The feasibility and preliminary effectiveness of Plate it Up®: the family focused food literacy intervention for children (8 -12 years) and their parent living in regional Victoria, Australia.

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Bachelor of Human Nutrition

Thesis submitted for the fulfilment of the requirements for the degree of

Master of Research

Victoria University, Australia

Institute for Health and Sport

January 2025

Abstract

Background: The globalization of food systems and food corporations' marketing strategies have led to an unprecedented availability of foods that are ultra-processed. The shift in the food systems and the impact of the social determinants of health has also led to the inadequate intake of fruits, and vegetables. Lifelong dietary intake that consists of predominantly processed foods has health consequences in the form of a higher risk of dietary-related chronic disease. Food behaviours and dietary intake patterns are established in childhood and continue into adulthood. Improving parent's and children's food literacy knowledge and skills is essential for dietary resilience to navigate complex food systems. Adequate levels of food knowledge, skills and behaviours support a holistic approach to food useful for navigating complex food systems. Food Literacy interventions that comprise the domains of: '*Plan & Manage'*, '*Select'*, *'Prepare'* and '*Eat*' are increasingly being developed and delivered. Community-based interventions provide positive outcomes that improve participants' food literacy, knowledge, skills and dietary intake. This thesis describes the development, feasibility and preliminary evaluation of a family-focused food literacy intervention. Delivered over four sessions, Plate it Up® educates children aged (8- 12 years) and their parent nutrition and food literacy. This thesis additionally investigates participants' barriers and enablers when applying food literacy education to select and eat nutritious food choices one month following the intervention. **Methods:** A mixed-method exploratory triangulation approach to the evaluation was conducted at three time points; baseline, post-intervention, and one-month follow-up. Feasibility and acceptability of the intervention were assessed by reported acceptability and satisfaction. Baseline, post and follow up questionnaires evaluate the interventions outcome in terms of participants' knowledge and skills in food literacy and eating behaviours, using online questionnaires and in-person sorting tasks. Parent and child dyad interviews further explored participants' views of the intervention and participants barriers and enablers when wanting to select and eat nutritious foods. **Results:** All eight participants completed all sessions of Plate it Up®. Acceptability and satisfaction outcomes suggest that parents and children received the intervention well. The largest change in food literacy skills was observed in the food literacy domain '*Prepare'*, while small improvements in the domains '*Select'* and *'Eat*' were observed. Preliminary outcomes from baseline and post-intervention sorting tasks indicate that

children had increased nutrition knowledge and an increased ability to identify healthier food and drink options. Interviews suggest that the marketing and sale of ultra-processed foods are prevalent in areas where families shop and play community sport. **Conclusions:** This novel food literacy intervention has been well received by families. There was rise in participants cooking confidence and children's interest in cooking, indicating that food literacy skills in children can be developed through practical cooking. Despite improvements in participants food literacy the commercial and financial determinants of health continue to affect participants food choice. The Plate it Up® intervention has the potential to create a more mindful approach to food literacy behaviours in larger cohorts of parents and children.

Student Declaration

I, Narelle Bickford, declare that the Master of Research thesis entitled 'The feasibility and preliminary effectiveness of Plate it Up®: the family focused food literacy intervention for children (8 -12 years) and their parent living in central Victoria, Australia' is no more than 50,000 words in length including quotes and exclusive of tables, figures, appendices, bibliography, references and footnotes. This thesis contains no material that has been submitted previously, in whole or in part, for the award of any other academic degree or diploma. Except where otherwise indicated, this thesis is my own work.

I have conducted my research in alignment with the Australian Code for the Responsible Conduct of Research and Victoria University's Higher Degree by Research Policy and Procedures.

Signature: ***N. Bickford*** **Date: 22.1.2025**

Ethics Declaration

All research procedures reported in the thesis were approved by the Victoria University Human Ethics Committee HRE23-022.

Signature: ***N. Bickford*** **Date: 22.1.2025**

Acknowledgements

I have had the privilege to work with an amazing team. I would like to express my gratitude to my supervisors who have supported and encouraged me throughout the Master of Research degree and while writing this thesis. Firstly, to my principal supervisor Associate Professor Helen McCarthy. Who has provided constant guidance and unwavering support who never doubted my abilities. I always wanted this work done right at its beginning and your guidance in research has enabled me to begin to achieve this goal. I also want to thank her for sharing here expertise in academic writing, evaluation, volunteering and working within the wider community setting and guidance in working with children and parents together.

Thank you to my associate supervisors, Imogen Rehm and Sarah Dash. Dr Imogen Rehm has provided invaluable knowledge, guidance in academic writing and reframing my language for positive eating behaviours. I also want to thank her for her patience as I grasped a greater understanding of thematic analysis and writing a thesis. I am very fortunate to have had the opportunity to learn from her. Dr Sarah Dash, as my former associate supervisor, helped guided me in development the of sorting task and its positive food inspired categories. I want to thank Sarah for introducing me to BCTS in evaluation and writing a protocol in academia. Her support, advice and her guidance has given me the opportunity to develop my writing in academia, something I never thought was achievable for me.

I say thank you to the participants themselves. I want to express my gratitude to the committee from the White Hills Junior Football Club for their support, particularly Andrew Millar. Thankyou you my supporting chef Deanna Reale. I would like to thank Erynn Trewartha - Lewicki, for her encouragement and for providing her exceptional skills in designing the food inspired artwork, the logo for Plate it Up® and guidance in the recipe templates. Thank you to Claire Hull, for her encouragement and for providing her skills in photography for the recipes, questionnaires and sorting task images. I also wish to say thank you to the recipe hand models Maxwell, Tilly and Marshall.

Thank you to the team Refugee Settlement Services and the Refugee and Cultural diversity teams from Bendigo Community Health Services (BCHS). I also want to say a particular thank you to Boo Htoo for donating her time to create and translate the very

popular Chicken and vegetable stir fry recipe. I also wish to say thank you to Michelle Murphy and Bridget Bentley from Bendigo Foodshare, and in particular Eh Thout for providing her time during facilitation of the intervention to chat about the work food relief agencies do in central Victoria.

I would like to thank my fellow board members of Plate it Up® Food Literacy Ltd. for keeping me focused while writing this thesis.

Finally, my deepest gratitude is for my friends, family and extended members from the Baker and the Bickford families. Thank you to my close group of friends Lynne, Hot One (Kylie), Donna, Annete and Leeanne. Thank you to my husband Pete, our three sons Caleb, Riley and Cody and their partners, Emm and Lauren. Without your support, patience and encouragement, I would not have completed this degree.

List of Abbreviations

ADGL, Australian Dietary Guidelines

AIHW, Australian Institute of Health and Welfare

BCHS, Bendigo Health Services

BCT, Behaviour Change Techniques

FEAST, Food Education and Skills Training

NCDs, Non-communicable diseases

NEST, Nutrition Education Skills Training

Plate model, The Australian Guide to Healthy Eating

SAKGF, Stephanie Alexander Kitchen Garden Foundation

SCT, Social Cognitive theory

UPFDs, Ultra processed foods and drinks

WHJFC, White Hills Junior Football Club

WHO, World Health Organisation

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1.1 Chapter overview

This chapter describes the change from a localised food system to one that is more globalized in nature. It introduces the domains and components of food literacy and considers how the determinants of health and food marketing can influence a family's lifestyle and food choices. This chapter summarises the literature on the benefits of food literacy interventions and food appreciation programs in Australia. Food literacy competencies in children and the future work required to increase children foundations in food literacy is presented.

1.2 Introduction

Family food behaviours are formed through experiences and interactions with social, environmental and economic factors, commonly referred to as the determinants to health [1, 2]. These complex factors can impact a family's ability to choose and prepare meals that beneficial to their health [1, 3-5]. The food industry marketing practices, an individual's financial capacity, their daily time constraints, often make the forward planning of healthy food provisioning difficult to achieve in a family environment [6].

A child's food-related experiences and subsequent behaviours can be continued into adult hood [7-9]. A child's food experiences and developing foundations in food literacy skills are intrinsically influenced by the marketing practices of the food industry, their dependency and the parenting style of their caregiver, parents or grandparents [7, 8, 10]. The family system that surrounds a child as they grow establishes food behaviours that can be lifelong [3, 10]. A familys' interaction with food and the food system and life experinces influcened by the determinants of health can lead to disengagement with the modern food system and poor health outcomes over time [3, 11, 12].

Positive parental food role modelling has the potential to be achieved by increasing parental food literacy knowledge and skills [4, 9]. Food literacy promotes health through

a food context [13]. The term food literacy can be defined as the ability of an individual to have positive food choices and a confidence to navigate food systems [14, 15]. Influenced by complex interactions with family, culture and the determinants of health, adequate levels of food literacy can improve an individuals' personal health and their impact upon planetary health through sustainable food waste practices [15, 16]. The Australian food literacy framework can increase individuals knowledge, skills and abilities around food choice and its safe preparation [15]. Food literacy interventions that are based upon the domains of '*Plan and Manage*', *'Select'*, '*Prepare'* and *'Eat*', together with their corresponding components, [15] are showing they can positively increase an individual's food literacy abilities across the life span [4, 11, 17-19]. A food literate parent has adequate knowledge of their food in terms of its origin, processing and have the ability to guide their child to choose and eat healthful food, as well as disposing of food waste in a sustainable way [16, 20, 21]. As the modern food system increases family members exposure to discretionary foods and drinks, a food literate parent has the autonomy to make feasible health related food choices and a confidence to prepare food safely for themselves and for their child [4, 5, 9]. This literature review will discuss food literacy within an Australian context, and the intersection with the determinants of health, health literacy and food insecurity. It will explore the literature in relation to food literacy and culinary intervention approaches and their impacts upon adults and children.

1.3 Australia's shift to a global food system and the subsequent impact on family food behaviours

A traditional food system was a localised system which delivered food from the farm to the plate and its path was widely understood [14]. The traditional food systems provided community residents the ability to access fresh and nutritionally adequate food that was locally grown and cooked from scratch at home [14]. Traditional food systems produced foods that had limited need for food preservation due to shorter travel distance to reach residents [22, 23]. Over the last 30 years, a rapid globalisation and greater demand for diverse food products, has led to a shift from the localised food system to a food system that is more globalised [22, 23]. Many foods and food products have become commodities

that are traded on the global market [23]. The advances in food production technologies, transportation and marketing strategies are innately linked to a shift in food systems [24-26]. Globalised food systems are considered a major influence on food-related disease, with production and marketing of discretionary foods which are cheap and easy to access [22, 23, 27-29]. Concurrent to increased production of food that is cheap and easier to access, the marketing of these products has increased, leading to the unprecedented availability of ultra processed food and drink (UPFDs) products in retail environments and the creation of food deserts [7, 29, 30].

Food deserts, are regions that have disproportionately higher amounts of food retail outlets that sell more UPFDs compared to outlets that sell food that is less processed and more nutritious to eat [29]. Food deserts, food and diet quality and socio demographic characteristics are linked to increased risk of non-communicable diseases (NCD) such as obesity, cardiovascular disease and Type 2 Diabetes [10, 18, 29]. Overtime, there has been increased acceptance of UPFDs that include readymade meals, takeaway food and sugary drinks, all of which are typically high in added fat, sugar and salt, and generally low in dietary fibre [7, 26, 29]. UPFDs often have a long shelf life, which are marketed as quick and easy food options with promotion that they are cheap to buy and appealing to eat [3, 24, 26].

Family meals involve individual interactions with other family members, delegation of household tasks and an opportunity for parents to share their values their values on food and eating with their children [10]. Different parenting styles and the determinants of health influence the quantity of food brought into the family home [10, 31]. Regular family meals are associated with improved diet quality and less risk of NCDs [4, 5, 10]. Energy and nutrient intake at family meals depends upon the type of food served which may contradict the nutritional benefits that is associated with home cooked meals [10, 32, 33]. Parents of today are spending more time in paid employment and more time organising their children's co-curricular activities, leaving less time to prepare family meals from scratch [1, 4, 5, 8, 20]. Over the past decade, the preparation of traditional home cooked meal has shifted towards the 'normalised' preference for ready-made or pre-prepared meals [1, 6, 7, 26]. Children's food preference is often a determinant to the family food choice and a healthful diet, with preference for pre-prepared meals and snacks fuelled by marketing and social norms [10]. The literature suggests that children who participate in fewer family

meals and are less involved in meal preparation may have a higher risk of NCDs and the less ability and interest in food preparation and cooking [1, 10].

Concurrent with the shift in food systems and changes in family food behaviours, there has been an epidemiological shift in rates of NCDs [23, 24, 28]. The rise in overweight and obesity levels is associated with the rise of NCDs, particularly cardiovascular disease and diabetes, with NCDs accounting for 65% of deaths on a global scale [34]. In 2018, NCDs contributed to 9.9% of total deaths in Australia [35]. In Australia, dietary risk factors are the third leading contributor to poor health and premature death, after tobacco use and overweight and obesity [35].

Despite no formal definition of a healthy diet [36], the World Health Organisation (WHO; 2003) suggests that a healthy diet should include a wide variety of foods that are predominantly plant-based and limited intake of foods that are highly processed [37]. To advance the promotion of health information, The Australian Dietary Guidelines (2013) advocate a healthier diet should consist of the consumption of a wide variety of foods that is high in fiber and a minimal consumption of foods that are predominantly high in added sugar, salt, and saturated fat [38]. The most common risk factors of NCDs in Australian diets are the consistently low intake of fruits, vegetables, whole grains and high fibre cereals and high consumption of sodium (salt), sugary drinks, red and processed meats [35]. Australians are not consuming a wide variety of the core food groups: vegetables, fruit, grains, lean meat and dairy, but are consuming high levels of discretionary food choices, predominantly UPFDs [35, 39]. In 2022, just 6.5% of Australian adults met vegetable intake recommendations [39], with 81% of children also not meeting their daily fruit and vegetable requirements [40]. Two in 3 Australian adults are overweight or obese and the trend in childhood obesity and overweight rates are similar, with 25% of children being overweight or obese [40]. The transition from a diet that previously consisted of meals that were homemade to readymade meals and the higher incidence of overweight or obesity in adults and children, puts them at a higher risk of mental and physical health problems as they age [8, 26].

1.4 Functional and critical skills in food literacy

To understand the importance of eating a diet based on the core food groups, and the sustainability of the environment, economy, and society, individuals need to have the capacity to understand the modern food systems [13, 25]. Basic food skills are needed by individuals for them to feed themselves and others are the interrelated components of food literacy [14, 15]. Being food literate enables the critical understanding of the impact that food has upon the health of individuals, societies, economies and environmental landscapes [14]. The ability to be food literate is contextual, with food knowledge, skills and abilities being dynamic, and can either support or hinder an individual's confidence to engage with the complex and modern food systems [14]. As the cost and availability of food fluctuates in communities, a person who is food literate has the ability to utilize their food skills to secure a wide variety of nutritious food for themselves and their family [4, 5, 15, 19]. A food literate individual has adequate food knowledge and capacity to reflect upon their own food choices and behaviours and change as required [14]. They also understand how food-related behaviours can impact planetary health and economies in times when localised food systems can fluctuate [14, 16, 21, 23, 24], and influences their access to nutritious food [14, 15, 23, 25, 26].

1.5 The food literacy domains and components that are required to navigate complex food systems.

The concept of food literacy can be defined as the capacity to obtain basic information on food, its impacts on personal health, and understand its consequences on the environment. Adequate levels food literacy can increase individual health and well-being, as it can go beyond nutrition knowledge and food preparation to encompass a broad range of food behaviours related to the modern food system and everyday life [26]. A food literate individual has adequate knowledge and skills to access food on a regular basis within available resources, is be able to choose and prepare foods using the time that is available, is able to determine quality of food and if it's safe to eat, to understand what is in a product and use that information determine its impact upon personal health and environmental health through an awareness of food recycling [15].

A framework for defining and evaluating food literacy knowledge, skills and abilities has been developed by Vidgen and Gallegos (2014), [15] who employed a Delphi study and a series of semi-structured interviews to identify four domains of the widely accepted Australian food literacy framework:

(1) Plan and Manage, (2) *Select*, (3) *Prepare,* and (4) *Eat.*

The domains and the components that make up these, all work synergistically with each other to provide positive food knowledge, skills and abilities. Figure 1 depicts the food literacy domains and components.

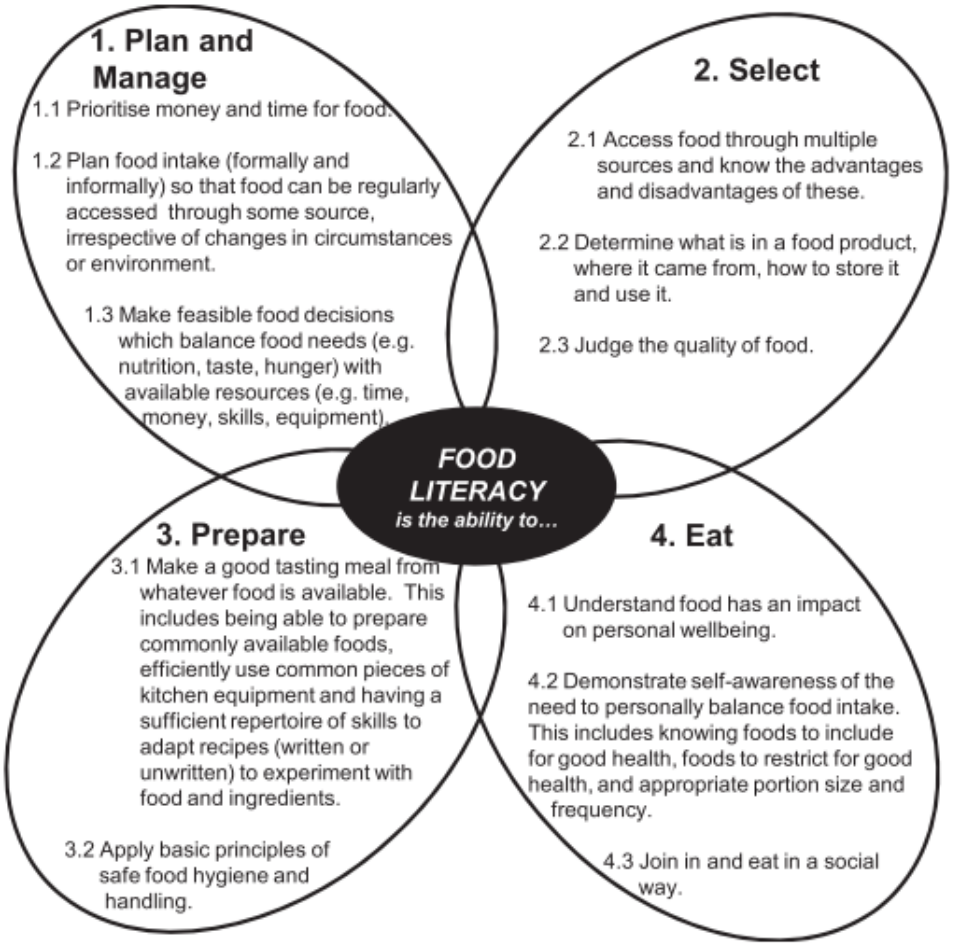

Figure 1: The domains and corresponding components of food literacy.
Image sourced: Vidgen & Gallegos, 2014, p 55.

The domain and components of Plan and Manage

For individuals to obtain a mindful and healthy relationship with food, Vidgen and Gallegos (2014) propose that they need to have skills and knowledge in the domain of '*Plan and Manage'*. This includes the prioritisation of time, money and the need to access food that is adequate for personal health and nourishment. Inclusive of three components, food decisions need to be based on their circumstance of need using the resources that are available at hand [15].

The domain and components of Select

The '*Select*' domain includes three components which are based on the origins of food origins, its accessibility from multiple locations and if these location influence their food choices. Vidgen and Gallegos (2014) prescribe that the judgment food quality, and its required storage enables the continuation of good health and wellbeing [15].

The domain and components of Prepare

The '*Prepare*' domain comprises of two core components which focuses on food preparation using commonly known food. Vidgen and Gallegos (2014) propose that the preparation of food requires a basic cooking skill set that includes knowledge of safe food handling practices using familiar utensils and equipment [15].

The domain and components of Eat

The '*Eat*' domain and its three components are based on an individual's understanding that food can impact their own physical and mental well-being through connection and eating food with others [15].

1.6 Health literacy through a food context

Adequate health literacy enables individuals to make informed decisions that are based on health information that is specific to their needs [25, 41]. Nutbeam (2000) suggests there are three competencies that are required to be health literate: 1), Functional health literacy; 2), Interactive health literacy and 3), Critical health literacy. 'Functional health literacy' is an individual's ability to read and write; enabling them to understand and apply basic health messages for personal health. 'Interactive health literacy' is a more advanced level of understanding, that refers to an individual's access and use of health information for the management of a condition. 'Critical health literacy' is the highest level of all three competencies and is a form of citizenship, which can empower individuals through social inclusion and equality. 'Critical health literacy' enables the empowerment of individuals through an understanding of social, economic and environmental health determinants and their impacts upon individuals and in communities [13, 41].

Food literacy extends health literacy, empowering individuals to gain an understanding of food, and then applying their critical knowledge to food choices and skills in meal preparation, leaving individuals empowered and having the self-confidence to navigate the complex food system [15, 25]. However, other factors such as limited time, educational attainment, and geographical location, can impact an individual's health and food literacy. These determinants of health can adversely impact individuals food behaviours and health outcomes over time [42].

1.7 The interrelated components of food literacy and nutrition literacy

Food literacy and nutrition literacy are separate forms of health literacy [43]. The two frameworks are distinct from each other, despite being often used interchangeably [13, 43]. Food literacy includes the ability to make decisions about food choice, the care of handling and preparing food safely and an ability to understand the food behaviours effects personal health, the environment and economies [14, 15, 25, 43]. An individual's knowledge and skills in food are dynamic which are developed within context, as these

behaviours can vary across families, cultures and religions [25, 43]. Food literacy occurs as a consequence of nutrition literacy [15]. Nutrition literacy is an individual's capacity to obtain, understand and act upon nutrition information and how food affects the body and health [13, 25, 43]. Similar to education on food literacy, nutrition education is dependent upon an individual's capacity in numeracy and literacy and their capability to understand and apply information to improve their own nutritional status [43].

According to Krause et al. (2016) nutrition literacy can be related to the three forms of health literacy: 'Functional', 'Critical' and 'Interactive' [41, 43]. In particular 'functional' health literacy which is influenced by an individuals' capacity to obtain, interpret and apply health information [43].

1.8 The social determinants of health and family food literacy

The interplay between the determinants of health and healthful eating can play a part in a person's attitudes and behaviours towards food [7]. Food literacy and the relationship to the social determinants of health can influence an individuals' ability to utilise their food knowledge and skills [5]. The educational level attained, employment and work-life balance are known to influence food perceptions and food skills over time [19, 42, 44]. Figure 2 depicts the determinants of family food literacy that align with the determinants of health, which can influence parents' ability to secure food that is of good nutritional quality and prepare it in the limited time that is available. Disadvantaged geographical locations are targeted by the marketing strategies of food corporations. Food deserts are geographical locations that have greater accessibility of discretionary foods and can impact on an individuals' diet quality over time, influencing children's acceptance and preference for foods that is are highly refined [3, 9, 29].

Figure 2. The determinants to food literacy in families.

1.9 Educational attainment in Australian families

Adults with low levels of education, often have lower levels of income and/or a greater dependency on welfare, which can impact on their ability to understand and apply basic health messages related to food [42]. Household members with lower education lack the disposable income to make a varied food choice and may lack the ability to contextualise food and health information [13, 17]. This can result in less optimal health outcomes when compared to household members who have a attained a higher level of education [13, 45]. Literature shows that adults with low education often rate their long-term health and wellbeing as poor, and have a low adherence to preventative food health messages, reducing their opportunity to make informed decisions on their choice of food [25, 42]. Studies show that adults find food labels difficult to understand, limiting their ability to swap their food choice to a food that is less refined [46]. Adults who experience illness from food-borne disease or NCDs have more sick days off work, and less financial capacity to seek health care resulting from less income brought into the home [42, 47]. Low levels of education can also impact a parent's decisions on their health, and that of their

children [45, 48]. A lack of understanding of basic health messages on food, can have a profound impact on parental food provisioning behaviours and their child's nutritional status, negatively impacting their family's health outcomes [7, 9, 44, 45, 48].

Education on food safety and improved food handling behaviours is connected with levels of food literacy [15]. Foodborne disease is a common cause of illness, with an estimated over 4 million cases per year in Australia, resulting in approximately 38 deaths [49]. Food borne illness is influenced by food choice, preparation and its storage [12], with the Australian Dietary Guidelines explicitly stating the importance of safe food handling when preparing and storing food [38]. High risk foods in the home are prone to bacterial growth, however, approximately 87% of food borne disease can be linked to food storage and preparation in the home environment [38]. One reason for this is the low importance placed on food safety in the family home [50] . Families have many barriers to performing safe food handling practices such as the lack of time, lack of food safety knowledge and a lack of belief that a specific food safety practice will prevent food borne illness [38]. Kitchens are a multifunctional spaces that include provisioning and preparation of cooked or uncooked foods, but also pet care, gardening and even bicycle repair activities, increasing the risk of food borne illness and more sick days off work and school [12, 50].

1.10 Food literacy and food insecurity in Australian families

Income is the key determinant that impacts food choice, and parents' ability to financially access food for themselves and their family. Food insecurity is the limited access to familiar food [51, 52] and is defined as the 'financial incapacity to access food' [52, 53]. Currently, Australia is experiencing a cost of living crisis, with many households getting less shopping in their basket due to the high cost of food and other everyday living expenses [52].

Typically, food insecurity is more common in regional and remote populations [11], however, in recent years the levels of food insecurity has increased Australia wide [52, 54]. In 2023, 3.7 million households went without food, and many other households were unable to buy nutritious food required for health and essential energy for daily activities [52]. In 2023, 365,000 Victorian children lived in homes that were experiencing food

insecurity due to low income [52]. Although food insecurity is not experienced by everyone in the same way, [52] families on a low income are more likely to experience food insecurity, anxiety and isolation [53]. The inability to regularly access nutritious foods, malnutrition and NCDs are intrinsically linked with food security [54]. To avoid going without food and experiencing hunger, food- insecure individuals are consuming more ultra refined foods due to their low cost and ease of access [19, 55]. A low quality diet, when experiencing food insecurity, can lead to a preference for UPFDs and an increased in the risk of NCDs and poorer health outcomes over time [19, 54]. Improved food security improves the connection to culture, to family and to community [53, 54]. Cultural food insecurity is the limited access to culturally familiar food [53] which can result when individuals experience challenges when connecting with their cultural food history and finding a sense of identity in their new country [53]. Individuals who are food insecure often experience financial pressures and a reluctance to connect with their culture due to embarrassment and lower emotional well-being, continuing the cycle of the sense of loss and disconnection with culture and community [52, 53].

The pillars of food security: 'Availability,' 'Access,' 'Utilisation,' and 'Stability' have informed policy [51], to prevent hunger and malnutrition across the globe [19, 54, 55]. As the food system has continued to change and the world has experienced increased hunger due to the COVID-19 pandemic [51, 56], there has been increased academic discourse that food security should include two additional pillars: 'agency' and 'sustainability' [19, 55]. The pillar 'agency' has the potential to align with the widening food inequalities that communities experience, and future government policies need to lessen this divide [55]. The pillar 'sustainability' advocates for the long-term restoration of the natural, social and economic systems and that future government policies should not be at the expense of current and future populations [55].

Education on food literacy not only enables adults to provide nutritious foods for themselves but also to their friends and family [9, 54]. The relationship between food insecurity and food literacy, predominantly lies within the pillar of 'Utilisation' [19, 54], which champions that safe food preparation can be achieved using knowledge and skills in food literacy and the ability to access cheap and nutritious ingredients [54]. Inadequate levels of food literacy may contribute to the cycle of food insecurity and an individual's

limited access to buy and prepare foods that are more cost-effective and nutritious to eat [54].

1.11 Food literacy and work life balances in Australian families

Parental food provisioning in the family unit has changed as a consequence of the shifting food system and a change in the labour force markets [7]. Over recent decades, income brought into the family home has marginally increased; however, this does not necessarily result in eating a wider variety of food in the home [20]. Of the 14.7% of Australian single-parent families, 80.3% were single mothers [57]. In previous decades, women's participation in paid work has increased [58] but this is against a background where 80.3% of Australian single-parent families, were single mothers [57]. Working parents report continually feeling tired and have concerns they lack the time to get daily family tasks done, including planning and preparing family meals [9, 21, 59]. This results in eating a less healthful diet and families having lower dietary resilience [7, 15, 60]. Specifically, families with primary aged school children report having less time for meal preparation [1, 4, 5]. Preparing food requires a parent to have a range of resources and self-efficacy in cooking [1, 4]. Families' food preparation in the home has changed from previous generations, as more parents have returned to work [1, 4], which has led to a greater reliance to pre-prepared meals in the home and the greater acceptance for processed foods in family meals in the home [7, 61]. Additionally, many parents feel pressure to accommodate all meal preferences for family members, removing the sense of enjoyment in cooking meals over time [8]. Using prepared meals or the ordering of meals that are delivered to the door, coupled with a reluctance to cook due to fatigue has resulted in parents losing confidence in their own cooking ability [62], and reluctance to allow their child to help in the kitchen due to fear of them becoming hurt [1, 7].

Health, wellbeing and physical activity are intrinsically linked to children's sporting co-curricular activities and the connection to others in their community [19, 63]. A balanced diet that consist predominantly of food high in essential nutrients, together with increased physical activity is essential for individuals health and well-being [19, 63]. Up to 75 % of Australian parents encourage their children to be social, healthy and active through community sport [64]. Children from low income families have less time playing sport and increased sedentary time [19, 63], due to a range of barriers such as costs associated with

organised activities, lack of playing equipment. This limits their capacity to live a healthy and active lifestyle [63, 64].

1.12 The impact of promotion of processed foods in Australian families

Consumer behaviour patterns and brand awareness can begin from 18 months of age which continues to develop in adolescence and adulthood [65]. Social and economic factors are causing inequity in communities eating a healthful diet in a neighbourhood environment [66, 67]. Parents living in advantaged regions have a higher quality of diet and a greater sense of health and well-being when compared to parents from disadvantaged regions [42, 48]. Households that are in advantaged regions are less exposed to convenience food outlets and consume a wider variety of fresh foods [67]. Socioeconomic disadvantaged regions are most vulnerable to the shift in the food system, as increased exposure to convenience foods is a lucrative commodity for food corporations [28, 67]. In Victoria, there is a greater accessibility to convenience food outlets in low socioeconomic areas when compared to socioeconomic advantaged areas [67]. Easier accessibility to UPFDs in disadvantage areas has led to individuals being more prone to overweight or obesity and the subsequent increased risk to NCDs, when compared to families from advantaged regions [19].

Families living in low socio economic regions are more likely to have greater exposure to discretionary foods and drinks foods [29]. Families commuting to and from work and/or school routinely see billboards and more food outlets that promote convenience foods compared to fresh food outlets [29, 65, 66, 68, 69]. Convenience foods are a high appeal for families, as food retail shops are designed to be easy to access through strategically positioned outlets that have drive - through and family friendly inhouse dining [66]. A greater accessibility to convenience foods is indicative to the acceptance of brand foods and adverse health outcomes over time [67, 68].

Parents are concerned about the amount of unhealthy food promotion that children are exposed to in the Australian retail environment as children have limited cognitive ability to resist the marketing techniques by food companies [68]. Food marketing found in supermarkets also adds to brand acceptance, impacting a child's acceptance and preference of healthier food choices [65, 68]. The targeted advertising employed by

companies often includes the strategic product placement of UPFDs is designed to entice consumers' purchasing behaviours [32, 65, 68]. Routinely used by food companies is the marketing strategy 4 Ps: product, price, promotion and placement, all are designed to increase company profits and change the purchasing behaviours of their customers [70]. Many Australian supermarkets have greater price discounts of UPFDs compared to healthier options, moreover; they have a greater exposure to UPFD products in their shopping isles, discount bins and at checkouts [70]. UPFDs also include packaging that routinely includes movie and cartoon characters, and games [61, 65]. The 'child friendly' placement of UPFDs presents as a challenge for parents who wish to routinely execute their parental power and mediate their child's interaction with foods [65, 68]. Research is showing that children are consuming more refined snacks while out shopping [61, 65], as parents succumb to the repeated requests for chocolate and confectionary due to the continued placement of discretionary food that is visible and accessible for children [68]. The persistent 'pester power' of children leads to discretionary foods being purchased more frequently, and being 'normalised' in the home environment [61, 65].

Adults have also expressed concerned about their child's time spent online and the subsequent exposure to branding to foods [65]. Online marketing of UPFDs to vulnerable children includes platforms, such as TikTok, Snapchat, Instagram and YouTube [65]. Children can easily access social media resulting in greater exposure to misinformation on what constitutes a healthy diet [69]. Youth and children; particularly girls aged 11- 12 years, are vulnerable to content on social media platforms as they are known to contribute to body issue concerns, mental health issues and the restriction of food [69]. The digital marketing strategy employed by companies is designed to engage users in their products; by encouraging online activities such as tagging, commenting and sharing content with their friends leading to a user generated marketing technique that is useful for company to market their product [65]. Over time this has led to brand acceptance, and the normalisation of UPFDs in family members daily food choices [65].

1.13 The impact of food literacy interventions in Australia

In recent years, the concept of food literacy has gained momentum to improve food choices and behaviours. Recent attention in research on evaluation of food literacy interventions are showing they can close the gap between food literacy and food illiteracy. Recent studies have evaluated interventions based on the domains of '*Plan & Manage*,' '*Select*,' '*Prepare*' and '*Eat*' [15]. There is a wide variety of duration of the sessions, target groups and sample size [11, 17-19]. Additionally, many evaluations develop their own questionnaires to inform outcomes of interventions and how they work [17, 18, 71]. Reviews indicate that interventions can be effective, but there are challenges associated with evaluating a community-based intervention [72]. Despite changes to food quality and behaviours overall, it can be difficult to make conclusive outcomes, mainly due to self-reporting and the associated intrinsic biases, the influence of external factors that cannot be controlled for, and the lack of valid and reliable tools to measure change in food literacy.

Two food literacy interventions have been delivered and evaluated in Australia in recent years for adults. Developed and delivered by Food Bank in Western Australia, *Food Sensations* for Adults (FSA) is designed to address food and health inequities in remote regions of Western Australia [17, 18]. On the east coast of Australia, Oz Harvest delivers the *Nutrition Education Skills Training Program* (NEST) which was evaluated to determine changes in participants food literacy behaviours and food insecurity status [19]. Both interventions used educational content is based upon the Australian Dietary Guidelines [38].

The program durations varied (FSA being 4 weeks and NEST being 6 weeks) and both used different approaches to evaluation. The programs measured adult participants change in food choices using pre- /post- intervention tools to capture increased fruits and vegetable intake and improved food literacy behaviours in the domains '*Plan & Manage*,' '*Select*' and '*Prepare*' [17, 19]. Both interventions reported improvement in the consumption of fruits and vegetables intakes of fast-food meals and sugar sweetened drinks [17-19]. The outcomes of FSA showed increased servings of fruits and vegetables each day, which was

not sustained at the three-month follow-up; however, fruit and vegetable consumption still remained significantly higher than pre-intervention. It should be noted that fewer respondents participated at the third time point which may have impacted on these findings [17]. The overall findings suggest an increase of ½ a serve of vegetables and ¼ a serve of fruit were consumed each day. However, the exact number of servings consumed each day was not identified, indicating outcomes still remain unclear [17].This trend was replicated in the NEST study, with statistically significant improvement in daily serves of fruits and vegetables being observed at post intervention and a marginal increase in daily serves of fruits and vegetables being sustained at the six months follow up [19]. However, the evaluation of NEST did not assess portion sizes consumed. Both the FSA and the NEST studies found reductions in consumption of fast food; however, this was only found to be statistically significant in the FSA intervention [17-19]. The authors of the NEST study suggested that the increased consumption of fast food is likely to be linked to the Government enforced lockdowns and difficulties in food supply during the COVID -19 pandemic [19]. Both the NEST and FSA studies reported long term improvements in nutrition knowledge, cooking confidence, and food preparation behaviours [17, 19]. The FSA study reported that 33.3 % of participants experienced difficulties or obstacles making food-related changes at home and, 23.2% suggested that busy lifestyles was a challenge for implanting healthier foods into the family home [17]. Qualitative data from the FSA model at a statewide level found participants had "*reduced soft drinks in the fridge at home*" drank more bottled water and added less sugar to "*Milo, tea or coffee"* after attending a program [18].

1.14 Learning about food in a school environment.

The holistic approach to food literacy includes food preparation [18]. Food preparation and cooking is known to be associated with an increased consumption of healthy meals [1, 73]. Food literacy is a relatively new concept and currently, there are few published food literacy interventions conducted in the Australian school setting [16, 21, 73].

Of the published interventions, differences exist in survey instruments, analysis, and reporting; none the less, nutrition and cooking initiatives reveal that they can instil positive food literacy foundations in children [16, 32, 74]. Research has shown mixed results in achieving a positive change in children's dietary intake; despite this, they may well

generate an interest in food and cooking among children and the wider school community that may have much longer term impacts that have not yet been evaluated.

FEAST (Food Education and Sustainability Training) program educated children in the Australian primary school curriculum. Conceived by OZ Harvest, since 2018, 643 schools have adopted the *FEAST* program. The program was developed using the PRECEDE-PROCEED Planning model and Social Cognitive Theory (SCT) [16, 21]. The school-based curriculum includes nutrition and food sustainability based on the concept of 'farm-to-plate' and experiential cooking components [16, 21]. In a study published in 2024 reported that all teachers completed the FEAST training modules before the delivery of the program in 20 schools. The program was designed to be delivered as 10 modules for 1.5 h/week, including ten theory and six food preparation/cooking activities over one school term; however, *FEAST* was delivered sporadically over two school terms due to the COVID-19 pandemic closures [16]. Some were delivered via online sessions involving teachers demonstrating cooking, and students learning with limited assistance of their parents/carers at home [16].

Outcomes were evaluated using a non-randomized controlled trial design that showed no significant improvements in children's food behaviours [16]. There was no change in children's nutrition knowledge and children's understanding of what constitutes a standard serving of fruits and vegetables suggesting more investigation into children's nutrition knowledge is warranted. There was no significant change in children's fruit and vegetable intakes and no change eating imperfect fruit [16]. Findings showed that 78.1% (n = 332) of the intervention respondents consumed more than two fruit serves per day and 71.3 % (n = 301) of children consumed more than two serves of vegetables each day [16]. Such findings indicated that children were not eating the recommended serves of fruits and vegetables, which are required optimal growth and development [38]. Improving children's F&V intakes needs to remain a priority of further investigation as this study does not consider children's nutrition knowledge of commonly consumed Australian foods. There was a statistically significant increase in understanding the 'farm to plate' concept, which suggests that children are interested in food through understanding its origins and its processing [16]. Although the FEAST curriculum was designed around SCT, the observational learning and role-modelling concepts that were planned to be incorporated into the classroom food preparation/cooking activities, did not occur. The

effects of the COVID-19 closures limited any increase in self-efficacy in cooking. Teachers reporting student disengagement suggesting that children want to learn to cook in person and with an adult [16].

Another organisation that supports food education with Australian school children is the *'Stephanie Alexander's Kitchen Garden Foundation'* (SAKGF). Although not designed to include the domains of food literacy [15], the program educates children on healthful eating using education on kitchen gardening [32]. The weekly sessions enables students to spend 45 minutes in the school garden growing fresh produce and another 90 minutes in a kitchen, developing their cooking skills [32].

Gibbs et al. (2013) utilised a mixed methods approach, to evaluate the wider impact of the program in the school and home environments [32]. Data was collected from multiple viewpoints to gain an in-depth understanding of children's fruit and vegetable intake, their interest in food and cooking after the program's completion. The study further explored children's appreciation of nutritious food and their willingness to try new foods [32]. After completing the program, no significant change in children's fruit and vegetable intake was observed, with fewer than 10% eating 5 servings of vegetables each day. Children appreciated learning about food and indicated they were willing to try something new, particularly if they had grown and cooked it themselves [32]. Cooking and sharing food was a core theme that was enjoyed by children, who particularly enjoyed the food socialisation aspect and the connection to others. Interestingly, the final outcomes showed that children had difficulties in describing their favourite 'savoury', fruit or vegetable foods, with authors suggesting this occurred due to the children's developing cognitive abilities [32]. This suggest that more education on food appreciation and taste preferences is required.

Focus groups and interviews were conducted with children, parents, teachers and volunteers to further explore children's appreciation of food and any increased willingness to try new foods after the program. Qualitative findings showed that parents saw their child having a renewed interest and willingness to try new foods after participating in the program. Teachers observing more children bringing lunch boxes packed with a wide variety of nutritious foods, while volunteers observed changes in children's attitudes towards nutritious foods [32]. Whether the program increased

children's independence to pack their own lunch box or if the lunch box options were more predominantly store bought remains unknown.

1.15 Children's food literacy knowledge and competencies.

The domains and components of food literacy are a relatively new concept and while research is showing food literacy can be improved in adults and children, the current food literacy framework was developed for individuals who have life experiences in navigating the complex food system as adults [15]. A child's skills and knowledge of food is still developing, with their food foundations greatly influenced by their developing autonomy and their relationships with their peers and family [3, 9].

Despite promising results being produced, children's food behaviours, currently there is a lack of a conceptual food literacy framework for children. The work of Ares et al. (2023) warrants consideration as it suggests that any future framework for children should consider the child's age with a focus on children's ability to develop their food socialisation skills within their family unit and in external social environments [3]. Ares et al. (2023) propose that a child framework needs to include three competencies: 1) Relational, 2) Functional and 3) Critical, with an emphasis that the competencies are transitional due to a child's developing cognitive ability, literacy and numeracy abilities [3].

Ares et al. (2023) argue that the 'relational' competency should consider the relational memories that infants and young children form through their social relationships with parents and caregivers [3]. The authors also note that a child's competency can be fostered through positive experiences with food [3]. However, the proposed 'relational' competency may overlook the challenges posed by family food insecurity and the emotional food struggles that some children experience. For example, children under 18 years with disordered eating may face challenges in achieving food literacy competency, as their ability to recognise and manage emotions can significantly impact their learning [75].

Meanwhile, Ares et al. (2023) [3] suggest that the 'functional' competency should include a child's basic knowledge of nutrition, food planning, and preparation skills. However, achieving this competency may be difficult for children whose parents have low

education and literacy levels, and have limited resources to develop their child's functional competency at home.

The authors of the children's food literacy indicate that a child's 'critical' competency can be impacted as they enter adolescence, as a childs' ability to influence change is shaped by peer relationships and the influence food marketing strategies employed by food companies [3]. It is well established that a child's social and emotional learning evolves as a child grows, which at times can lead to a disconnection from the learning process [75]. The lack of connection with learning over time can negatively impact a child's academic performance [75] and the child's ability to critically evaluate the nutritional profile of UPFDs.

1.16 Conclusion

Adequate knowledge and skills in food empower individuals with confidence to navigate complex food systems. As food systems have switched to a more globalised food system, food deserts and less reliance on sourcing food from a localised food system have occurred. The food literacy domains and components have been designed to inform initiatives and to empower participants with confidence to navigate complex food systems and to routinely choose and prepare foods that are known to provide essential nutrients and energy required for optimal health and development. There are many influences that can impact an individual's food choice and behaviours and the interconnectivity between determinants of health and their impacts on Australian families' ability to choose, prepare and eat foods are known to impact on health and wellbeing. To improve families' food literacy knowledge, skills and ability to eat and prepare healthier meals, food literacy interventions that include adults and/or children have been developed and evaluated. However, the lack of consistency in approaches and evaluation tools continue to hinder the identification of conclusive outcomes. Children's food literacy foundations are continually to be developed through experimentation and food socialisation. There is a need to undertake further research into what constitutes food literacy in children, thus informing interventions that specifically target children, with longer term impacts being evaluated.

Chapter 2. Rationale

2.1 Introduction

The shift in food systems has led to a higher consumption of the 'Western-style' diet that is typically processed and high in saturated fat, salt, sugar and energy (kilojoules), while being low in dietary fibre [24]. Conversely, the urbanization of regions has led to 'food deserts' which can be described as the geographical areas where residents have less access to affordable healthier food options, and the easier access to discretionary food options within a convenient travelling distance [29, 31]. Food deserts and the associated high intake of discretionary foods result in an increased burden on healthcare systems [15, 20, 31]. The 'Western-style' diet is a major risk for dietary-related chronic diseases such as Type 2 Diabetes, high blood pressure, dyslipidaemia, heart disease, stroke, and dietary related cancers [76]. Since 1995, there has been a 10 % rise in adults who are overweight or obese in the Australian population due to the regular intake of UPFDs [35, 77], a trend that is replicated in children [40].

The study by Butcher et al. (2021) suggest that our food behaviours and dietary patterns can be greatly influenced by our social environments [18]. Parents who have higher education and income and live in more affluent communities are more likely to have increased health outcomes as they are more likely to eat a well-balanced nutritious diet [78, 79]. In sharp contrast individuals who live in disadvantaged regions such as rural and regional populations typically have low levels income and education are more likely to consume the 'Western style' diet and subsequent are at higher risk of developing NCDs [18, 71]. These determinants of health influence an individual's ability to choose a health promoting diet as outlined by the Australian Dietary Guidelines [71]. The determinants of health can impact family's food behaviours and the overall family health environment; potentially fostering the development of future generations who place low importance on planning for and choosing to eat eating healthier foods [9].

Food literacy represents a holistic approach to healthy eating, a concept that aligns with dietary resilience and the navigation of complex food systems for health and wellbeing [13, 15, 71]. Food literacy is a relatively new framework that can improve food-related

behaviours and eating habits through choosing and cooking with ingredients that are nutritious, easy to access, cost-effective and safe to eat [15]. Encompassing the domains of '*Plan and Manage'*, '*Select*', '*Prepare*' and '*Eat*' [15], food literacy focuses on empowering individual's knowledge, skills and behaviours to inform healthier food behaviours [18, 71]. Food literacy interventions have been shown to increase food literacy skills across all ages in the lifespan, empowering participants to prioritise their time, their energy and money to select, prepare and then eat foods that are beneficial to health [18]. Current research is revealing that food and cooking interventions have the potential to positively impact food literacy skills in individuals who are at any stage of life, potentially decreasing the burden of diet-related diseases on healthcare systems [18, 20]. However, there is a lack of research on food literacy in the family context, particularly in socially disadvantaged areas.

Current research has focused on either adults or children who live in urban/ metropolitan regions. There is limited research or evaluations of food literacy interventions that include parents and their children who live in regional areas of Australia. It is also yet to determine if food literacy interventions can impact a child's ability to select and consume healthier nutritious foods after participating in community-based initiatives with their parents. To address this gap in the literature, a family-focused food literacy intervention has been developed for delivery in a regional and socioeconomically disadvantaged area of Victoria, Australia. The intervention, Plate it Up®, will subsequently be evaluated to assess the feasibility, acceptability and outcomes on family food literacy.

The Social Cognitive Theory (SCT) is applied to the development and evaluation of the intervention to understand how self-confidence interplays with food behaviours [80]. An individual's personal and social environment and personal characteristics can help explain how individuals learn and then apply new knowledge in their everyday lives [80, 81]. The interplay between the two distinct effectors can impede an individual's self-confidence in their abilities in food literacy [80, 81]. An example is individuals with lower levels of education and an inability to contextualise food and health information, resulting in less confidence to select foods that are low in refinement [17, 82]. Improving nutrition knowledge in adults with low literacy can ultimately improve their health and well-being via increased confidence to choose foods that are beneficial for health [4, 11, 17, 82]. The central construct of SCT is self-efficacy and is a good predictor of how behaviour change

shapes the food behaviours the individuals would extend to achieve [80]. A high level of perceived self-efficacy is therefore anticipated to contribute to how effectively a family-focussed food literacy intervention can positively influence desired behaviour change.

2.2 Study aims and research questions.

This Master of Research project aims to investigate the preliminary outcome of Plate it Up® a pilot family-focused food literacy intervention. This thesis specifically evaluated the first family-focused food literacy intervention held in the City of Greater Bendigo, Victoria, Australia. A mixed-method approach was applied to investigate the following questions:

1. How and to what extent does Plate it Up® effect parents' and children's food choices?
2. How and to what extent does Plate it Up® effect parents' and children's nutrition knowledge and their ability to select healthier foods and drinks?
3. How and to what extent does Plate it Up® effect parents' ability to plan and manage their resources to obtain nutritious food for their family?
4. How and to what extent does Plate it Up® effect parents' safe handling practices of food at home?
5. How and to what extent does Plate it Up® effect parents' and children's self-efficacy in cooking?

The secondary aim of this project was to explore food literacy learning in participant families and determine sustained challenges experienced by participants by answering the following question:

6. What are the barriers and enablers parents and children experience when selecting, preparing and eating healthier food one month after completing Plate it Up®?

Chapter 3. The development of the family focused food literacy intervention Plate it Up®

3.1 Chapter overview

Chapter 1 discussed the determinants of health and food literacy, and the positive outcomes presented by food literacy and culinary interventions to adults and children. This chapter revisits the influence of food marketing on family food behaviours and skills in food literacy, and the effectiveness of family-focused interventions to improve these. Relevant theories and considerations that are required when educating children are discussed and application to the development of a food literacy intervention based on the four domains of food literacy is described. Evidence-based learning content and the importance of including food socialisation in the design will also be addressed.

3.2 Introduction to food literacy in families

The shift in the food system and marketing strategies employed by retail environments has led to an increase in easily accessed energy-dense, nutrient poor, refined foods [3, 26, 28]. Current evidence shows that there is an inadequate intake of fruits and vegetables, and high levels of overweight/ obesity in adults and children [1]. At the same time, there is a sustained long-term risk of non-communicable disease (NCD) and poor health literacy [19, 25, 43]. Family food behaviours are formed through experiences and complex interactions of multiple social and environmental factors [1, 2, 10]. The determinants of health and poor food literacy have led to a greater reliance on pre-prepared convenience meals and takeaway food options [18, 83]. Time constrains for parents and the determinants of eating healthfully that families experience may be associated with the decreased engagement in the food system and less importance placed on healthy eating [3, 7, 60].

Positive food behaviours in the family unit can be difficult to achieve, however, it remains one of the most important factors of health that can be improved [9, 16, 21]. Food literacy is an integrated approach to food and engagement with food systems. Adequate levels of

food literacy enable individuals to make feasible food choices despite their environment that surrounds them [15]. Adequate levels of food literacy can additionally empower individuals to understand that food choice can affect health, the environment and economies [14, 15]. Through learning, food literacy interventions are showing they can increase levels of food literacy, re-engagement with food systems which may improve long term health outcomes [11, 17-19] .

3.3 Culinary interventions that are family focused

It is well established that educating children on how to cook in a school setting can improve food choice [16, 32, 62, 74]. However, results are showing that children's interest in food and cooking can improve when learning to cook with their parent in a community setting [1]. There is a paucity of research into parent and child food literacy interventions, however a recent study in Ireland has shown positive outcomes.

The *Fun with Food* program is a four-week cooking program that is designed to increase cooking competencies through repetition. Delivered in Ireland, the program included simple-to-read recipes to educate children on the topic of cooking meals that are considered quick, simple, and tasty. This study used the term *healthy foods* to describe the dishes that were prepared; however, questions remain as the nutritional content of the dishes was not assessed. The program was guided by the Experiential Learning Theory and the sessions were developed by home economics teachers. The culinary intervention included simple to read recipes of meals that could be prepared at home. The participants that signed up to be part of the evaluation were parents and their children aged 8-12 years [1]. The study by Lavelle et al. (2023) used a mixed methodology to evaluate the impact of the program. The evaluation did not evaluate dietary intake, instead aiming to determine the program's impact on children's cooking competencies (pre vs post intervention) and parents' perceptions of including children in cooking [1]. Qualitative results showed that many children continued to follow a recipe and to help prepare dishes at home after completing the program. Parent focus groups revealed that many parents felt the program created a "*Spark*" or a "*Flare*" in their children, and the children indicated they were willing to try new foods; despite new foods or their healthiness not

being identified [1]. After completing the program, parents felt that they were surprised at their child's capability to help prepare meals at home, and endeavoured to see it continue. The evaluation of the *Fun with Food* program included a convenience sample of participants with parents who were already motivated to have their children learn to cook from an early age, which may have overinflated the outcomes of the program. Children's post-program survey data revealed there was a statistically significant increase in their self-reported cooking competency ($p < 0.001$) and 85% of children enjoyed the classes, with 11.5% of children reporting that they wished the program ran for longer [1]. The experiential learning style employed by the *Fun with Food* program showed it was an effective method of education as participants enjoyed spending time together cooking and that they would miss attending the program [1].

3.4 Observational learning in the Social Cognitive Theory

The interaction between observing and learning from others and the influence of the surrounding environment needs to be considered when developing a community based intervention [80, 84, 85]. The Social Cognitive Theory (SCT) considers the interactions between an individual's social environment and their individual characteristics that interplay on their food behaviours and health outcomes [80, 81]. Formulated by Bandura, (2004), SCT is considered one of the most common theoretical frameworks to promote behaviour change in food-related interventions [80, 86, 87]. Self-efficacy is the level of a person's own confidence in their ability to successfully perform a behaviour and is the key concept of SCT [81]. Increasing individual's self-efficacy through learning promotes sustained behaviour change; however, it is the individuals final decision how they choose to act upon information that is best suited to them [80, 81]. SCT is known to offer opportunities to increase one's self-efficacy using food education and food socialization [87], but to what degree depends upon the influence of the environment ultimately has upon the individual.

Self-efficacy and self-regulation are essential to integrating healthful eating into everyday life [80]. Figure 3 was inspired by the Social Cognitive Theory [81] which depicts the differing ways that learning can increase self-efficacy. Together SCT key principles of self-regulation, observational learning, surrounding environments, behavioural capability, expectation and reinforcement, all work synergistically resulting in the increased self-efficacy required to achieve sustained behaviour change [80, 81, 86].

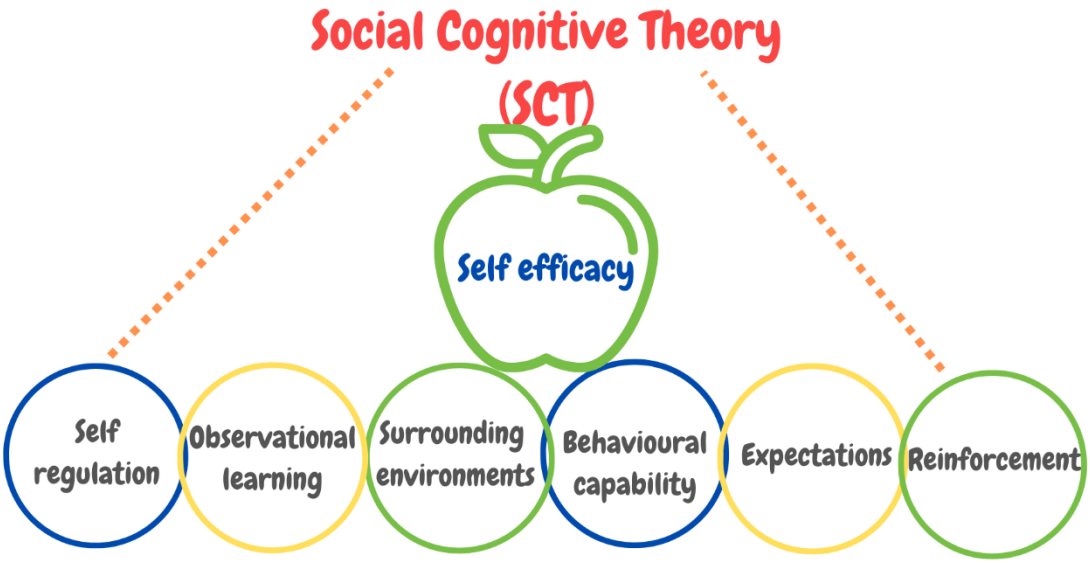

Figure 3. The Social Cognitive Theory (SCT) and the different mechanisms of learning that impacts self-efficacy [81].

3.5 The behaviour change techniques used in the development of Plate it Up®

Improving food literacy in families provides an opportunity to improve food choices and behaviours [88]; however, learning factual information about food alone does not lead to sustained change in behaviour [2]. The development of the Plate it Up® intervention utilised the Behaviour Change Technique Taxonomy v.1 (BCT) [2], as it is deemed useful to inform future work regarding the program (Table 1). Michie et al. (2013) developed the hierarchy of the BCT Taxonomy as an extensive tool that consists of 93 distinct and observable techniques that are grouped into 16 different categories. BCTs are the smallest components that are 'active and observable' which can be used in educational sessions and are known to facilitate a sustained change in behaviour [2] . According to Fraser et al., (2023) the active and observable components of the taxonomy can additionally increase self-efficacy in food behaviours. The concept of replication and the components in the BCT Taxonomy provides the opportunity to replicate positive behaviours further into families and wider in a community [88].

Table 1. The Behaviour Change Taxonomy (BCT) (v1) [2] identifies the specific mechanisms that may aid the behaviour change in participants of any age. The following table includes the identified BCTs across the four sessions of the family focused food literacy intervention Plate it Up®.

Named BCT	BCT definitions as defined in the behaviour change technique taxonomy (BCTT v.1)	Specific behaviour Change Techniques (BCTs) in the sessions.
2.3 Self-monitoring of behaviour	To establish a method for the person to monitor and record their behaviour(s) as part of a behaviour change strategy	Self-monitoring of behaviour: Parents monitor their own and their child's food behaviours and eating behaviours
2.4 Self-monitoring of outcome(s) of behaviour	Establish a method for the person to monitor and record the outcome(s) of their behaviour as part of a behaviour change strategy	Self-monitoring of behaviour: Parents reflect upon their and their child's food and eating behaviours.
3.1 Social support (unspecified) (General)	Advise on, arrange or provide social support (e.g. from friends, relatives, colleagues,' friends' or staff) or noncontingent praise or reward for performance of the behaviour.	Supportive facilitators and sessions

		Support in accessing information on emergency food relief. Social support to overcome the language barrier (Bendigo Foodshare and the Karen chicken stir fry recipe donated by Bendigo Community Health Services (BCHS)
3.2 Social support (practical)	Advise on, arrange, or provide practical help (e.g. from friends, relatives, colleagues, 'friends' or staff) for performance of the behaviour	Teaching approach supportive in nature free from judgement. Resources provide positive reinforcement of current food diet and water intake while elaborate more on hydration and eating a wider variety of food.
4.1 Instruction on how to perform a behaviour	Advise or agree on how to perform the behaviour (includes 'Skills training')	Practical learning on reading nutrition panels and selecting healthier food and drinks in canteen. Visual identification of the prescribed serves required each day form the core food groups. Identification of shopping apps through group discussions

		Identification of how to store and thaw high risk foods. How to cut safely with a sharp knife to children. How to measure and weigh ingredients.
5.1 Information about health consequences	Provide information (e.g. written, verbal, visual) about health consequences of performing the behaviour	Recognition of health consequences from current diet using props of sugar content in sugary drinks and healthy foods.
6.1 Demonstration of the behaviour	Provide an observable sample of the performance of the behaviour, directly in person or indirectly e.g. via film, pictures, for the person to aspire to or imitate (includes 'Modelling').	Healthy food preparation by chef facilitators Socialisation skills in group dining.
7.1 Prompts/cues	Introduce or define environmental or social stimulus with the purpose of prompting or cueing the behaviour. The prompt or cue would normally occur at the time or place of performance	Visual understanding of the benefit of consuming a wide variety of diet from educational resources through discussion with other families with similar aged children. Group discussion on the prescribed serving size of foods.

8.1 Behavioural practice/ rehearsal	Prompt practice or rehearsal of the performance of the behaviour one or more times in a context or at a time when the performance may not be necessary, in order to increase habit and skill	Food preparation and cooking
13.1 Identification of self as role model	Inform that one's own behaviour may be an example to others	Parental approach to food role modelling behaviours and including children in food preparation practices
13.2 Framing/ reframing	The deliberate adoption of a perspective or new perspective on behaviour in order to change emotions about performing the behaviour	Supportive teaching approach provide positive reframing of current diet on health.

3.6 Considerations when developing a food literacy intervention

Food literacy interventions need to accommodate the differing learning styles and cognitive abilities of participants, differing cultures and perceptions of food [1, 85, 89]. There are multiple learning styles outlined already; however, knowledge does not always translate into behaviour change. The experiential learning theory has been shown to be effective in promoting learning and changes in attitudes and food behaviours in families [1] . To this end the Plate it Up® intervention included practical food-based activities and cooking. However any food-based activities need to be assessed for risk.

Food allergy and intolerance are increasing in prevalence in the Australian population [90] and needs to be considered and accommodated in any intervention that includes experiential learning with food. To mitigate the risk from exposure to food allergens in susceptible participants, it was a requirement for participants to disclose any food allergies or intolerances prior to session commencement. Facilitators need to consider and provided ingredient substitution and monitor any cross-contamination of allergenic foods during food preparation. Approximately 87% of foodborne illness occurs in the home environment [12]. To decrease the risk of foodborne diseases, interventions need to be designed to include the key elements of how to handle food safely, namely: clean, separate, cook, and chill [91]. These elements were included in session to embed learning that can be transferred to the home environment [12]. Monitoring and adherence to safe food handling procedures in sessions occurred under the supervision of the chefs, enabling participants to practically apply food safety knowledge in the intervention and in the home environment.

Food preparation and cooking by children can develop a variety if skills such as literacy, numeracy, spatial awareness, and fine motor skills [1, 3]. The development of the Plate it Up® intervention considered a child's fine motor skills, and their literacy and numeracy capabilities based on the recommendations of Dean et al. (2021) [85]. A child's knife handling skills develop at a pace that fits them best, due in part due to their growing confidence in food preparation [1, 84]. Fine motor skills are increased using kitchen utensils and various methods of food preparation. A child's cognitive ability and their understanding of safety during the food preparation process can be built upon using spatial awareness [85].

3.7 The development of the family focused food literacy intervention Plate it Up®

There is an increase in community-based food interventions that are developed using the food literacy framework [15]. Despite the lack of valid and reliable tools to measure food literacy [72, 92], evaluations are revealing interventions can be effective at improving food choices and ability to prepare nutritious foods using the resources they have on hand [11, 17, 19, 93, 94]. Plate it Up® is developed using evidenced based evaluations and research in to the food literacy in a family context.

3.8 Program logic model and aims

The Plate it Up® food literacy intervention is a pilot of four session, with the overall goal of increasing food literacy knowledge, healthier food choices and cooking abilities in parents and their children aged 8-12 years. The development of the intervention has been informed by the work of Food Bank '*Food Sensations'* (FSA) intervention [11] and Oz Harvests '*NEST'* program [82]. The intervention and session plans of Plate it Up® (Appendix 1) was created by the research student as part of the Master of Research degree at Victoria University, Melbourne, Australia, under the guidance of the supervisors.

The intervention conveys the message that all foods can play a part in personal health and wellbeing; however, improper handling of food, or excessive consumption of discretionary foods and drinks, can result in illness and less favourable health outcomes. The primary aim of the pilot food literacy intervention, Plate it Up® was to provide knowledge on the selection and storage of foods that are less refined using evidence-based resources, to empower participants with the confidence to prepare nutritious meals on a budget, to promote positive behavioural changes in food, and to ultimately reduce longer term risks of dietary-related chronic disease.

The sessions incorporate the four domains of food literacy, which are '*Plan and Manage*', '*Select*', '*Prepare*', and '*Eat*' [15]. In an effort to increase a feeling of belonging to a wider community, the intervention aimed to enhance the sense of community and inclusion using food socialisation. All four sessions were held in an inclusive and supportive environment [BCT: 3.1], that enables SCT approaches to increase participants' confidence to choose and prepare simple family meals. Each session was led by the research student; a university-trained nutritionist and qualified chef and supported by second qualified chef. Both provided simple and unique cooking tips; giving the parents the confidence to build positive food role-modelling behaviours for their child at home [1, 8, 74].

To reduce any negative emotions around healthy foods, all four sessions were framed to educate participants that all food and drinks provide benefits to health, reshaping any negative emotions on diet inadequacies [95], [BCT: 13.2] as guided by Michie et al. (2013) [2]. By including parents together with their child in each of the sessions allows positive modelling of the behaviour to be replicated at home [BCT:8.1]. The new information learned was reinforced across all four sessions through the practical preparation of dishes using healthy and cost effective ingredients.

The intervention sessions ran for approximately 110 minutes. Regular breaks were offered in each session, allowing the children to refresh through rest or play-based food and sporting activities with their parents and other children. The sessions enabled the children an opportunity to build upon their numeracy and literacy levels by weighing ingredients and choosing appropriately sized cooking jugs and baking trays. The child's spatial awareness and personal safety is built upon by close monitoring on the location of their fingers during cutting and where they have placed the knife while performing other food preparation tasks.

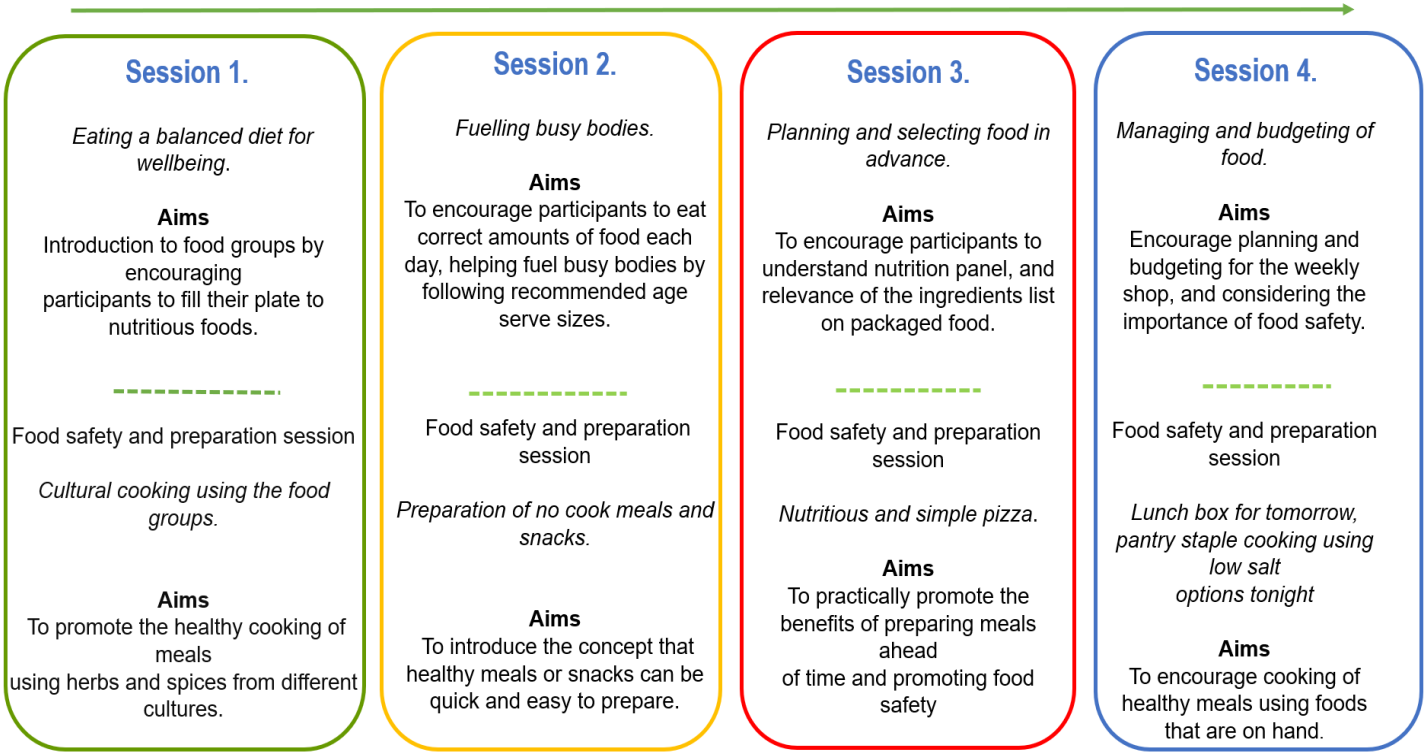

Figure 4: Intervention structure for the piloted food literacy intervention Plate it Up®.

3.9. Session structure

3.9.1 Session one

Session one of Plate it Up® is called 'Eating a balanced diet for wellbeing. Cultural cooking using the food groups.' This session aims to encourage consuming a wide variety of foods for health and wellbeing (Figure 4).

Active learning component: The key learning outcome for this session was to decrease the consumption of discretionary food and drinks and encourage eating a wider variety of foods in both parents and children. Participants were introduced to the Australian Guide to Healthy Eating '*Plate Model*' [96] using PowerPoint slides and posters. The *Plate Model* is designed for healthy Australians, including those with common health risks such as being overweight [97] and is designed for the prevention of diet related conditions and the prevention of NCDs. The

'*Plate Model'* is not tailored towards avoiding eating disorders [95]. Levels of eating disorders in the Australian population are increasing [95]. In an effort to avoid any feeling of inadequacy from current diet or potential food avoidance [82, 95], nutritional advice was provided in a way of encouragement for participants' positive current food choices and behaviours. The teaching approach included an emphasis on the positive benefits of participants' current diet on their health while bringing attention to what could be improved without being judgemental [BCT: 13:2] [82].

The educational activities included icebreakers, group discussions. The learning was supported by using food props to aid discussions on participants' current food choices as suggested by West et al. (2020) [82]. Posters, handouts and PowerPoint slides were used to help guide discussions on the core food group and were designed to help participants' ability to reflect upon their current diet [BCTs: 2.3; 2.4]. Adults with low levels of education often have difficulties understanding health information [54]. To overcome this barrier, a strategy included tactile food props and fresh produce that is useful for learning about food choices and increased weight [BCTs: 5.1:7.1]. During the session, the interactive break activity included placing images of foods on a blank Guide to Healthy Eating '*Plate Model'* [97]. This enabled the children to refresh through rest and play-based food activities enjoying the company of their parents and other children through food socialisation [15].

Food interventions are more effective when focusing on motivation rather than just information on food [95]. To provide more than just information on food in the PowerPoint Slides, a tactile poster was used to motivate discussions on the amounts of added sugar in common sweetened drinks [BCTs:5.1; 7.1] [2]. The poster included visual ques on the amounts of added sugar, in grams and teaspoons, to common sugary drinks to emphasise that regular consumption of sugary drinks is associated with increased weight and subsequent risk of NCDs, The information learned was reinforced through the preparation of dishes using healthy ingredients.

Food preparation component: The food preparation component aimed to improve confidence to prepare healthy meals using herbs and spices from different cultures. With an objective to increase healthy food and cultural food preparation at home [BCT: 8.1] [2]. The cooking activity aligned with SCT where self-efficacy can be increased through practical learning [81]. The session also incorporated modelling of simple food preparation techniques by both chefs [BCT:6.1] [1, 2]. Appropriate handwashing was practically taught using an interactive game based activity prior to commencing food preparation. The "*glitter bug*" activity utilized a blue ultraviolet torch to identify parts of participants hands that have been missed during hand washing. The four key elements of food safety: clean, cook, separate and chill were applied and monitored throughout the practical session [91]. The teaching approach towards safe food preparation included avoidance of any cross-contamination risk between raw and cooked meats, cooking over heat, and safe knife-handling. Parents consider healthy food provisioning important in their family [5, 7] and to support this desire to include more healthy food preparation in the family home, the recipe is designed to include all five core food groups [38, 96, 97]. Recipes were written in Easy English, to support their use by children and adult participants with low levels of literacy [98]. Inclusive of pictorial images, the recipe was designed to increase literacy and mathematical skills by reading and measuring ingredients [85]. Children's motor skills and spatial awareness was increased by washing, peeling and cutting fresh ingredients with knives [85]. To promote experimental cooking and trying new foods, participants prepared stir fry that was inspired by the second most spoken language in the city of Greater Bendigo, the Karen language [99]. A language barrier is a causal pathway to lower literacy levels and understanding health information [42]. To continue the support participants who speak and read Karen as their first language, the recipe was also available in the Karen language [BCT: 3.1] (Appendices 2 & 3). To increase children's motor skills and interest in food preparation children created a rose tomato that was used as a novel garnish (Appendix 4).

3.9.2 Session two

Session two of Plate it Up® is titled "Fuel busy bodies". The aim of the session was the importance of eating the correct amounts of food to get through their busy day at school and work (Figure 4).

Active Learning Component: The resources included nutrition education based on information from the Australian Dietary Guidelines [38, 97]. The session supported visual based learning activities on drinking adequate amounts of water and the recommended amounts of food from each five food groups on the *Plate Model* [96]. The nutrition education included the key concept of eating enough food from the food groups to provide enough energy for daily needs [95]. The learning was supported by food props of a simple meal that comprised of lean protein, cereals and vegetables, in standard serve sizes and the recommended number per day. Recommended serving sizes of fresh fruit was also on display. The participants were encouraged to hold props to support participants comprehension of what constituted a serve [BCTs:5.1:7.1]. As a group, participants were able to discuss and reflect on their current food choices, together with any changes that need to be considered when aligning to meet the Australian Dietary Guidelines [BCT: 3.2]. The teaching approaches encouraged positive group discussion on the benefits received from current diet [82]. The educational content did not discuss excess intake, to help mitigate any negative consequences of diet and potential eating disorders [95]. To ensure the participants were not overwhelmed by new information, [82] the facilitator remained aware of the participant's verbal and nonverbal cues when discussing the recommended serving sizes and changed approach when required. To guide positive conversations around food, the facilitator guided participants attention to the serving size prompts to help facilitate the visual based learning approach [98]. Educational content supported parents' ability to reflect on their own and their child's current diet [BCT's: 2.3; 2.4] using posters and PowerPoint slides. In the review by Amoutzopoulos et al. (2020), participants with low education levels have difficulties in conceptualizing and estimating a recommended serves when leaning about serve sizes using props [100]. To overcome this challenge, the review recommends to combine two learning approaches, photo images and food props, when delivering nutrition education to participants with low literacy levels [100]. To this end, serve

size props were supported by photo images of a serving size of water, together with a child's hands holding the recommended serves of fruit and vegetables in the PowerPoint slides to help support understanding of daily recommended serve and portion sizes [BCTs: 5.1:7.1] [2, 100].

Finally, adult participants were briefly educated on the 2-hour- 4-hour rule through group discussions and a take home resource (appendix 4). The 2-hour and 4-hour rule is an instructional protocol for safe food storage that is based upon the information from Nutrition Australia's "*Nourish 'N' Nurture*" food literacy program manual [101]. The rule highlights the length of time high-risk foods spend in the danger zone and the growth of the foodborne bacterium. The '*Danger Zone'* relates to the optimal temperature that allows bacterial growth, which is between 5 to 60 degrees Celsius [102]. Greater exposure of at-risk food to these temperatures increases the multiplication of foodborne bacteria and foodborne diseases [102] To help further guide the disposal of at-risk foods, it is recommended that food stored in the temperature danger zone for up to 2 hours is safe to eat or can be put in the fridge and eaten later. Foods that have been left in the danger zone for more than 2 hours, but less than 4 hours food are safe to eat but should not be put back in the fridge at all. Foods left out for longer than 4 hours is unsafe to eat and should be discarded [103].

Figure 5: Depicts the 2-hour- 4-hour rule and the prescribed hours for the safe storage of at risk foods [103].
Image source: Food Safety Information Council Australia [102].

Food preparation component: The food preparation component encourages participants to choose foods that are low in cost, and easy to prepare (Figure 3). The session also incorporated modelling of simple food preparation techniques by the chefs [BCT:6.1] [1]. This session increased the parents' ability to support their child to learn how to cook in a supportive environment [BCT:8.1] [1, 2]. Busy family members have less self-efficacy in the basic life skill of cooking due to the continued limited time to prepare foods [1, 9]. Improving self-efficacy in cooking can also associated with increased safe food handling knowledge and abilities and can have an impact on health by reducing the risk of foodborne disease incidences [12, 81]. To overcome low levels of self-efficacy in the kitchen the four key elements of handling food safety 'Clean, Separate, Cook and Chill' were applied [91] and a recap on correct hand-washing techniques was practically taught using the glitter bug activity. Incorporating BCTs 6.1 and 8.1, [2] participants were practically learnt the 2-hour 4-hour rule and how to avoid cross-contamination while preparing a no cook crispy chicken salad recipe. Considered to be low cost and easy to prepare, this recipe was designed to increase cooking self-efficacy in participants (Appendix 5). The recipe is designed for children to build upon their literacy using easy to read English [98] and numeracy skills by weighing and measuring its ingredients [85].

3.9.3 Session three

Session three of Plate it Up® is called 'Planning for food choices and meals.'
The session aims to increase participants' knowledge of the ingredients list and nutrition labels thereby increasing their ability to make informed decisions on the food choice (Figure 4).

Active learning component: Participants were reintroduced to the Australian Guide to Healthy Eating [96] through simple practical conversations that were designed not to overwhelm participants [82]. Posters and PowerPoint slides included nutrition education which helped guide conversations around reading food labels and ingredient lists [97].
Adults with low levels of literacy have difficulties in understanding nutritional labels; a barrier that can influence their child's food choices and subsequently health in adulthood [4, 5, 7, 9, 46]. Children's food choices and behaviours can be influenced by their surrounding environments, such as the marketing strategies employed by companies in the retail space [24, 65]. To overcome this issue, the power point slides, and group discussions were based upon nutrition education that included reading and understanding the ingredients list on packaged foods. Learning resources included PowerPoint slides and paper based resources of laminated nutrition panels, which focused on the ingredients list, and nutrient content using the 100g column [97]. The learning content was included to aid participants in selecting and swapping their food choice to a product that was more aligned to the Australian Dietary Guidelines [11, 82]. The participants had the opportunity to learn about added ingredients using colour referencing of blue and red. This activity was intended to help facilitate role-modelling behaviour from parent to child [BCT: 13.1] [2]. To enable participants to make a sound food choice using practical learning is based upon reading nutrition labels, that further supported parents ability to guide this information to their child [BCTs: 4.1;7.1] [2].

Middle and low income households in socio-economically disadvantaged regions tend to access cheap ultra-processed foods due to low cost [54], resulting in a higher risk of NCDs over time [19]. To overcome this barrier to eating food that is less refined, participants had the opportunity to investigate the marketing of ultra-processed foods in a retail space. A visit to the hosting facility's kiosk in this session reinforced learning enabling parents and children to select foods that were low in added salt, sugar, and saturated fat. It also offered the opportunity

for children to practice their new skills in reading the ingredient lists or food panels on packaged food and drinks.

Food preparation component encouraged participants to prepare their meals ahead of time (Figure 4). Studies have shown a willingness for parents to spend time safely preparing food with their child is a predictor of improved cooking confidence in children [1, 18]. Time poor parents have less time to prepare meals from scratch [7, 8, 33], which has resulted in a decrease in adults cooking confidence [62] and less time for children to learn to cook at home [1]. To address this, the cooking activity facilitated the development of planning and preparation skills to ultimately increase healthy food in the home environment [BCTs: 8.1; 13.1] [2]. The cooking activity aligned with the key concept of SCT [81] where self-efficacy can be increased by exposure to practical learning. Additionally, the practical learning of food preparation incorporated the modelling of simple food preparation techniques by skilled chefs [BCT:6.1] [1, 2]. The four key elements of handling food safety were reviewed [90, 91] and hand-washing techniques were revisited. To practice health-enhancing behaviours, participants made a simple healthy pizza (Appendix 6). Before preparation, a recap on handling knives safely was emphasised during discussion and preparing the recipe [85]. The chefs asked the participants questions about the placement of knives and holding knives safely. Following this, the parents and children safely prepared fresh toppings consisting of brightly coloured fresh vegetables, deli meat, low-fat cheese and fresh herbs. A 'Napoli sauce' that consisted of canned tomatoes, onions and herbs was pre-prepared, the recipe and storage of which was shared with the participants (Appendix 7).

3.9.4 Session four

Session four is named '*Planning and selecting food in advance.'* The final session aimed to encourage participants to choose healthier foods based on what resources that are on hand (Figure 4).

Active learning component: This session provided participants with helpful strategies for eating healthily on a limited budget. Consuming a wide variety of nutritious food can present as challenging for communities living in disadvantaged regions where there are fewer opportunities to access healthy food retail outlets [29, 31, 38, 54]. It has been reported that while parents believe that planning their money and resources for food is important, many struggle to find the time [5] or have difficulties accessing food at a reasonable cost [52]. To address this issue, the key message in the final session was how to prioritise time and money for food and its preparation [BCT's: 3.2; 4.1] [2]. The parents and children are split into two groups; children prepared their lunch boxes with the supporting chef, while parents reflected on the difficulties in budgeting and accessing food for their family with the facilitating research student.
This active session included a guest presenter from Bendigo Foodshare, an organisation that distributes food to local food relief agencies. The guest presenter informed parents on the work of Bendigo Foodshare with at risk youth and where food relief could be accessed in the region [BCT: 3.1] [2]. Information on access to low cost and free food was presented, supporting parents to approach learning through problem-solving guided discussions around shopping on a budget and unit pricing [101]. To continue to build knowledge on safe food storage the topic of storing and thawing foods in the refrigerator was included [101]. Participants were encouraged to share their own strategies for accessing food on a budget with open acknowledgement that levels of food insecurity in families are increasing due to the high cost of living [52]. To reduce any stigma and to avoid any feeling of inadequacy from their current diet or potential food avoidance [82, 95] the advice given by the facilitator included an emphasis on the positive benefits of participants' current diet without being judgemental [BCT's: 3:2, 13.2] [2].

Children's food preparation component: Supported by posters outlining the traffic light food system, children prepared lunch boxes for the next day [104].

Foods were colour coded with **GREEN** representing foods and drinks that are the most nutritious choices. **AMBER** represented foods and drinks that are processed and have some sugar, salt and/or fat added to them to be consumed occasionally, **RED** represented discretionary foods and drinks that should be consumed rarely and in small amounts. Children packed their new lunch boxes with **GREEN** options such as rice paper rolls, while some **AMBER** foods were selected such as orange juice. When packed and ready for the next day the lunch boxes were stored in a refrigerator reinforcing the importance of keeping lunch boxes chilled [91].

Food preparation component supported participants to prepare meals using low cost pantry staples (Figure 4). In this final session, parents and children prepared a low cost meal together using a variety of pantry staples such as flour, potato and tinned tomato. As in all previous food preparation activities allergen advice, safe food handling, and hand washing was revisited to embed the importance of this information. [91] [12], [BCTs: 4.1; 6.1] [2]. A 'Napoli sauce' was again pre-prepared (Appendix 7). The participants prepared potato gnocchi (Appendix 8), which gave children an opportunity to build upon their motor skills and define their hand-eye coordination mashing potatoes using a hand masher or mouli and hand rolling prepared gnocchi. Through sharing skills and tasks in food preparation, children and parents also participated in serving meals using tongs and spoons, discarding food waste and other general cleaning after meals, which is helpful when providing practical education on hygiene and food safety [4].

3.9.5 Food socialisation - group dining

Eating is more than nourishment alone, it is the social connection with others, which adds sense of personal identity, a connection with family, culture and to the wider community [3, 53]. The review by Patrick and Nicholas (2005) suggest that socialisation through sharing a meal is known to facilitate a higher consumption of foods from the core food groups [60]. Therefore, the family food socialisation component of Plate it Up®, which aligned with the food literacy domain '*Eat*' was an important aspect of the intervention [15]. Each of the four sessions concluded with participants and facilitators sharing conversations over the prepared meal. Vidgen and Gallegos (2014), suggest that "*sharing a meal is an important part of eating*" (p. 57) which can establish lifelong family relationships [6, 15]. Time shared over a meal develops positive food behaviours in children through friendly conversation and role modelling [6, 9, 10] and influences behaviour change [BCT: 6.1] [2]. Through food and conversation, the group enjoyed each other's company when eating the prepared meals together. This final part in each of the four sessions provided children the opportunity to continue practising their numeracy and literacy skills [85] by completing food-inspired activities [BCTs: 4.1; 5.1] [2]. The resources were designed to be fun and engaging for primary school-aged children and were made available in the food socialisation component to support educational content. Children had the opportunity to complete crosswords, word puzzles and cartoon-style food safety puzzles and illustrations. Two learning resources based upon the 2-hour 4-hour rule and food safety in the kitchen were developed by the research student and a local artist specifically for the Plate it Up® intervention.

3.10 Conclusion

Studies have found that, after completing community-based food literacy interventions, individuals' food behaviours have changed, with outcomes such as the increased vegetable consumption and a reduced intake of processed foods [18]. However, there is a lack of information in the literature regarding the evidence-based development of a parent and child food literacy intervention and alignment to theories of learning and behaviour change. This paper presents the development of the Plate it Up® food literacy intervention and how the identifiable active mechanisms of the intervention may facilitate behaviour change. This chapter described how the social cognitive theory can be applied to increase confidence and self-efficacy in food choice and abilities which are known to facilitate behaviour change. Each of the sessions included program logic model reflecting nutrition knowledge, food safety and cooking that was developed using evidence-based learning content. Children and adults with low levels of literacy need to understand information on health and food using easy to understand information [53, 54, 85, 95, 98]. Each session was focused on the delivery of supportive learning content to reduce the risks of food avoidance and restriction and negativity towards food, which may have resulted upon reflection of participants current food choices.

Chapter 4. Methods and materials

4.1 Chapter overview

This chapter presents the epistemology through which this study is positioned and the mixed methods approach employed to determine the preliminary impact of Plate it Up®. The evaluation is designed to align with the food literacy domains, '*Plan & Manage*,' '*Select*' '*Prepare*' and '*Eat'* [15]. This study additionally aims to provide a deeper understanding of participants experiences in the intervention and their barriers and facilitators when planning, choosing and eating healthful foods. Chapters 1 and 3, discussed literature and development of the intervention that were also guided by the food literacy framework [15] and the theoretical concepts of the Social Cognitive Theory (SCT) [81]. The same literature and theoretical concept has been included in the evaluation of the Plate it Up® food literacy intervention. This chapter outlines the evaluation design and its timeline, including the parents and children evaluation tools that were developed from questions sourced from peer reviewed food literacy and culinary interventions. To further understand and measure children's nutrition knowledge and their ability to select healthier foods and drinks, the development of the novel children sorting task will be discussed. This chapter additionally outlines the qualitative method used in to seek further information on participants barriers and enablers to selecting, preparing and eating healthier foods.

4.2 Research paradigm

A worldview paradigm can often form the epistemological foundations of the way that research is undertaken [105]. The approach taken by this research study is primarily post-positivist in its use of quantitative methods and supplemented by a constructivist ontology in its use of qualitative methods. Post-positivism values empirical research to validate outcomes, yet values objectivity[105]. This approach recognises probability rather than certainties and recognises the possibility that bias may interplay while conducting research [105].

A constructivist ontology recognises that humans create many meanings in their behaviours due to their complex nature and their lived experiences and that it is the researcher's role to identify, interpret, and make sense of those meanings [105]. These characteristics apply to this

study's aims to gain a greater understanding of participants' behaviours that are influenced by lived experiences by investigating the barriers and enablers to food choice and food behaviours.

In qualitative research, the role of the researcher in interpreting participants' meanings is a potential limitation that can impact the ability to interpret the food behaviour of participants' accurately; however, due to the researcher's education from a scientific background in biomedical human nutrition, and in combination with the use of post-positivist methods for (quantitative) outcomes in evaluation, this challenge may be mitigated by attempting to centre the importance of accurate, verifiable, and consistent results [105, 106].

4.3 Study design

This pilot study of the delivery and evaluation of Plate it Up® was designed to inform future development of the intervention. According to Conn et al. [107] piloting a project offers the opportunity to experience implementation, delivery, and testing the methodology before any future work.

This research project used a sequential mixed methods triangulation design to evaluate the effectiveness of a pilot family-focused food literacy intervention, Plate it Up®. The triangulation design included the collection of data from multiple evaluation tools and is commonly used in public health research, while a sequential approach to mixed methods research enables a deeper understanding of an intervention's outcomes [105, 108, 109]. Given the intervention itself was developed using the principles of Social Cognitive Theory (SCT) [81] the evaluation was also designed to investigate the key SCT constructs, such as self-efficacy in cooking, using online questionnaires and in-person interviews.

The data collection and timeline is depicted in Figure 6. In addressing the primary aim, self-reported questionnaire and sorting task data was collected at three time points; at the start of the intervention (baseline), at the end of the intervention (post), and again 1-month following the intervention. Collected from 1-month follow up parent-child dyad interviews, qualitative data was used to address the secondary aim. The descriptive triangulation evaluation design employed parent and child questionnaires, child's baseline and post sorting tasks and parent

and child dyad interviews. The strategy of triangulation was used to strengthen the study [105]; namely, the investigation into the intervention's effects on participants' food choices and behaviours in food literacy. Data sourced from the questionnaires was used to examine the changes in parental food choice, together with their knowledge and skills in the food literacy domains, '*Plan and Manage'*, '*Select*', '*Prepare*' and '*Eat*' [15] .The data from the children's questionnaire was used to examine children's food choices, nutrition knowledge and self-efficacy in the food literacy domain '*Prepare*'. This evaluation employed a baseline and post child's sorting task to measure children's nutrition knowledge learned for their skills in the domain '*Select*'. The dyad interviews provided further exploratory framework to the quantitative results, by providing an in-depth description of participant's perspectives of their food skills outcomes. The qualitative data from the interviews provided identification of the key barriers and enablers to participants planning choosing and eating healthier food choices one month following the intervention.

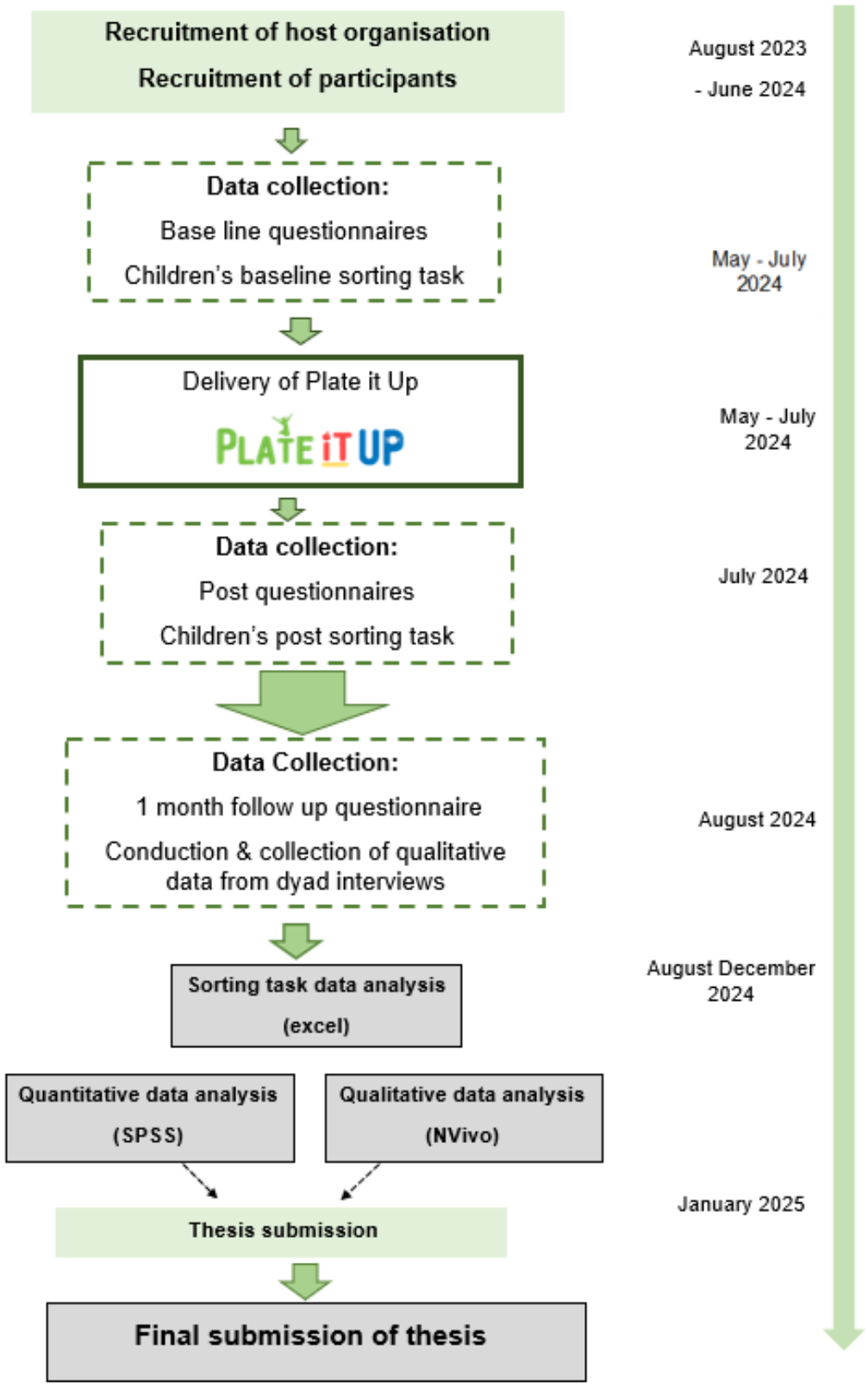

Figure 6. Study timeline and data collection.

4.4 Ethical approval

All study procedures were conducted in accordance with the National Statement on the Ethical Conduct in Human Research [110]. Ethical approval was granted by Victoria University Human Research Ethics Committee (HRE23-022). Parental/guardian consent and child assent was obtained in writing prior to their participation in this study.

All data was anonymised with linked identifiable, confidential information is stored on the Victoria University R: Drive. All transcripts from interview were also anonymised and then stored in Victoria University R: Drive. This data will be retained for a period of 7 years as required by the National Statement on the Ethical Conduct of Human Research (2018) [110].

Prior to each evaluation activity, parents and children were reminded of their previous consent/ assent and children were supervised by their consenting parent. Non-verbal indicators of dissent from the child were monitored and acted upon appropriately with the evaluation activities discontinued. The semi-structured qualitative interviews were conducted with a subset of participants who opted-in to be interviewed, with their verbal consent/assent to participate and to be audio recorded was reaffirmed at the start of the interview. No direct payments for participation were made, however children received a take home lunch box during the intervention, and the parents who participated in the parent-child dyad interviews each received a $15 Coles voucher as acknowledgement of their time.

4.5 Recruitment

Recruitment was conducted in regional Victoria in the City of Greater Bendigo. Located in central Victoria Australia, the region has an estimated 122,647 residents [111]. The region has 32,281 families of those, 39.7% are from couple family with children [112]. Considered to be diverse in ethnicities, the City of Greater Bendigo is a region where the western diet and high levels of obesity and overweight, are placing the community at an increased risk of dietary-related chronic diseases such as Type 2 Diabetes, cardiovascular disease, stroke, and some cancers [112].

The initial recruitment of a hosting sporting organisation was conducted during June to August 2023. Both summer and winter clubs were approached including the sporting codes of Football (AFL), netball, cricket, baseball, basketball, soccer and swimming. An email was sent to clubs that included an introduction to the research team and a copy of a community project proposal. The committee of an amateur junior football club in the urban regions of the City of Bendigo agreed to host the intervention sessions during the 2024 playing season.

Participants were recruited through the junior sporting club by committee members placing posters on-site and posts via the club's social media page in Facebook. Additionally, the research student was on-site at the 2024 club registration day and on four training nights to share information with prospective families. The intervention was promoted at local community houses, local libraries and the Facebook page of the local supporting sporting association Sports Focus.

Families were eligible to participate in the intervention and it's evaluation if children were aged between eight to twelve years old and played community sport in the City of Greater Bendigo, Victoria, Australia during the 2024 AFL playing season. The adult participants were required to be a parent/guardian or grandparent of the child participants. Participants were required to complete all four sessions of Plate it Up® for inclusion in the evaluation.

4.6 Implementation

The Plate it Up® sessions were held in the City of Greater Bendigo, which is located in central Victoria, Australia. The traditional owners are the Dja Dja Wurrung and Taungurung (Jaara) people. The region has an estimated 122,647 residents [111].The intervention was held in the urban Bendigo region of White Hills, which has an Index of Relative Socio-economic Disadvantage score of 979.7 (31st percentile) [111]. The sessions were facilitated at the home ground of the White Hills Junior Football Club (AFL) in the function rooms and kitchen/kiosk during May and August 2024 to four parent and child dyads.

Food orientated puzzles, props and games were available for children when they became disengaged with the learning content. Breaks were allocated; however, children were given permission to take a break at any time. Each session lasted for approximately 100 minutes and

facilitated by the research student (an associate Nutritionist and qualified chef), a volunteer supporting chef, and a guest presenter from Bendigo Food Share and organization that provides food and resources to Central Victorian food relief agencies. The teaching plans outlined: the structure and plans for each session; timeframe for each presentation/activity; required resources; and teaching approaches required for a successful intervention delivery.

4.7 Questionnaires

Due to a lack of established valid and reliable evaluation questionnaires to measure the impact of a family-focused food literacy intervention in Australian participants, bespoke questionnaires were developed for this project based on questionnaires published in the literature. The questions were selected and adapted for their relevance to the research aims, research questions and the intervention session objectives. An Easy English approach to the wording and presentation of the questionnaire was adopted, ensuring that the accessibility of questions was suitable for school-aged children and appropriate for adults who find reading English difficult [98]. The questionnaires were piloted with three Australian children aged between 8 and 12 years and three parents over 18 years of age, all were independent of the intervention and its evaluation. There were no reported issues with comprehension. The time taken to complete was 15 minutes for children and 10 minutes for adults.

Children were supported when answering the baseline and post-intervention questionnaires on-site at the hosting club. The research student and parent explained questions if children were uncertain or confused, but did not answer questions or prompt answers with examples. Baseline, post-intervention, and one month follow-up questionnaires were accessible online using Qualtrics XM (2002). A link to the one month follow-up questionnaire was sent via email to adult participants to facilitate their completion at a time and location suitable for the parent and child participants.

4.7.1 Parent questionnaires

The baseline questionnaire consisted of 22 open and closed questions across 5 sections (Appendix 10). The sections explored demographic information, parental behaviours in relation to the domains of food literacy: '*Plan & Manage'*, '*Select*', '*Prepare*' and '*Eat*' [15]. Closed questions used Likert scales and multiple choice options to gather responses. The same questionnaire was completed by the same parents at the start of the intervention, at the end of the intervention and one month following the intervention. The questionnaire versions administered at the end of the intervention and at the one month follow up time points contained additional questions on parents' views on the intervention and how the intervention had impacted their children and their families diet.

There were seven questions regarding adult participants' demographics, including: age, gender, residential postcode, their highest level of education achieved, current work status, household members and living situation.

In the '*Eat'* domain there four questions regarding parents eating patterns. To determine adults' dietary behaviours two questions used a dichotomous response to explore fruit and vegetable consumption [82]. Questions were supported with images of standard serve sizes based on the Australian Dietary Guidelines [38]. A further two questions explored frequency of consumption of discretionary food and drink in an average week using a dichotomous response of "Less than once a week" or "More than once a week".

There were two questions on parent participants' nutrition knowledge and their ability to '*Select*' healthier foods. Each question was measured using a question from a previous evaluation of a food literacy program in Western Australia [11]. The questions utilised an image of a food label sourced from the Australian Dietary Educator Guide [97], and asked participants to identify the main ingredient, together with how many grams of sugar they could identify in the 100g column.

Adequate levels of food literacy represent a confident approach to navigating complex food systems [15]. To measure participants behaviours in food literacy a 14 - item food literacy checklist that was developed and validated was included [113]. This checklist encompasses the four domains of food literacy and has been validated through two previous studies that assessed the tool for content, face, and construct validity using large samples of adults with low levels

of food literacy [72, 113]. Since its creation, the tool has been utilised to evaluate the impacts of Food Bank's '*Food Sensations*' program for adults (FSA) [17]. Inclusive of the four domains of food literacy, adult participants were asked how often they planned meals; managed their money, time and other resources for food provisioning and preparation tasks in the home. Responses were measured using dichotomous response of "Sometimes" or "Most of the time". Parents running out of money for food also used dichotomous responses.

To further investigate parents confidence in their food preparation and safe food handling skills, additional questions were sourced from Australian and international evaluations using adults. Questions addressed parents' frequency to cook for themselves or others was measured using a question from a food literacy intervention conducted Western Australia [82]. Responses were gathered using a 3 point Likert scale ranging from one ("Prepare or cook no food/meals for myself or others") to three ("Prepare or cook most food/meals for/and others").

To further investigation into parents' skills in the *Prepare* domain. Parent's skills to cook using low cost ingredients utilised four additional questions, sourced from an Australian food and cooking intervention [33]. Participants were asked for their agreement on a range of topics, cooking using seasonal produce is cheaper, cooking from scratch using herbs and spices with no recipe, cooking a meal in less than 30 minutes, and preparing meals from low-cost ingredients. These four questions used dichotomous responses of "Disagree" and "Somewhat agree". Another two questions sought to answer the families frequency of purchasing ingredients and cooking from scratch using a 3-point Likert scale. Responses were scored one ("Less than once or twice a week") to three (Twice a day or more") were sourced from a Brazilian study [114]. The same Brazilian study was used to measure parents' frequency to cook meals by combining spices and pantry staples spices without a recipe. Responses were "Not confident" or "Confident".

Three questions regarding food safety behaviours investigated parental behaviours in relation to storing and thawing of raw chicken in the home as this is considered a high risk food and general food storage behaviours that is based upon the two-hour/four-hour rule [50]. Responses were scored using a three point Likert scale ranging from 1 ("Never") to 3 ("Always").

In the questionnaires administered immediately post and 1 month following the food literacy intervention, two additional open ended questions asked about parental views on the resources and activities included in the intervention. The final two questions were open ended which

explored parent's views on whether their child's and other extended family member's behaviours around food changed following the intervention [115].

4.7.2 Child questionnaires.

The questionnaire consisted of 18 questions (Appendix 11). The questionnaire included visual prompts and divided into 4 sections that explored demographic information, as well as the child's behaviour and knowledge in relation to the domains of food literacy: '*Select*', '*Prepare*' and '*Eat*' [15] .

Five demographic questions were included to establish child participants' characteristics, including location of the child's sporting club, age, gender, common language spoken at home, and their current grade at school.

There were 10 questions to assess behaviours in the '*Eat*' domain. Children's preference to eat odd shaped or blemished fruits and vegetables (yes/no), and the number of serves of fruits and vegetables consumed daily [21]. In this current study the questions utilised a dichotomous response of "One serve or less" or "Two or more serves a day". Children's water daily cups of water consumed required a response of either "1 cup a day" or "2 or more cups a day".

To measure children's consumption of convenience food and drink (e.g., deli meats, takeaway food, salty crisps, sweet foods and sugary drink) response of "Less than once a week" or "1 or more times a week" was used.

There was one question that consisted of 2 parts that was used to investigate children nutrition knowledge. Child participants' knowledge of the Australian Guide to Healthy Eating and their ability to '*Select*' 'healthier' food and drinks was investigated using image-based prompts [96]. They were also asked to describe their understanding of the Australian Guide to Healthy Eating 'Plate Model' in an open-text format.

To measure children's skills in the '*Prepare*' domain, 2 questions were used. This included to measure children's frequency of helping to cook at home, and their confidence in the food preparation skills they employed [116]. Responses were gathered using image-based prompts of smiley-face emoji, which scored as "Never" and "Occasionally". The final question explored

children's confidence in their food preparation ability (e.g., cut up vegetables, follow recipes or measuring ingredients). Responses were gathered using image-based prompts of smiley-face emoji, which reflected "I cannot do this at all" or "I can do this".

The post-intervention and one month follow-up questionnaires investigated child views on the resources and activities included in the intervention using 6 questions that consisted of open ended and open-ended questions [116].

4.8 Children's sorting task

To further measure children's nutrition knowledge and their ability to select healthier foods and drinks, this project used a hands-on sorting task derived from a study previously published study involving Australian school children [117]. Administered prior the intervention and immediately after the final session, children were required to sort 17 images of commonly consumed Australian snacks and drinks into categories representing the 'healthiness' of the item. Parents and the researcher were present during the task but did not assist the children in completing the task. Child participants were encouraged to think aloud and try to give explanations for why they were sorting the items into their chosen category.

Well intentioned education on healthy food may foster disordered eating patterns through the labelling of foods as "bad" or "unhealthy" foods [60, 95]. In this current study the original task design was amended to mitigate risks associated with negative food relationships [95]. In this current study categories have been adapted to include colours of the traffic light system (**GREEN**, **AMBER** or **RED)** [104] . The classification of the foods was based upon the Australian Dietary Guidelines [38] and Australian Guide to Healthy Eating 'Plate Model' [96]. The '**GREEN**' category represented a wide variety food low in added salt, sugar and saturated fats, high in fibre, and should be consumed regularly, and drinking water. '**AMBER**' referred to occasional consumption of foods and drinks that are typically processed and contain moderate levels of added salt, sugar and saturated fat, with limited dietary fibre. The colour '**RED**' represented highly processed discretionary food choices that should be eaten in only limited amounts [104]. Responses were scored based on the number of images correctly sorted into their category. A guide to the correct responses and categories can be found in Appendix 12.

4.9 Parent and child dyad interviews

A semi-structured interview guide was developed to explore themes around the acceptability of the intervention, changes in family behaviour related to food following the intervention, family barriers and facilitators wanting to select, prepare and eat nutritious foods (Appendix 13). The parent-child dyad interviews were completed 1- month after attending the intervention, with each interview lasting for approximately 20 minutes. Consenting adults opted-in for themselves and their child to be interviewed at 1-month following the intervention. Interviews were conducted in-person by the research student. As financial security can directly impact food security [19, 51, 52, 54], parents were given the opportunity to share information in the interviews to without the child's present. If parents requested this opportunity, children were supervised by an appropriate qualified adult during this time.

4.10 Data analysis

4.10.1 Quantitative data

Statistical analysis for questionnaires was completed using SPSS Statistics version 25 (IBM Corporation, Armonk, NY, USA). Descriptive statistics were collated and reported in terms of number and percent (%). Comparisons between baseline, post-intervention and follow up questionnaire responses were collated and reported in terms of frequency and percent (%). Figures on participants nutrition knowledge and parent's food safety behaviours were reported using Microsoft Excel (v.2411, 2022). Children's correct sorting task responses and common words were analysed using Microsoft Excel (v.2411, 2022).

4.10.2 Qualitative data

Children's correct sorting task common spoken words were analysed using Microsoft Excel (v.2411, 2022). Consent to participate in the dyad interview and to be audio recorded was reaffirmed. All dyad interviews were audio recorded on a laptop using Dark Audacity (v2.3.2x,

2019) and transcribed verbatim using Otter ai (v.2.18.3, 2016). Supervisors verified transcript quality to ensure accuracy and avoid misrepresentation. The transcribed data underwent thematic analysis as guided by Braun and Clarke [118, 119] using NVIVO 12 (QRS International 2012). The transcribed data underwent the six steps of thematic analysis that included: 1) familiarisation of data; 2) generating initial codes; 3) searching for themes; 4) reviewing themes; 5) defining and naming themes; and 6) writing up the findings.

As outlined by Braun and Clarke (2022) [119] step one included a thorough examination of the transcribed text to ensure complete immersion in, and familiarity with, participants' experiences and behaviours related to food. The second step involved re-immersion of the data and searching for initial food codes and adopting a broad perspective to capture participants' insights regarding the intervention and their lived experiences relating to food. Steps three and four involved a rigorous reading and re-reading of the coded segments of transcripts to compile a cohesive set of themes, allowing for the refinement of the initial identified themes to occur. Steps five and six involved naming the themes and writing definitions that were intended to reflect their core meanings, with names and definitions further refined following supervision with other members of the research team. The coding process and identified themes were verified by supervisors.

4.11 Conclusion

There are limited evaluation tools for family focused food literacy interventions that are developed using the food literacy domains: *'Plan and Manage*', '*Select'*, '*Prepare*' and '*Eat'* [72]. This chapter described the methods employed and tool development to evaluate the outcomes of the Plate it Up® intervention. Tool development was evidence based with questions sourced and adapted from peer reviewed publications. There are limitations to self-reported data and to effectively determine children's nutrition knowledge after participating in an intervention, therefore this chapter discussed the adaptation of a novel baseline and post children's sorting task. There are multiple factors that impact people's ability to select, prepare and eat healthier foods [60]. To further explore family barriers and facilitators to healthier food choices and the application of food literacy skills, semi-structured parent-child dyad interviews were used.

Chapter 5. Results

5.1 Chapter overview

This current chapter reports the findings of the Plate it Up® intervention inclusive of the participant demographics, quantitative findings of parents' and children's knowledge, behaviours and confidence in relation to food literacy. The evaluation of engagement and acceptability of the intervention as perceived by the families is reported, along with perceived barriers and enablers to families selecting, preparing and eating more healthier options one month following the intervention.

5.2. Participants

The intervention was held an amateur junior sporting complex, in the City of Greater Bendigo, central Victoria, Australia. Plate it Up® was delivered during the Australian winter months of May-July 2024. The first delivery was after school on training nights, and the second delivery was during the July school holidays of the Victorian school calendar year. A total of four parent-child dyads signed up for the intervention.

Table 2 shows the demographic characteristics of the parent and child participants who completed all four sessions the intervention. All parents reported having post codes in areas of disadvantage in the urban and regional areas within the City of Greater Bendigo [111]. There was an equal number of male and female parents with the majority working in full time employment. All parents were similar in age and living situation and 2 (50%) of parents indicated their highest level of education was secondary/high school. At baseline, half of the parent participants reported that most meals were prepared in the home. All children were male who spoke English and reported helping to prepare meals at home occasionally.

Table 2 Demographic characteristics of parent and child dyad participants.

Category	*n*	%

Parent Participants: ($n = 4$)		
Gender:		
Male	2	50
Female	2	50
Age:		
35 - 44 years	1	25
45 - 54 years	3	75
Post codes*		
Rural Bendigo	1	25
Urban Bendigo	3	75
Highest level of education completed:		
Secondary: high school	2	50
Certificate: TAFE, Apprenticeship, Diploma, Adv. Diploma	1	25
Tertiary: Bachelor degree or higher	1	25
Current employment:		
Working part time	1	25
Working full time	3	75
Family situation:		
Couple with dependent children	4	100
Current living situation:		
Living in a house/apartment that I own with my child	4	100
Meal preparation and frequency:		
Prepare some meals	1	25
Prepare most meals	2	50
Prepare all meals	1	25
Category	***n***	**%**
Children Participants: ($n = 4$)		
Gender:		
Male	4	100
Age:		
9 years	1	25
10 years	1	25
11 years	2	50
Grade:		
Grade 4	1	25
Grade 5	1	25
Grade 6	2	50
Locations of playing sport:		
Urban Bendigo	4	100
Main language spoken at home:		
English	4	100
Children's frequency to help prepare meals at home:		

Occasionally	4	100

* Socio-Economic Indexes for Areas (SEIFA) are ranked areas according to the relative socio-economic advantage and disadvantage. Post codes represent areas of disadvantage in participants who live and play community sport in the Urban and Rural regions in the City of Greater Bendigo 928.5 - 1079.2

5. 3 Preliminary outcomes

All parent and child participants completed the online questionnaires that were delivered at three different timepoints; baseline, post and one month following the Plate it Up® intervention.

5.3.1. Outcomes on participants eating behaviours.

Parents and children's eating patterns was measured at baseline, post-intervention, and one-month follow-up, results served as a primary outcome of the evaluation. At baseline only 2 (50%) of parents reported eating two or more serves of vegetables each day. This increased post-intervention, with all four parents (100%) reported eating 2 or more serves of vegetables each day, however this was not sustained at the 1-month follow-up (Table 3). The children's serves of vegetables was unchanged from baseline to post-intervention with 2 (50%) reporting consuming two or more serves daily which increased at follow-up 3 (75%). One month following the intervention three children (75%) consumed 2 or more serves of vegetables each day compared to 2 children (50%) post-intervention. Children eating imperfect or "funny" shaped vegetables produced minimal changes (Table 3). Parents and children eating fruit showed similar trends (Table 3). At post and follow up three parents (75%) reported eating: "two or more serves each day" of fruit, a rise of 25% from baseline. In regard to children two reported eating: "2 or more serves a day" of fruit at post and follow up (50%); compared to 1 child (25%) at baseline. The children replicated this trend of eating funny-shaped fruit, which increased over all by 25% at follow-up (Table 3). At follow-up, four children (100%) reported that they: consumed "more than 2 cups a day" of water each day at follow-up compared to two children (50%) at baseline. Parents' consumption of water was not recorded (Table 3).

There were similarities between children and parents' consumption of sugary drinks, fast food, biscuits/cakes, and deli meats. Two (50%) of the parents reported that they eat takeaway meals

"less than once a week"; with no change being observed at post-intervention and follow-up. Overall, there were no changes in children self-reported eating takeaway food.

There were differences in parents' and children's consumption of sugary drinks following completion of the intervention. At post and follow-up time points three (75%) parents reported consuming sugary drinks: "more than once a week ", compared to 2 (50%) at baseline. Children's patterns of consuming sugary drinks minimally changed across the three time points (Table 3). However, 4 (100%) children reported that they consumed more than 2 cups a day of water each day at follow-up compared to 2 (50%) children at baseline (Table 5.2). No changes were observed in children eating potato crisps across all three-time points; however, there were changes noted in children's reported consumption of sweet foods. Children eating cakes and lollies slightly improved. All children (100%) reported eating cakes and lollies: more than once a week at baseline, compared to three (75%) who ate cakes less than once a week at post and follow-up. Children's eating less deli meats improved at post and follow up, 2 (25%) of children reported eating deli meats less than once a week when compared to 3 (75%) at baseline.

Table 3. Parent and children's eating behaviours.

Parent eating behaviours (*n* = 4)	**Baseline, post-intervention and one month follow up questionnaires**		
	Baseline *n (%)*	**Post** *n (%)*	**Follow up** *n (%)*
Fruit: per day*			
2 serves of fruit	2 (50)	3 (75)	3 (75)
Vegetables: per day*			
2 or more serves of vegetables	2 (50)	4 (100)	3 (75)
Overall discretionary items (less than once a week)			
Discretionary drinks: Soft or sport drinks & cordials	2 (50)	3 (75)	3 (75)
Discretionary fast foods: Burgers, pizza, chicken or chips	2 (50)	2 (50)	2 (50)

Children's eating behaviours (n = 4)	Baseline, post- intervention and one month follow up questionnaires		
	Baseline *n (%)*	**Post** *n (%)*	**Follow up** *n (%)*
Fruit (per day)*			
2 serves of fruit	1 (25)	2 (50)	2 (50)
Do you eat funny shaped fruits			
Yes	2 (50)	1 (25)	3 (75)
No	2 (50)	3 (75)	1 (25)
Vegetables (per day)*			
2 or more serves of vegetables	2 (50)	2 (50)	3 (75)
Do you eat funny shaped vegetables			
Yes	2 (50)	1 (25)	2 (50)
No	2 (50)	3 (75)	2 (50)
Water (per day)			
Cups of water	2 (50)	3 (75)	4 (100)
Overall discretionary items (less than once a week)			
Sugar sweetened drinks: Soft drinks, cordials, sports drinks like Coke, Lemonade, Gatorade	1 (25)	2 (50)	1(25)
Discretionary fast foods: Burgers, chicken or chips from local fast food places or McDonalds, Hungry Jacks, Pizza Hut, KFC, Red Rooster	1 (25)	1 (25)	1 (25)
Potato crips, salty snacks: Potato crips, Twisties, Corn chips, pretzels.	3 (75)	3 (75)	3 (75)
Processed meats and pastries: Sausages, hotdogs, salmi, ham, devon, salami, bacon, meat pies, sausage rolls, chicken nuggets	3 (75)	2 (50)	2 (50)
Sweet foods: Biscuits, cakes, muffins, lollies, chocolate	4 (100)	3 (75)	3 (75)

*Serving sizes of fruits and vegetables in adults was identified using image prompts and photos of weighted and cup size of fresh and frozen fruits or vegetables based upon Australian Dietary Guidelines [38] (Appendices 10 and 11).

5.3.2. Outcomes on participants' nutrition knowledge and their ability to select healthier options

There was minimal change in parents' nutrition knowledge, as measured using nutrition information panels across all time points. When asked to identify the main ingredient, no parent correctly identified the main ingredient at the baseline compared to four (100%) at post-intervention and three (75%) at one-month follow-up (Figure 7). Across the three time points all parents were able to identify the amount of sugar in the 100g column in the nutrition panel (Figure 8). There were also improvements in children's nutrition knowledge noted with three (75%) children having a greater understanding and awareness of the Australian Guide to Healthy Eating at baseline, compared to all four (100%) at post and follow up time points (Figure 9). When asked to describe the message of the Australian Guide to Healthy Eating all children associated to it in terms of "*healthy eating.*" When used as an education tool the guide shows *"What foods are healthy"* and *"Which food is good for you and not"* which educates "*Children to eat healthier"* and *"When to eat stuff."*

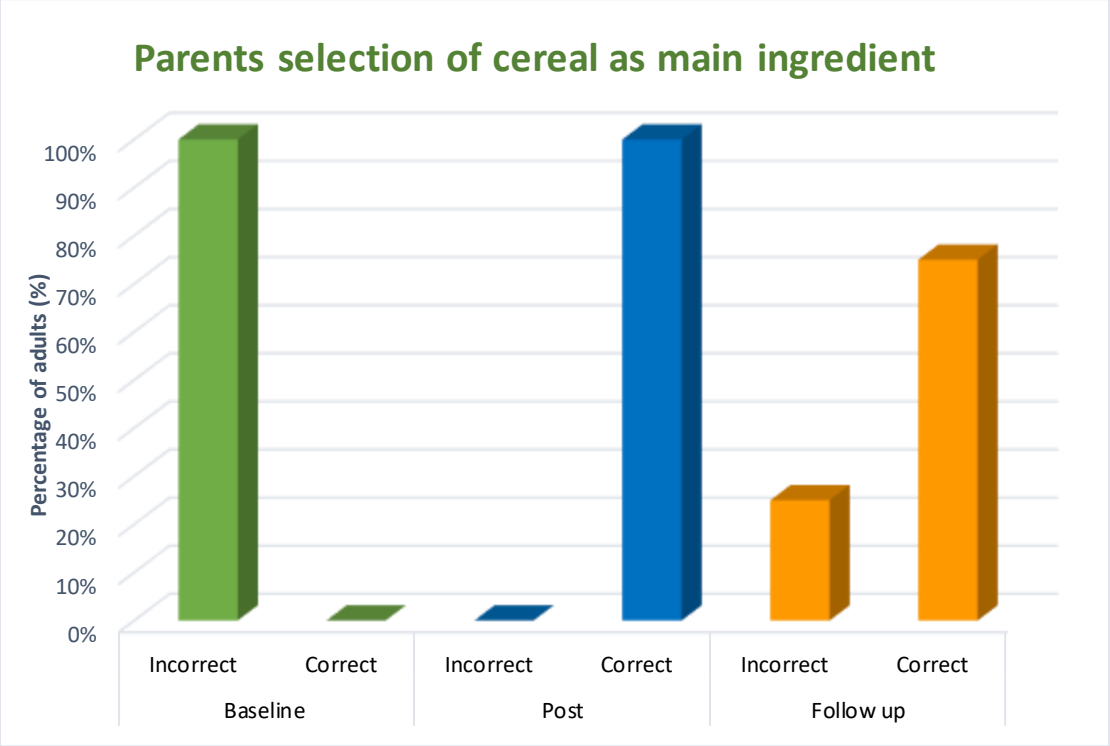

Figure 7. Parents' ability to select main the ingredient on the nutrition panel ($n = 4$).

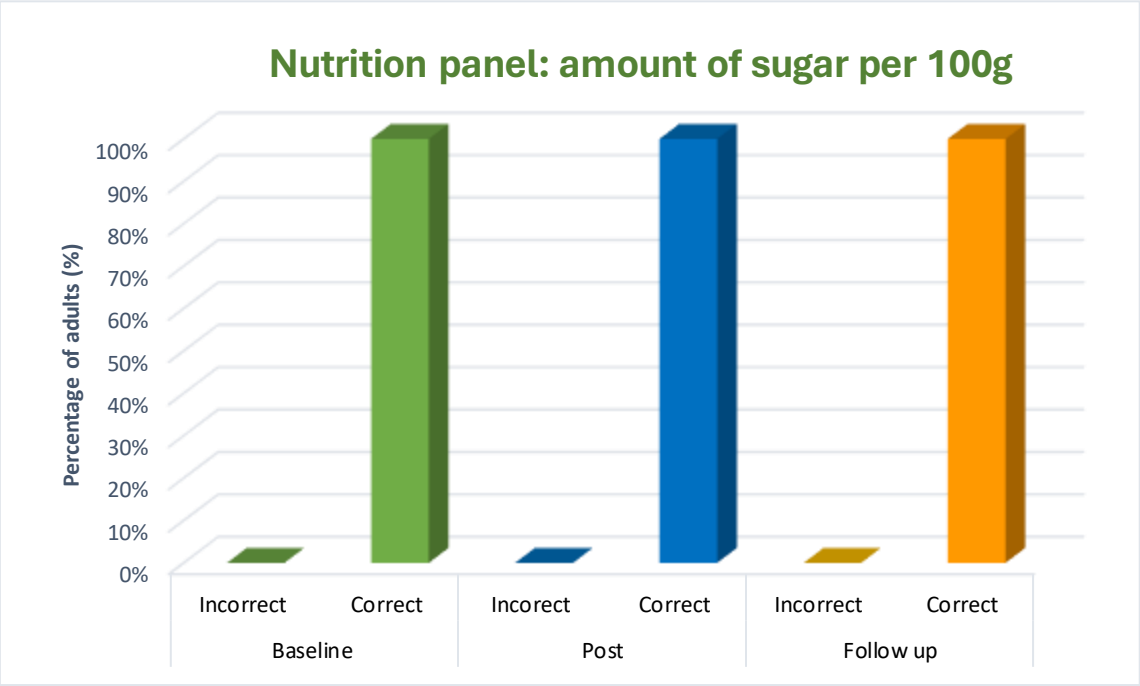

Figure 8. Parents' ability to select the amount of sugar on the nutrition label panel across all time points ($n = 4$).

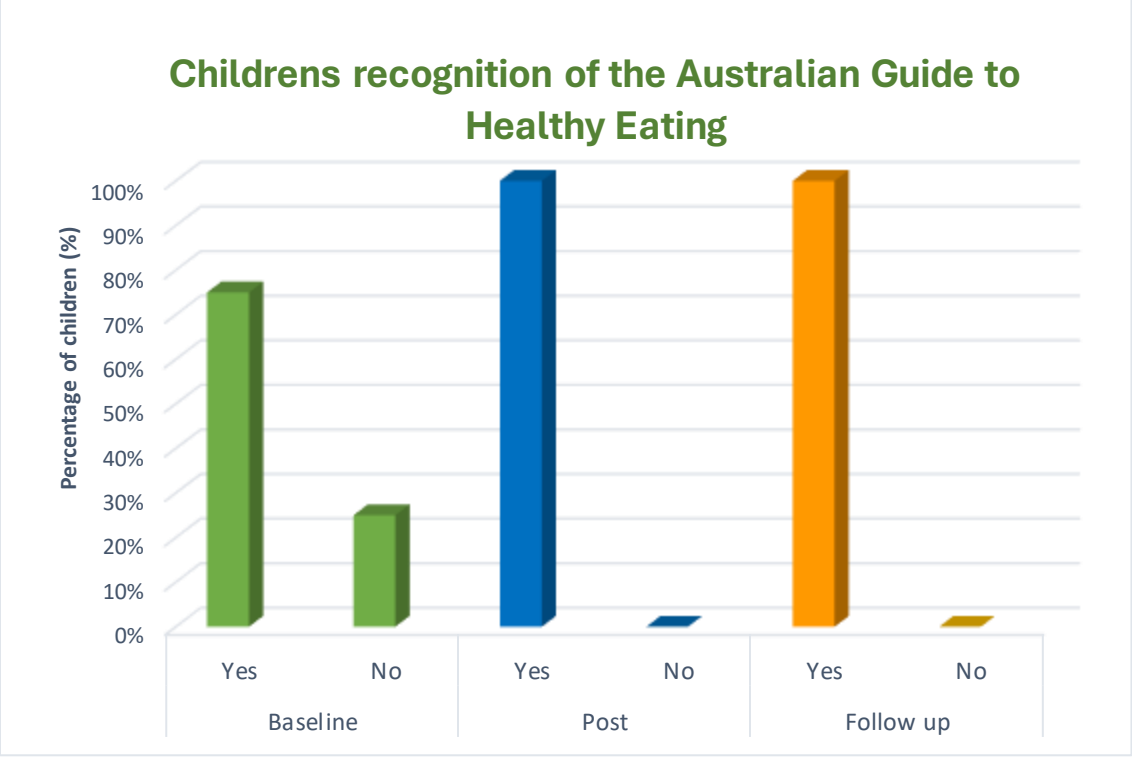

Figure 9. Children's recognition of the Australian Guide to Healthy Eating at baseline, post-intervention and one month follow up ($n = 4$).

5.3.3 Outcomes on children's nutrition knowledge (sorting task).

All child participants (n = 4) completed the sorting task at baseline and at post-intervention to determine their nutrition knowledge and ability to select healthier foods and drinks. As shown in Figure 10, more children correctly sorted items at post-intervention when compared to baseline. No children correctly sorted the muesli bar, strawberry milk, or strawberry yoghurt at baseline compared to three children who correctly sorted these items at post-intervention (Table 4). One child correctly sorted orange juice with no added sugar into the amber category at baseline compared to all four children at post-intervention (Table 4). Table 5 shows that the words "*healthy*," "*fruit*," and "*vegetables*" were mentioned most frequently to describe food and drink items sorted into the green category at baseline and post-intervention (17 times). Children had less accuracy when categorising foods/drinks belonging to the amber category; despite this, improvements were observed, with ten foods and beverages correctly sorted at post-intervention compared to four items sorted correctly at baseline (Table 4). Two of the four children indicated their reasoning for placing foods in the amber category being that food items have "sugar" and "*added sugar*" (mentioned twice). One child commented that white bread belongs in the amber category with their rationale being that it is "*not healthy like brown (bread)"* (Table 5). Children correctly sorted foods and beverages into the red category a total of 18 times post-intervention compared to 16 times at baseline (Table 4). Children's reasoning for most frequently sorting food/beverages into the red category was based on sugar content (mentioned 12 times), salt content (mentioned 4 times), and the food item containing "*chocolate*" (mentioned 2 times). Three of the four children mentioned that soft drinks are "*unhealthy*," while one child mentioned guessing the health star rating while sorting Tim Tams into the red category post-intervention (Table 5).

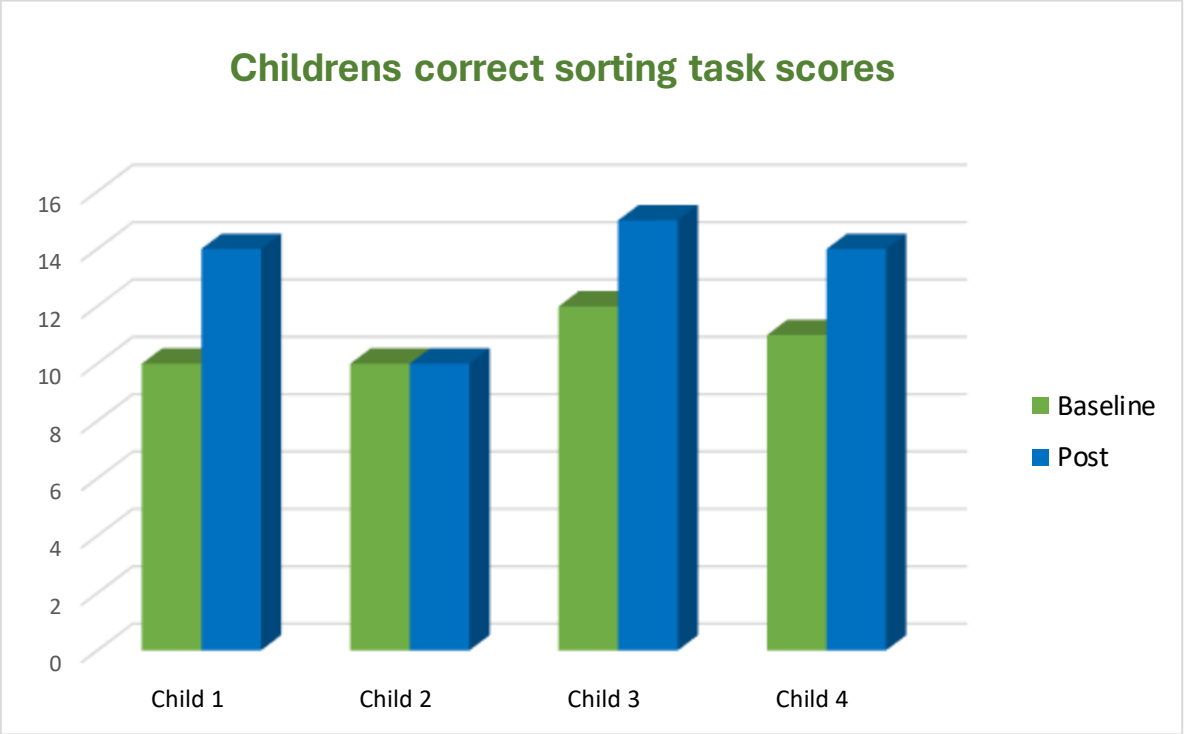

Figure 10. Children's correct sorting task scores at baseline vs post-intervention ($n = 4$).

Table 4. Children's ($n = 4$) baseline and post nutrition knowledge and their subsequent ability to select healthier foods and drinks.

Food/beverage items	Green		Amber		Red		Total correct score	
	Baseline	Post	Baseline	Post	Baseline	Post	Baseline	Post
Banana	* 4	4	0	0	0	0	4	4
Carrot	* 4	4	0	0	0	0	4	4
Chips	0	0	1	0	* 3	4	3	4
Cola	0	0	0	0	* 4	4	4	4
Egg	* 3	4	1	0	0	0	3	4
Unsalted mixed nuts	* 1	2	2	2	1	0	1	2
Muesli bar	3	1	1	2	* 0	0	0	0
Muffin	0	0	3	2	* 1	2	1	2
Orange juice	3	0	* 1	4	0	0	1	4
Plain yoghurt	* 4	4	0	0	0	0	4	4
Pork sausage	2	1	1	1	* 1	2	1	2
Straw. yoghurt	4	2	* 0	2	0	0	0	2
Strawberry milk	4	2	* 0	2	0	0	0	2

Tim tam	0	0	0	0	* 4	4	4	4
Water	* 4	4	0	0	0	0	4	4
White bread slice	1	1	* 3	3	0	0	3	3
Wholemeal bread slice	* 3	4	1	0	0	0	3	4

* Correct answer

Table 5. Children's sorting task (n = 4) frequency of spoken common themes for sorting a food/beverage into a category.

Quotes from the green category	Frequency
"Healthy"	11
"Fruit"	13
"it's a vegetable"	3
"Cos it's a veg"	1
"Good for sport (banana)"	1
"Water is healthy"	1
"Has milk"	1
"No added salt to nuts"	1
"They are plain (mixed nuts)"	1
"Healthy liquid"	1
Quotes from the amber category	**Frequency**
"Has fruit and added sugar and flour"	1
"It's not healthy like brown"	1
(comparing white to brown bread)	1
"Has sugar"	1
"Doesn't look nice to eat"	1
Quotes from the red category	**Frequency**
"Lots of added sugar"	4
"Soft drink has lots of sugar"	3
"Has lots of sugar"	2
"Has lots of salt/sodium"	2
"Unhealthy/ not healthy"	1
"Looking at star rating at supermarket"	1
"Lots of salt and savoury"	1
"They have sugar and chocolate/ not a lot of stars"	1
"It is a soft drink"	1

5.3.4 Outcomes on parents behaviours to '*Plan and Manage'* their resources for food.

Parents' ability to '*Plan and Manage'* their resources for healthier meals served as a primary outcome of the evaluation and was measured at baseline, post-intervention, and one-month follow-up. There was minimal change in parents agreeing fresh food is cheaper when in season; however, improvements related to using a nutrition panel to make food choices, making a list before shopping, planning meals ahead of time and thought about healthier food choices when deciding what to eat (Table 6). Three (75%) parents reported that they used a nutrition panel to help them make healthier food choices "most of the time" at post-intervention compared to no parents at baseline; however there was a small decrease observed at the 1- month follow up timepoint. At post-intervention and follow up 3 (75%) of the parents made a list before shopping "most of the time"; compared to 1 (25%) parent at baseline. At post-intervention and follow up there was an improvement in parents planning their meals ahead of time; 2 (50%) and 3 (75%) respectively, compared to 1 parent at baseline (25%). Parents' ability to plan meals to include all food groups and compare the prices of healthy foods rose by 25%. Parents' behaviours to check the use-by dates on food increased between baseline (25%) to 75% post; a rise that was not sustained at one-month follow-up (25%) (Table 6).

Table 6. Participants' food literacy behaviours and cooking confidence.

Parents food literacy behaviours (*n* = 4)	**Baseline, post-intervention and one-month follow-up questionnaires**		
	Baseline ***n* (%)**	Post ***n* (%)**	Follow up ***n* (%)**
Plan meals ahead of time	1 (25)	2 (50)	3 (75)
Plan meals to include all food groups	2 (50)	3 (75)	3 (75)
Cook meals at home using healthy ingredients	3 (75)	2 (50)	3 (75)
Make a list before you go shopping	1 (25)	3 (75)	3 (75)
Compare prices of foods to find the best prices on healthy foods.	2 (50)	3 (75)	3 (75)
Confident to cook a variety of meals	3 (75)	3 (75)	3 (75)
Confident to manage money to buy healthy foods	4 (100)	4(100)	3 (75)
Confident to make changes in your food choices	1 (25)	3 (75)	2 (50)

Use a nutrition panel to make healthier food choices	0 (0)	3 (75)	2 (50)
Change recipes to make them healthier	1(25)	3 (75)	2 (50)
Try a new recipe at home	1(25)	2 (50)	2 (50)
Think about healthy foods choices when deciding what to eat	2 (50)	3 (75)	3 (75)
Checked used by dates on food	2 (50)	3 (75)	2 (50)
Ran out of money for food	0 (0)	0 (0)	0 (0)
Parents views on affordability of fresh food			
Fruit and vegetables are cheap when they are in season	2 (50)	3 (75)	2 (50)
Parents self-reported cooking confidence			
Confidence to make a meal from simple ingredients that is low in price	1(25)	1 (25)	0 (0)
Confidence to put together a simple meal from scratch in 30 minutes	0 (0)	1(25)	2 (50)
Confidence in making lunch or dinner by combining foods and spices in your pantry without recipe.	1 (25)	3 (75)	2 (50)
As a family we buy ingredients and cook from scratch.	3 (75)	1(25)	3(75)

Children's self-reported cooking confidence (*n* = 4)	**Baseline, post-intervention and one-month follow-up questionnaires**		
	Baseline ***n* (%)**	Post ***n* (%)**	Follow up ***n* (%)**
Cut up fruit or vegetables	2 (50)	1 (25)	3 (75)
Follow recipe instructions	1 (25)	2 (50)	3 (75)
Measure and weigh ingredients	1 (25)	1 (25)	2 (50)

5.3.5 Outcomes on participants cooking confidence.

The Plate it Up® intervention evaluated parents' and children's self-efficacy in cooking as a primary outcome. Preliminary results indicated a positive trend in parents' confidence regarding several cooking-related tasks. Parents reported increased confidence to prepare healthy meals, modifying recipes to make them healthier, cooking from scratch, and adding herbs and spices into their family meals (Table 6).

Parents reported being most confident in their ability to prepare lunch or dinner by combining pantry ingredients and spices with no recipe. At post intervention, 3 (75%) of parents had greater confidence in using pantry ingredients, although this confidence dropped slightly by the one-month follow-up time point (Table 6). Additionally, parents reported increased confidence to make a simple meal from scratch in 30 minutes, with small increases at post-intervention and one-month follow- up.

Three (75%) parents reported that, as a family, they were buying ingredients and cooking together more often at baseline and at one-month follow-up when compared to 1 (25%) parent post-intervention (Table 6).

Children's confidence in cutting fruits and vegetables showed mixed results with a decrease from baseline to post-intervention but an increase demonstrated at 1- month follow-up (Table 6). However, by the 1- month follow-up time point, there was an increase in children's confidence for all cooking activities compared to baseline (Table 6).

5.3.6 Outcomes on parents' safe handling of food

This study evaluated parents' safe handling of food as a primary outcome. Parents' food safety behaviours was determined based upon their behaviours related to cross-contamination avoidance, behaviours in the 2-hour 4-hour rule, and in the thawing at-risk poultry. There was improved practices reducing the risks of cross-contamination in leaving cooked foods on the same plate where uncooked meat had been (Figure 11). It is recommended that uncooked meats be defrosted in the refrigerator that is set at 5 degrees Celsius or below [120]. All 4 (100%) parents reported thawing frozen chicken in a refrigerator at the post-intervention and one-month follow-up, an increase from baseline (Table 7). The best response is to keep food safe is

to keep food out for no more than 2 – 4 hours [103] . If cooked food is kept outside of the refrigerator for longer than 2 hours but less than 4 hours it is safe to return to the refrigerator. If a cooked food is left out for 4 hours or longer it is unsafe to eat and should be discarded [101-103]. At post-intervention and one month following the intervention one parent (25%) left their cooked food longer than four hours out of the fridge compared to all four parents at baseline (100%). However, there was no improvement in the number of parents who avoided leaving cooked foods outside the refrigerator longer than six hours (Table 7).

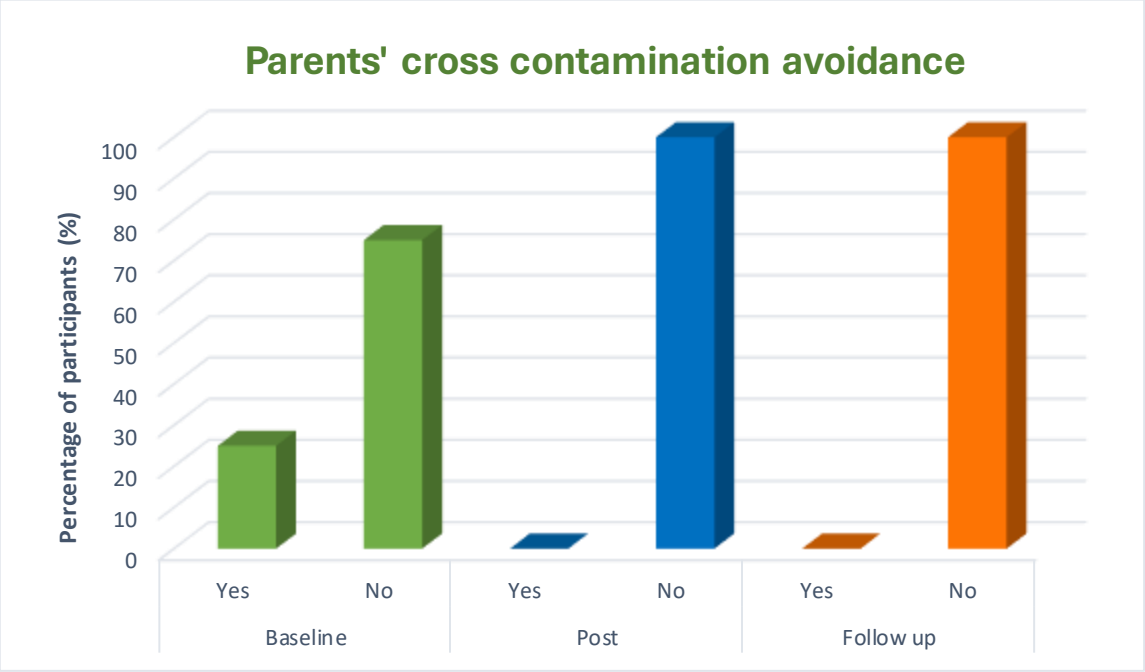

Figure 11. Parents' (n = 4) cross contamination avoidance of meat.

Table 7. Parent participants (n = 4) safe food handling behaviours.

Parents behaviours in safe food handling*	Baseline, Post and 1 month follow up intervention		
	Baseline **n (%)**	Post **n (%)**	Follow up **n (%)**
Defrosting raw chicken on kitchen bench	2 (50)	1 (25)	4 (100)
Defrosting raw chicken on table	4 (100)	4 (100)	4 (100)
Defrosting raw chicken in the refrigerator	1 (25)	4 (100)	3 (75)
Parents behaviours in the 2 hour 4 hour rule**			
Leave cooked food out of the refrigerator for at least 2 hours	1(25)	4 (100)	4 (100)
Leave cooked food out of the refrigerator for at least 4 hours	4 (100)	1 (25)	1 (25)
Leave cooked food out of the refrigerator for at least 6 hours	4 (100)	4 (100)	4 (100)
Leave cooked food out of the refrigerator overnight	3 (75)	4 (100)	4 (100)

*It is recommended that raw food is thawed in the refrigerator [120].

**It is recommended that food should be left out of the refrigerator between 2 – 4 hours, any longer it is unsafe to eat and should be discarded [103].

5.4 Acceptability of the Plate it Up® intervention

5.4.1 Children's questionnaire quantitative feedback

Children reported appreciating the cooking component. At post and one month follow up four children (100%) believed the recipes were easy to read and they wanted to do more food and cooking activities (Table 8). Across the two time points three children enjoyed time cooking with their parent during the intervention (75%) and enjoyed cutting up fruits and vegetables while attending Plate it Up®. Most children wanted to cook more often (Table 8). Some children enjoyed leaning how to prepare their lunch boxes (Table 8).

Table 8. Children participants ($n = 4$) views on the on the Plate it Up® intervention.

Children's feedback on Plate it Up®	**Post-intervention and 1 month follow up intervention**	
	Post intervention **n (%)**	Follow up **n (%)**
Did you cook some of the cooking class recipes at home? *	2 (50)	2 (50)
Was the recipes easy to read? *	4 (100)	4 (100)
Tell us what you liked in the cooking activities. *		
Taste new foods	4 (100)	3 (75)
How to be safe cooking in a kitchen	1 (25)	2 (50)
Cooking with my parent or guardian	3 (75)	3 (75)
Learning how to prepare my lunchbox	2 (50)	1 (25)
Cutting or peeling fruits and vegetables	3 (75)	2 (50)
Did the cooking activities want you to cook more often? *	4 (100)	3 (75)
Would you like more food and cooking activities.	4 (100)	4 (100)

*Yes responses reported

5.4.2 Acceptability of the nutrition education

Acceptability of the nutrition education was collected from parents post and follow up questionnaires. The majority of the participants felt the learning resources delivered were appropriate and the nutrition information was "*helpful and was explained clearly*." While one parent believed: " *Some information was more relevant for teens/ older children. Although the younger children absorbed and paid attention to what was discussed* ". Parents felt "*more educated in what we eat now,"* that their child *"eats more variety*," and that their child is "*aware of the fruit and vegetable increase and seems okay with it*".

5.4.3 Acceptability of the cooking components

Acceptability of the interventions cooking components were collected from parents and children's post and follow up questionnaires. Overall, the cooking aspect of the intervention was well received by the majority of participants with one parent suggesting that *"more time in the kitchen would have been great*." Children felt that "*cooking is fun*" and they enjoyed *" making pizza, cutting fresh vegetables."* All children wanted to cook more in the sessions: "*I want to learn how to cook salon and rice, burgers, lasagne and desserts,"* with one child stating they wanted more information on *"learning how to cook and (be) healthier at home and in (my) school lunch boxes"* in the future.

While one parent reported they did not like cooking but participated in the intervention for the benefit of their child:

"*I'm very particular with what I eat.. found it challenging at times*." "*I have a better understanding of dietary intake, but my [partner] does all the cooking, I don't cook at all, have no interest in it*."

5.4. Dyad interview responses: Acceptability

The acceptability of the intervention was explored in the interviews at the 1- month follow-up to gain further insights.

One interviewed parent had a particular disliking to be part of a very small group and commented that "*Me and my [child] did not have anyone else in our group, would have been nice to if more people were there*" and would have preferred a larger sized cohort " *just to have more ideas to bounce off* " - parent 2.

When asked about the value of holding the intervention at a community sporting reserve an interviewed parent reported enjoying to play kick to kick football during the session breaks but ended up: "*missing it on the rainy days*"- parent 2.

Learning also included information on the safe handling of food and how long raw and cooked foods can be safely stored at room temperature. One parent described learning about the 2-hour 4 - hour rule as "*Pretty interesting*" and "*I didn't realise you shouldn't put food back in the fridge after it has been out for more than a couple of hours* "- parent 2.

One child particularly liked the cultural cooking session and enjoyed showing the translated recipe to his friends: "*I told my friend about the course we did, and how we learnt about healthy food and cooking in the "plate it up" thing… I've got a friend whose mum doesn't speak a lot of English cause they are Karen, so I showed them (the recipe), and they really liked seeing it in Karen*."- child 3.

One parent-child dyad appreciated spending extra time together through food and cooking: "*That was nice…yeh one on one time*"- parent 2. The child agreed: "*Yes that was pretty fun*" to be "*hanging out, just having fun, doing gnocchi and the pizza and that stir fry thing or whatever it's called* " – child 2.

5.5 Preliminary outcome of Plate it Up®

The interviews also focused on exploring the impact of participation in Plate it Up® on food choice and behaviours as perceived by the families. Two sub-themes were identified in relation to this theme: generation of an interest in eating healthfully and children's confidence to prepare food.

5.5.1 Subtheme 1a: Generating interest on eating healthfully

Interviewed parents believed Plate it Up® affected their behaviours related to eating healthfully. One parent described leaning about healthier eating through nutrition and cooking led to a more mindful approach to their food choices and behaviours:

"*I guess just being more aware of the amount of fruit in particular that people need to be eating. Aside from the adults, the kids need to be having, especially if they're not eating it throughout the day, trying to get in an extra serve of fruit later in the day, yeah, and the veggies, trying to add more to the lunches. That's been good for all of us, not just the adults, the kids as well. And just trying to make them more mindful of the fact that they need to have a variety throughout the day, not just one serve, like eating it all in one meal and it's done*" -parent 1.

This parent further described having more fruit available home:

" *Yeh we're trying to have fruit on hand, which isn't always that easy, because it goes pretty quick at our house, being five of us, but just trying to make sure that, we have a good range available. And that's the thing, to have a few different things, not just the standard, apples, bananas, you know, kiwi fruits, berries, like considering the prices, that's a bit much at the moment, but if it means people are going to eat some fruit, then I will grab some* "- parent 1.

5.5.2 Subtheme 1b: Children's confidence to prepare food

Parents reported they had encouraged their child to continue to help more with food-related tasks at home, as all parents reported being not overly concerned their child will "*hurt themselves."* One parent described that, "*he's being a bit more independent… making sandwiches and doing stuff like that*"- parent 2.

Another parent described how their child had progressed with his knife handling skills in the month following the intervention: "*[their child] uses a bigger cutting knife now, but I'm in there watching [them]...but it's good to see [child] cutting carrots and peeling them."* This parent further reported enjoyment upon seeing their child help to prepare meals: "*It's good to see [their child]cutting carrots and peeling them and putting them in the stir fry*" - parent 3.

One parent reported observing a change in their child's confidence and helping out more:

"*definitely getting more confident. Yeah, [their child is] just a little lazy… if mum and dad can do it, [their child] would prefer that, like every other kid*."- parent 2.

5.6. Barriers and enablers

Parent and child dyad interviews explored participants ability to choose, prepare and eat food that is more healthful. Participants' social and family experiences informed the subthemes (Appendix 13). Two sub-themes related to barriers to obtaining healthier foods, were identified from responses: (1) high economic cost of food, and (2) the ease of access to discretionary foods and drinks. Three sub-themes in relation to enabling and encouraging healthier eating were also identified. These were described as: (1) Parents restricting their child buying food from sporting clubs canteens, (2) parents encouraging their children to cook with other family members and, (3) parents adding hidden vegetables to family meals.

5.6.1 Subtheme 2a: The high economic cost of food

All parents described being "*pretty busy*"- parent 3 and having a limited amounts of spare time. All parents also believed the high cost of food was a barrier to purchasing nutritious food for themselves and their family, as all parents referred to the high cost of groceries; namely fresh fruits and vegetables, and the substantial cost of meat.

One parent described their challenges to purchase everyday groceries for their family: "*I think overall, it just really hits you in the pocket like to feed a family. It's confronting actually. It's like, find something that's not going to break the bank and it's trying to be healthy* "- parent 2.

Another parent explained their efforts to plan and manage their budget ahead of time for healthier food provisioning, but still, healthier food not easier or cheaper to buy:

"*We always try and have a plan of what we're going to be buying, but sometimes it's more on what's available they have to go with and especially because we're a family of five, meat in particular, I have to buy more than what I used to. So it does add up. It does add up. Yeah, yeah, that's for sure"*- parent 1.

All parents reported that takeaway food was no longer cheap to buy, but acknowledged it was still easier to access in their neighbourhood environments:

"*Honestly, we've probably been eating them a bit more than we normally do… I think we've had pizza once, like one takeaway pizza, and then it's sort of more Asian food. Yeah, like Thai, Chinese which is meat and veggies, rice."*- parent 2.

5.6.2 Subtheme 2b: The ease of access to discretionary foods and drinks.

All participants described that foods such as sugary drinks, sweets, and crisps were cheaper to buy and easier to see, grab, and go. One parent explained, "*especially because right now at school holidays if you are going to (supermarket name), it is like the lollies, chips and all that sort of stuff "* - parent 1.

Another parent described the placement of discretionary food in their local supermarket as a barrier to encouraging healthier food choices:

"*We've noticed that the milk is way up one side of the supermarket, and we have to walk our way through the whole supermarket just to get some milk… we are seeing all these chips and soft drinks everywhere, and that makes it really hard to get in and out without chips and soft drink*" - parent 3.

Parents believed that the local junior sporting club canteens also had easier access to discretionary foods and drinks which directly influenced their child's purchasing of food. All parents reported that canteens did not have a great range and the options available were "*not as healthy*" - parent 1. Another parent reported that they often saw "*a lot of lollies, lot of soft drinks, pies, hamburgers, I think they even do nachos*" and the local community sporting canteens routinely placed lollies, chips, and soft drinks "*right in front of you*" - parent 2.

All parents believed that the marketing strategy employed by local sporting club canteens exposed their child to more discretionary foods, resulting in their child wanting to buy and eat more unhealthy foods and drinks. One parent-child conversation recalled how the marketing strategy influenced a young family friend's food selection. The child participant began to describe the experience and explained:

"*My best friend had a sister, and she's like, 'I feel like getting a dim sim. Can I please have one?"* – child 2. To this, parent 2 contextualised and explained: "*Her dad only had a $50 note and gave her the note to get a dim sim…* (but) *she bought everything except for a dim sim… she brought everybody lollies and drinks, and she got Gatorade".* (She was) *"Very generous but I don't think she got a dim sim… she got distracted with all the lollies*" - parent 2.

5.6.3 Subtheme 3a: Parental restriction to buy food from community canteens.

All parents believed the canteen food in junior sporting clubs influenced their child to buy and eat discretionary food options during game days. All parents described restricting their child's access to a junior club canteen and routinely packing fruit and water for their child's match days. Parents reported actively promoting that canteen foods were "*snacks*"-parent 1 and "*treats*," – parent 2 as options that should be consumed in small amounts.

One parent reported, "*we don't tend to get too much food from the canteens. Maybe they'll have a dim sim or two as a snack. But [parent] was pretty good at packing food* " – parent 2.

Other parents echoed this theme with another reporting "(we) *still go to the canteen at times, but we always take fruit with us and water"* and they are *"not a big fan of buying drinks, especially soft drinks. I'd prefer not to be doing that…yeah. Still, we have some treats, but we always have our own fruit and water* "- parent 1.

5.6.4 Subtheme 3b: Parents encouraging their children to cook with other family members.

Most parents described encouraging their child to cook more with other adults within their wider family circle. One parent-child dyad described how the child's new interest in food and cooking has led to conversations with extended family members:

"*He talks to his Nana about the foods he's been cooking. And that's really nice to see. I like that*"- parent 3. To which her son replied: "*Nana tells me about the kisses, the sponge kisses she used to make*."- child 3. Parent 3 replied: "*Oh, yeah, those cakes, they're not bad, are they?*

Might need to do a bit of cooking with Nan?" – parent 3, to which the child replied*: "Yeah, I'd like that* "- child 3.

5.6.5 Subtheme 3c: Parents adding hidden vegetables in family meals.

Parents value the nutritional benefit of consuming healthier food to support their child's growth and development. Parents reported 'hiding' extra vegetables in meals as an enabler of preparing more nutritious meals. Parent participants have described a "*busy family work life"* yet still preferred to provide a decent meal, despite some children objecting to eat vegetables. All children described they prefer more fast fried food because it: '*Tastes good* " – child 1. To add more cost-effective food measures to family meals, most parents described attempting to "*hide*" frozen or fresh vegetables that are diced or pureed into soups, pasta and other meals without their children knowing. For one parent this meant secretly adding frozen vegetables to family meals that are considered a "*dish that's an all in one*."

One parent described how:" *You hide it…. yeah, add in more veggies that way. I'm always a bit sneaky with adding in, especially if I'm doing like soup* "- parent 1.

Another parent reported hiding finely chopped fresh vegetables in their family meals without their child's knowledge: " *Sometimes when we cook a spaghetti we'll…chop it up finely and put it in, and they just don't know it's there*." - parent 2. They further described attempting to add vegetables to other family meals such as: "*grated carrot, grated zucchini, chopped up, like, baby spinach*." For this parent, their efforts were not always successful as their children detect:

" *mushrooms and they'll pick them out."* – parent 2.

For parent 3, this meant adding frozen vegetables when cooking the chicken stir fry recipe at home: "*Sometimes we use frozen veggies* (in that) *stir fry, particularly…when we're in a hurry*." At this point, her son interjected and stated that he didn't like frozen vegetables as they were "*not good*." - child 3.

5.7 Conclusion

This current chapter presented the results of the preliminary impact of the Plate it Up® intervention. Small changes were demonstrated in knowledge, behaviours and confidence as measured using a pre- post questionnaire approach. Additionally, the acceptability and impact of Plate it Up® were explored through qualitative data collection and analysis. Interview results allowed for themes in relation to the participants' perception of barriers and enablers when selecting and eating healthier foods. The next chapter, chapter 6, discusses these results in relation to what is currently known in the research literature and future directions for this work.

Chapter 6. Discussion

6.1 Chapter overview

This chapter discusses the quantitative and qualitative findings that are presented in Chapter 5. Findings are discussed within the context of relevant theories and what is already published in the literature. Findings are presented under two subheadings: feasibility and acceptability of intervention, and preliminary outcomes. Finally, the strengths and limitations of the current study are considered and future research proposed.

6.2 Research aims

The overarching research aim is what is the feasibility of the food literacy intervention Plate is it Up®, and its preliminary outcomes on parents and children's food literacy skills and dietary intake, namely: 1) eating behaviours, 2) nutrition knowledge, 3) parents behaviours in planning and managing their resources to obtain nutritious food for their family, 4) parents food safety behaviours and, 5) self-efficacy in cooking in parents and children. The secondary aim was to explore participants barriers and enablers when choosing, preparing and eating nutritious foods one month following the intervention.

6.3 Feasibility and acceptability of Plate it Up®

The intervention was an initiative designed to support food literacy for parents and their primary-aged children who play amateur community sports in central Victoria, Australia. A small sample size of eight participants consented to take part. Overall, the intervention produced modest improvements in self-reported food choice and food literacy behaviours. Delivery was conducted after school on sports training nights and during the day on school holidays. The Plate it Up® intervention included nutrition education, group conversations, cooking, games, and puzzle-based activities, all designed with the principles of social cognitive theory [81] and sustained behaviour change [2] in mind. Plate it Up® is designed using evidence based information to support the nutrition education, and the importance to choose and prepare foods from the core food groups as recommended by the Australian Dietary guidelines [38]. Additionally food safety and practical cooking was informed by the 'Nourish and Nurture' food literacy manual [101] and peer reviewed evaluations of food and culinary interventions [1, 11, 16, 18, 21, 82].

One parent voiced concerns that the nutrition education in the Plate it Up® sessions may have been more suitable for older children. This may reflect different levels of comprehension of children at a similar age and is a valid consideration when developing interventions that target children, with or without their parents. It may also reflect the parental view of their child's ability. The intervention has a responsibility and obligation to convey nutrition messages that are clear and consistent to its participants. To determine if the intervention was meeting this obligation while evaluating changes in nutrition knowledge at the same time, children participated in a novel sorting task which indicated that children began to understand which foods are high in added salt, sugar and fat, however further research is required into evaluation children's knowledge using a sorting task.

One parent indicted they found cooking the meals sometimes challenging. Reasons for this require further investigation but are likely to be related to self-efficacy in cooking and the limited time to prepare meals from scratch [1, 8, 62]. The intervention placed emphasis on building participants' confidence to cook in a supportive, inclusive, and fun environment. For example, the cooking component educated children how to read from simple, easy to read recipes that were based upon "Easy Read" [98]. The practical cooking included education on safe and basic

knife handling skills, safe food handling, and preparing simple meals in unique ways such as a food garnish (rose tomato) to increase interest in cooking (Appendix 4).

The research student, who is a trade qualified chef and associate nutritionist registered with Nutrition Society Australia (NSA), developed the recipes. The recipes were well received by participants, who continued to use them at home, with some sharing the recipes with family and friends. Responses from participants in the interview suggested they enjoyed leaning how to cook with their parents and cook meals from other cultures. Many parents have noticed the increased price of food, especially meat, fruits, and vegetables.

Today's parents are limited in time due to work commitments and organising children's activities [4, 5]. The recipes used in this current study were developed to be quick and simple to prepare using cost effective ingredients. The recipes were not designed to align with the World Health Organization Guidelines (WHO) [37]. WHO recommended that individuals of any age should consume less animal based sources of food and more fruits and vegetables to reduce chronic disease risk [37].

Most recipes used in the intervention delivery included food from the core food groups [38, 97]. However, changes are required for future delivery of Plate it Up®. While favoured with children, the pizza recipe was not aligned with the Australian Dietary Guidelines [38]. The recipe prescribed using low fat cheese but included some processed meats offering more salt, saturated fat (Appendix 7). This suggests that the recipe may have reached the Red traffic light labels, indicating that the pizza ingredients are options that need to be eaten sometimes and in small amounts, as prescribed by the Victorian Government [104]. Investigations into replacing the processed meats with lean protein in the form of grilled chicken, fish and the addition of more plant based ingredients to the recipes is warranted. Overall, it is likely that the recipes are of a higher nutritional quality when comparted to ready-made meals that are readily available in food retail stores [121]; however, this issue needs to be addressed. For future use, the recipes need to be reviewed for their nutritional content and tested before delivery with new cohorts of participants.

The low cost of pre prepared meals and the reduced time involved in preparing family ready meals have become appealing for time-poor parents [1, 83]. Results showed that several BCTs [2] aligned with the four domains of food literacy [15]. The intervention provided education on meal preparation using step-by-step recipes and the health consequences of the overconsumption of

foods that are ultra-refined and improper handling and storing of food. Outcomes suggest that behaviour change techniques (BCTs) [2] can be mapped to nutrition education, food safety and food preparation. The outcomes show that parents were planning and managing their own and their children's food intake by providing more fruits and adding more vegetables to family meals. Qualitive findings show that parents were limiting the consumption of discretionary foods and drinks while their children played community sport suggesting that parents were employing role modelling behaviours, the active mechanisms which known to facilitate sustained behaviour change [2]. Quantitative outcomes indicate that parents were preparing a wider variety of meals using common pieces of kitchen equipment while factoring in food safety knowledge and applying that knowledge and their behaviour to keep their food safe to eat.

The education facilitated easy meal preparation at home using simple nutritious foods. Children's involvement in cooking from an early age is known to facilitate healthier food intake [1, 4, 83]. There is a presence that behaviour change has occurred in the family home as parents planned to involve children in cooking with other family members. Qualitative outcomes show that as the children's interest in cooking had grown parents continued to encourage their children to cook with other family members and that the family environment has restructured to accommodate the children's new interest in cooking. This indicates that there are unexpected BTCs that had continued to influence behaviour change at home [2, 83]. These findings suggest that food literacy and BCTs may help overcome perceived barriers to food preparation and improve diet quality and more investigation using a larger cohort of participants is warranted.

6.4 Preliminary outcomes

6.4.1 Changes in the domain '*Prepare*'

Findings suggest that the "Prepare" domain had the potential to be the most influencing domain for family members. The evaluation results showed a small trend in improving food literacy skills and knowledge in terms of behaviour change improvements in cooking confidence and skills in children, and cooking enjoyment. Participants' nutrition knowledge and their ability to select healthier foods in retail environments also slightly improved. There were positive food

socialisation benefits gained from attending the intervention, both in terms of cooking at home where children engaged more in food conversations with friends and in terms of cooking with other family members. Modest dietary behaviours improved through understanding of the nutrition panel, participants' ability to select healthier food and drink options, and a greater understanding of the recommended servings of food for all family members as prescribed by the Australian Dietary Guidelines [38]. Interview responses also indicated that parents had continued to role model positive food behaviours and enact a "gatekeeper" role by restricting their child's access to, and purchase of, foods and drinks that are ultra processed. The findings provide a story of improved cooking skills, confidence, and nutrition knowledge amongst the participants after attending the family focused food literacy intervention, Plate it Up®.

The Plate it Up® intervention placed emphasis on building participants' confidence to cook in a supportive, inclusive and fun environment. During this process participants were able to produce a range of inexpensive meals that were quick and easy for all family members to prepare. Through positive reinforcement and active participation in cooking, results have shown an increased interest to cook among children. Children participants reported increased interest in cultural cooking and increased confidence in their own developing cooking skill set, suggesting that they had an increased self-belief of their own cooking skills. Results also indicated that parents and children experienced the changes described by the social cognitive theory that are essential to achieve sustained behaviour change in food literacy [80-82]. Parents reported increased confidence to apply their nutrition knowledge and prepare healthier meals and to cook from scratch concurrent to children's increased frequency to cut fruits vegetables, measure and weigh ingredients. These increased frequencies suggest that participants had an increased self-belief in their capability to cook more often at home.

Results indicate parents continued to reinforce what their child learnt about food and cooking at home and a greater opportunity for their child to learn through observation as prescribed by the social cognitive theory [81]. Relatedly, to overcome their time limitations, parents were employing other family members to help teach their child how to cook, such as cooking with their child's grandparents or other parent. The qualitative findings in this pilot study suggest that while children were enthusiastic about cooking at home, despite parental time constraints and the need to plan for meal preparation was a challenge. Parents of today typically have to work longer hours and have more children's activities to organise, resulting in a greater reliance on more readymade meals and convenience foods to feed their family as they are easier to see,

grab, and go [8, 47, 60, 121]. It is well established that frequent meal preparation in the home is associated with a healthier diet [33, 62]. Food and cooking interventions typically report a range of improvements in participants' eating patterns and self-efficacy in cooking [122]. An international evaluation of the "*Fun with Food*" parent-child cooking intervention found that busy lifestyles, work commitments, and management of children's activities are factors that impact caregivers' ability to involve their child in preparing a meal, particularly during mid-week [1]. Typically, busy parents rely on convenience foods and prepared meals for their family [60, 121] who often find mid-week is a time when they felt more under pressure to prepare, cook, and then serve the family meal [8]. In contrast, parents report the increased willingness to have their children involved in meal preparation at home [1], a finding that is also supported in the current study. Qualitative findings showed that as their child's confidence grew to help prepare food, parents took this a que and actively encouraged their child to help in many other food preparation tasks in the home. This is a challenge that needs to be addressed as evidence suggests learning to cook at home can positively affect health behaviours and improve health outcomes [62, 122]. Strategies to effectively support the development of cooking skills in children using food literacy needs to be promoted with the long-term impacts of cooking confidence and skills in cooking from scratch in parents needs evaluated further.

Fredericks et al. (2020) discussed the key drivers of food interventions that are routinely linked to motivating behaviour change; those drivers being collaboration, generated interest in the home environment, recipe concept, and skill building [123]. Many studies suggest it is important to introduce healthy foods and cooking from an early age to build a confident engagement with food systems and healthier meal preparation [3, 4, 8]. People often learn about eating not only from their own experiences but also by observing other individuals preparing food and selecting a healthier food choice [60, 81]. Individuals who feel more confident about performing specific behaviours actually perform the behaviours more often; hence confidence continually grows [12]. Interventions that include learning through observation and social food interaction have demonstrated that increased confidence in cooking can be fostered [62, 82, 124]. Guided by the social cognitive theory (SCT) [81], it is believed that improvement in participants' interest in healthier food and self-efficacy in cooking was related to participants' self-belief in their ability to plan for and prepare meals [86]. Therefore, it is not surprising that the active learning and participation in cooking, as used in the Plate it Up® intervention, produced a greater interest in cooking at home among participants.

The home kitchen home is a space that is used for multiple uses in the kitchen, ranging from gardening, laundry, repairs [12]. These family activities along with improper care of food is a determinant to foodborne disease [12]. Currently under review, the Australian Dietary Guideline 5, recommend keeping and handling food with care [38]. Education and evaluation on food safety was included in this current study that consisted of the key elements of clean, cook, chill, and separate. The 'chill' elements of food safety recommendations that perishable food is to be kept at or below five degrees Celsius, to keep food safe to eat [12, 101, 103]. Qualitative results of the current study found that two of the four children enjoyed learning about packing lunch boxes and keeping them cool while all children wanted more food and cooking activities. In qualitative interviews, it was identified that some children remembered the importance of keeping lunch boxes cool and that parents recalled the 2-hour 4-hour rule. This indicates that parents and children can be educated on food safety in the home environment and Plate it Up® has the potential to produce similar outcomes (e.g., confidence to keep food cool during transportation) of larger evaluations [4, 54].

A recent evaluation of a food literacy intervention for parents examined the intervention's impact on parents' feeding practices and food literacy skills in West Australian adults. The evaluation of *Food Sensations for Parents* utilised a pre-and post-intervention design using Foodbanks' adult food literacy tool [72], a tool that precedes the food literacy checklist used in the current study. Additionally, a parents' feeding practices questionnaire was administered. A multivariate logistic regression analysis was used to predict relationships between improved food literacy knowledge, behaviours, and the feeding practices of parents with children under 5 years of age [4]. The Food Sensations' intervention was developed to include the domains of food literacy '*Plan and Manage*', '*Select*', '*Prepare*' and '*Eat*' [15]. The five week intervention included education on the Australian Dietary Guidelines, optimal nutrition for growth and development, feeding behaviours, food budgeting and food safety [4].

Similar to Plate it Up®, the food safety component of the *Food Sensations*® intervention focused on educating parents about keeping lunch boxes cool and fostering their confidence in maintaining food safety at home [4]. That study found a significant change in parents' confidence in keeping food safe, which included keeping school lunch boxes cool.[4]. To ensure food remains cool and safe to eat, it is essential to use refrigerators and frozen lunch box ice packs [91, 102, 120]. According to the food literacy framework by Vidgen and Gallegos (2013) [15], food safety is addressed primarily in the domains of '*Select'*, '*Prepare'*, and '*Eat'*, with less

emphasis on the '*Plan and Manage'* domain. Refrigerators and freezers should be maintained at temperatures below 5 degrees Celsius, and to ensure food that is safe to eat, ice packs for lunch boxes must be frozen ahead of time [91, 120]. This indicates that further research is needed to reassess the components of food literacy as food safety management needs to be integrated more in the domain '*Plan and Manage'*.

6.4.2 Changes in the domain '*Eat*'

Changes in participants' eating behaviours was a primary outcome in the evaluation of the piloted intervention, Plate it Up®. Both quantitative and qualitative results indicated small trends in the improvement of participants' eating patterns. There were small improvements in parents and children's consumption of fruits and vegetables, a reduced consumption of processed meat and pastries in children and sugary drinks in adults.

Quantitative findings showed that there was no change in participants' consumption of takeaway food items, or in children's consumption of salty chips and sugary drinks. There was also a minimal change in children's consumption of processed meats and pastries. Qualitative findings in the current study offered some explanations, as parents described a common barrier to healthy eating as their neighbourhood retail environment. Specifically, parents explained that convenience foods and drinks were easier to access in their neighbourhood retail environment. Qualitative interview findings showed that community canteens typically sold pies, potato chips, crips, and soft drink that were placed right in front of their children. Parents described that community canteen foods where their child plays sport were influencing their children's preference to buy discretionary foods and drinks. Children indicted a preference and acceptance for convenience foods as they "*taste good* ".

Despite qualitative findings indicating that participants continued to experience barriers to buying healthier food choices, quantitative outcomes highlighted that parents acquired more knowledge in food literacy. Outcomes showed that parents thought more about healthy foods when deciding what to eat. This included a modest improvement in terms of planning and cooking with food from the core food groups and cooking more with healthy ingredients Parents who were interviewed appeared to be more motivated to encourage their children to

eat more nutritious food after completing the intervention. Their intention of change was a desire for their children to eat more vegetables, which some parents intended on achieving by adding "*extra finely chopped*" vegetables in family meals. Such comments show that family food conversations were about choosing foods from the core food groups, cooking with and then more eating fruits and vegetables. Children described a greater confidence in cooking more with vegetables. These elements are not surprising given that the intervention educates participants about cooking from 'scratch' and incorporating vegetables into quick family meals, such as the crispy chicken salad prepared in session two (Appendix 6).

Results indicated that the changes in food behaviours were experienced in accordance with the Social Cognitive Theory (SCT), including positive reinforcement, observation of others, and self-regulation [80, 81, 87]. This aided the participants to develop the behavioural capability of increasing their consumption of healthier foods. Following the intervention, parents achieved the ability to self-monitor their behaviour and increase their healthier food role modelling for their children [83, 125, 126]. The findings showed that a family focused food intervention has the potential to improve participants' eating behaviours and increase confidence to cook; results that may be in line with other culinary interventions [1, 32, 62, 127] when future research is undertaken.

Currently there is a growing body of evidence that children mimic their parents' patterns of food preferences [4, 60]. In the review by Mahmood et al. (2021), parents' food modelling helps shape their child's healthy eating patterns [128] . Few food literacy interventions are guided by behaviour change mechanisms [17]. However, the Plate it Up® intervention utilised different behaviour change techniques known to improve food choice and food literacy skills through role modelling with promising results. Interview results in the current study suggest that parents were similarly role modelling and applying specific rules to the eating behaviours of their children. Qualitative findings showed that parents were routinely packing fresh fruit on sporting days for their child and promoted that canteen foods should be eaten only sometimes and in very small amounts, however, more research is required to confirm this outcome using a larger sample.

Eating behaviours are a group of interrelated actions that multi-component interventions can influence [2, 128]. The results discussed in chapter five indicated that parents believe that healthy eating is important for their children's health and development. Childhood is a time

when information is learnt through observation and then consolidated [3, 128]. Parental modelling is a good source of information where food preferences and positive food habits can be formed [128]. Tartaglia et al. (2023) suggest that increasing nutritional knowledge in parents will ultimately benefit their child's eating habits by positive parental food modelling [4].

Quantitative findings suggested that parents' knowledge of nutrition and food choice behaviours showed that parents felt confident to make healthier food choices, used a nutrition panel to make healthier food choices, and thought about more nutritious food options when deciding what to eat. This was concurrent to children learning how to choose discretionary foods and drinks that are low in sugar and/or salt. Results align with previous studies where parents use parental feeding rules and behaviours to control when, what, and how much their child should eat [3, 4, 128].

Parents employ the 'gate keeper' role over their children's food choice and purchasing behaviour [5, 9, 10]. Qualitative results found that parents were restricting their child to buy and eat foods in local community club canteens that sell more discretionary foods and drinks, which suggests that parents personally believe it is important to eat for health and advocate that importance to their child using parental role modelling. A narrative review of 88 studies found that a parents' personal importance of health and food choice can influence their family's food choices [10]. Parents control their children's consumption of food by employing strategies such as purchasing healthier foods and promoting them more in their family unit and avoiding retail environments that sell more discretionary options [10].

Tartaglia et al. (2023) confirmed this finding in an evaluation of a food literacy intervention for parents with young children [4]. Using a pre-post design to evaluate improvements in food literacy and a multivariate logistic regression analysis to predict relationships, it was found that parents' improvement in food literacy enabled them to model healthier eating to their child and employ healthier food provisioning [4]. Results in this current study show a similar trend in parents employing positive food role modelling and enacting the 'gate keeper' role upon their child's food choices; however, more research is required to confirm this outcome using a larger sample.

6.4.3 Changes in the domain '*Select*'

The quantitative and qualitative findings showed a small change in participants' knowledge of healthier foods in the domain, '*Select*'. The Plate it Up® intervention directly taught nutrition education in three of the four sessions and effect on knowledge was a primary question of the evaluation. However, it should be noted that, whilst nutrition education is not a core component of the food literacy framework [15], knowledge of nutrition is considered an essential part of being food literate [13]. Food literacy interventions typically report a range of improvements in participants' food choice behaviours [4, 11, 17-19, 82]; hence, education on nutrition and the benefits of eating a well-balanced diet was embedded in all aspects of the intervention.

In the current study, parent participants were asked to select the main ingredient and highest amount of sugar from a visual prompt of a nutrition label in the questionnaires (Appendix10). The findings showed increased frequency to use the nutrition panel to make food choices and an improvement in parents' ability to identify main ingredients in packaged foods. In the children, findings showed that some children looked at health star ratings when deciding what to eat , suggesting that some children are beginning to determine their own personal importance of eating a balanced diet. Additionally, the findings from the children's sorting task showed that they had begun to understand that different foods and drink options have different amounts of added salt (sodium) and/or sugar. Findings showed that parents felt they were more informed on selecting foods, indicating that nutrition is one major factor that governs a parent's perceived importance for their child's growth and development. Qualitative findings also show parents are self-monitoring their own food behaviours and that of their child and employing modelling behaviours through food choice and accessibility .

Quantitative and qualitative findings reveal that children's largest improvement in nutrition knowledge is in the Green category. The Green category represents foods and drinks that are in the five core groups and should be readily available [38, 104]. Quantitative and qualitative findings also suggest that children had difficulties in categorising options into the Amber and Red categories of the sorting task. The Australian Dietary Guidelines suggests the importance of consuming a wide range of nutritious food and suggests limiting ultra-processed food that is high in saturated fat and added salt or sugar [38, 104]. Whether a product is considered "processed" or "ultra-processed" depends upon the degree of processing and the amount of added ingredients, which varies greatly among similar products in the category [38, 104, 117]. For

example, not all muesli bars have the same nutrient profile and results of the current study showed that children participants noted some muesli bars have "*added chocolate*" and others can have "*lots of sugar added*" .

These outcomes of the current study correspond with another Australian study, which also presented similar outcomes in children's nutrition knowledge [117]. The study by De Vlieger et al. highlighted there can be conflicting information on food labels, which can impact a child's ability to read and interpret nutrition information on products [117]. Tasking Australian children to sort food choices into the categories of 'healthy', 'neutral' or 'unhealthy', outcomes showed a higher percentage of children incorrectly sorted foods that are high in added salt and sugar into the wrong category more often [117].

It is well established that a child's interaction with food, their food preferences, and a child's developed food habits can be carried through into adulthood, impacting their overall health and well-being later in life [128]. The review by Mahmood et al. (2021) suggests that children need to have repeated exposure to food and its nutritional quality, as this can be associated with a child's acceptance and preference of healthier foods over time [128]. The current study produced small but positive outcomes when educating parents and children about nutrition and the selection of food that is beneficial to their health. However, more research needs to be undertaken as children are confused about the amounts of added ingredients found in food and drink choices available for sale in the retail environment.

6.5 Strengths and limitations

There are strengths and limitations to the current study. There are strengths and limitations to the current study. Firstly, a strength of the study included the facilitation of the intervention by a team that included a registered nutritionist, a qualified chef, and the inclusion of culturally appropriate meals using English and non-English recipes. Another strength included a strong evaluation design using triangulation of multiple methods to identify changes in food literacy skills [105, 108, 109, 129]. The intervention and its evaluation aligned to the food literacy framework [15], the behaviour change taxonomy (v1) [2] and the social cognitive theory [81]. Despite these strengths, a discussion of key limitations is warranted.

The study evaluated changes in food literacy using a small sample that included child participants who were all male, which limits the generalisability of the findings. As the research student delivered the Plate it Up® intervention, the researcher became known to the participants as the sessions progressed which may have resulted in the social desirable response bias influencing the authenticity of the data that was provided. Further, accuracy in obtaining self-reported dietary intake from questionnaires can be particularly vulnerable due to social desirability and social approval response bias [130]. Social approval and desirability is the tendency of an individual to portray a positive image in line with social norms to avoid criticism [130].

The evaluation questionnaires were piloted before administration. The current study presented outcomes on eating patterns that were similar to other interventions [4, 11, 19, 82]. Despite the small improvements in participants food choices, none of these investigations utilised a food frequency questionnaire or a 24 hour recall approach [76], but rather used specific focused questions. Using self-reported food questionnaires, participants can over-report or under-report their intake due to social biases, resulting in challenges in the accuracy of data when reporting evaluation outcomes [130, 131]. Therefore, the detail and extent of dietary change was limited. Therefore, the detail and extent of dietary change was limited.

Thematic analysis was guided by Braun and Clarke (2022) [119] on participants barriers and enablers to their food choices. This provided information on how commercial determinants of health continues to influence families and their food behaviours. However, data saturation was not achieved due to the small sample size, [132] and no piloting of the interview schedule.

Semi-structured interviews have a high risk of bias and achieving data saturation [130, 133]. To overcome these challenges, it is essential to design and pilot an interview schedule for validity and reliability for the achievement of data saturation [130, 133]. Before being used in the interview process, piloting the interview schedule needs to be undertaken to determine reliability and validity [133]. Piloting allows researchers to assess the reliability of the interview schedule and to identify deviations from the original plan, which could hinder the ability of the study to achieve data saturation and salience required to confidently answer the research questions effectively [130, 133].

These preliminary findings and identified limitations warrant further research. The findings in this study suggests additional information could be identified if a larger sample were accessed.

Further investigation into recruiting processes to a larger sample of participants using a lager team of independent facilitators who are independent to the research team is required. The piloting of interview schedules is also recommended.

6.6 Conclusion

This chapter discusses both the quantitative and qualitative findings collected at baseline, post and one-month follow-up in the context of theories of behaviour change and the current literature on food literacy interventions. This preliminary evaluation of a family-focused food literacy intervention was designed for parents alongside their children. The findings show a trend towards improvements in cooking confidence, nutrition knowledge and eating behaviours. The results suggest that the commercial determinants of health are influencing food choices, however, parents are continuing to encourage and provide more fruits and vegetables for their children. The findings show an accord with the literature and improving self-efficacy and parental role modelling. The major preliminary findings highlight the evidence around the effectiveness of the intervention on improving cooking skills, confidence and cooking enjoyment increasing the participant's capability to make sustained behaviour change in food choice and cooking capabilities. There are limitations to this study however, future research into family literacy through the Plate it Up® intervention may produce findings that outweigh the limitations.

Chapter 7. Implications and conclusions

7.1 Chapter overview

This study presented the feasibility and preliminary impacts of a family focused food literacy intervention, Plate it Up®. Using a mixed methods approach, small changes in participants food choices, and cooking confidence were noted. The qualitative outcomes suggest that the high cost of food is influencing parents ability to provide nutritious food to their families, highlighting the importance of education on planning for food shopping and food preparation. This research highlights the need for future research evaluating Plate it Up® over the course of its implementation. Going forward, it is recommended that land use planners and policy makers adopt urban planning to promote healthy communities through permanent infrastructure in state government policy. This study suggests that local governments contemplate the implementation of Plate it Up® to committee members and canteen staff/volunteers of local community sporting clubs and determine the interventions value for money as a public health investment.

7.2 Considerations for future research

Qualitative findings suggest that parents are spending more money on fruits, vegetables and meat when shopping for the family's meals. In the years following the initial wave of the COVID-19 pandemic, the high cost of living and pressures from higher cost of food have remained [19, 52, 56]. In this current study, there was no evidence that parents ran out of money for food or went without food, indicating families were food secure, although some parents indicated they were beginning to feel financially strained. A recent review found that there are fewer food - secure families following the COVID-19 pandemic [56]. The review found that parents with children under 18 years are currently experiencing increased financial and emotional strain [56], and are experiencing moderately high levels of stress, change in eating patterns, purchasing fewer fresh vegetables, and purchasing more discretionary foods that contain more energy [56]. The outcomes of this current study align with these findings and that families continued to purchase discretionary food, following the intervention. Reasons for this finding appear to relate to product placement and marketing that negatively influence food

choice [29, 65, 70], despite improvements in food literacy knowledge and skills . Currently changes are being implemented to product marketing that targets children, but future research could focus on the strategies and motivators to apply food literacy skills and improve food choice in the face of easy access to cheap discretionary foods. In Australia there are also few food literacy interventions around family food insecurity to facilitate comparisons [11, 19] suggesting that more research is required to explore food insecurity families after completing a food literacy intervention.

The Plate it Up® intervention showed improvements in the components in the '*Selec*t' '*Prepare*' and '*Eat*' domains. The intervention appeared to create an interest in food cooking with children using easy to read recipes that were well received. Future work to support family focused meal preparation and cooking skills could build on this finding and potentially support improved food literacy knowledge and skills in future generations. Longer term impact studies are lacking in food literacy interventions, and this is an aspect that should be considered for future evaluations of Plate it Up®.

To this end it is suggested that the RE-AIM framework could guide future evaluations considering the reach, efficacy, adoption, implementation and maintenance of the intervention and the outcomes [134]. Including the RE-AIM framework process evaluation can enhance the understanding of the intervention's effects and how resources used, and delivery style can be improved. The framework will help understand whether or not activities used in Plate it Up® worked as intended and investigate any unintended consequences of the intervention. As the intervention is designed to be adaptive to different settings, a process evaluation using the RE-AIM framework will allow differences in the delivery of the intervention and the reasons for these differences to be explored. This current study includes a small investigation into the feasibility of the intervention, however, due to a small sample size these could not be explored fully. It is proposed further investigation is required to assess the feasibility of the range of study procedures (e.g. recruitment strategies and outcome measurement tools) and understand differences between centres.

The RE-AIM framework does not evaluate the cost factors for running an intervention, and all economic costs associated with running an intervention should be measured against improving food literacy knowledge and skills, and longer term impacts

7.3 Implications for government policy

This study highlights the need for ongoing advocacy for healthy eating through government policy and the promotion of nutritious eating within community sporting clubs.

Rural and disadvantaged communities experience a significantly higher number of convenience food outlets than advantaged areas [67]. The qualitative findings of the current study suggests that neighbourhood food access influences family food choices and purchasing behaviours for those who live in regional Victoria. This study assists potential policy planning mechanisms in the government sector. State and land planners need to mobilise policy and step up the regulations of 1) easier access to foods that are low refined; 2) fiscal subsidies to consumers to increase the affordability of nutritious food; and 3) tighter regulation of planning approvals in the built environment of convenience food outlets in Australian disadvantaged regions.

Community sporting clubs provide a setting that can promote health and well-being through physical activity and healthier food choices sold in their canteens [135]. There is a need for sports clubs to reduce the availability and promotion of convenience foods in their canteens [135]. This small study shows there is a continued need for more research on the promotion of healthier food in sports in the City of Greater Bendigo through local government policy. The findings show a need for further investigation of clubs' promotion and sale of unhealthy foods to their players, their extended family, and community members. The findings also indicate that a food literacy intervention when held in the sporting club environment can improve healthy food choices. The Plate it Up® food literacy sessions have been designed such that, in future, they may be adapted for use in different settings and to meet the needs of different audiences. A useful strategy to overcome mixed messages of clubs on health is to determine the impact of Plate it Up® when educating local sporting club committee members, canteen staff, and volunteers on food literacy. This may support the adoption of healthier options sold in canteens and the broader improved health and well-being in the community.

7.4 Contribution of this thesis

This Master of Research thesis contributes to new understandings of evidence-based food literacy in families as a public health food intervention. The development of the intervention is intended to inform future work and other community-based interventions. This study included a robust methodology, and its findings make a modest contribution to the field. It is the first evaluation of Plate it Up® and, to the student researcher's knowledge, is the first study to include parent and child dyad pairs to evaluate changes in family food literacy after attending a community-based intervention. The robust methodology of a mixed-methods triangulation design enabled its findings to show modest improvements in participants' food choice, nutrition knowledge, and cooking confidence; although it must be reiterated that the sample size was small, which warrants future research to confirm if these outcomes extend to other communities.

The quantitative and qualitative findings may offer new contributions and a path forward for family-focused food literacy interventions. The study expands the theoretical concepts of food literacy and a logical pathway to include behavioural change theories. This research leverages the foundations of food literacy in children and the importance of applying a food literacy framework for children.

This research offers small insights into how the commercial and social determinants of health continue to influence families' dietary intake and food literacy behaviours. Firstly, family food literacy may be the motivator for improved food choice and cooking confidence, and findings show cooking can be seen as a motivator for children to become more food task independent at home. Secondly, the nutrition knowledge delivered may have empowered participants on food literacy and ongoing evaluation of Plate it Up® may identify whether positive food choices are sustained for participants in the future. The findings uncovered new information that parents were motivated to continue to perform positive parental role modelling when selecting and eating healthier foods. This study continued to expand the new findings through children's interest in nutritious food, cooking, and their greater acceptance of healthier food choices after attending Plate it Up® using family food conversations. The findings expand upon previous research into food safety by educating and evaluating parents' behaviours in storing food as guided by the 2- and 4-hour rule. The findings from the parents and child dyad interviews indicate that the commercial and the social determinants of health are influencing family food

literacy and their ability to select, prepare, and eat healthier food choices. Lastly, findings have uncovered a future direction for Plate it Up® Food Literacy Ltd and an area for consideration by policymakers and programme implementers going forward.

7.3 Conclusions

This study has investigated the preliminary outcomes of a four-week family-focused food literacy intervention, including the barriers and enablers to choosing and eating healthier foods. Delivered in Bendigo, central Victoria, Australia, the intervention Plate it Up® demonstrated encouraging outcomes in parents and children. Preliminary outcomes from an innovative curriculum show an increase in child participants' cooking confidence creating a greater interest in healthier food options and cooking. There was modest improvement in participants' eating patterns, and parents continued to promote and provide healthier food provisioning to their children post intervention. There were changes in parents' and children's nutrition knowledge and food behaviours with outcomes showing that the commercial determents to health are impacting participants' ability to '*Select*', '*Prepare*' and '*Eat*' healthier food choices.

The feasibility of the intervention lays the foundation for the continued implementation of Plate it Up® across regional Victoria in a larger sample of families. There is a need to continue evaluations on a larger sample size to provide more conclusive outcomes.

The food literacy framework, the Social Cognitive Theory, and the Behaviour Change Taxonomy, together informed an intervention curriculum that was found to be an effective model to enable behaviour change through increased food literacy knowledge, and skills. These results strengthen the proposition that interventions need to consider parent and child dyad participants and parental food role modelling.

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Appendices

Appendix 1. Session plans for the family focused food literacy intervention Plate it Up®.

Session plans one and two of the food literacy intervention.

Evaluation of Plate it Up®: a pilot food literacy intervention for families from central Victoria.

Research Aims

This Master of Research project primarily aimed to investigate the feasibility of Plate it Up®: a family focused food literacy intervention. This thesis specifically evaluated the first family focused food literacy intervention held in the City of Greater Bendigo, Victoria. This thesis employed a mixed method approach to assess the preliminary efficacy of the intervention The **secondary aim** is to explore food literacy learning in participant families and determine sustained challenges experienced by participants by answering the following question:

The primary research questions

1. How and to what extent does Plate it Up® impact parents' and children's eating behaviours?
2. How and to what extent does Plate it Up® impact parents' and children's nutrition knowledge and their ability to select healthier foods and drinks?
3. How and to what extent does Plate it Up® impact parents' ability to plan and manage their resources for healthier meals?
4. How and to what extent does Plate it Up® impact parents' safe handling of food?
5. How and to what extent does Plate it Up® impact parents' and children's self-efficacy in cooking?

6. What are the barriers and enablers parents and children experience concerning their choosing and eating healthier food choices one month after completing Plate it Up®?

Week	Title of session	Aims of session	Objective assessed	Food literacy domains evaluated, and behaviour change techniques
1	**Group learning component** Eating balanced diet for wellbeing. **Practical learning component** Cultural cooking using the food groups.	Introduction to the food groups by encouraging participants to fill their plate with nutritious foods. To promote healthy cooking of meals using herbs and spices from different cultures.	Participants have increased confidence in naming the 5 food groups and examples of foods that fits into each food group. Participants are able to identify that discretionary food should be consumed occasionally Children will be able to identify healthy foods/ drinks and less healthy food/drink items from the discretionary items.	Participants skills in the food literacy domains ***select* & manage** and ***prepare.*** Data sourced from visual, and text prompted questions in baseline vs post and one month post questionnaire**.** Children's ***select*** domain, data collected using hand on, interactive fun activity of the baseline and post sorting tasks. **BCTs** **4.1:** instruction on how to perform a behaviour. **5.1:** health consequences.

			Parents will be preparing and cooking a wide variety of meals and snacks more frequently at home. Children will help prepare main meals more frequently at home.	
2	**Group learning component** Fuelling busy bodies **Practical learning component** Preparing no cooking meals or snacks.	To encourage participants to eat correct amounts of food each day, helping fuel busy bodies by following the recommended age serve sizes. To introduce the concept that healthy meals or snacks can be quick and easy to prepare.	Participants will be able to identify age appropriate portions and standardised serves of foods. Parents will be preparing and cooking meals and snacks more frequently at home. Children will help prepare main meals more frequently at home.	Participants food literacy skills in the domains ***select, eat*** and ***prepare*** upon visual prompted questions measured baseline and post and one month post questionnaires. **BCTs** **5.1**: health consequences. **7.1**: prompts/cues.

3	**Group learning component** Planning and selecting food in advance **Practical learning component** Nutritious and simple pizza.	To introduce the importance of planning your meals and food choices by understanding the ingredients list and nutrition labels when choosing packaged food. To encourage participants to plan & manage their meals ahead of time. To encourage participants, choose foods that are cost effective, fresh, quick and easy to prepare	Participants will be introduced to reading Nutrition panels and ingredients list. Children will have decreased consumption of take away foods and discretionary food items Participants will have increased confidence to cook and prepare foods with basic skills. Children will have increased frequency in helping to prepare main meals more frequently at home.	Participants food literacy skills in the domains of ***plan & manage, select, prepare and eat.*** Data sourced from visual, and text prompted questions in baseline vs post and one month post questionnaire**.** Children's ***select*** domain, data collected using hand on, interactive fun activity of the baseline and post sorting tasks. **BCTs** **7.1:** prompts/cues. **12.3:** avoidance/changing exposure to cues for the behaviour.
4	**Group learning component.** Managing and budgeting for food.	Introduce the importance of planning your meals in advance and food safety in the kitchen	Children will be able to pack their lunch box using foods based upon the traffic light food system.	Participants food literacy skills in the domains of ***plan &*** **manage** and ***prepare.***

	Practical learning component. Lunch box for tomorrow, pantry staple cooking using low salt options tonight.	Encourage safe cooking of cost effective healthy meals and snacks.	Children will have increased consumption of imperfect fruits and vegetables. Participants increased confidence to cook and prepare foods with basic skills. Participants will be preparing and cooking meals and snacks more frequently at home. Children will help prepare main meals in the home more frequently.	Data sourced from visual, and text prompted questions in baseline vs post and one month post questionnaire**.** Children's ability to ***select*** data collected using hand on, interactive fun activity of the baseline and post sorting tasks. **BCTs** **1.2:** problem solving, **3.1:** social support (unspecified) **4.1:** instructions on how to perform a behaviour.

Session 1, (100 minutes).

Eating a balanced diet for wellbeing. Cultural cooking using the food groups

Aims:

- Introduction to the food groups by encouraging participants to fill their plate with nutritious foods.
- To promote healthy cooking of meals using herbs and spices from different cultures.

Main messages:

To achieve and maintain well-being, it is important to drink adequate water and consume a wide variety of fresh foods and processed foods that are high in dietary fibre, and low in added salt, sugar, and saturated fat. The preparation and cooking meals can be fun, quick, simple.

Objectives of the session	By the end of the session parents and children will be able to identify healthy foods and drinks from the *Eat for Health 'Plate Model.'* By the end of the session parents and children will know the importance of consuming water on their health. By the end of the session participants will have an increased understanding of the effects of discretionary foods and drinks on their health and wellbeing. By the end of the session participants will have increased confidence to prepare and cook cost effective, nutritious, and cultural meals.			
Time allocation	**Activity details**	**How will it be evaluated**	**Resources required**	**Who will be involved**
5 minutes	**Welcome and settle participants.** **Introduction** to the graduate researcher and the intervention **Session times** **Introductions,** housekeeping- toilet locations, emergency procedures. **Acknowledgement** of Indigenous land.	Observations over the sessions. Questions from participants.	First aid kit Visual identification of fire extinguishers, meeting points in the event of an emergency.	Parent & child participants Graduate research student
15 minutes	**Introduce The Australian guide to Healthy Eating Plate model.**	Baseline vs post and one month parent and child	A projected slide of the AGtHE Plate model. **Posters** • AGtHE Plate model.	Parent & child participants Graduate research student

	The graduate research student will • Present the image of the AGtHE Plate Model. And prompt parents and children give examples of the foods that fall in each food group. The graduate research student will • Emphasize to group that eating a wide variety of foods from 5 food groups each day provides macro nutrients to grow, learn and play. • Importance of water. • Fiber, foods from whole grains, fruits and vegetables.	questionnaires collected online using Qualtrics. Children's baseline and post sorting task, manually observed & recorded by graduate research student. Group discussions, observations, verbal questioning.	• Guide to making healthy food and drink choices, (Vic Health). **Visual learning examples** • Food props from each food group – displayed in cup serving sizes. • Display of amount of sugar in 1 can of coke and lemonade. • Tactile models of healthier food and sugary drinks poster **Take home hand out.** • AGtHE *Plate Model.* • Graduate researcher to hand out local emergency food relief agencies and support organisations (if required).	

	• Milk, yogurt and cheese and alternatives for bone health.			
5 minutes	***Group move it break***	Questionnaire: Participant feedback in post and one month post intervention collected on line using Qualtrics.	Poster of AGtHE Plate model Butchers Paper Texters Balls Cones	Parent and child participants. Graduate researcher. Training staff from club.
15 minutes	**Further group discussion using the Australian guide to Healthy Eating Plate Model.** Using the Plate model image, the graduate research student will lead the group in talking about fats and oils. Focusing on • Types of lean meats shown in the lean meat, fish and poultry, tofu, nuts	Baseline vs post and one month parent and child questionnaires collected online using Qualtrics. Children's baseline and post sorting task, manually observed & recorded by graduate research student. Group discussions, observations, verbal questioning.	A projected slide of the AGtHE Plate model. **Posters** • AGtHE Plate model. • Guide to making healthy food and drink choices, (Vic Health). **Visual learning examples** • Food props from each food group – displayed in cup serving sizes. • Display of amount of sugar in 1 can of coke and lemonade. • Tactile models of adipose tissue and heart. **Take home hand out.** • AGtHE Plate model. • ADGL.	

	and seeds, legumes and beans. • How the body needs all different fats, best to limit intake of saturated and trans fats- decreasing risk of cardiovascular disease. • Low fat diets not recommended for children under 2 years. Graduate research student leads group to identify and discuss the discretionary foods they eat. • Amount of sugar in soft drinks. • Discretionary foods best to eat/drink		• Graduate researcher to hand out local emergency food relief agencies and support organisations (if required).	

	occasionally & in limited amounts.			
40 minutes	***Food safety and preparation session.*** **Food safety and preparation session. Participants and graduate research student encourages** hand washing, use of aprons, and change to enclosed shoes if required. Class discussion • Favourite meals they like to prepare and why? **The graduate research student presents to the group** • The recipe and allergens in ingredients. Bringing to attention to the group of the black	Baseline vs post and one month post questionnaire collected online using Qualtrics. Verbal questioning and observation of group	First aid kit. Recipe – Karen inspired rice noodles Additional recipes in plastic pockets. Black menu board for recipe and allergens disclosure. Tea towels Gloves Essential equipment for recipe Ingredients for recipe **Posters on walls** • Hand washing technique • Allergen advice.	Parent and Child participants. Graduate research student

	board identifying any potential food allergens. Graduate researcher helps prepare and oversea the preparation of the meal, monitors safety in the kitchen and food safety practices. • Group discussion during preparation on how to make the dish healthier • Vegetable vs canola oil. • Clean down benches, put away food stuff.			
15 - 20 minutes	***Group dinning*** Group will eat the meal they have prepared enabling further discussion on session content.	Observations. Post, one month post questionnaires Feedback on program collected online using Qualtrics.	Place mat- Eat for Health Plate model. Cutlery and plates- napkins Tables chairs	Parent & child participants Graduate research student

Session 2, (105 minutes).

Fuelling busy bodies & preparation of no cook meals and snacks

Aims: To encourage participants to eat correct amounts of food each day, helping fuel busy bodies by following the recommended age serve sizes. To introduce the concept that healthy meals or snacks can be quick and easy to prepare.

Main messages: Participants will be able to understand that a serve size is different than portion and the benefits they are receiving from their current diet. Serves recommended are based upon age and not daily physical activity. The preparation and cooking of healthy meals can be cost effective, quick, and fun to prepare.

Objectives of the session	**By the end of the session, parents and children will be able to understand the benefits on their health from their current diet.** **By the end of the session, parents and children will know the food and drinks they consume need to provide enough energy for their daily activity levels.** **By the end of the session, children will have increased time to help prepare meals at home.** **By the end of the session, parents will be cooking more meals at home.** **By the end of the session, parents and children will begin to understand the importance of food safety in the home**			
Time allocation	***Activity details***	***How will it be evaluated***	***Resources required***	***Who will be involved***

20 minutes	Welcome and housekeeping. Group will be reintroduced to the AGtHE plate model and give examples of the foods they currently eat. Graduate research student further explains some benefits of foods that are consumed. The graduate research student will present and discuss the Australian Dietary Guidelines, focusing on the amounts of foods eaten each day. **Graduate research student advises** • (AGtHE) Plate model and dietary guidelines do not consider participants daily physical activity	Observation and verbal questions. Feedback from post and one month follow up questionnaires using Qualtrics.	**Projected image**: AGtHE Plate Model. **Poster on wall:** Enlarged laminated poster of Plate Model. **Poster:** Guide to making healthy food and drink choices, (Vic Health). **Take home resources:** Power point slides Healthy eating for children and dietary guidelines. Healthy eating for adults and dietary guidelines.	Parent and Child participants Graduate researcher

	levels. It is possible that serves required may be less or more when playing sport or being active. Group will discuss and compare the size of foods eaten vs the daily amount of food required when being inactive using food props and discussion. Foods, serving size will be emphasised by participants holding a suggested serve.			
10 minutes	The **Plate Model** game revisiting of the food groups. **Or** family can take a ball outside and play kick to kick	Observation and verbal questions. Feedback from post and one month follow questionnaires using Qualtrics.	**Poster on wall:** Enlarged laminated poster of Eat for Health *Plate Model* **Poster:** Guide to making healthy food and drink choices, (Vic Health).	Parent and child participants Graduate research student

15 minutes	Group learning discussion will focus on the benefits of participants current diets as well as • The importance of washing fresh ingredients. • 1 medium banana is a good serve of energy for sport. • Wash fruits and vegetables before eating. • Avoid peeling carrots for more fiber. • Importance of removing skin and lean fat from animal product. • Wholemeal vs white bread- more fiber longer lasting energy to play.	Pre vs post and one month follow up questionnaire- collected using Qualtrics. Observations. Verbal questioning, visual reinforcement.	**Projected image**: AGtHE Plate Model. **Poster on wall:** Enlarged laminated poster of Plate Model. **Poster:** Guide to making healthy food and drink choices, (Vic Health). Examples of Food props of serves of meat, eggs, dairy product (cheese) Examples of fresh ingredients- green salad, a whole carrot, tin of tuna, sweet potato, 1 medium banana, fresh vegetables, food prop of oily fish, wholemeal bread.	Parent and child participants Graduate research student

40 minutes	**Food safety and preparation session. Participants and graduate research student:** Hand washing, aprons, change to enclosed shoes if required. Graduate research student presents • The recipe and methods of preparation and potential allergens. The graduate research student will discuss Cooking healthy tips during food preparation • Importance storing and thawing foods correctly based upon the 4 hour 2 hour rule • No cook snacks and meals are to be stored at	Baseline vs post and one month follow up questionnaires, administered by Qualtrics Observations. Feedback on sessions from post and one month post questionnaires- collected using Qualtrics.	First aid kit Recipe- Crispy chicken salad Additional recipes in plastic pockets. Black menu board for recipe and allergens disclosure. Tea towels Gloves Equipment for recipe. Ingredients for recipe Posters • Hand washing. • Allergen poster	Parent child participants Graduate researcher.

	correct temperatures. • Clean down benches, put away food stuff.			
20 minutes	***Group dinning*** of prepared meal. Further discussion on session content. Participants are also encouraged to have a go at the place mat quizzes.	Observations and verbal feed back	Children's cross word puzzle – food safety in the kitchen. Cutlery and plates-napkins Tables chairs	Parent & child participants Graduate researcher

Session 3, (100 minutes).

Class session: Planning and selecting food in advance.

Food safety and preparation session & Nutritious simple pizza.

Aims:

- To introduce the importance of planning your meals and food choices by understanding the ingredients list and nutrition labels when choosing packaged food.
- To encourage participants to plan & manage their meals ahead of time.
- To encourage participants, choose foods that are cost effective, fresh, quick, and easy to prepare.

Main messages: It is important to plan and prepare for the week ahead, by reading the ingredients list and the nutrition information panel. Marketing and product placement influences your food and drink choice when out shopping. Products that are high in kilojoules, added salt and sugar and high in saturated fat typically are brightly coloured and within easy reach.

Session Objectives.	**By the end of the session participants will be able to understand that ingredients in packaged foods is listed in descending order.** **By the end of the session adults will have increased confidence in reading and understanding food labels on packaged foods.** **By the end of the session participants will see how marketing of foods influences their food and drink choices in the food retail space.** **By the end of the session participants will have increased confidence in cooking pizza with nutritious foods.**

Time	Activity details	How will it be evaluated	Resources required	Who will be involved
5 minutes	**Welcome and settle participants.** Acknowledgement of Indigenous land. Graduate research student introduces supporting facilitator Deanna Reale who will briefly introduce herself her role in the kitchen and the days recipe. **Graduate research student prompts the group to describing the food groups and their foods.** The graduate research student draws attention to group of the packaged foods and introduces the sessions topic.	Answers from participants. Verbal and nonverbal feedback.	A slide with a picture of the AGtHE. Projector. **Poster on walls** • AGtHE. • A guide to making healthy food and drink choices.	Parent and child participants- Graduate researcher.

25 minutes	**Graduate researcher** Will lead the group discussing not all foods and drinks have food labels. Leading the group participants will prompt the group to discuss the health STAR rating. **What is the importance of the ingredients list.** The group will identify ingredients which are listed in descending weight using food props. • Salt (sodium) and other common names. • Sugars and the other common names for added sugar. • Ingredients high in fat. **Graduate research student will lead the group in discussing the**	Participants online baseline, post one month follow up questionnaires, collected using Qualtrics. Children's baseline and post sorting task, manually observed & recorded by graduate research student. Observation, Feedback, and verbal questioning.	**Laminated handouts** – • Eat for Health *how to understand food labels.* Visual education examples (props) - energy drinks, muesli bars, soy sauce, tinned soup, sauces, baked goods. Lollies, soft drinks, biscuits, packing used for cheese products. Butchers paper, pens, grey leads and coloured pencils. **Take home resources** • Eat for Health- how to understand food labels. • Power point slides	Parent and child participants. Graduate researcher

	food labels and what they mean. Group discussion using the 100g column on food labels on food props. • **Energy** in Kj per serve • **Total fat** and its subheadings • **Fibre** • **Sugars** • **Sodium**			
15 minutes ***Inclusive of a 5 mins break**	**Group activity** Graduate research student and participants visit the canteen. • Participants are encouraged to read the recipe list and food panels on various packaged snacks and drinks available in the clubs canteen. • Group discussion on their observation of the placement of products.	Observation feedback and verbal questioning.	Club canteen fridge and bench food stock.	Graduate researcher Parent and child participants.

40 minutes	**Food safety and preparation session. Graduate research student overseas the session & encourages** hand washing, use of aprons, and change to enclosed shoes if required. • Presents the recipe and allergens in ingredients, drawing attention to the black board. Graduate research student will lead group discussion in • Making the pizza healthier. • How to prepare the meal in advance. The supporting facilitator will help the graduate research student oversea the preparation of the meal, monitors safety in the kitchen and food safety practices.	Parent and child's online baseline vs post and one month follow up questionnaire collected by Qualtrics. Childs baseline vs post sorting task- manually recorded and collected by graduate researcher. Observation, verbal questioning and feedback.	Recipe - pizza Additional recipes in plastic pockets. Ingredients Aprons Black menu board for recipe and allergens disclosure. Cooking utensils - from utensils list First aid kit **Posters on walls** • Hand washing • Food danger zones. **Take home resources** • Recipe	Child participants Graduate researcher Guest facilitator

	• Bench wipe down, return any remaining food stock to fridges and cupboards.			
20 minutes	**Group dinning** of prepared pizza. Further discussion on session content.	Friendly communication -verbal questions from participants	**White board and stickers** Texta's, pencils, paper. Cutlery and plates, cups -napkins Tables chairs	Graduate researcher Support facilitator Parent and child participants.

Session 4, (110 minutes).

Managing and budgeting for food. Children's lunch box for tomorrow & pantry staple cooking using low salt options.

Session aims:

- Introduce the importance of planning your meals in advance and food safety in the kitchen
- Encourage safe storage of food in lunch boxes
- Delicious meals can be prepared using cost effective healthy meals and snacks.

Key messages:

Fresh seasonal produce is cost effective and packed full of nutrition. Pantry staple foods are nutritious, cost effective and easy to prepare. Consider purchasing imperfect fresh foods and packaged food on sale. Remember to check the used by dates before purchasing. It is important store foods at their correct temperature in lunch boxes. When cooking, use low salt or sugar foods and add sparingly when cooking. Reduce the use of manufactured tomato pasta sauces which cost more and can be loaded with salt or sugar.

Session objectives	**By the end of the session participants will learn that all food benefits health and wellbeing.** **By the end of the session participants will have an increased knowledge on the food relief organisations and where to seek food relief.** **By the end of the session participants will become familiar with the services of local community gardens.** **By the end of the session parents will have increased confidence in budgeting their meals ahead of time.** **By the end of the session parents will have increased frequency in planning and preparing for meals ahead of time.** **By the end of the session children will have an increased confidence in preparing and packing their own school lunch box ahead of time.**			
Time	**Activity details**	**How will it be evaluated**	**Resources required**	**Who will be involved.**
5 minutes	Graduate research student acknowledgement of Indigenous land. Graduate research student welcomes the group to the final session, prompts group discussion on • What new things have they learnt when	Verbal and nonverbal ques and feedback from participants.	• **Poster on walls** • Eat for Health Plate model. • How much sugar is in soft drinks poster.	Parent and child participants. Guest presenter. Supporting facilitator.

	reading the food labels in the past week. The graduate research student details of the final session which involves dividing the group into different spaces. • Parents in group learning component. • Children will be asked if they wish would join in a practical learning component packing their lunch boxes with Deanna (supporting facilitator). • Reminders about post questionnaires at the end of the session.			Graduate research student.
35 minutes. Group learning component.	The graduate researcher introduces the guest presenter from Bendigo Food Share and prompts the importance to the group to plan and budget for the weekly or fortnightly shop.	Verbal feedback and observations. Online baseline vs post and one month follow up questionnaires collected online using Qualtrics	• **Poster on walls** • Eat for Health Plate model.	Parent and child participants. Guest presenter

	Graduate researcher prompts the group to discuss any • Useful Apps for locating where the specials are. Graduate research student to prompt discussion on the importance of when purchasing foods check best before and used by dates and transport, store appropriately. • Unit pricing • Choosing fresh foods in season. • Selecting cost effective good quality imperfect fruits or vegetables sold in stores and local community gardens. Guest presenter from Bendigo Food Share will present to the group the Grow a row pick a		• How much sugar is in soft drinks poster. • A guide to making healthy food and drink choices. Butchers paper, pens, coloured pencils. **Take home resources** • AGtHE Plate model. • Australian Dietary guidelines for children and adults • Relevant contact details for Bendigo Food Share (provided by guest presenter)	Supporting facilitator. Graduate research student.

Child practical group learning. ***Held concurrently**	bunch initiative at risk youth and the role of Bendigo Food Share within central Victoria. The supporting facilitator will settle any children who wish to prepare their lunch box will be in the kitchen. **Lead by the supporting facilitator**, Children will choose foods based upon the *Traffic Light System*. Children wash fresh ingredients, then prepare them ready for the next day. Support facilitator will prompt to the children the importance of keep their lunch cool.		Resources for children packing lunch box – • Children's take home lunch box. • Reading food labels - Nutrition Australia. • Keep lunch boxes cool - Nutrition Australia. Resources on the traffic light system (Healthy Eating advisory service, Vic Health).	

			Ingredients for children's take home lunch box, based upon foods from the green and amber categories of the traffic light system. • Butchers paper, pens, coloured pencils.	
10 minutes	The children will join the parents in the group learning session, the graduate research student will prompt the children to tell their parents what they learnt and packed in their lunch box. The graduate research student will emphasise all foods fresh or packaged consumed benefits family members grow, learn, work and play.	Pots and one month follow up questionnaires collected online using Qualtrics.		
40 minutes	**Supporting facilitator introduces** today's recipe and allergens in ingredients and overseas the meal preparation while monitoring basic	Online baseline vs post and one month follow up questionnaires using Qualtrics. Feedback and verbal questioning.	• Face mask (on hand if needed) • Recipe – **Gnocchi.** • Additional recipes in plastic pockets.	Graduate research student Supporting facilitator

	hygiene and food safety principles. **Discussion** on how recipe can be adapted to make it quick, healthy. • Wipe down of bench, putting away remaining ingredients.		• Black menu board for recipe and allergens disclosure. • Aprons • First aid kit Posters on walls • Hand washing • Food safety danger zones.	Parent and child participants.
20 minutes.	Group dinning of prepared snack/meal. Further discussion on session content.	Friendly engagement between all group members.	• Puzzle- children's word search • Place mats - Eat for Health, Plate model • Cutlery and plates-napkins • Tablets, laptops for participants to complete questionnaires.	Graduate research student. Supporting facilitator. Guest facilitator. Parent and child participants.

			• Images and coloured boxes for the children's sorting task.	

Appendix 2. Sesson one recipe in written Karen.

Appendix 3. Sesson one recipe in written English.

Karen

Chicken & Vegetable Stirfry

This recipe may contain gluten, seeds and seafood products

The inspiration for this recipe was provided by Boe Htoo from

bendigo Community Health services

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Cooking utensils

- Chopping board
- Stirring spoon
- Tongs
- knives
- Peeler
- Frying pan

Ingredients

- Chicken breast = 250grams (optional)
- Broccoli = 250grams
- Green beans = 250grams
- Red capsicum = 1
- Spring onion = 1 small bunch
- Crushed garlic = 3 cloves
- Onion = 1
- Grated ginger = 1/2 teaspoon
- Lime juice = 1 teaspoon
- Oyster sauce = 2 tablespoons
- Dark soy sauce = 2 tablespoons
- Olive oil = 2 tablespoons
- Sesame oil = 1 tablespoon (optional).
- Fresh chilli = 1 (optional)

Method

1. 
Cut fresh ingredients

2. 
Cook onion, garlic, chilli, ginger in a pan for 10-15 seconds.

3. 
Brown off the chicken then add soy sauce and cook for 5 minutes.

4. 
Add broccoli, green beans, red capsicum lime juice, sesame oil and oyster sauce, then stir fry for 5-6 minutes

5. 
Top with spring onions and serve with steamed rice and fresh salad.

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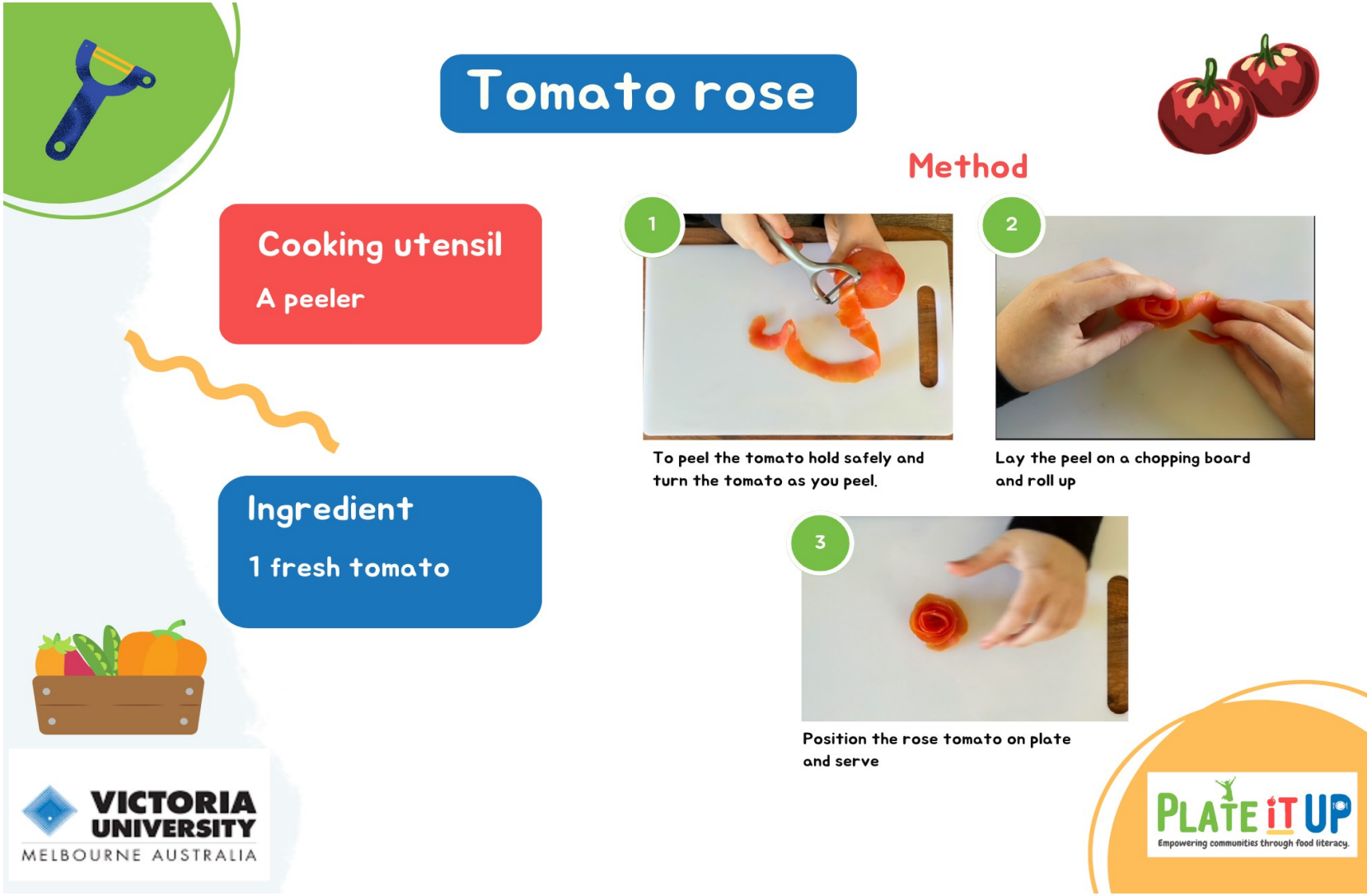
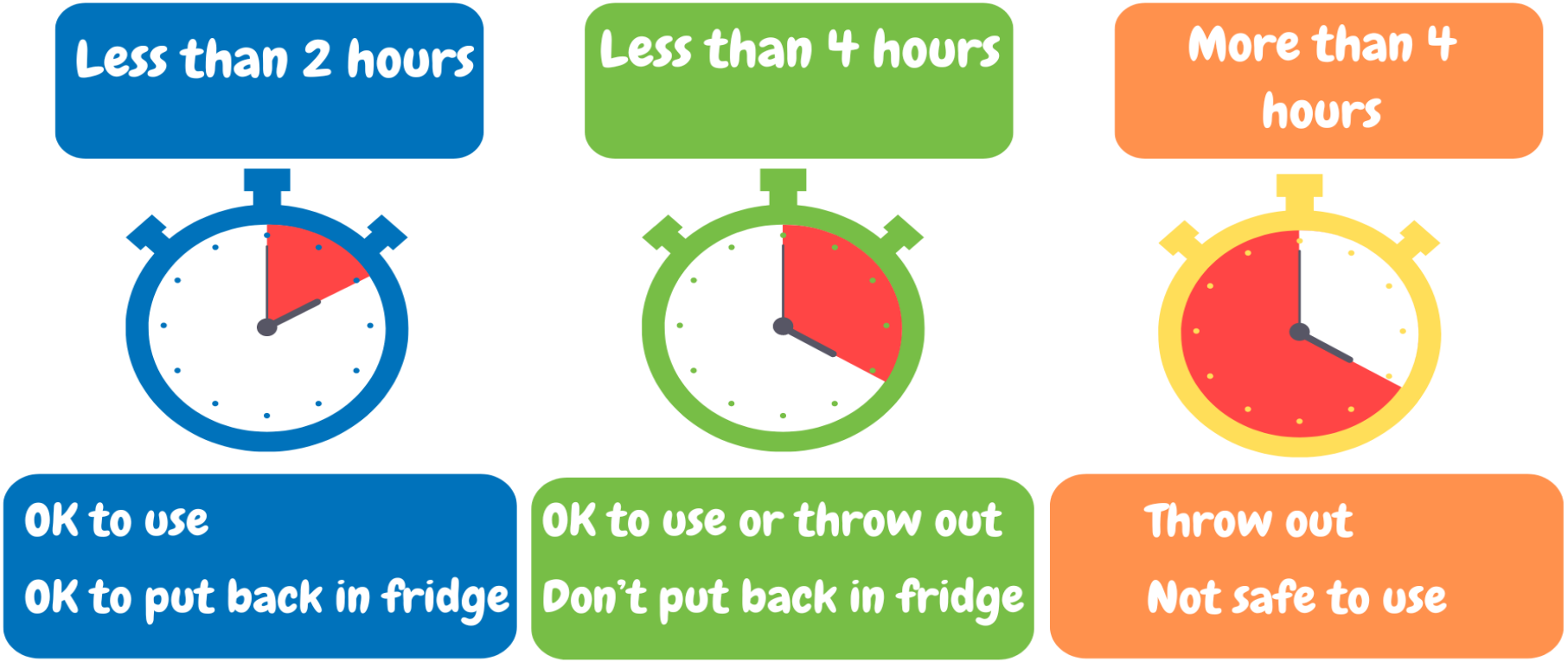
Appendix 4. Sesson one: Rose tomato garnish



Appendix 5. Session one take home resource: 2- hour 4 - hour rule.



Appendix 6. Session two recipe: Crispy noodle salad

Crispy noodle salad

4 serves

Cooking utensils

- Chopping board
- Glass jar with lid
- Measuring spoons and cups
- Knife, peeler
- Grater
- Spoons
- Mixing bowl

This recipe contains seeds, gluten and honey

Ingredients

Iceberg lettuce (sliced) = 2 cups
Carrot (grated) = 1 cup
Red Cabbage (sliced) = 1 1/2
Spring onion (sliced) = 1/2 cup
Skin free roast chicken = 1
Avocado = 1/4
Fried noodles (optional) = 1/4 cup

DRESSING
Sesame oil = 2 tbsp
Rice vinegar = 1/4 cup
Honey = 1/2 tbsp
Garlic (crushed) = 1 tsp.
Salt reduced soy sauce = 1/4 cup

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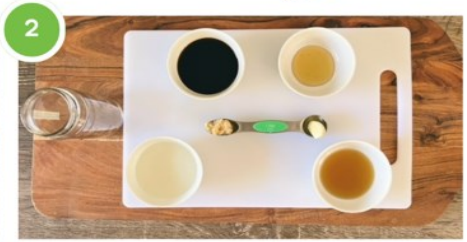
Method

1. 
Prepare fresh ingredients and shredd chicken meat

2. 
In a jar add sesame oil, vinegar, honey, soy sauce and garlic. Close the lid then shake

3. 
Add lettuce, cabbage, carrot, spring onion, avocado, chicken and noodles in bowl, add dressing

4. 
Toss salad together

5. 
Serve and eat immediately.
*Optional, garnish with celery and carrot slices.

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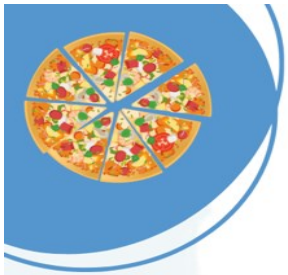
Appendix 7. Session three recipe: Pizza



Pizza

Cooking utensils

- Chopping board
- Knife
- Spoons
- Small bowls
- Pizza tray and cutter

This recipe contains dairy and gluten

Serves 3 people

Ingredients

Pizza base = 1
Napoli sauce = 1 cup

Pizza cheese = 1 cup
Lean bacon = 1/4
Ham = 1/4 cup
Roasted pumpkin = 1/4 cup
Spinach = 1/4 cup
Red or green capsicum = 1/4
Cherry tomato's = 1/4 cup
Pineapples pieces = 1/4 cup

Method

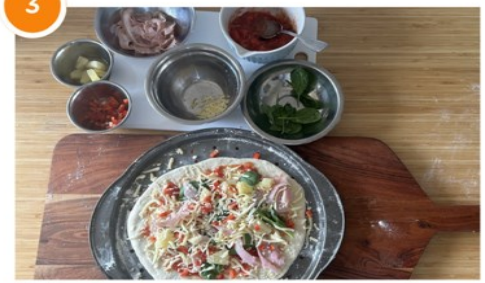
1

Preheat oven to 200 C and cut fresh ingredients

2

Spread Napoli sauce evenly over the pizza base

3



Add your your pizza topping that includes cheese and fresh ingredients.

4

Bake in the oven for 20 minutes. Cut and then serve.

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Appendix 8. Recipe: Napoli sauce

Tomato Napoli Sauce

4 serves

Cooking utensils

Chopping board
Stirring spoon
Knife
Can opener
Saucepan

Ingredients

Tinned tomato = 410 gram can
Basal = 1 1/2 teaspoons
Garlic = 1 teaspoon
Onion = 1/2
lemon juice = 1 teaspoon
Olive oil = 1 tablespoon
Sugar = 1 teaspoon
Chilli = 1/2 (optional)

Method

1

Slice or dice onion, wash basil

2

In a frying pan add olive oil, onion and garlic and cook on a medium heat for 3 minutes.

3

Add tinned tomato to pan together with basil, sugar and lemon juice and simmer for 10 minutes, or until thickened.

4

Use straight away or store in a fridge for up to 3 days.
This recipe can be frozen

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Appendix 9. Session four recipe : Gnocchi

Potato Gnocchi

Cooking utensils

Chopping board
Knife, fork
Saucepan
Spoons
Frying pan

This recipe contains eggs, gluten and dairy products

Makes 4 serves

Ingredients

Dry mashed potato = 2 cups
Plain flour = 1 1/2 cups
Egg = 1

Napoli sauce = 2 1/2 cups
Grated light cheese = 3/4 cup

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Method

1

Place flour and potato on a flat surface, then make a centre well, add the egg

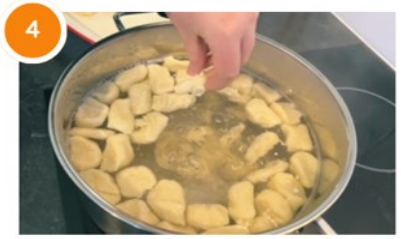
2

Mix together to form a soft dough and the mix will not stick to your fingers

3

Roll small amounts of dough into a rope shape and cut into small pieces. Roll on a fork. then rest (10 minutes)

4



In a large saucepan of salted boiling water add gnocchi and cook until the pasta floats.

5

Remove with slotted spoon from and place in heated sauce.

6

Stir through and top with grated cheese and serve.

Appendix 10. Parents baseline, post one month follow up questionnaires

Welcome to the Plate it Up® questionnaire!

Thank you for participating in Plate it Up.

This survey asks about what you eat and what you like to cook. It also asks about your families cooking at home.

By completing this survey you agree to us using your answers to understand how you plan and choose food for you and your family.

If you do not understand any questions from your or you child's questionnaire, please ask for help from the program leader.

Your individual information will be kept confidential and private.

In this first section of the questionnaire we would like to know more about you and your child.

1. **What is your age?**

Mark only 1 square

18- 24 years	25- 34 years	35- 44 years	45-54 years	55-64 years	65-74 years	75+ years

2. **What is your gender?**

Mark only 1 square

Male	Female	Other	Prefer not to say

3. What is the post code of your usual household/residence?

4. What is the highest level of schooling that you have done?

**Mark only 1 square*

High school, year 12 or less	Certificate, TAFE, Apprenticeship, diploma, advanced diploma	Tertiary, Bachelor degree or higher

5. What is your current employment situation?

Working full time	Working part time	Home duties
Not working (pension or carer allowance)	Retired	Other

6. Who lives in your current household?

**Mark only 1 square*

Couple with dependent children

One parent family with dependent children

Multiple family household

Other

7. Which is your current living situation

**Mark only 1 square*

Living in a house/ apartment/flat together with my child that I own.

Living in a house/ apartment/ flat together with my child that I rent.

Living in temporary accommodation/ caravan together with my child.

Living in short term emergency accommodation/ crisis/ shelter/ transitioning housing together with my child.

Other:

In this page we would like to know more about what you understand when using a nutrition panel.

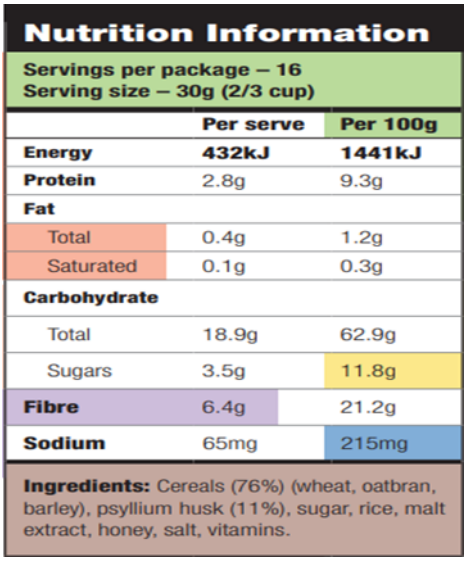
8. What is the main ingredient in the product ?

**Mark only 1 square*

Sugar Honey

Rice Salt

Cereals Not sure



Nutrition Information

Servings per package – 16
Serving size – 30g (2/3 cup)

	Per serve	Per 100g
Energy	**432kJ**	**1441kJ**
Protein	2.8g	9.3g
Fat		
Total	0.4g	1.2g
Saturated	0.1g	0.3g
Carbohydrate		
Total	18.9g	62.9g
Sugars	3.5g	11.8g
Fibre	6.4g	21.2g
Sodium	65mg	215mg

Ingredients: Cereals (76%) (wheat, oatbran, barley), psyllium husk (11%), sugar, rice, malt extract, honey, salt, vitamins.

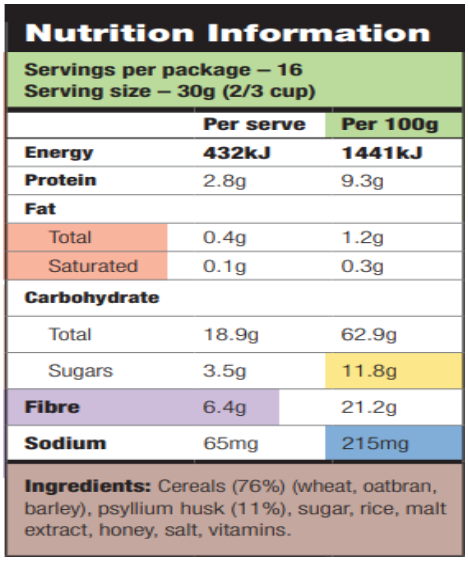
Figure 1: Eat for health-eating well food label.

In 100 grams of this product, how many grams of sugar are there?

**Mark only 1 square*

11.8 grams 1.2 grams

21.2 grams 1.3 grams



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Ingredients: Cereals (76%) (wheat, oatbran, barley), psyllium husk (11%), sugar, rice, malt extract, honey, salt, vitamins.

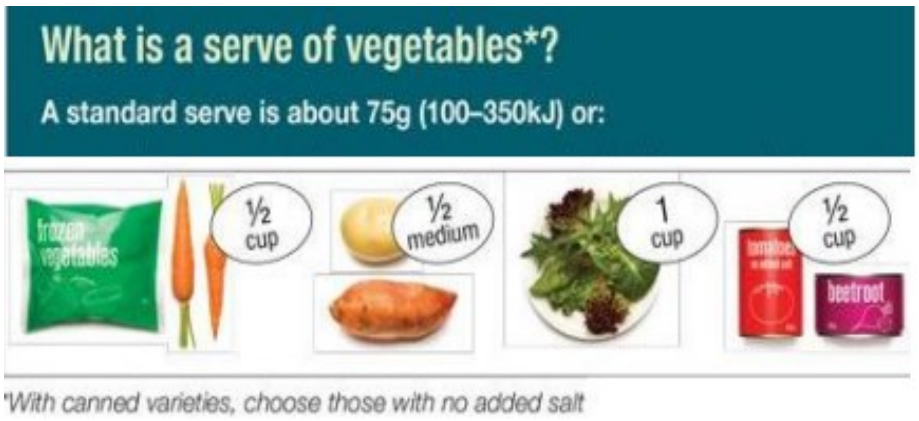
Figure 1: Eat for health-eating well food label.

Confidential

Now we would like to know what you eat

9. How many serves of VEGETABLES do you usually eat per day? Do not include hot chips or fried potato.

*****Mark only 1 square*

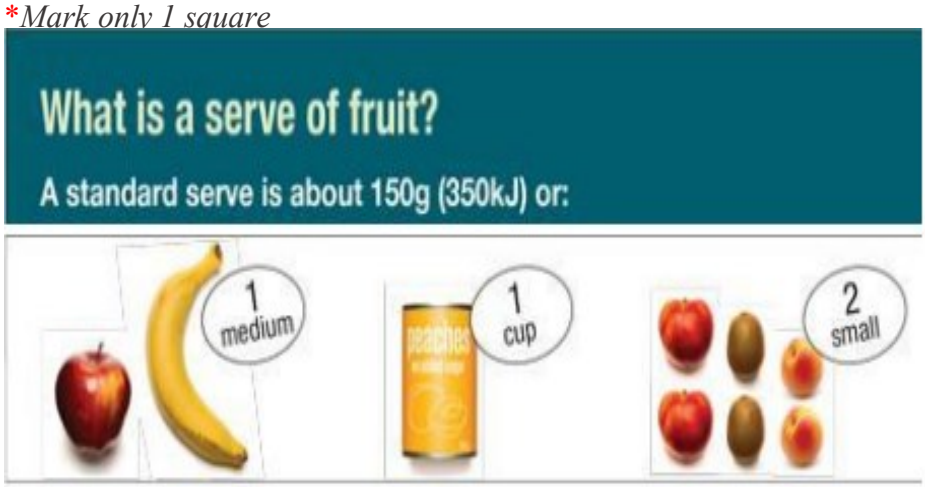


1 serve or less each day

2 serves or more each day

10. About how many serves of FRUIT do you usually eat per day? Do not include fruit juice or fruit drink.

**Mark only 1 square*



1 serve or less each day

2 serves or more each day

11. How many times a week on average do you eat fast food meals such as burgers, pizza, chicken or chips from fast food shops?

**Mark only 1 square*

Less than once a week	More than once a week

12. How many times a week do you drink soft drink (not diet or sugar free), energy drinks, sports drinks, flavoured mineral or vitamin water?

**Mark only 1 square*

Less than once a week	More than once a week

13. How often do you do each of the following?

Plan meals ahead of time	Most of the time	Sometimes
Plan meals to include all food groups	Most of the time	Sometimes
Cook meals at home using healthy ingredients	Most of the time	Sometimes
Made a list before shopping	Most of the time	Sometimes
Felt confident about cooking a variety of healthy meals	Most of the time	Sometimes
Felt confident in managing money to buy healthy food.	Most of the time	Sometimes
Compare prices of foods to find the best prices on healthy foods	Most of the time	Sometimes
Change recipes to make them healthier.	Most of the time	Sometimes

Try a new recipe at home.	Most of the time	Sometimes
Felt confident in making changes in your food choices.	Most of the time	Sometimes
Think about healthy choices when deciding what to eat.	Most of the time	Sometimes
Use a nutrition panel to make food choices	Most of the time	Sometimes
Check used by dates on food	Most of the time	Sometimes
Run out of money for food	Never	Sometimes

14. Fruit and vegetables are cheap when they are in season.

*Mark only 1 square

Disagree	Somewhat agree

15. How often do you cook at home for yourself and/or others?

*Mark only 1 square

I prepare/cook MOST food/meals for myself and/or others

I prepare/cook SOME food/meals for myself and/or others

I prepare/cook NO food/meals for myself and/or others

16. I can make a meal from simple ingredients that is low in price.

*Mark only 1 square

Disagree	Somewhat agree

17. I can put together a healthy meal from scratch in 30 minutes.

*Mark only 1 square

Disagree	Somewhat agree

18. What is your confidence in making lunch or dinner by combining foods and spices in your pantry without recipe.

*Mark only 1 square

Not confident	Somewhat confident

19. As a family we buy ingredients and cook from scratch.

*Mark only 1 square

Less than once a week	More than 2 times a week	Twice a day or more.

20. Do you put cooked meats or chicken on the same plate where raw meat or chicken has been?

*Mark only 1 square

Never	Sometimes	Always

21. How often do you do the following actions

Do you leave cooked foods outside the refrigerator for at least 2 hours	Never	Sometimes	Always
Do you leave cooked foods outside the refrigerator for at least 4 hours	Never	Sometimes	Always
Do you leave cooked food outside of the refrigerator for at least 6 hours?	Never	Sometimes	Always

22. How do you defrost your raw chicken at home?

On the kitchen bench	Never	Sometimes	Always
On the table	Never	Sometimes	Always
In the sink without water	Never	Sometimes	Always
In the refrigerator	Never	Sometimes	Always

Parents' post and one month follow up questionnaires: additional questions

23. What parts of the program did you enjoy the most and why?

24. What parts did you not like or could be improved about the program?

27. How has the program impacted the dietary intake/ nutrition of your child?

28. How has the program impacted the dietary intake/ nutrition of your family, as a whole?

Thank you for completing the questionnaire

Appendix 11. Childrens' baseline, post and one month follow up questionnaire

Welcome to the Plate it Up® quiz!

Thank you for being a part of this food and cooking program

This quiz asks about what food you eat and cook.

It is OK if you cannot answer a question.

Please ask your parent or the programs leader for help

We will not tell anyone about you and your answers

1. **What is the name of your sports club**

2. **What grade are you in?**

Grade 3

Grade 4

Grade 5

Grade 6

3. **How old are you?**

8 years old

9 years old

10 years old

11 years old

12 years old

4. **Please tick which is you**

I am a girl

I am a boy

I am not a boy or a girl

I do not want to say

5. **What language do you speak at home?**

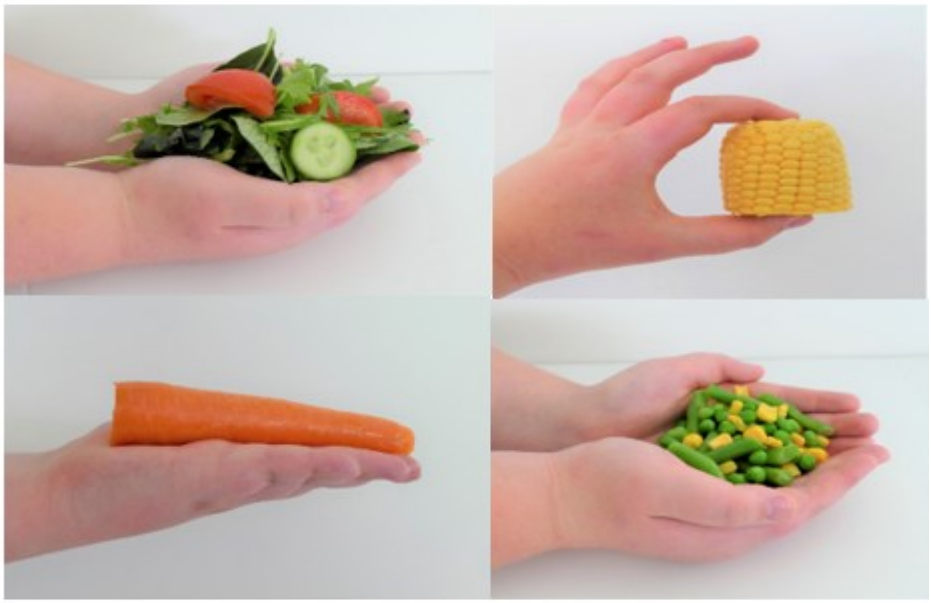
6. **Do you eat funny-shaped and spotty fruits?**

YES NO

7. **Do you eat funny-shaped vegetables?**

YES NO

Each picture below shows 1 serve of vegetables.



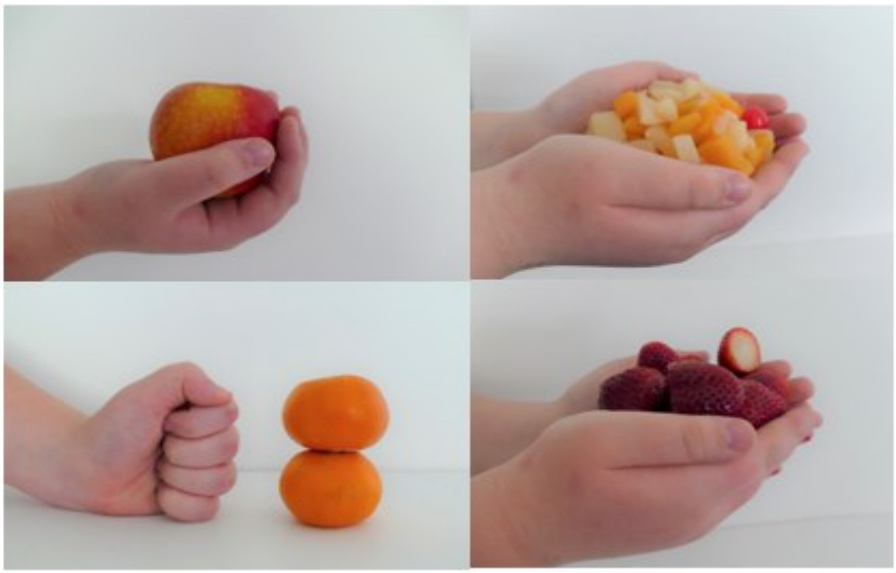
(A serve is half-cup of cooked vegetables or 1 cup of salad)

9. **How many serves of vegetables do you USUALLY eat each day?*** ***Please mark one box***

1 serve or less

2 or more serves

Each picture below is 1 serve of fruit.



(A serve is 1 medium piece or 2 small pieces of fruit or a cup of diced pieces)

10.How many serves of fruit do you USUALLY eat each day?

******Please mark one box*

1 serve or less

2 serves or more

11.Have you seen this before?

YES NO

If yes, can you explain what it is used for?

To help you answer this question take a look at the pictures below.

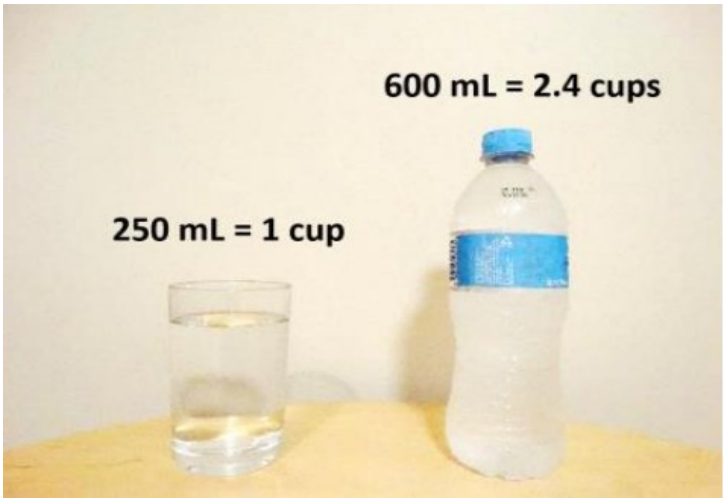
(1 can of soft drink = 1 ½ cups).

12. How much soft drinks, cordials or sport drinks do you USUALLY drink (like cordial, Coke, Lemonade, Gatorade). ****Please mark one box***

1 cup or less a week.

About 2 or more cups a week.

To help you answer this question take a look at the pictures below.



13. How much water do you USUALLY drink each day? This can be plain tap or bottled water.

******Please mark one box***

1 cup or less a day

2 or more cups a day

14. How often do you have meals or snacks such as burgers, pizza, chicken, or chips from places like McDonalds, Hungry Jacks, Pizza Hut, KFC, Red Rooster, or local takeaway food places? ***Please mark one box***

Less than once a week

2 or more times a week

15. How often do you eat meats like sausages, hot dogs, ham, Devon, sausage rolls, salami, meat pies, chicken nuggets or bacon? ***Please mark one box***

Less than once a week

2 or more times a week

16. How often do you eat sweet foods, like sweet biscuits, cakes, or muffins? ***Please mark one box***

Less than once a week

Two or more times a week

16 How often do you eat potato crisps or other savoury snacks (such as Twisties, Corn chips)? ****Please mark one box***

Once a week or less

2 or more times a week

17. How often do you help cook at home? ****Please mark one box***

Never

Occasionally

A few nights a week

Every night or almost every night

18. If you are helping to cook at home, can you please tell us what you do when you help.

Children's post and one month follow up questionnaire additional questions.

19. Were the activities that you used easy to read?

YES NO

20.Did you cook some cooking class recipes at home?

YES NO

21. Did you learn something new about food or cooking that you did not know before? If yes, please tell us what

22.Tell us what you liked about the cooking activities you did.

* *You can tick more than 1 box.*

Tasting new foods

How be safe cooking in a kitchen

Cooking with your parent/ guardian

Learning how to prepare my lunch box

Cutting and peeling fruits or vegetables

23.**What other things would you liked to have done?**

24. Did the activities make you want to cook more often?

Yes, I want to cook a lot more

Yes, I want to cook more often

No, not really

No, I don't like cooking

26. Would you like more food and cooking activities?

YES NO

27. If you answered yes, please tell us why you would like more activities?

28. Is there anything else you would like to tell us about food and cooking ?

Appendix 12. Childrens' baseline and post sorting task

The guide uses a "traffic light" system to assign foods and drinks categories depending on how nutritious they are. Children will be tasked to sort 18 laminated images of foods into their correct categories: GREEN) category foods and drinks as they are the most nutritious choices, AMBER) category foods and drinks sometimes as they are mainly processed and have some sugar, salt and/or fat added to them. RED) category foods and drinks rarely as they are not an essential part of a balanced diet. It is recommended that these foods and drinks are only consumed occasionally and in small amounts.

The correct answers for the children sorting task

Food item (laminated image)	Correct box	Recommendations from ADGL & Healthy Eating Advisory Service.
Bottled plain water	*GREEN*	The Australian Dietary Guidelines advise to drink plenty of water.
Plain Natural yoghurt	*GREEN*	Guideline 2: Enjoy a wide variety of nutritious foods from the food group consisting of milk, yogurt, cheese and/ or their alternatives. Prefer low fat.
Unsalted mixed nuts	*GREEN*	Guideline 2: Eat a wide variety of lean meats and poultry, fish eggs, tofu, nuts and seeds, legumes and beans.
Wholemeal bread slice	*GREEN*	Guideline 2: Enjoy a wide variety of nutritious foods from the food group consisting of grain (cereal) foods, mostly whole grain and/or high cereal fibre such as breads, cereals, rice, pasta, noodles, polenta, couscous, oats, quinoa, and barley.
Banana	*GREEN*	Guideline 2: Enjoy a wide variety of nutritious foods from the fruit food group.
Carrot	*GREEN*	Guideline 2: Consume plenty of vegetables, including different types and colours, and legumes and beans.
Egg	*GREEN*	Guideline 2: Eat a wide variety of lean meats and poultry, fish eggs, tofu, nuts and seeds, legumes, and beans.

Strawberry milk	***AMBER***	Guideline 2: enjoy a wide variety of nutritious foods from the food group consisting of milk, yogurt, cheese and/ or their alternatives. Guideline 3a limit foods high in saturated fat and added sugars. Choose ***AMBER*** category foods and drinks sometimes as they are mainly processed and have some sugar, salt and/or fat added to them.
Orange juice.	***AMBER***	According to guideline 2 of the Australian Dietary Guidelines, people should enjoy a wide variety of fruits. ½ cup of fruit juice (with no added sugar) can only occasionally be considered a standard serve. Therefore, orange juice is placed in the ***AMBER*** category.
Strawberry yoghurt	***AMBER***	Guideline 2: enjoy a wide variety of nutritious foods from the food group consisting of milk, yogurt, cheese and/ or their alternatives. Guideline 3a limit foods high in saturated fat and added sugars.
White slice of bread	***AMBER***	Guideline 2: Enjoy a wide variety of nutritious foods from the food group consisting of grain (cereal) foods, mostly whole grain and/or high cereal fibre such as breads, cereals, rice, pasta, noodles, polenta, couscous, oats, quinoa, and barley. Guideline 3b: limit intake of food and drinks containing added salt.
Cola	***RED***	Guideline 3c: Considered red as the Australian Dietary Guidelines state to limit foods and drinks containing added sugars such as sugar sweetened soft drinks. Choose ***RED*** category foods and drinks rarely as they are not an essential part of a balanced diet. It is recommended that these foods and drinks are only consumed occasionally and in small amounts.
Chips	***RED***	Guideline 3a: limit intake of foods high in saturated fat such as biscuits, cakes, pastries, pies, processed meats, commercial burgers, pizza, fried foods, potato crisps and other savoury snacks. Guideline 2b: limit intake of foods and drinks containing added salt.
Muffin	***RED***	Guideline 3a: limit intake of foods high in saturated fat and sugars.

Tim tam	***RED***	Guideline 3a: limit intake of foods high in saturated fat and sugars.
Pork sausage	***RED***	Guideline 3a: limit intake of foods that are high in added salt and saturated fat such as processed meats.
Muesli bar	***RED***	Guideline 3a: limit intake of foods high in saturated fat and sugars.

Appendix 13. Parent and child dyad interview schedule

Questions for parent and child (blue), or parent (green).

Aim: Ice breaker: A very brief review of intervention.

In the surveys we asked you about what your thoughts on the program. In this interview can you share more information on what was the best thing you got out of being involved in the program?

Prompt: learning about healthy foods, cooking new and interesting foods, spending time with each other, learning how to cook with my friends or family members, learning about food safety, budgeting for food.

Aim: Identify the barriers experienced when selecting and eating healthier food.

Since finishing the program, is there anything you learnt in the program that you have continued to do?

Can you talk me through what things you learnt from the program you feel you can't do anymore?

Prompt: Planning and budgeting for meals, easier and cheaper to buy takeaway foods for meals, concern of injury to child during cooking, accommodating different family members taste preferences. Cultural customs to finish what is on a plate. Less availability of healthy foods to purchase in the clubs and school canteen.

Aim: Identify the enablers recruited when trying to overcome the barriers

Can you tell me a bit more about how you have tried to overcome any big challenges you have experienced when wanting to buy/eat healthier everyday foods?

Prompt: Introduce new tastes and fresh food, reuse of leftovers, simple recipes, buying imperfect fruits and vegetables. Bringing your own food when family attends training or a match day. Asked if there are fresh healthier foods available in canteen, discussed with family healthier foods they wish to cook or eat.

Aim: Parents are free to talk on any personal and sensitive topics individually.

Thank you for your time today, we have discussed many things about your day to day experiences with food is there anything else you can think of that you wish to share?

Prompt: Food insecurity, high cost of living pressures, eating disorder.