sustainability

MDPI

Article

Sustainable Culinary Skills: Fostering Vegetable-Centric Cooking Practices among Young Adults for Health and Environmental Benefits—A Qualitative Study

Rajshri Roy [1,2,3,*], Alshaima Alsaie [3], Jessica Malloy [3] and Joya A. Kemper [4]

[1] Charles Perkins Centre, The University of Sydney, Sydney, NSW 2006, Australia
[2] Discipline of Nutrition and Dietetics, Susan Wakil School of Nursing and Midwifery, Faculty of Medicine and Health, The University of Sydney, Sydney, NSW 2006, Australia
[3] Discipline of Nutrition and Dietetics, University of Auckland, Auckland 1010, New Zealand; aals888@aucklanduni.ac.nz (A.A.); jessica.malloy@auckland.ac.nz (J.M.)
[4] Management, Marketing, and Tourism, University of Canterbury Business School, Christchurch 8140, New Zealand; joya.kemper@canterbury.ac.nz
* Correspondence: rajshri.roy@sydney.edu.au or r.roy@auckland.ac.nz

Abstract: With young adults (18–30 years) having low vegetable intake, primarily due to inadequate cooking skills, this study aims to explore the usability and desirability of educational tools, such as written recipes and cooking videos, to foster sustainable eating habits. Employing a descriptive, qualitative, and user-centered design, three focus groups were held at a major urban university campus in New Zealand, engaging students and staff within the target age group. Discussions with 15 participants identified key facilitators of vegetable-based cooking, including access to ingredients, ease of recipe visualization, and cost-effectiveness. Consequently, 13 vegetable-centric recipes and instructional videos were created, incorporating nutritional value, affordability, and preparation efficiency. These resources, tailored to young adults' preferences, were designed to mitigate the identified barriers to vegetable use, contributing to sustainable food practices. The application of a user-centered approach in developing educational content yielded a set of recipes and videos that not only address the gaps in cooking skills among young adults but also promote the broader goals of sustainability in food consumption patterns. This approach offers actionable insights for practitioners and food marketers to enhance vegetable utilization and sustainable eating behaviors in this demographic.

Keywords: young adults; vegetables; cooking; user-centered; nutrition education

Citation: Roy, R.; Alsaie, A.; Malloy, J.; Kemper, J.A. Sustainable Culinary Skills: Fostering Vegetable-Centric Cooking Practices among Young Adults for Health and Environmental Benefits—A Qualitative Study. *Sustainability* **2024**, *16*, 928. https://doi.org/10.3390/su16020928

Academic Editors: Michael A. Long and Hossein Azadi

Received: 4 December 2023
Revised: 9 January 2024
Accepted: 19 January 2024
Published: 22 January 2024

1. Introduction

Adequate vegetable consumption is an essential part of a healthy diet, which is important for protecting against major noncommunicable diseases [1], such as obesity [2], and reducing environmental impact [3]. In New Zealand, a third (34%) of the adult population consume less than the previously recommended intake of three servings a day (75 g per serve), with young adults aged 15 to 30 years reporting the lowest rates of meeting the guidelines relative to those in older age groups [4]. This trend is consistent in other countries, including Australia [5], the UK [6], and the US [7]. These unfavorable trends are consistently more exacerbated amongst groups of low socioeconomic status and ethnic minorities (e.g., Māoris and Pacific Islanders) [8,9].

Young adulthood represents a valuable target for promoting dietary habits as the impact of negative dietary habits early in life often manifests later in adulthood [10,11]. This period of transition, involving leaving school, going to university or college, leaving the parental home, and starting employment, often brings unique or significant challenges that contribute to suboptimal dietary behavior, including the lack of culinary skills and

knowledge of practical ways to incorporate vegetables into meals (particularly breakfast and lunch) [12–15], as they often require cooking [16,17], as well as limited time, perceived cost, and/or the availability of convenient and cheap (takeaway) options [13,14,18]. However, while many studies have examined vegetable consumption and the barriers to consumption in young adults [19–21], there is currently a lack of research on how to encourage cooking with vegetables [13].

Past research links low cooking confidence and poor cooking skills with unhealthy food choices [22]. Thus, interventions often target cooking skills to improve healthy food consumption [18]. While past research has examined resource-intensive cooking courses or food skills programs [23,24], there is a clear interest from young adults in more easily accessible recipes [16,25,26] and cooking videos [16] to address the barriers to cooking and/or vegetable consumption. These types of tools are ubiquitously available online [25,27] and are largely appealing (based on the engagement metrics).

The format in which the recipe is presented, whether it be through text, video, or a combination of both, significantly impacts the learning experience during the cooking process [28–32]. Videos have been perceived to help over and above recipe cards through improved comprehension, real-time reassurance, and enjoyment of the cooking process, as well as the acquisition of new cooking skills [28].

Previous research has investigated the impact of video-based learning on cooking skills, finding significant improvements in culinary skills and food knowledge [33,34]. Other research has found that the use of a short video was effective at improving self-efficacy for cooking simple (and short) meals [35] and motivation [13]. Cooking videos have also been shown to influence food choice behavior, enjoyment of the foods, and intentions to eat and prepare the foods portrayed [36]. Nour et al. (2018) discovered that the utilization of short videos enhances motivation and reduces the perception of time as a barrier to cooking with vegetables. However, their study did not specifically examine the impact of visual and audio features in the videos.

However, research has rarely examined the use of recipe cards on cooking motivation and skills. Buykx et al. (2013) found that recipe cards, with their concise format and easy-to-follow instructions, significantly improved cooking skills among novices [29]. Furthermore, Liu et al. [37] provided three interventions: food samples, recipe cards, and promotional discounts on fruits and vegetables, and found that recipe cards were significantly associated with the frequency of fruit and vegetable consumption. This underscores the potential of recipe cards in influencing positive dietary changes, particularly in the context of fostering vegetable-centric cooking habits among young adults. However, no research has examined what features aid consumers to use recipe cards.

Our research objective is to create usable and desirable recipe cards and videos for dissemination on the internet to help young adults to cook with vegetables. We utilize the findings of a focus group (user-centered design) to prepare written recipes and video recipes that address barriers, are salient, engaging, and relevant to young adults to help motivate them to cook with vegetables. Overall, this study aimed to:

1. Understand the barriers and enablers faced by young adults when cooking with vegetables.
2. Understand what format and characteristics of recipes (written and videos) appeal to young adults.
3. Design and develop user-centered written recipes and video recipes that address barriers, are salient, engaging, and relevant to young adults to help motivate them to cook with vegetables.
4. Test the acceptability of these cooking videos.

2. Materials and Methods

Table 1 provides an overview of the aims and actions during each phase of the study [38].

Table 1. Overview of the iterative development steps.

Phase	Aim	Actions
Understand	Understand the barriers and enablers faced by young adults when cooking with vegetables.	Focus group discussions
Plan	Concept recipes and cooking videos development.	Five concept recipes and videos were developed
Prototype test	Testing of the concept versions: perceived relevance and user requirements.	Focus group discussions
Develop	Development of the final version of the recipe cards and cooking videos	Thirteen recipes and cooking videos were developed

We draw on the COM-B theoretical model, which stipulates that changing behavior requires positive changes in capabilities, opportunities, and motivation [39], to provide a theoretical basis for the use of recipe cards and videos. Providing recipes and cooking videos can address 'opportunities' such as time, cost, and taste, while improving culinary knowledge and skills can improve 'capabilities'. Altogether, alongside appealing imagery, this can enhance the 'motivation' to cook and, ultimately, promote behavior change.

We also adopt a user-centered design approach to develop a series of recipe cards (written recipes) and cooking videos based on the qualitative findings. User-centered design is an iterative design process in which designers focus on the users and their needs in each phase of the design process [13,40,41]. The major difference between user-centered and participatory design is agency. Participatory design gives the user agency and control over the design process, whereas user-centered design involves consulting them for more data to help make decisions about design [42]. User-centered design focuses on the final technology product, as demonstrated through usability, which includes learnability, memorability, efficiency, and satisfaction, resulting in greater adoption of the product [43]. Overall, user-centered design allows practitioners to create products and services which appeal directly to the target audience.

Five prototype recipes were developed by student dietitians that provided at least one serving of vegetables based on the New Zealand Eating and Activity Guidelines [44]. These were available in two versions: a recipe card (i.e., a written version/poster) and a complimentary video, with each being based on existing research. The purpose of these was to serve as a prototype for qualitative feedback.

The recipe cards were designed based on previous research [12] to be suitable for sharing on social media, and were also printed on paper for each participant. Two different prototype recipe card templates were developed for each of the 5 recipes by a professional graphic designer. These varied significantly in terms of their design and color schemes and the types of information they included. For example, one template included photographs of the final product, the steps being carried out, and/or the ingredients. The other included additional information, such as nutrition tips, cooking and storage tips, preparation time, cost, ideas to swap with people, servings, and vegetable servings. Both recipe cards included a nutrition information panel that was produced using the nutrition analysis software FoodWorks 10, which uses the New Zealand food composition database [45].

The videos produced ranged in length from 1 to 3 min, as this was considered to be an acceptable length by young adults in previous research [13]. All the videos were filmed primarily from a bird's-eye angle, focusing on the food, and only showing the person's hands preparing the dish. Some also showed the people who prepared the dish at the end of the video. All videos had music playing in the background, none had a voiceover, but all included text instructions. None of the videos included a complete list of the ingredients. Instead, the ingredient's name and amount were stated while they were being used. A

few videos started by showing the final dish, and only one video included the number of serves, preparation time, and the cost at the start.

Participants were recruited for focus group discussions using convenience sampling through flyers, emails, and online advertisements on a large urban university website and social media accounts in Auckland, New Zealand. Focus group participants were offered NZD 50 shopping vouchers as reimbursements for their time. Participants were initially recruited by completing a screening survey that gathered demographic information and assessed their eligibility. Participants reviewed the participant information documentation prior to giving their written informed consent to be involved. Participants were briefed on the purpose of the study and asked if they understood it or had any questions. Eligible participants were young adults aged 18 to 30 years. Those with a current nutrition major or a degree were excluded, as their diet-related knowledge, attitudes, and habits might not reflect those of the general population. A total of three focus groups were conducted with a total of 15 participants, who were young adults ranging in age from 18–30 years.

Qualitative feedback was gathered through the focus group discussions to capture the acceptability and viewer perceptions of the created (prototype) short cooking videos and recipe cards, as well as the development of the final short cooking videos and recipe cards [38,46,47]. As a form of qualitative research, focus groups are ideal for examining the experiences, beliefs, needs, and concerns of individuals [48]. Visual elicitation stimuli, in this case recipe cards and videos, were used to provide discussion points [49]. Visual elicitation stimuli are artefacts used in interviews, such as drawings, photographs and video clips [50], which enable insight that may not be possible through verbal discussions alone [51]. The use of visual elicitation stimuli is common in user-centered design as it allows prototypes to be discussed [38,46].

Focus groups were facilitated by two of the female authors, who were active qualitative researchers with doctorates, using a standardized moderator guide. Three 90 min sessions were conducted in the university with a mixture of males and females in each group. There were 5 participants in each focus group. Open-ended focus group questions explored perceived motivators of home food preparation to assess attitudes to commonly perceived barriers and enablers to home cooking and motivation to cook with vegetables [52]. While we did not present an in-depth discussion of these barriers and enablers in this paper due to space limitations, we used them to inform our final recipe cards and videos. Next, five prototype recipes and videos were presented in varying order to avoid order bias. An open group discussion was held regarding the acceptability of the videos by asking participants to share their likes and dislikes. Questions regarding cooking and vegetable consumption were raised throughout the session, as deemed appropriate to maintain the conversation's natural flow. No further sessions were arranged, as no new concepts were generated in the third group. Thus, we stopped data collection at theoretical saturation [53,54]. Examples of final cooking videos were shown across 3 follow-up focus groups with another cohort of young participants (n = 19) for pilot testing. One focus group moderator led an open group discussion regarding the acceptability of the final videos, asking participants to share their likes, dislikes, and overall feelings about the videos seen. The main ideas were summarized.

Focus group discussions were audio and video recorded and transcribed into electronic format via Microsoft Word. Following this, all the data were migrated to a Microsoft Excel worksheet and thematic analysis of the transcripts was conducted [55]. Thematic analysis of transcripts was conducted by one researcher and independently moderated by the other two researchers. A deductive thematic analysis approach was taken to analyze the focus group discussions, where the data were read and interpreted to generate codes related to the key aims of the study (barriers and enablers to vegetable cooking and consumption, and recipe and video format and characteristics) [56]. As such, our process adhered to template analysis (a form of thematic analysis) [57,58]. Template analysis is a broad and flexible approach which utilizes a priori codes related to the research objectives or aims [58]. Firstly, the transcripts were read to familiarize oneself with the data, then a coding template was created based initially on a priori codes related to the research aims, which was then

followed by an iterative process where codes and themes were modified, created, or deleted throughout the analytical and reflective process of coding [58]. This process was particularly aided by discussions between the researchers and reflection on the literature.

To ensure trustworthiness, the coding process was discussed between all the authors and continual discussions took place to understand and clarify the relationships between codes and themes [59]. Credibility was addressed through triangulation (i.e., triangulation using quotes from different participants) [59], while dense descriptions and quotes from the focus groups were used to increase the transferability of the findings to other contexts/individuals. The audit trail discussed above also provides greater trustworthiness [59].

3. Results

Firstly, we discuss the characteristics of the participants, followed by the barriers and enablers to vegetable consumption and cooking.

Of the 15 focus group participants, six (41%) were male, half (54%) were current students, 29% were past students or employees, 13% were current students also working for the university, and 4% were current employees. Many lived with flatmates and a few lived with their partners, parents, or in a catered residence (i.e., where meals are provided). One participant was a mother who lived with her husband and children. The cultural backgrounds also varied, including NZ European, Asian, South Asian, and one Middle Eastern. All were native English speakers.

3.1. Barriers

3.1.1. Cooking Confidence

The majority (n = 14) appeared to be confident cooking familiar dishes, and either avoided taking the 'risk' of experimenting with new recipes: *"[I am] risk averse . . . I just have recipes that I just alternate in my head" (Participant 4C),* or would take the risk in the absence of the barriers discussed in the following themes, such as time and cost: *"It depends on how much time we have, . . . the other thing I wanted to say ... that's when the inventiveness comes in, when it's really really cheap and you bought it without even knowing how you're going to use it. . ." (Participant 1C).* As a result, ingredients used in the recipes represent a major factor influencing interest in a recipe, with some participants expressing a lack of confidence with excluding/substituting undesirable ingredients, and a sense of obligation to use the listed ones because diverting away from them would render the recipe unsuccessful.

3.1.2. Price

Price was frequently reported to be the most important barrier influencing shopping behavior. A few participants (n = 6) expressed a preference to shop at a local supermarket known to supply products at lower prices, and two emphasized that low prices and promotions motivate them to try unfamiliar products. Cost was also a major barrier to utilizing convenience services, such as online shopping and meal-box services (seven participants). *"If it's big sale signs, cheap or 'Reduced to clear'. Yeah, Pak'n'save sometimes be like '99 cents week', SO good! (Participant 4A).* Many (n = 10) reported changing their shopping behavior in response to seasonal price changes. Frozen vegetables were noted to be cheaper sometimes. As a result, participants discussed how inaccessible ingredients are deterring factors (i.e., not readily available at home/shops or expensive): *"The list of ingredients I think to some extent would put me off just because there's too many things to buy" (Participant 2B).*

3.1.3. Shared Living Spaces

Sharing storage spaces with flatmates (e.g., fridges) limits how much food and vegetables can be purchased and the quantities of meals the individual can prepare and store for future consumption. Sharing the kitchen space when many people want to cook around the same time was also noted to exert pressure on the individual, leading them to compromise on things like the healthiness of food in favor of time, as shown in these comments. *". . .you*

have to cook very fast and it tends to be not the most healthiest because there's five people that want to cook around at the same time…" (Participant 1A).

3.1.4. Busy Schedule

Most participants (n = 13) agreed that the lack of time due to university/work schedules is a major barrier to cooking, enjoying it, and experimenting with new recipes. Many (n = 13) noted that they would trial new recipes if they had spare time (e.g., in the holidays), but would otherwise default to cooking the same recipes they are familiar with. University/work commitments limit the time available to cook, as reported in these comments: *"It's just the time with uni and everything. The time with uni is like the biggest problem…" (Participant 3A).*

Many (n = 11) consistently stated that vegetable preparation (e.g., chopping and slicing) was time and energy consuming. Some noted using prechopped frozen vegetables to overcome this and provide convenience. One also noted frozen vegetables to be even easier to cook (e.g., microwavable), while another expressed that she opts for salads, which require no cooking. However, half of the participants reported finding vegetables easy to cook, particularly when compared to meat. This means that many versatile cooking methods can be used (e.g., boiling and baking): *"Vegetables are pretty easy to cook, like if you're just going to boil them or put it in the oven, not too difficult" (Participant 3C)*; with minimal risk of the food poisoning associated with undercooked meat: *"…with vegetables you don't always have to have them cooked, like when I'm cooking chicken and stuff I'm always worried that I'm going to undercook it, because obviously you can get food poisoning from that…" (Participant 4A).*

There was a consensus that recipes requiring minimal equipment are desired, such as those requiring one pot/pan to combine and cook all the ingredients. This was noted to provide convenience (i.e., less effort) and save on the preparation and clean-up time. Recipes that consist of multiple components that need to be prepared separately and assembled to produce the final dish were deemed relatively more ''complicated and troublesome''. For example, one stated *"There just seem [s to be] too many steps, I was so confused at what was going [on]" (Participant 3C, Recipe 5).* Some (n = 5) participants also expressed a preference for recipes that require no heating and/or reheating. Recipes requiring minimal effort (e.g., few pieces of equipment and no heating) are preferred by the participants.

3.2. Enablers

3.2.1. Enjoyment

Many participants (n = 12) perceived cooking as a positive experience and described it as enjoyable, relaxing, engaging, and rewarding. However, some emphasized that this is only the case in the absence of pressure from barriers. For example, one stated *"I do like it but only if I have time" (Participant 7C).* Cooking with others, particularly friends, was also deemed fun, and reduces the preparation time. Six participants also noted that cooking for other people/special occasions (e.g., birthdays) is rewarding and justifies cooking complex recipes that require longer time: *"… if you're cooking with friends, that will make it more enjoyable… if you're doing it with friends it's ok, but if I'm going to do it on my own it's time consuming" (Participant 4C).*

3.2.2. Batch Cooking

Around a third of the participants stated that they batch cook regularly, meaning cooking food in excess (i.e., for more than one meal) and storing it in the fridge or freezer to be consumed in the future. Many participants cook in batches to reduce the following barriers: time, price, shared storage and kitchen spaces, vegetable spoilage, vegetable preparation time, and helps with eating healthily: *"It saves time on the cooking, you do one-time cooking, get two meals out of it" (Participant 1C).*

3.2.3. Health and Nutrition

For most participants (n = 12), health as a factor was at least as important as price when grocery shopping and was noted to motivate them to cook at home instead of opting for fast food and takeaways. Two participants perceived healthier food products to be more expensive, one of which stated that a *"...bigger salary..." (Participant 1A)* would allow her to prioritize health over price. The participants consistently expressed an appeal for healthy recipes. Their perception of the healthiness of a recipe was influenced by the ingredients used (e.g., recipe 3 was deemed unhealthy due to the use of noodles), and by health and diet trends (e.g., the words 'paleo', 'buddha', 'turmeric', and 'Mediterranean' in some recipes were associated with health).

3.2.4. Grocery Shopping Appeal

Grocery shopping was overwhelming to two participants, one of whom opts for online shopping to avoid going during rush hours, particularly when there is no plan for what to purchase or cook in the upcoming week. The majority, however, reported enjoying grocery shopping and feeling inspired by the different products. Preplanning at least part of what to purchase before going appeared to be a common practice, with the remaining purchases being influenced by other factors such as sales and promotions. The majority enjoy grocery shopping, but two find it overwhelming. Preplanning what to purchase for the week is helpful, as suggested: *"I just like seeing the different products you can get, sort of makes you feel inspired sometimes, if you see new things" (Participant 7A).*

3.2.5. Taste

While taste was acknowledged to be an important factor, many participants (n = 10) agreed that it could be compromised on while shopping in favor of other factors (such as price), as it can be enhanced during cooking by using other ingredients (e.g., spices). *"Taste? Oh, it's very important. Yeah, but you can buy the plain ingredients and make it tasty with spices and stocks and sauces and stuff, once you're confident, you know?" (Participant 1B).* As a result, the recipe ingredients represent a major factor determining the individual's interest in a recipe, for example, personal taste/ dietary/cultural preferences/influence/the acceptability of a recipe.

3.2.6. Social Media and Influence

Around half of participants mentioned learning to cook from their family, primarily their parents. Half also learn recipes from their friends. There was a consensus that online sources (e.g., Google, YouTube, and Instagram) are frequently used to learn new recipes and to research unfamiliar ingredients. *"I've actually learned most of my cooking from YouTube" (Participant 3C).*

Three participants reported being influenced by celebrity chef shows, while five were deterred by them due to the recipes often being too difficult or requiring inaccessible ingredients. Parents, friends, and the internet influenced the individual's cooking. Celebrity chef shows attracted some and deterred others. *"...I was watching Master Chef so and then, one of the judges was making pumpkin Gnocchi, and so I decided to try that out..." (Participant 7C).*

3.3. Recipe Cards and Videos

Figure 1 displays the themes and codes related to the preferred (appealing) format and characteristics of recipes (written and videos).

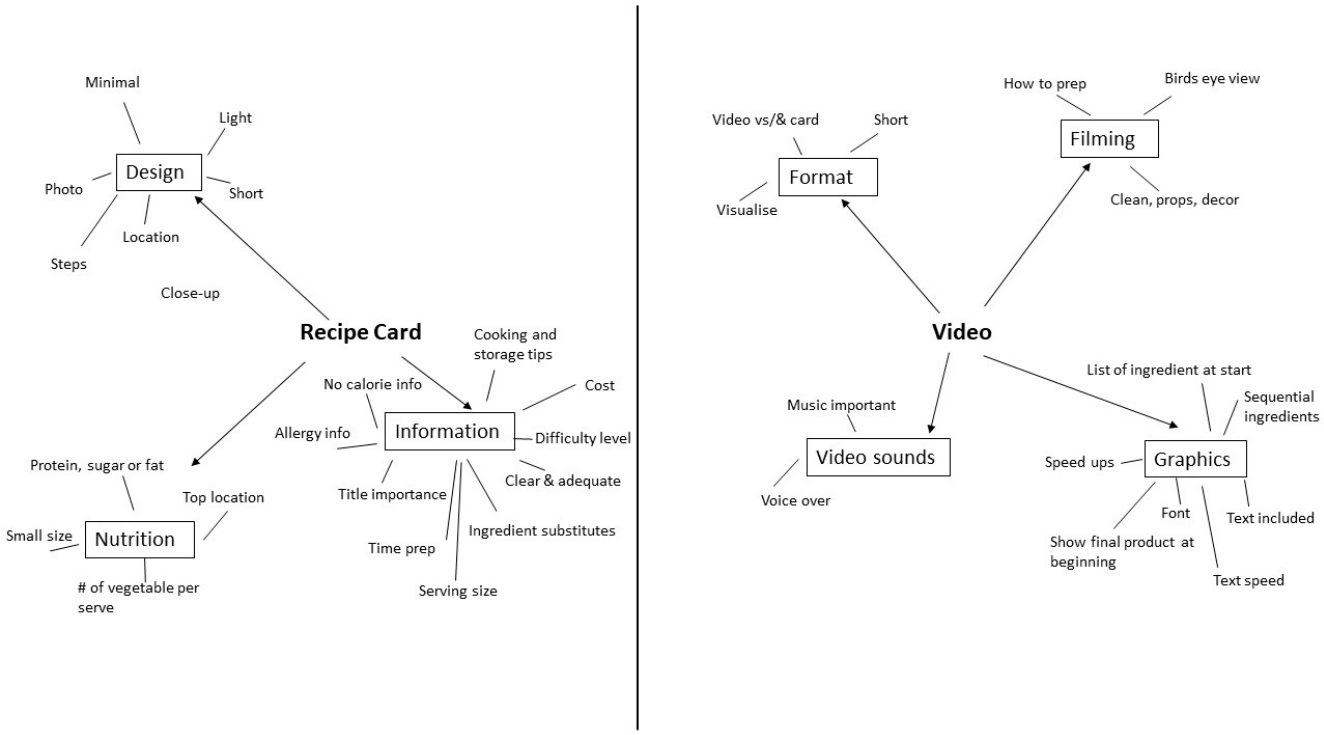


Figure 1. Themes and codes related to the preferred (appealing) format and characteristics of recipes (written and videos).

We also mapped the different elements of the recipe card and video design to the behavior change framework's COM-B model, as can be seen in Table 2.

Table 2. Elements linkages to COM-B model.

Element	C	O	M
Recipe card			
Design			
Minimalism			x
Light colors			x
Short			x
Photos			x
Steps	x		
Location			x
Close-up			x
Information			
Allergy info	x		
Title			x
Clear and adequate	x		
Cooking and storage tips	x		
Difficulty level	x		
Serving size	x	x	
Time prep	x	x	
Cost per serve	x	x	

Table 2. *Cont.*

Element	C	O	M
Ingredients substitutes	x		
Nutrition			
Protein, sugar, or fat	x		x
Small size font			x
Top location of card			x
Number of vegetables per serve	x		x
Video			
Format			x
Video vs card			x
Short video			x
Visualize	x		x
Film			
Birds eye			x
Clean, props, décor	x		x
How to prep	x		
Video sounds			
Music			x
Voice over			x
Graphics			
Sequential ingredients	x		
Text included	x		
Font size			x
Text speed			x
Show final product at beginning	x		x
Speed up			x
List of ingredients at start			x

Where possible, we link these themes to the barriers and enablers for vegetable cooking identified by the focus group and whether these address capabilities, opportunities, or motivation.

3.4. Formative User-Testing of Recipe Cards

The following themes emerged concerning what the participants deemed to be important aspects of the recipe cards: (1) design, (2) recipe information, and (3) nutrition information.

3.4.1. Design

In terms of the color scheme, the majority disliked a dark background and preferred a white/light-colored background. The green color was also associated with health and generally appealed to most. A minimalistic design (i.e., the inclusion of minimal text and/or visual information) was desirable and enhanced motivation. Notably, while the recipe card's appearance was consistently noted to be important, two participants expressed that this can be compromised to an extent provided that the recipe card provides clear and adequate information required to replicate the recipe.

"...the presentation doesn't matter that much because you're mostly there to find out the recipe." (Participant 6C)

Participant 7C: *"yeah no, essentially you just want to know how to make it yourself."*

Including an appetizing photograph of the meal is one of the most important features, as it serves to capture the person's attention and determines their interest in cooking the recipe, thus affecting motivation. The photograph may also overcome negative taste perceptions.

"If there's no photo so it doesn't motivate me to make it" (Participant 1A).

The food must also be visible, meaning the photo should be large enough, well-located (ideally at the top as opposed to the bottom), not covered by text, and up-close. The availability of visual cues, such as images illustrating the desired outcome at each step of the recipe, enables participants to effectively comprehend the subsequent actions they need to take. Thus, this increased perceived capability. Most of the participants wanted the inclusion of additional photographs of the steps and ingredients in the recipe card. Such directions would allow users to overcome barriers to the perceived cooking burden, ingredient appeal, and lack of convenience and cooking confidence.

Some participants (n = 6) preferred a shorter version (all information on one page) as it is more convenient and motivating and because any additional photos are deterring and visually overwhelming. Interestingly, one noted that a more extended version of the template implied that the recipe would be longer and more complicated. Notably, one participant indicated that the photographs of the steps, but not the ingredients, were helpful.

"I like those photos of the method, but I think those [ingredients] aren't really necessary" (Participant 7A).

3.4.2. Recipe Information

The majority (n = 12) stressed the importance of providing clear information and adequate details to enhance motivation, the lack of which can cause anxiety, and uncertainty, and make the recipe difficult to understand.

"...how do you know when the Kumara is cooked? What consistency? should you poke test it? Should you bite into it? How do people know that? And that's one of the anxieties around cooking, when is it ready? ... especially cooking with meat, I'm like [gasp] is it ready? Is it overdone? ... I remember trying to teach a 22-year-old to cook, and she was SUPER anxious, she's like: I don't know if it's ready and how long should it be in there for ..." (Participant 1B).

For some participants (n = 8), the title appeared to be as important as the final product photograph when it comes to determining their interest in the recipe. The title should be clear, concise, and informative (i.e., include the key ingredients characterizing the recipe). For example, one participant stated that a recipe titled 'marvelous meatballs' was deceiving, as fish was used. *"I find the title a bit misleading because it says meatballs, but it's made of fish, so I'd probably say fish-balls" (Participant 7C).* Specifying whether the recipe is suitable for different dietary preferences, such as for those with allergies, was deemed important by most participants, and was suggested to be presented visually using symbols, ticks, or icons instead of statements for a minimalistic design.

Cooking and storage tips in the recipe cards were considered helpful by some participants for enhancing capability. These tips aim to make the cooking process simpler and more efficient and provide information on how to store the cooked recipe for longer periods safely. A few participants (n = 9) suggested including the difficulty level in the recipe card, meaning whether the recipe is suitable for people with beginner, intermediate, or advanced cooking experience/skills. Overall, this provided more confidence to participants in their ability to cook the recipe.

"Maybe here it could have commentated like, writing like uh, how long does it take to prepare, what's the level of difficulty, is it easy to bake, things like that" (Participant 3C).

Five participants also voiced that it is helpful to include the time needed to prepare the recipe, with one stating that they would only consider making the recipe if this information was available. Around half of the participants found it helpful to include the number of servings or portions the recipe caters for. Most participants believed that recipe cards should include an estimated cost per portion of food, as opposed to 'total cost', which was perceived to be expensive and unappealing. Such additions created both enhanced capability and opportunity by overcoming the barriers of increased cost and time and thereby also providing the knowledge of how long the meal should take and what the meal should 'produce' (i.e., serving size): *"I like how it does have the cost on it. Like an estimated cost" (Participant 1A).*

The majority of participants (n = 11) also discussed the need to include a list of ingredient substitutes, particularly ones that are not readily available or not commonly used (e.g., tahini, blood orange, or sesame oil). This was noted to provide flexibility and enhance confidence in modifying the recipe. Overall, all these suggested tips and tricks try to address the perceived cooking burden, cooking/preparation time, ingredient appeal, lack of convenience, and cooking confidence.

> *"I think it actually depends on the person because if you're a person who's trying to lose weight and if you're obese or something or you have diabetes or something then you'd probably be more focused on these things. For us, we're generally healthy so we usually look at something that's appealing and not too unhealthy I think?" (Participant 7C).*

3.4.3. Nutrition Information

Some (n = 6) participants reported using nutrition information panels (NIPs) for one or two nutrients (mainly protein, sugar, or fat), and around half noted that including it in the recipe card would not pertain to them as they are unable to interpret it without reference values, with two expressing interest in educational information on how to do so. While none opposed the inclusion of NIP for those who need it, there was a consensus that it should not be too large (taking up over a quarter of the recipe card), and should ideally reserve the important locations (e.g., top) for more valuable information (e.g., photographs). Interestingly, however, a couple of participants implied that emphasizing the NIP by enlarging it or placing it at the top implies that the recipe targets health conscious people.

> *"It's interesting to have this, you know, sort of expanded out in your face. Even though I might not read it, it feels like if the people who made this recipe are confident enough to bold it and kind of zoom it out, they're confident enough to say that it's healthy enough for us to do that [recipe]. That's kind of the impression I get" (Participant 2B).*

Including the number of vegetable servings the recipe provides was deemed important to some participants. Despite the majority seeming to lack knowledge of the recommended intake, including this information can provide motivation to cook the recipe. *"I don't really, but if you show me [that] this is a good serving, then it'll make me feel even better [Facilitator: like a bonus] Yeah" (Participant 5A).*

There was a consensus that information such as 'how many calories the recipe contains' is not necessary and is of no interest to the participants, who perceived it to be targeting people with health conditions or those aiming to lose weight.

3.5. User-Testing of Cooking Videos

The first theme ((1) 'format preference') relates to the participant's perceptions of the video format relative to the traditional infographics. Three additional themes emerged relating to the features that appealed to the participants: (2) 'video sounds', (3) 'filming', and (4) 'graphics'.

3.5.1. Format Preference

Some (n = 4) participants indicated that stand-alone cooking videos without any recipe cards would suffice, but only if they include sufficient information. This was seen to

enhance motivation. *"I think in a way yes, but also if there was a little, like, description, maybe a list with the ingredients at least, that would be good" (Participant 2A).* Many (n = 11) participants noted that the video version helped improve their confidence in cooking the recipes shown: *"I think the video improved it, like: 'oh it's not that hard. When you see something done it's like oh yeah, it's easier" (Participant 1A).*

Participants noted that cooking videos that help with visualizing the steps and presenting them sequentially (i.e., one by one) improve the understanding of the cooking instructions. Seeing the desired colors, textures, and consistencies, provides validation and removes doubts about whether the steps are followed properly. However, the recipe cards need to accompany the videos so the steps can be followed while simultaneously watching the video.

The videos ranged in length from 1 to 3 min. More than half of the participants reported preferring short videos as it helps retain their interest and attention. The appropriate video length suggestions ranged from 1 to 4 min, though some perceived videos exceeding 2 min to be too long. The length of the video initially provides a 'hook' to continue watching, but the length also provides some indication of convenience and cooking time.

> *"It was quite long [video length: 2.5 mins], compared to the Black Bean Chili [video length: 1 min]. If I saw that on Instagram or something I wouldn't have watched the whole thing, just halfway, because my attention for that [is] not that long" (Participant 3A).*

Notably, four participants said that they would be interested in watching a longer version, which is not speeded up, when they are preparing the recipe to provide them with more detailed, step-by-step instructions. Such longer videos seem to help those who are less confident cooks. *"If I'm interested to find out how to actually properly do it then I'd probably click the full thing [i.e., full video]" (Participant 7C).*

3.5.2. Video Sounds

In terms of music and voice-over for the video, none of the participants opposed the use of music, but the majority frequently commented on the appeal of (i.e., liked, or disliked) the music choice in the video, indicating its importance, especially in capturing attention and motivating them to use the recipes. Some noted that the videos would benefit from a voice-over to provide additional information (e.g., cooking tips and ingredient suggestions). Most, however, voiced that including a voice-over with music and/or text instructions would be overwhelming and deterring.

> *"I feel like if I have visual information, especially when they're labelling things as you go, and then on top of that if I also have audio cues it just becomes a bit too overwhelming. I'd like to follow one thing at a time, and if they're showing me exactly what to do and labelling it as well, having additional voice over just seems a bit too much" (Participant 2B).*

3.5.3. Filming

In terms of film angles, the birds-eye angle appealed to most as it emphasizes the food and its appearance over the person preparing it, thus overcoming the lack of the perceived appeal of vegetables and cooking, as well as increasing the perceived taste of the meal.

> *"I really like how it was zoomed in as opposed to, like, zoomed out and having a person go 'oh today I'm going to teach you this'. Like it was really focused on the food. And the first shot itself when you focus on, you know, those chickpeas, it makes you kind of hungry, makes you more interested in knowing what's to come" (Participant 2B).*

Using appropriate props, decorations, and clean working surfaces are important for the participants, providing something 'nice' to look at and, thus, increasing motivation to use the recipe. The ingredient preparation process (e.g., vegetable chopping) was deemed to be helpful, particularly for unfamiliar ingredients. Such advice helped provide confidence to those who lacked the skills to prepare vegetables.

> *"There's too much missing though, and like, where are these magical zucchini ribbons coming from? And how do you make them? The tomato's diced, it doesn't say canned, how do you make these diced tomatoes? I mean we know this but young people who are inexperienced won't" (Participant 1B).*

3.5.4. Graphics

The videos included instructions in text format, which three participants explicitly stated to be important, particularly in the absence of voice-over instructions. The text is also important as videos on social media channels, such as Facebook and Instagram, may not have the audio on and, thus, people watching the video on the bus only read the text. The text also aided the clarity of the instructions, increasing participants' perceived confidence in cooking the meal.

> *"Also, I really like how they labelled the food items as they were putting it in. I'd like to follow one thing at a time, and like if they're showing me exactly what to do and labelling it as well" (Participant 2B).*

As with the recipe card, some participants commented on the importance of the font being clear and easy to read. Six participants also reported the text speed to be important, as they were unable to read the full text sometimes due to it being too long and/or disappearing too quickly. There was a consensus that it is important to show the final product (i.e., a preprepared dish) in the beginning, and for the food itself to look appetizing, as it captures the viewers' attention and informs their decision to watch and learn the recipe.

> *"If I see delicious food that first image of the video maybe it appeals [to] me to see the video, check it out and see how can I cook it. But if the food is not delicious at the first look, I will not continue" (Participant 6A).*

The ingredients' names and quantities were shown sequentially as they were being used in the videos. Participants suggested also supplementing the video with an ingredients list at the beginning of the video. This ingredients list helped people to assess the recipe and its level of difficulty, enhancing their motivation to cook the recipe. There was a consensus about speeding up the videos, particularly the repetitive actions where real speed would be noninformative (and thus, lose viewers' interest). Again, related to the timing of the videos, participants noted the lack of time to watch videos making it important to initially capture attention. *"I quite like those videos that are quite sped up . . . because people are really impatient. . ." (Participant 1B).*

3.6. Final Recipe and Video Development

Based on the focus group results, thirteen cooking videos suitable for sharing on social media pages were produced. These final recipes (Figure 2) were developed to be simple, quick, affordable, and healthy, using readily available ingredients to address the barriers the participants reported. These aimed to include sufficient details to allow for the recipe to be replicated by watching the video alone, with the complimentary infographic made available if further details are needed. The videos were all under 2 min long and included the features described in Table 3, which were based on the findings from the focus group discussions. Many were also made suitable for breakfast and lunch, as these meals were previously noted to be more challenging for incorporating vegetables [60].

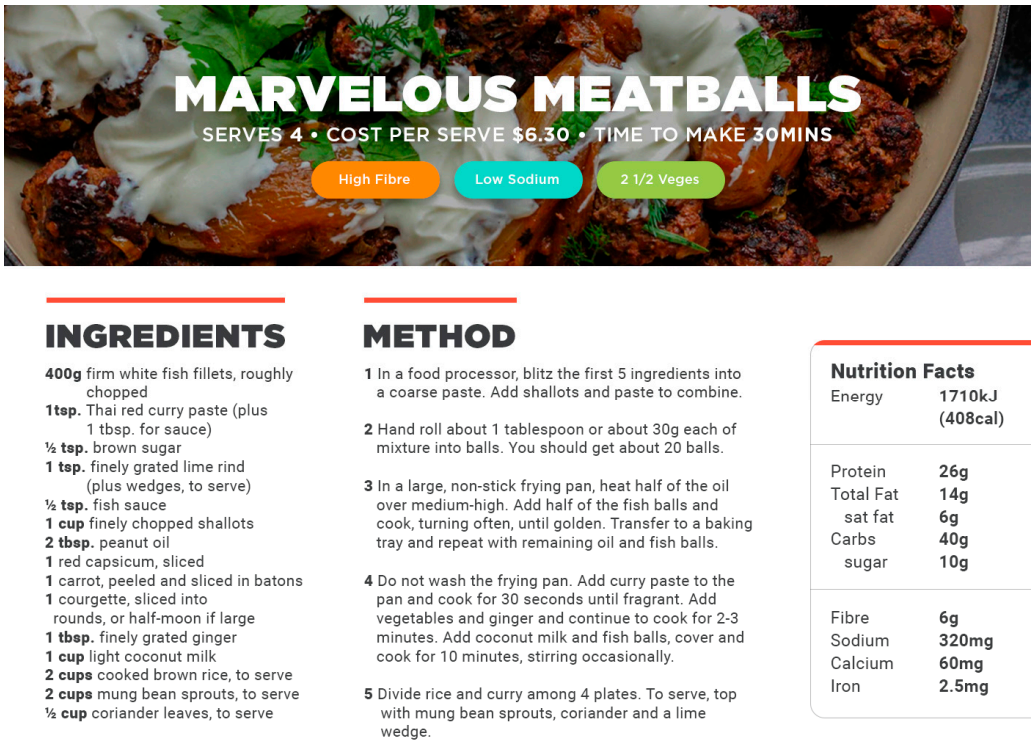


Figure 2. The final design and presentation features of the recipe cards, intended to reflect what appeals to young adults.

Table 3. The features of the videos developed to reflect what appeals to young adults.

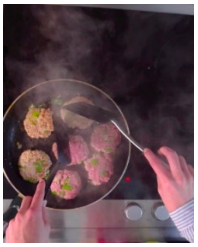
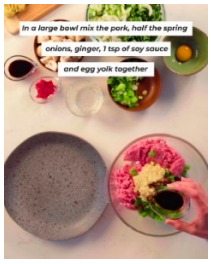
Feature	Description	Screenshot (Where Applicable)
	Filming	
Birds-eye angle	▪ The food was primarily filmed from the point of view of the person preparing it.	
Props and backgrounds	▪ Decorations and props were used to ensure that the background and food are visually appealing.	
	Graphics	
Final product shot	▪ Shown as the first shot in the video. ▪ Professional food styling was used to ensure the food is visually appealing.	

Table 3. *Cont.*

Feature	Description	Screenshot (Where Applicable)
Recipe information	▪ The number of servings, vegetable serves, preparation time, and the cost per serve were deemed important in discussions about the infographic. These were included in the video to minimize the need for the written version by those who prefer the video format.	
Ingredients list	▪ A list of all the ingredients was included prior to starting the preparation to allow the viewer to easily review them and take a screenshot of the list if needed.	
Fast speed	▪ The videos were sped up	N/A
Length	▪ All videos were under 2 min long.	N/A
Text instructions	▪ Standard font type and color were used to ensure that it is readable. ▪ Instructions were intended to be concise.	

3.7. Acceptability of Cooking Videos

Qualitative feedback on the cooking videos was organized under themes. Overall, feedback on the videos was mixed. Most participants (n = 12) appreciated the inclusion of price per serve and the omission of energy content, whilst others commented on the realistic nature of the videos and praised the 'quite normal' ingredients used compared to other cooking videos that are common across social media. Other positive feedback included the "delicious looking" food, the completeness of the information provided, and the accessibility of the recipes shown.

> *"[The price] reminds people that it's not expensive to prepare your own food. And when I see that, I'm encouraged. I think that really helps because a lot of people say that money is a barrier to eating healthy. And so, it kind of shows that can help to mitigate that barrier" [Young Adult 5].*

> *"I absolutely loved these ones. I feel like out of the three slides you have shown us, this is the one that would actually force me to take action" [Young Adult 17].*

Consensus on the length of the videos was they were slightly too long and could be trimmed to retain attention. One young woman acknowledged the saturation of similar cooking videos across social media, whilst another stated that the music used was "annoying and distracting", adding that it is "giving BuzzFeed". Participants suggested having the recipe in the caption or comments as well as the video to enhance usability, as well as having a descriptive title, such as "Food in a Minute", which flashes up at the start of the video so that viewers know what to expect. Another helpful suggestion included rewording the serving size from "serves four" to "serves up to four", to be more inclusive.

Finally, there were concerns over the Eurocentric repackaging of recipes. To combat this, participants suggested that recipes should be prepared in a culturally appropriate manner, reflective of the culture the food(s) belong to.

> *"When I was watching this video, I was laughing because I realised I lost attention to this video and that happens because there are so many cooking videos on the internet, and it only caught my interest back because of the money" [Young Adult 7].*

> *"The only thing I would say is like I wouldn't retain all of that information—I feel like, say, if it was posted to Instagram, I'd really like having the recipe and instructions in the captions or in the comments" [Young Adult 13].*

4. Discussion

Young adults have the lowest rates among adult age groups of meeting dietary guidelines [4–7]. Adhering to dietary guidelines has a minimal impact on the environment, contributes to food security, and promotes a healthy lifestyle for present and future generations [61]. Given that young adults lack culinary skills, especially knowledge of practical ways to utilize vegetables [12–14], it is important to address this issue, as dietary habits established during the formative years after leaving home often persist into adulthood [10,11]. Additional research is warranted to understand how to encourage and facilitate vegetable cooking among this demographic [13].

The objective of this study was to understand the major factors influencing the usability and desirability of written recipes and cooking videos for young adults, with specific attention on how these elements can help to overcome barriers and enhance enablers. Both the video and written recipes represent a quick, convenient, and appealing resource that can be accessed by young adults practically anywhere. We make several contributions to the education of young adults and dissemination of information in the context of vegetable preparation and cooking skills.

We demonstrate the importance of a user-centered design approach to interventions in healthy cooking behaviors, namely vegetable use. The importance of user-centered design is becoming increasingly important to create digital health interventions [62]. Utilizing user-centered design provides researchers with the ability to determine the attitudes, values, interests, and capabilities of the target audience and is more likely to provide an 'acceptable' intervention tool [62]. Using user-centered design, we were able to provide unique insights into what the target audience (young adults) desired from cooking videos and recipe cards. The cooking videos and recipe cards can be adapted to different cultural, geographic, or socioeconomic contexts by considering the specific needs, preferences, and challenges of each target group. For example, recipe content and cooking methods can be tailored to align with local dietary practices, ingredient availability, and cooking facilities. Additionally, understanding local socioeconomic constraints can guide the development of recipes that are both affordable and culturally relevant [20,24,63]. Collaboration with local food programs and community kitchens can also support practical implementation [23]. Involving individuals from different cultural backgrounds in the co-design and development process and offering recipes that are adaptable to various dietary restrictions can enhance inclusivity [64,65].

Our research provides several suggestions about the format and presentation of videos and recipe cards, as discussed in more detail below. To address the barriers and help stimulate interest (enablers) the focus group discussions provide key insights into how cooking with vegetables is experienced and how recipe cards and videos may help. Overall, we find that recipe cards and cooking videos must be easily accessible, simple, minimal, quick, and appealing, with adequate information and extra tips. They must also provide nutritional, cost, and time-saving information that appeals to young adults and aims to address their perceived barriers to cooking with vegetables. In regions with limited internet access, offline methods like printed recipes or community workshops could be more effective.

Firstly, using the COM-B framework, we demonstrate the importance of providing elements in the recipe card and video which appeal to capabilities, opportunities, and motivation. As one example, using behavioral modeling in terms of watching people cook increases self-efficacy in these learned skills and may enhance motivation to make behavioral changes [13], and is one of the 93 behavior change techniques that inform the COM-B model [39]. The visual appeal of the video, recipe card, and final meal image also enhanced the motivation to cook the meal. Overall, it is important to use behavior change models in social marketing and health interventions to enhance effectiveness, but surprisingly there is still a lack of integration, with one study finding that 89% of health interventions appear not to be based on theory [66].

Secondly, the findings show the importance of both recipe cards and videos. The videos and recipe cards have the potential for improving capability by building skills and increasing motivation through their visual appeal [13]. The participants expressed a desire for both recipe formats (i.e., written and video versions). However, the videos were said to confer several advantages over the recipe card, such as visualization [28,67], reassurance, and convenience (i.e., able to be played at a person's own pace), enabling the learning of new skills or reinforcing existing skills [28,67]. The written version remains important to participants, as other research demonstrates [28,67].

Thirdly, our findings lead to important implications for designing recipe cards. The research demonstrates the importance of simplicity and minimalism (minimal visual/written information), a clear and easy-to-read layout/text, and short length, which was associated with a simpler recipe. All of this was able to enhance motivation to try the recipe. Young adults in another study expressed a desire for a simple app interface and noted that having a lot of information could be discouraging [13], which can be explained by the concept of cognitive overload (i.e., processing too much information) [27]. The photograph of the food was also found to be of extreme importance for providing an effective attraction to try the recipe. Moreover, the information provided on the recipe card demonstrated that the young adult participants wanted to know the difficulty level, time of preparation, serving size, vegetable servings, cost, and possible ingredient substitutes [13,27]. They also wanted to know the nutritional content, focusing mainly on protein, sugar, and fat, but wanted these displayed in small text so as not to focus too much on being 'healthy' (as this was perceived to detract from its attractiveness), while calories were deemed not important [68].

Fourthly, the findings also have important implications for designing videos. The visual appearance of food is highly important and essential for attracting interest in the recipe [31]. Thus, a food styler was employed to ensure that the food items presented in the videos were appetizing. This was also reinforced by the participants, who discussed the importance of visuals to enhance motivation and capability. As found in previous research, the birds-eye angle was appealing as it focuses on the food [13]. The participants emphasized the importance of showing the food in a still-shot at the beginning of the video and in a photograph on the recipe card to capture attention and enhance its appeal. But there must be a balance between looking appetizing and appealing but not too complex, as young adults in another study preferred homemade looking dishes over gourmet ones [27]. Additionally, the participants found voice-overs (in addition to text captions and music) to be helpful [13], while only a few others found this to be overwhelming [27]. This is also explained by cognitive overload from processing multiple sensory information sources (visual, audio, and text) [27] and simple visual content can be understood without audio [69]. Speeding up the videos to keep them short (under 2 min) but with sufficient information to understand the steps was highly desirable, especially as it retained attention [35]. Videos exceeding two minutes were deemed too long by some participants, which raises a question about some studies' reference to longer videos as 'short' (e.g., 6 min) [68]. Providing too much information is unmotivating, while providing too little information will fall short of improving cooking confidence [28]. Further, there may also be a need for 'hooking' attention while individuals are scrolling through social media; thus, future research may consider the role of two videos—one for attention and one for following while cooking.

Thus, interventions must pay special attention to the visual and audio appeal of video content. Emerging technologies like mobile apps, virtual reality, and augmented reality could be integrated to create interactive and engaging learning experiences [25]. Apps can offer personalized recipe recommendations, shopping lists, and step-by-step cooking guidance [70]. Virtual reality could simulate cooking experiences for skill practice, and augmented reality could provide interactive elements in cooking, like overlaying cooking steps on real-time footage [71,72].

The final cooking videos in this study were generally well received by all participants. The price-per-serving aspect of the cooking videos was considered beneficial because it highlighted that preparing healthy meals can be cost-effective, countering the notion that healthy eating is expensive, which is a barrier to cooking with vegetables for young adults [73]. Participants commented positively on the realistic nature of the videos. They noted that the ingredients used were "quite normal," which likely made the recipes more relatable and achievable for them. The participants found the food presented in the videos to be "delicious looking," which could contribute to their motivation to try the recipes [73]. Additionally, the completeness of the information provided in the videos was appreciated, indicating that comprehensive instructions and details are crucial for user engagement [74]. Accessibility was considered to be a positive aspect of the videos. It is important for cooking resources to be accessible to a wide audience [75], and this feedback suggests that the videos achieved that goal. There was a consensus that the videos were slightly too long, and participants suggested that shorter videos would be more effective in retaining their attention. Attention span is a critical factor in online content [76], and shorter videos tend to perform better, which will be tested in future studies involving these cooking videos.

Overall, this is one of a limited number of studies that utilized user-centered design of cooking videos for saliency and relatability [13,33], and the first to directly involve the target group in the development and tailoring of the videos and recipes. Additionally, this study included many non-Caucasian participants and almost half were males, both of which groups are underrepresented in many studies in the literature [13,28,33]. That said, the sample remains small and nonrepresentative of the wider population, as it was obtained using convenience sampling from one university in an urban area of New Zealand. As such, the findings are not generalizable. It might also be worthwhile to further subdivide this age group, as the opposite ends of this age range (i.e., 18–30) might have distinctive experiences (e.g., starting university compared to starting families). To include a more diverse and representative sample in future research, researchers could use stratified sampling methods to ensure the inclusion of various demographic groups [77]. Outreach should be extended beyond university settings to include young adults in different living situations, such as those in the workforce, vocational training, or in different geographic locations. Collaborations with community organizations could also aid in reaching a more diverse audience. While there is evidence for positive improvements in the motivation and confidence in one's cooking skills [13,28], it is possible that when it comes to actual cooking skills, videos might be less effective than hands-on and interactive cooking classes [34].

Future studies could employ longitudinal research designs to assess the long-term impact of these educational tools on young adults' dietary habits and cooking skills. Surveys, interviews, and focus groups conducted over extended periods would provide insights into behavioral changes and skill retention [67]. Additionally, digital tracking tools, such as apps that monitor cooking frequency and dietary choices, could offer quantitative data on long-term habits. Comparing the effectiveness of new age methods (like digital recipe cards and videos) with traditional methods (like in-person cooking classes and printed cookbooks) could assess different learning styles and preferences [31,78]. Digital tools offer convenience and accessibility, appealing to tech-savvy young adults, whereas traditional methods might be more effective for hands-on learning and personal interaction [28,31,33,78]. Future studies could compare learning outcomes, engagement levels, and skill retention between these methods. Other behavior change techniques, like goal setting, self-monitoring, social support networks, and gamification could be effective in promoting

vegetable-centric cooking [39,79]. Programs that include challenges, rewards, and community support can increase motivation and adherence to healthier cooking practices [24]. Nutritional education can be effectively integrated by providing clear, concise information in an engaging format. This could include highlighting nutritional benefits in recipes, using infographics, and incorporating brief educational segments into cooking videos. Interactive quizzes and challenges in apps could also reinforce learning [25]. Implementing feedback mechanisms like user surveys, comment sections in digital platforms, and focus groups can help to continually adapt and improve cooking resources. Additionally, analyzing user engagement data from websites and apps can provide insights into preferences and areas for improvement [80]. Thus, future research is needed to further explore the relative effectiveness of different types of cooking with vegetables education, as well as to examine the effectiveness of the videos and recipe cards designed in our study.

5. Conclusions

The findings presented in this research may serve as a guide for other researchers, public health professionals and marketers to design and pilot-test video-based nutrition education and identify whether videos and recipe cards lead to improvements in attitudes and motivation which translate to changes in intake. It identified barriers such as lack of cooking skills, time constraints, and perceived cost, while enablers included the desire for health benefits, environmental consciousness, and the appeal of quick, easy-to-prepare meals. Participants made several suggestions to enhance the usability of the videos, for example including the recipe in the caption or comments for easy reference, using descriptive titles to set expectations, and rewording serving size descriptions to be more inclusive. These suggestions included having the recipe in the caption or comments for easy reference, using descriptive titles to set expectations, and rewording serving size descriptions to be more inclusive. The study suggests that young adults are particularly drawn to recipe formats that are simple, visually appealing, and incorporate familiar ingredients. These recipes should address the identified barriers by being straightforward, budget-friendly, and time-efficient. Additionally, they should be engaging, incorporating elements like step-by-step visuals and relatable content that resonates with the young adult audience. The cooking videos and recipe cards resulting from this study will be tested as part of participatory co-design research with a more diverse sample of young adults. They will also be posted on social media platforms to see if they are well received using social media engagement metrics and whether they are an effective medium for reducing perceptions of barriers around cooking with vegetables. To evaluate the acceptability of these cooking videos, methods such as user feedback surveys, focus groups, and engagement metrics on digital platforms will be employed, providing insights into how well these resources meet the needs and preferences of young adults and motivate them to incorporate more vegetables into their cooking.

Author Contributions: Conceptualization, R.R. and J.A.K.; methodology, R.R. and J.A.K.; formal analysis, A.A.; writing—original draft preparation, A.A.; writing—review and editing, R.R., J.A.K. and J.M.; supervision, R.R. All authors have read and agreed to the published version of the manuscript.

Funding: This research was funded by the University of Auckland, Food and Health Programme Seed Funding 2019, grant number A8AN 48422.

Institutional Review Board Statement: The study was conducted in accordance with the Declaration of Helsinki and approved by the University of Auckland Ethics Committee (approval number 022980; 16-May-2019).

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The data presented in this study are available on request from the corresponding author. The data are not publicly available for privacy reasons.

Conflicts of Interest: The authors declare no conflicts of interest.

References

1. Hartley, L.; Igbinedion, E.; Holmes, J.; Flowers, N.; Thorogood, M.; Clarke, A.; Stranges, S.; Hooper, L.; Rees, K. Increased consumption of fruit and vegetables for the primary prevention of cardiovascular diseases. *Cochrane Database Syst. Rev.* **2013**, *6*, CD009874.
2. Mytton, O.T.; Nnoaham, K.; Eyles, H.; Scarborough, P.; Ni Mhurchu, C. Systematic review and meta-analysis of the effect of increased vegetable and fruit consumption on body weight and energy intake. *BMC Public Health* **2014**, *14*, 886. [CrossRef] [PubMed]
3. Reynolds, C.J.; Buckley, J.D.; Weinstein, P.; Boland, J. Are the dietary guidelines for meat, fat, fruit and vegetable consumption appropriate for environmental sustainability? A review of the literature. *Nutrients* **2014**, *6*, 2251–2265. [CrossRef] [PubMed]
4. Ministry of Health. *Annual Data Explorer 2020/21*; New Zealand Health Survey; Ministry of Health: Wellington, New Zealand, 2021.
5. Australian Bureau of Statistics. *Australian Health Survey: Nutrition First Results—Food and Nutrients 2011–12*; 4364.0.55.007; Australian Bureau of Statistics: Canberra, Australia, 2014.
6. Mak, T.N.; Prynne, C.J.; Cole, D.; Fitt, E.; Roberts, C.; Bates, B.; Stephen, A.M. Assessing eating context and fruit and vegetable consumption in children: New methods using food diaries in the UK National Diet and Nutrition Survey Rolling Programme. *Int. J. Behav. Nutr. Phys. Act.* **2012**, *9*, 1–15. [CrossRef]
7. Centers for Disease Control Prevention. *Fruit and Vegetable Consumption among Adults—United States, 2005*; Centers for Disease Control Prevention: Atlanta, GA, USA, 2007; pp. 213–217.
8. Theodore, R.; McLean, R.; TeMorenga, L. Challenges to addressing obesity for Māori in Aotearoa/New Zealand. *Aust. New Zealand J. Public Health* **2015**, *39*, 509–512. [CrossRef] [PubMed]
9. Ministry of Health. *Annual Data Explorer 2018/19: New Zealand Health Survey*; Ministry of Health: Wellington, New Zealand, 2019.
10. Larson, N.I.; Neumark-Sztainer, D.R.; Harnack, L.J.; Wall, M.M.; Story, M.T.; Eisenberg, M.E. Fruit and vegetable intake correlates during the transition to young adulthood. *Am. J. Prev. Med.* **2008**, *35*, 33–37. [CrossRef]
11. Riddell, L.J.; Ang, B.; Keast, R.S.; Hunter, W. Impact of living arrangements and nationality on food habits and nutrient intakes in young adults. *Appetite* **2011**, *56*, 726–731. [CrossRef]
12. Pelletier, J.E.; Laska, M.N. Balancing Healthy Meals and Busy Lives: Associations between Work, School, and Family Responsibilities and Perceived Time Constraints among Young Adults. *J. Nutr. Educ. Behav.* **2012**, *44*, 481–489. [CrossRef]
13. Nour, M.; Cheng, Z.G.; Farrow, J.L.; Allman-Farinelli, M. Short videos addressing barriers to cooking with vegetables in young adults: Pilot testing. *J. Am. Coll. Nutr.* **2018**, *37*, 724–730. [CrossRef]
14. Larson, N.I.; Perry, C.L.; Story, M.; Neumark-Sztainer, D. Food Preparation by Young Adults Is Associated with Better Diet Quality. *J. Am. Diet. Assoc.* **2006**, *106*, 2001–2007. [CrossRef]
15. Larson, N.; Laska, M.N.; Story, M.; Neumark-Sztainer, D. Predictors of Fruit and Vegetable Intake in Young Adulthood. *J. Acad. Nutr. Diet.* **2012**, *112*, 1216–1222. [CrossRef] [PubMed]
16. Hartman, H.; Wadsworth, D.P.; Penny, S.; van Assema, P.; Page, R. Psychosocial determinants of fruit and vegetable consumption among students in a New Zealand university. Results of focus group interviews. *Appetite* **2013**, *65*, 35–42. [CrossRef] [PubMed]
17. Graham, D.J.; Pelletier, J.E.; Neumark-Sztainer, D.; Lust, K.; Laska, M.N. Perceived social-ecological factors associated with fruit and vegetable purchasing, preparation, and consumption among young adults. *J. Acad. Nutr. Diet.* **2013**, *113*, 1366–1374. [CrossRef] [PubMed]
18. Ha, E.-J.; Caine-Bish, N. Effect of Nutrition Intervention Using a General Nutrition Course for Promoting Fruit and Vegetable Consumption among College Students. *J. Nutr. Educ. Behav.* **2009**, *41*, 103–109. [CrossRef] [PubMed]
19. Herbert, G.; Butler, L.; Kennedy, O.; Lobb, A. Young UK adults and the 5 A DAY campaign: Perceived benefits and barriers of eating more fruits and vegetables. *Int. J. Consum. Stud.* **2010**, *34*, 657–664. [CrossRef]
20. de Borba, T.P.; da Silva, M.V.; Jomori, M.M.; Bernardo, G.L.; Fernandes, A.C.; Proença, R.P.D.C.; Rockenbach, G.; Uggioni, P.L. Self-efficacy in cooking and consuming fruits and vegetables among Brazilian university students: The relationship with sociodemographic characteristics. *Br. Food J.* **2021**, *123*, 2049–2065. [CrossRef]
21. Menozzi, D.; Sogari, G.; Mora, C. Understanding and modelling vegetables consumption among young adults. *LWT Food Sci. Technol.* **2017**, *85*, 327–333. [CrossRef]
22. Hartmann, C.; Dohle, S.; Siegrist, M. Importance of cooking skills for balanced food choices. *Appetite* **2013**, *65*, 125–131. [CrossRef]
23. Bernardo, G.L.; Jomori, M.M.; Fernandes, A.C.; Colussi, C.F.; Condrasky, M.D.; Proença, R.P.D.C. Nutrition and Culinary in the Kitchen Program: A randomized controlled intervention to promote cooking skills and healthy eating in university students–study protocol. *Nutr. J.* **2017**, *16*, 83. [CrossRef]
24. Garcia, T.; Ford, B.; Pike, D.; Bryce, R.; Richardson, C.; Wolfson, J.A. Development and implementation of a community health centre-based cooking skills intervention in Detroit, MI. *Public Health Nutr.* **2021**, *24*, 549–560. [CrossRef]
25. Nour, M.M.; Rouf, A.S.; Allman-Farinelli, M.J.A. Exploring young adult perspectives on the use of gamification and social media in a smartphone platform for improving vegetable intake. *Appetite* **2018**, *120*, 547–556. [CrossRef] [PubMed]
26. Murray, D.W.; Mahadevan, M.; Gatto, K.; O'Connor, K.; Fissinger, A.; Bailey, D.; Cassara, E. Culinary efficacy: An exploratory study of skills, confidence, and healthy cooking competencies among university students. *Perspect. Public Health* **2016**, *136*, 143–151. [CrossRef] [PubMed]
27. Bramston, V.; Rouf, A.; Allman-Farinelli, M.J.N. The development of cooking videos to encourage calcium intake in young adults. *Nutrients* **2020**, *12*, 1236. [CrossRef] [PubMed]

28. Surgenor, D.; Hollywood, L.; Furey, S.; Lavelle, F.; McGowan, L.; Spence, M.; Raats, M.; McCloat, A.; Mooney, E. The impact of video technology on learning: A cooking skills experiment. *Appetite* **2017**, *114*, 306–312. [CrossRef] [PubMed]
29. Buykx, L.J.S.I. *Interactive Cookbooks: How Recipe Format Affects the Cooking Experience*; University of York: Heslington, UK, 2011; p. 35.
30. Buykx, L.; Petrie, H. What cooks needs from multimedia and textually enhanced recipes. In Proceedings of the 2011 IEEE International Symposium on Multimedia, Dana Point, CA, USA, 5–7 December 2011.
31. Mechling, L.C.; Stephens, E.J.E. Comparison of self-prompting of cooking skills via picture-based cookbooks and video recipes. *Educ. Train. Dev. Disabil.* **2009**, *44*, 218–236.
32. Danforth, S.K.; Schumacher, J.R.; Cullen, R.W.; Ma, Y.J. Evaluation of format preference and effectiveness of vodcasts for recipedemonstrations and nutrition education. *Nutr. Diet. Suppl.* **2014**, *6*, 85–91.
33. Surgenor, D.; McLaughlin, C.; McMahon-Beattie, U.; Burns, A. The use of video to maximise cooking skills. *Br. Food J.* **2021**, *123*, 3918–3937. [CrossRef]
34. Schaeffer, L.; Warren, J. Will Culinary Videos Increase Dietetic Students' Culinary Skills and Food Knowledge? *J. Fam. Consum. Sci. Educ.* **2013**, *31*, 50–61.
35. Kaesberg, Z. Effects of video technology on cooking self-efficacy of college students. *J. Am. Coll. Health* **2023**, *71*, 2562–2568. [CrossRef]
36. Ngqangashe, Y.; De Backer, C.J. The differential effects of viewing short-form online culinary videos of fruits and vegetables versus sweet snacks on adolescents' appetites. *Appetite* **2021**, *166*, 105436. [CrossRef]
37. Liu, E.; Stephenson, T.; Houlihan, J.; Gustafson, A. Peer Reviewed: Marketing Strategies to Encourage Rural Residents of High-Obesity Counties to Buy Fruits and Vegetables in Grocery Stores. *Prev. Chronic Dis.* **2017**, *14*, E94. [CrossRef] [PubMed]
38. Preuhs, K.; van Keulen, H.; Andree, R.; Wins, S.; van Empelen, P.A. Tailored Web-Based Video Intervention (ParentCoach) to Support Parents with Children With Sleeping Problems: User-Centered Design Approach. *JMIR Form. Res.* **2022**, *6*, e33416. [CrossRef]
39. Michie, S.; van Stralen, M.M.; West, R. The behaviour change wheel: A new method for characterising and designing behaviour change interventions. *Implement. Sci.* **2011**, *6*, 42. [CrossRef]
40. Monk, A. User-centred design. In *International Conference on Home-Oriented Informatics and Telematics*; Springer: Berlin/Heidelberg, Germany, 2000.
41. Biediger-Friedman, L.; Crixell, S.H.; Silva, M.; Markides, B.R.; Smith, K.S. User-centered design of a Texas WIC app: A focus group investigation. *Am. J. Health Behav.* **2016**, *40*, 461–471. [CrossRef] [PubMed]
42. Pope, A.R. *Open Technical Writing: An Open-Access Text for Instruction in Technical and Professional Writing*; University of Arkansas: Fayetteville, AR, USA, 2019.
43. Lyon, A.R.; Koerner, K. User-centered design for psychosocial intervention development and implementation. *Clin. Psychol. Sci. Pract.* **2016**, *23*, 180. [CrossRef]
44. Ministry of Health. *Eating and Activity Guidelines for New Zealand Adults*; Ministry of Health: Wellington, New Zealand, 2015.
45. Xyris. *FoodWorks 10 Professional*; Xyris: Brisbane, QLD, Australia, 2019.
46. Sungur, H.; Yılmaz, N.G.; Chan, B.M.C.; van den Muijsenbergh, M.E.; van Weert, J.C.; Schouten, B.C. Development and Evaluation of a Digital Intervention for Fulfilling the Needs of Older Migrant Patients with Cancer: User-Centered Design Approach. *J. Med. Internet Res.* **2020**, *22*, e21238. [CrossRef] [PubMed]
47. Friedman, L.B.; Silva, M.; Smith, K. A focus group study observing maternal intention to use a WIC education app. *Am. J. Health Behav.* **2018**, *42*, 110–123. [CrossRef]
48. Kitzinger, J. Focus group research: Using group dynamics. *Qual. Res. Health Care* **2005**, *56*, 70.
49. Barton, K.C. Elicitation techniques: Getting people to talk about ideas they don't usually talk about. *Theory Res. Soc. Educ.* **2015**, *43*, 179–205. [CrossRef]
50. Banks, M.; Zeitlyn, D. *Visual Methods in Social Research*; Sage: New York, NY, USA, 2015.
51. Crilly, N.; Blackwell, A.F.; Clarkson, P.J. Graphic elicitation: Using research diagrams as interview stimuli. *Qual. Res.* **2006**, *6*, 341–366. [CrossRef]
52. Jones, S.A.; Walter, J.; Soliah, L.; Phifer, J.T. Perceived motivators to home food preparation: Focus group findings. *J. Acad. Nutr. Diet.* **2014**, *114*, 1552–1556. [CrossRef]
53. Guest, G.; Bunce, A.; Johnson, L. How many interviews are enough? An experiment with data saturation and variability. *Field Methods* **2006**, *18*, 59–82. [CrossRef]
54. Saunders, B.; Sim, J.; Kingstone, T.; Baker, S.; Waterfield, J.; Bartlam, B.; Burroughs, H.; Jinks, C. Saturation in qualitative research: Exploring its conceptualization and operationalization. *Qual. Quant.* **2018**, *52*, 1893–1907. [CrossRef] [PubMed]
55. Braun, V.; Clarke, V. Using thematic analysis in psychology. *Qual. Res. Psychol.* **2006**, *3*, 77–101. [CrossRef]
56. Fereday, J.; Muir-Cochrane, E. Demonstrating rigor using thematic analysis: A hybrid approach of inductive and deductive coding and theme development. *Int. J. Qual. Methods* **2006**, *5*, 80–92. [CrossRef]
57. Brooks, J.; McCluskey, S.; Turley, E.; King, N. The utility of template analysis in qualitative psychology research. *Qual. Res. Psychol.* **2015**, *12*, 202–222. [CrossRef] [PubMed]
58. King, N. Doing template analysis. *Qual. Organ. Res. Core Methods Curr. Chall.* **2012**, *426*, 9781526435620.
59. Creswell, J.W.; Miller, D.L. Determining validity in qualitative inquiry. *Theory Pract.* **2000**, *39*, 124–130. [CrossRef]

60. Livingstone, K.M.; Burton, M.; Brown, A.K.; McNaughton, S.A. Exploring barriers to meeting recommendations for fruit and vegetable intake among adults in regional areas: A mixed-methods analysis of variations across socio-demographics. *Appetite* **2020**, *153*, 104750. [CrossRef]
61. Larson, N.; Laska, M.N.; Neumark-Sztainer, D. Do young adults value sustainable diet practices? Continuity in values from adolescence to adulthood and linkages to dietary behaviour. *Public Health Nutr.* **2019**, *22*, 2598–2608. [CrossRef]
62. Farao, J.; Malila, B.; Conrad, N.; Mutsvangwa, T.; Rangaka, M.X.; Douglas, T.S. A user-centred design framework for mHealth. *PLoS ONE* **2020**, *15*, e0237910. [CrossRef] [PubMed]
63. Gatley, A.; Caraher, M.; Lang, T. A qualitative, cross cultural examination of attitudes and behaviour in relation to cooking habits in France and Britain. *Appetite* **2014**, *75*, 71–81. [CrossRef] [PubMed]
64. Jenkins, E.L.; Brennan, L.; Jackson, M.; McCaffrey, T.A. Re-Licious: Co-Design with Adolescents to Turn Leftovers into Delicious and Healthy Meals—A School-Based Pilot Intervention. *Int. J. Environ. Res. Public Health* **2023**, *20*, 6544. [CrossRef] [PubMed]
65. Malloy, J.; Partridge, S.R.; Kemper, J.A.; Braakhuis, A.; Roy, R. Co-design of digital health interventions with young people: A scoping review. *Digit. Health* **2023**, *9*, 20552076231219117. [CrossRef] [PubMed]
66. Prestwich, A.; Webb, T.L.; Conner, M. Using theory to develop and test interventions to promote changes in health behaviour: Evidence, issues, and recommendations. *Curr. Opin. Psychol.* **2015**, *5*, 1–5. [CrossRef]
67. Lavelle, F.; McGowan, L.; Hollywood, L.; Surgenor, D.; McCloat, A.; Mooney, E.; Caraher, M.; Raats, M.; Dean, M. The development and validation of measures to assess cooking skills and food skills. *Int. J. Behav. Nutr. Phys. Act.* **2017**, *14*, 1–13. [CrossRef] [PubMed]
68. Adam, M.; Young-Wolff, K.C.; Konar, E.; Winkleby, M. Massive open online nutrition and cooking course for improved eating behaviors and meal composition. *J. Behav. Nutr. Phys. Act.* **2015**, *12*, 118. [CrossRef]
69. Miura, K.; Hamada, R.; Ide, I.; Sakai, S.; Tanaka, H. Motion based automatic abstraction of cooking videos. In Proceedings of the ACM Multimedia 2002 Workshop on Multimedia Information Retrieval, Juan les Pins, France, 1–6 December 2002.
70. Mauch, C.E.; Wycherley, T.P.; Laws, R.A.; Johnson, B.J.; Bell, L.K.; Golley, R.K. Mobile apps to support healthy family food provision: Systematic assessment of popular, commercially available apps. *JMIR Mhealth Uhealth* **2018**, *6*, e11867. [CrossRef]
71. Chicchi Giglioli, I.A.; Bermejo Vidal, C.; Alcañiz Raya, M. A virtual versus an augmented reality cooking task based-tools: A behavioral and physiological study on the assessment of executive functions. *Front. Psychol.* **2019**, *10*, 2529. [CrossRef]
72. Majil, I.; Yang, M.-T.; Yang, S. Augmented reality based interactive cooking guide. *Sensors* **2022**, *22*, 8290. [CrossRef]
73. Munt, A.; Partridge, S.; Allman-Farinelli, M. The barriers and enablers of healthy eating among young adults: A missing piece of the obesity puzzle: A scoping review. *Obes. Rev.* **2017**, *18*, 1–17. [CrossRef]
74. Dobrian, F.; Sekar, V.; Awan, A.; Stoica, I.; Joseph, D.; Ganjam, A.; Zhan, J.; Zhang, H. Understanding the impact of video quality on user engagement. *ACM SIGCOMM Comput. Commun. Rev.* **2011**, *41*, 362–373. [CrossRef]
75. Terrenghi, L.; Hilliges, O.; Butz, A. Kitchen stories: Sharing recipes with the Living Cookbook. *Pers. Ubiquitous Comput.* **2007**, *11*, 409–414. [CrossRef]
76. Subramanian, K. Product promotion in an era of shrinking attention span. *Int. J. Eng. Manag. Res.* **2017**, *7*, 85–91.
77. Robinson, O.C. Sampling in interview-based qualitative research: A theoretical and practical guide. *Qual. Res. Psychol.* **2014**, *11*, 25–41. [CrossRef]
78. Levy, J.; Auld, G. Cooking Classes Outperform Cooking Demonstrations for College Sophomores. *J. Nutr. Educ. Behav.* **2004**, *36*, 197–203. [CrossRef]
79. Michie, S.; Richardson, M.; Johnston, M.; Abraham, C.; Francis, J.; Hardeman, W.; Eccles, M.P.; Cane, J.; Wood, C.E. The behavior change technique taxonomy (v1) of 93 hierarchically clustered techniques: Building an international consensus for the reporting of behavior change interventions. *Ann. Behav. Med.* **2013**, *46*, 81–95. [CrossRef]
80. Roy, R.; Malloy, J. *Evolving Role of Social Media in Health Promotion, in Health Promotion-Principles and Approaches*; IntechOpen: London, UK, 2023.