1-10, how useful do you find this interface to be from the description?

- Number: 2
  Number: 8 because it teaches cooking without the danger of cooking
- Number: 8.5/10
- Number: 5
- Number: 6/10

DURING DEMO:

How much time did the user spend on each task?

- Learning about an ingredient: 1 minute and 7 seconds
- Customizing loadout: 10 seconds
- Assisted cooking: 1 minutes 20 seconds

- Learning about an ingredient: 20 s
- Customizing loadout: 1m 20s
- Assisted cooking: 2m

- Learning about an ingredient: 15 seconds
- Customizing loadout: 2 min 45 seconds
- Assisted cooking: 2 min 34 seconds

- Learning about an ingredient: 20s
- Customizing loadout: 1m10
- Assisted cooking: 1m30

- Learning about an ingredient: 4mins
- Customizing loadout: 34 seconds
- Assisted cooking: 5 mins

Did the user choose assisted cooking?

- ☑ ~~Yes~~
- ☑ ~~No~~

Did the user add more tools than the ones recommended?

- ☑ ~~Yes~~

☑ ~~No~~

Were accessory buttons (e.g. the “i” tooltip) clicked for each task?

- Learning about an ingredient:
  - ☑ ~~Yes~~
  - ☑ ~~No~~
- Customizing loadout:
  - ☑ ~~Yes~~
  - ☑ ~~No~~
- Assisted cooking:
  - ☑ ~~Yes~~
  - ☑ ~~No~~

Did the user appear confused/frustrated on a certain part(s) of the prototype?

☑ ~~Yes~~

- If yes, what part(s) was it and what was it for?
  - Answer: could not tell how to move on, the loadout screen was not clear that you could edit the ingredients (would’ve liked add symbol)
  - Didn’t know why he was taken back to the assisted cooking screen after he finished the fried egg stage

☑ ~~Yes~~

- If yes, what part(s) was it and what was it for?
  - Answer: Guided cooking part where it says “You have made an error”. Was unsure how to proceed and kept going in a loop.

☑ ~~Yes~~

- If yes, what part(s) was it and what was it for?
  - Answer: The tool selection - since there was no picture for the tools that were able to be selected, she was confused why she was clicking on a box, but there was no indication that the tool was selected (we should have shown a specific tool image being added into the cart when clicked)

☑ ~~Yes~~

- If yes, what part(s) was it and what was it for?
  - Answer: Selecting loadout because most of the tools/recipes/ingredients are invisible and it’s not clear what they’re selecting. They didn’t seem to realize right away the selection menu is on the left while the right side is what you have selected.

☑ ~~Yes~~

- If yes, what part(s) was it and what was it for?
  - Answer: User cannot find out how to learn about an ingredient
  - The user found it frustrating that it was preprogrammed to fail in the cooking portion
  - Confused on why he couldn't press sink if he needed to wash dishes

Did the user repeat an action?

☑ ~~Yes~~

- If yes, what action(s) was it and what was it for?

        - Answer: confused with Balsamiq interface, tried to remove ingredients but didnt' know what that was for, confused why there were already preset ingredients (confused) tried searching or adding ingredients but couldn't

- ☑ ~~Yes~~
    - If yes, what action(s) was it and what was it for?
        - Answer: User was confused and exited back to the menu to reset the options.
- ☑ ~~Yes~~
    - If yes, what action(s) was it and what was it for?
        - Answer:
            - She tried adding the same tool 3 times
            - When she was done cooking the egg, she almost clicked to cook a fried egg again
- ☑ ~~Yes~~
    - If yes, what action(s) was it and what was it for?
        - Answer: Recipe selection
- ☑ ~~Yes~~
    - If yes, what action(s) was it and what was it for?
        - Answer: The user had to repeat the part where it told them they made a mistake

Is there a point where the user couldn't move on?

- ☑ ~~Yes~~
    - If yes, what section(s) was it and what was it for?
        - Answer:
- ☑ ~~Yes~~
    - If yes, what section(s) was it and what was it for?
        - Answer: User could not get to the finished egg screen as the guided text says to "take a spatula" but there was no spatula so the user did not click next and was confused.
- ☑ ~~Yes~~
    - If yes, what section(s) was it and what was it for?
        - Answer: When she was done cooking the egg, she did not know where to go or how to continue on
- ☑ ~~No~~
- ☑ ~~Yes~~
    - If yes, what section(s) was it and what was it for?
        - Answer: The user had to repeat the part where it told them they made a mistake. The user didn't know they can press continue.

POST-DEMO:

On a scale 1-10, how useful do you find this interface to be after playing with our interactive prototype?

- Number: 3

- Number: 8 because it was kind of confusing but it has potential to be helpful.
- Number: 8/10
- Number: 5
- Number: 5
    - If it was more finished, score will be higher (confused on why some buttons were not implemented)

On a scale from 1-10, how helpful did you find the instructions?

- Number: 2
- Number: 5 because some of the instructions were unclear and undoable.
- Number: 9/10
- Number: 7
- Number: 5
    - Found it very misleading, since it told him to do something but unimplemented buttons didn't allow him to do it (ex. couldn't go to sink even though it told him to wash dishes while eggs were cooking)
    - Told him to pick up spatula, but spatula didn't appear on the side bar

On a scale from 1-10, how easy and intuitive did you find the interface?

- Number: 6
- Number: 7 because the buttons were generally clear to click on but since sometimes there are lots of buttons it could be tricky to know which one to click and when to click.
- Number: 9.5/10
- Number: 4
- Number: 3
    - Could be more intuitive if was finished

On a scale of 1-10, how much did you enjoy the interactive prototype as a simulation for a VR game?

- Number: 4
- Number: 8 because though the user could not fully accomplish the task, he still had fun trying it.
- Number: 7.75/10
- Number: 6
- Number: 0
    - Didn't find too engaging, everything was done for him

Would you prefer this interface over learning a recipe with a Youtube tutorial?

- No
    - If not, why?
        - Answer: i already know how to cook and i don't need the issues of instructions, i prefer to see someone cook it and see it and do it myself
        - Don’t see the benefit of vr
        - Would consider myself as an intermediate to advanced person in the kitchen
- Yes
    - If yes, why?

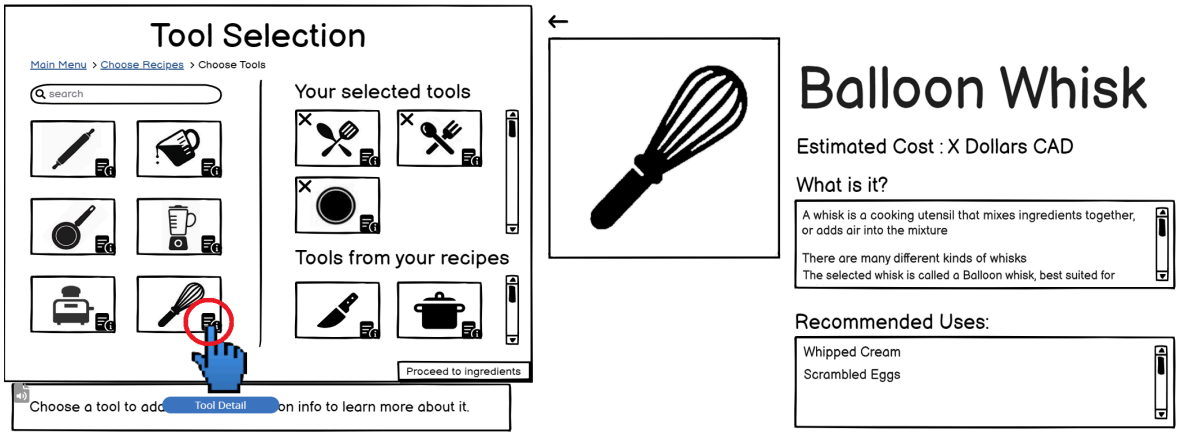
        - Answer: Even following a Youtube tutorial, he might still make a mistake. Also he feels safer doing a simulation rather than doing the real thing.
- No
    - If no, why?
        - Answer: She feels like this takes longer and using a youtube tutorial, you can actually get real food.
- No
    - If no, why?
        - Answer: The instructions were unclear and the UI is ugly. On Youtube you can see somebody do it and see how it's supposed to look like. It'd be useful if there was a demo of someone doing it before you cook
- No
    - If no, why?
        - Answer: He learned nothing from the prototype, but can possibly see learning if it was in VR and not the state its in right now

Appendix G

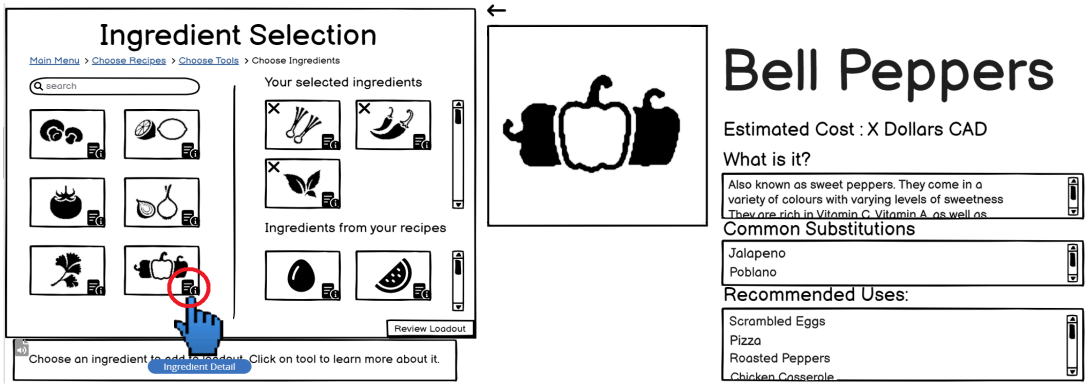
High Fidelity Prototype: Task 1

Viewing ingredients, recipes, etc.

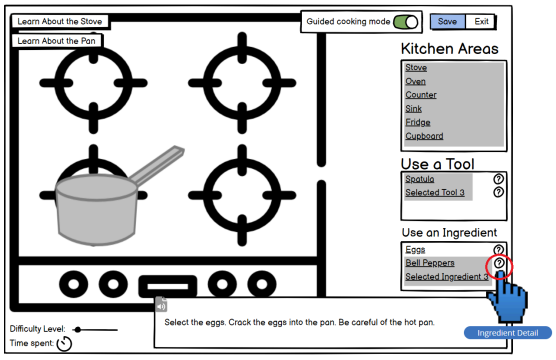
(A) *Upon Clicking:*



(B) *Upon Clicking:*



(C)

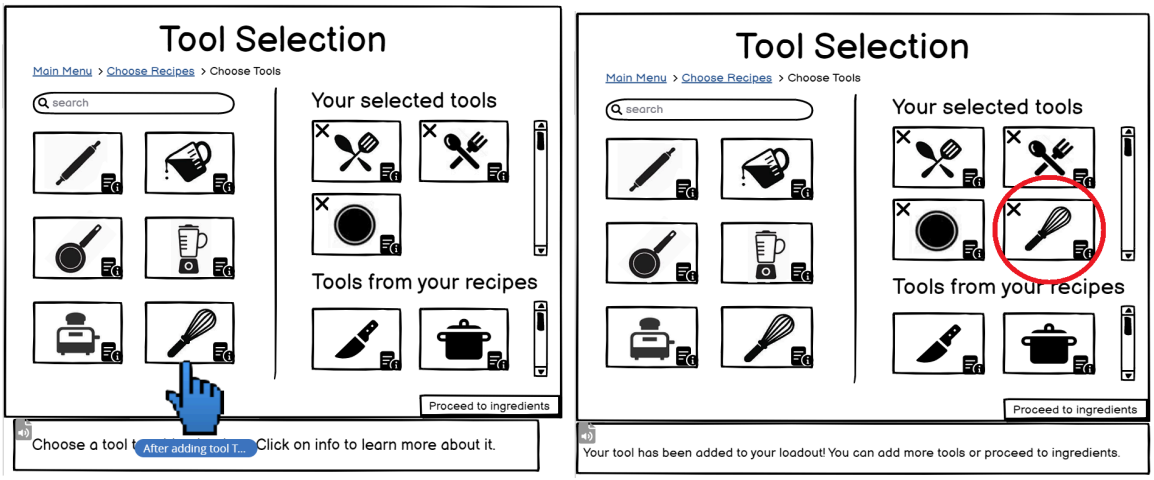


Appendix H

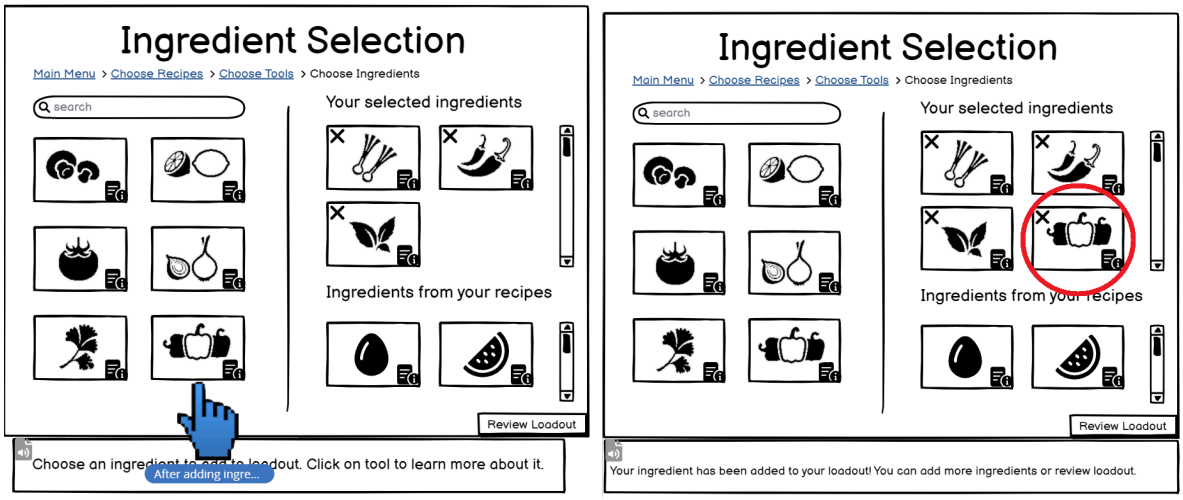
High Fidelity Prototype: Task 2

Customizing the loadout

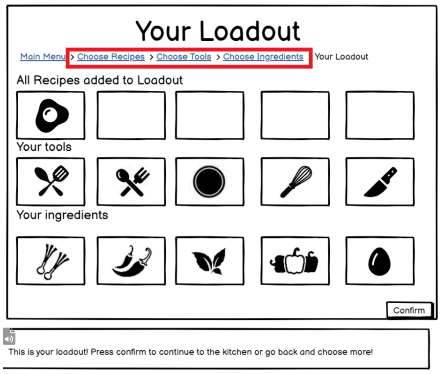
(A) *Upon Clicking:*



(B) *Upon Clicking:*



(C)



Appendix I

High Fidelity Prototype: Task 3

Assisted Cooking