Impact Evaluation of the

*Kids in the Kitchen*

School Based Health Promotion Program

Barbara Ritchie
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School of Health and Sport Sciences
Faculty of Science, Health and Education
University of the Sunshine Coast
Sippy Downs, QLD
Australia

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ABSTRACT

Australian children’s fruit and vegetable consumption is lower than the level required for optimal growth, development and health. A number of health promotion programs aimed at increasing children’s fruit and vegetable consumption have been implemented and evaluated, with mixed results. Students’ self efficacy in food preparation is one of the determinants of fruit and vegetable consumption. However there are few studies published in the literature that describe the implementation or evaluation of health promotion programs addressing this important determinant. The *Kids in the Kitchen* health promotion program was developed and has been implemented at Chancellor State College, Queensland, Australia since 2005. The major program strategy involves the engagement of children in the preparation of fruit and vegetable snacks and meals. Teachers and parents work with children in small supervised groups to prepare fruits and vegetables for consumption. The ten week program is integrated into existing school curriculum units in Grades one and five. An evaluation of the impact of the *Kids in the Kitchen* program was conducted from July to December 2007 and is the focus of this research.

The research methodology is evaluation research, guided by the Hawe, Degeling and Hall Health Promotion Evaluation Framework. A questionnaire and skills audit were used to collect quantitative data pre and post the implementation of the *Kids in the Kitchen* program. Impact evaluation data were collected in relation to children’s: knowledge of fruits and vegetables; attitudes towards eating fruits and vegetables; consumption of fruits and vegetables; skills in preparing fruits and vegetables; and environmental supports in the home for the consumption of fruits and vegetables.

The questionnaire included photographs of twenty different fruits and twenty different vegetables which the participants were asked to identify. The number of correct responses was used as an indicator of each participant’s level of knowledge about fruits and vegetables. The extent to which participants agreed with a statement about eating fruits and vegetables everyday keeping them healthy was the second indicator of knowledge.

The extent to which participants liked each fruit and vegetable, and the extent of their agreement with a number of statements relating to fruits and vegetables were used as the indicators of attitudes towards fruits and vegetables. Whether or not participants had tried each fruit and vegetable, how often they reported eating each fruit and vegetable, and the
extent to which they agreed with a statement about eating raw vegetables, were used as the indicators of consumption of fruits and vegetables.

Participants were asked the extent to which they agreed with a statement about their fruit and vegetable preparation skills, and to rate their skills in preparing fruits and vegetables. In addition Grade one participants were asked to demonstrate their skills in fruit and vegetable preparation. The researcher observed the participants and assessed their fruit and vegetable preparation skill level using a skills audit.

The extent to which participants agreed with a number of statements relating to environmental factors that impact on eating fruits and vegetables, such as availability of fruits and vegetables at home and encouragement from parents to eat fruits and vegetables, were used as indicators of environmental support for fruit and vegetable consumption.

Data were coded and entered into SPSS for analysis. Descriptive statistics determined frequency distribution, measures of central tendency and variability. The Related-Samples Wilcoxon Signed-Rank Test was used to determine differences in participants’ knowledge of fruits and vegetables, attitudes towards eating fruits and vegetables, consumption of fruits and vegetables, fruit and vegetable preparation skills, and environmental supports for fruit and vegetable consumption pre and post the Kids in the Kitchen program. The Independent-Samples Mann-Whitney U Test was used to detect differences based on participants’ grade and gender. Pearson’s Chi-Square Test was used to explore associations between willingness to try new fruits and vegetables, and other environmental and behavioural factors.

A total of 118 children participated in the evaluation; 70 Grade one students and 48 Grade five students. Compared to before the Kids in the Kitchen program, there were significant increases in participants’ recognition of a number of fruits and vegetables including plums, mangoes, peaches, pineapple, dates, cucumber, radishes, chickpeas, eggplant, baby carrots, cauliflower and sweet potato after the program.

Significantly more participants had tried kiwi fruit, lemons, mango, pear, pineapple, rockmelon and sultanas, liked tomato and watermelon, and regularly ate mango and tomato. Significantly more participants had tried cauliflower, cucumber, eggplant and potatoes, and regularly ate carrots and sprouts. Significantly fewer participants regularly ate celery and sprouts.
There were significant increases in the median number of fruits known, tried and liked, and the number of vegetables known after the *Kids in the Kitchen* program. Grade 5 students had significantly higher levels of fruits and vegetables known, tried and liked than Grade 1 students at both pre and post time points. Grade 5 students regularly ate significantly fewer fruits at the post program time point than Grade 1 students. At the post program time point females liked significantly more fruits than males and correctly identified significantly more vegetables than males.

Prior to the program more than half the participants (56%) correctly identified between 11 and 15 fruits, and a further quarter (29%) identified 16 to 20 fruits. After the program more than half the participants (55%) correctly identified 16 to 20 fruits, and a further third (38%) identified 11 to 15 fruits. Before the program over half the participants (53%) could only identify up to 10 vegetables, whereas after the program this decreased to just over a third of participants (35%).

Before the program, 41% of participants had tried 16 to 20 fruits, whereas after the program 56% of participants had tried 16 to 20 fruits. Although no participants had tried more than 11 vegetables before or after the program, the proportion that had tried 6 to 10 vegetables increased from under a third (32%) to almost one half of the participants (47%).

Before the program, one half of the participants liked between 11 and 20 fruits, increasing to almost two-thirds after the program. The proportion of participants who liked 16 to 20 vegetables doubled from 3.5% to 7%. The proportion of participants that regularly ate between 11 and 20 fruits increased from 8% to 10%. More than 80% of participants regularly ate between 0 and 5 vegetables pre and post the program.

Participants’ perceptions of their skills in using a knife to prepare fruits and vegetables increased significantly. Grade one participants’ observed skills in cutting and grating apples and carrots improved significantly.

Participants’ attitudes towards trying new fruits and vegetables were strongly associated with behaviours such as eating fruit and vegetables for health or taste, and environmental factors such as availability of foods and vegetables at home and encouragement from parents. Overall, the findings suggest that the program had a positive impact on participants’ knowledge, attitudes and skills related to fruits and vegetables.
This research project provides evidence of the positive impact of strategies that facilitate students preparing fruits and vegetables for their own consumption. These results add weight to the theory that if children are involved in the preparation of fruit and vegetables then they are more likely to eat them. It is recommended that the preparation of fruits and vegetables for consumption be included as a classroom based activity in school based nutrition programs.
STATEMENT OF ORIGINALITY

This work has not previously been submitted for a degree or diploma in any university. To the best of my knowledge and belief, the thesis contains no material previously published or written by another person except where due reference is made in the thesis itself.

[Signature]

17 September 2010
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1 INTRODUCTION

Children need good nutrition to develop and grow to their full physical and cognitive potential, and to be protected against chronic disease in later life (1-3). Eating a variety of fruits and vegetables ensures adequate intake of most micronutrients, dietary fibre and a range of essential non-nutrient substances. In addition, increased fruit and vegetable consumption can help displace foods in the diet that are high in saturated fats, sugar or salt (1). Inadequate daily intake of fruits and vegetables is a global problem. It is considered one of the top 10 risk factors contributing to mortality (1). Including fruits and vegetables as part of the daily diet contributes to the prevention of major chronic diseases such as cardiovascular diseases and certain cancers (1). A global strategy on diet, physical activity and health was endorsed by the World Health Organisation in May 2004 at the World Health Assembly (3). The strategy recommended increased consumption of fruits and vegetables for populations and individuals to improve health and reduce the risk factors for chronic disease.

In Australia the problem of inadequate fruits and vegetables in children’s diets has been examined for more than two decades. The 1985 National Dietary Survey (4), 1995 National Nutrition Survey (5) and the 2007 Australian National Children’s Nutrition and Physical Activity Survey (6) all report inadequate intake of fruits and vegetables in children. National and State government and non-government initiatives have been developed to address the issue.

Health promotion programs addressing the issue of inadequate fruit and vegetable consumption need to include effective strategies that address the complexity of factors that influence the eating behaviours of children (7). Given that children’s food preferences are often guided by taste or liking alone (8), health promotion programs need to include a behaviour focus and employ educational strategies based on relevant theory and research (9). These need to be in line with the community’s goals and targets for prevention, protection and health promotion. The body of evidence-based practice on increasing fruit and vegetable consumption however is still developing.

The purpose of this thesis is to report on the impact evaluation of the Kids in the Kitchen school based health promotion program implemented from July to December 2007 at Chancellor State College on the Sunshine Coast, Queensland, Australia.

The thesis is organised into six chapters. Chapter 2 provides a review of the literature relevant to children’s fruit and vegetable consumption. The review commences with an
exploration of the different perspectives on health and the various conceptual frameworks used to describe the determinants of health. Children’s fruit and vegetable consumption rates in Australia and other parts of the world are described, followed by an exploration of the individual and environmental determinants of consumption. The health promotion paradigms used in current practice today, and a range of health promotion programs developed to address children’s fruit and vegetable consumption internationally and in Australia are explored and critiqued. The chapter concludes with the identification of gaps in the literature.

Chapter 3 describes the research design including the Kids in the Kitchen program, research aim, research questions, methodology, theoretical frameworks, participants, ethics, and data collection and analysis methods.

Chapter 4 presents the results of the impact evaluation of the Kids in the Kitchen program. It commences with the demographic data, followed by the results for each of the five research questions. This includes results related to participants’: knowledge of fruits and vegetables; attitudes towards eating fruits and vegetables; consumption of fruits and vegetables; skills in preparing fruits and vegetables; and environmental supports in the home for the consumption of fruits and vegetables.

Chapter 5 presents a discussion of the research results with reference to the theoretical foundations and the literature. It also describes the strengths and limitations of the project.

Chapter 6 presents the conclusion and the recommendations. Recommendations include those for future research, for Chancellor State College, for schools as settings for health promotion and for partnerships and networks.

The Appendices include the ethics approval, Research Project Information Sheet, Consent to Participate in Research forms, Privacy Record, and the questionnaire and skills audit used in the research project.
2 LITERATURE REVIEW

The literature review focuses on the issue of children’s fruit and vegetable consumption and the programs that have been developed to address this issue. The review commences with an exploration of the different perspectives of health and the conceptual frameworks used to describe the determinants of health. Children’s fruit and vegetable consumption rates in Australia and other parts of the world are described, followed by an exploration of the individual and environmental determinants of consumption. The health promotion paradigms used in current practice today and a range of health promotion programs developed to address children’s fruit and vegetable consumption internationally and in Australia are explored and critiqued. The chapter concludes with the identification of gaps in the literature.

2.1 Understanding health and health determinants

2.1.1 Defining health

According to the constitution of the World Health Organisation ‘the enjoyment of the highest attainable standard of health is one of the fundamental rights of every human being’ (10). Health is a dynamic concept with multiple meanings that are dependent on the context in which the term is used (11). A broad view of health is described through the World Health Organisation’s definition of health as a state of complete physical, mental, and social well being and not merely the absence of disease, or infirmity (10). This definition highlights health as more than disease prevention or cure. This view has an individual focus and recognises the mental, physical and social aspects of health and well being.

People have different views about their health and articulate these views using everyday language. For some people, health is about food intake, such as eating plenty of fruits and vegetables, or about physical activity (7). Others, particularly younger people, believe that health is related to outward appearances such as a slim well toned body developed through physical activity, or the amount of energy they have (7). Some people believe they are healthy even though they may have a disease. For example, “I am healthy apart from this arthritis”, while others consider health as a reserve that allows them to recover quickly from illness (7). Health is also viewed as functional or the ability of individuals to do things. Another example refers to health in terms of people’s mental state. For example, “When I’m happy I feel quite well” (7). These examples of how lay people view health indicate the individual characteristics of health and the value people place on their health. People assess their own health subjectively and in terms of a reasonable expectation for age and disability (7).
The holistic, ecological view of health includes mental, physical, spiritual and social health and well being at the individual, family, group, community and population levels. Holistic, ecological health is created by an interconnected web of individual factors such as genetic, social, emotional, mental, spiritual and lifestyle factors in concert with a range of environmental factors (12). This view emphasises the role that health contributes to overall meaning in life, rather than health as the primary goal of life (13). The holistic, ecological view of health does not define health in terms of absence of disease or the accumulation of health behaviours, rather it redefines health as the manner in which people live well, despite inescapable illness, disabilities and trauma (14). This is consistent with the Ottawa Charter for Health Promotion which states that ‘Health is a resource for everyday life, not the objective of living. It is a positive concept emphasizing social and personal resources, as well as physical capacities’ (15).

2.1.2 The determinants of health

The health and well being of people is influenced by a broad range of health determinants. Health determinants are factors, events, characteristics or other definable qualities that contribute to health and well being (16). Health determinants include individual characteristics of people, and the environments in which they live. Individual factors include biological factors, socioeconomic status, skills, knowledge, attitudes and behaviours. Environments impacting on health, both positively and negatively include the social, cultural, economic, political, built and natural environments in which people live (10, 16-21). Health and wellbeing result from the complex interactions that occur between the multiple determinants of health (17).

Numerous frameworks have been developed to explain the relationships and complex interactions between the determinants of health (11, 18-20). These frameworks primarily demonstrate the connections between various societal and individual (biological and behavioural) factors. Dahlgren and Whitehead’s Social Determinants of Health Rainbow (18) identifies living and working conditions, agriculture and food production, education, the work environment, unemployment, water and sanitation, health care services, and housing as contributors to health (21). The framework describes the layers of influence on an individual’s potential for health and raises questions about the size of the contribution of each of the layers to health. This framework has helped researchers construct a range of hypotheses about the determinants of health, and to explore the relative influence of these determinants of health and the interactions between them (22).
Keleher and MacDougall focus on social and economic factors as key determinants of health including: class and the socioeconomic gradient; early child development; poverty, deprivation and social exclusion; health literacy; and gender (11). The conceptual framework of the World Health Organisation’s Commission on Social Determinants of Health (23) and the framework for Reporting on Australia’s Health 2010 (20) have both highlighted how a person’s socioeconomic status influences subsequent life experiences and ultimately, health status (20, 23). The Commission on Social Determinants of Health outlines the need to improve the conditions of daily life as one of its overarching recommendations (23). Other frameworks have been developed to examine the complex interactions between people and the broader range of social, cultural, economic, political and physical environment systems in which they live.

The Butterfly Model of Health (17) and the Red Lotus Health Promotion Model (24) have contributed to understanding about the determinants of health through their exploration of the relationships between people’s health and the environments that they live in. The Butterfly Model of Health considers the impact of biophysical and socioeconomic environments on people’s health through their biological and behavioural filters. It is based on the premise that a healthy state is attained when the biophysical and socioeconomic environments are in balance (17).

The Red Lotus Health Promotion Model also considers the environmental determinants such as social, cultural, economic, political, built and natural environments which interact with the biological factors, socioeconomic status, cognitive factors (knowledge, attitudes and beliefs) and behaviours of people to determine health status (24). The model was developed as a foundation for holistic, ecological, salutogenic health promotion practice, with explicit application of a system of values and principles (24).

Whilst these models and frameworks describe the various determinants of health using different terminology, the common feature of all models is the recognition that health and well being are created through complex interactions between individual and environmental determinants. The models are therefore useful in the examination of the determinants of children’s fruit and vegetable consumption. The next section begins with a description of current patterns of fruit and vegetable consumption, followed by an exploration of the determinants of children’s fruit and vegetable consumption.

### 2.2 Children’s fruit and vegetable consumption
Children need good nutrition to develop and grow to their full physical and cognitive potential, and to be protected against chronic disease in later life (1-3). Eating a variety of
fruits and vegetables ensures adequate intake of most micronutrients, dietary fibre and a range of essential non-nutrient substances. Essential vitamins and minerals found in fruits and vegetables, such as Vitamin A, C and folate, and other biofunctional components such as vegetable proteins, contribute to a child’s normal growth and development (25).

Increased fruit and vegetable consumption can help displace foods in the diet that are high in saturated fats, sugar or salt (1). Incorporating colourful and crunchy fruits and vegetables into children’s diets can help children be satiated longer after consuming foods high in fibre, which reduces the need for other snack foods (26). Some children have stated that they feel refreshed or think clearly when they eat fruits and vegetables (27). Fruits and vegetables contain essential vitamins and minerals that have a protective affect against diseases; in particular some cancers (2, (25, 28), 48-52).

Whilst fruits and vegetables have many health benefits, children in many parts of the world are not eating enough of them. A minimum of 400g per day of a variety of fruits and vegetables is considered appropriate for the achievement of good health, appropriate growth and development, and the prevention of chronic diseases such as heart diseases, cancer and diabetes (1). Recommended quantities of fruit and vegetables for consumption are promoted in various countries to support the health of their people (29-31). Promoting at least five servings of fruits and vegetables is a common strategy (2). However, in the United Kingdom only 7% of girls and 22% of boys aged 11-18 years eat the recommended quantities of fruit and vegetables (32) while in the United States only 25% of 2-18 year olds eat the recommended quantities, with one third of the vegetables eaten being potatoes (33). In New Zealand 40% of children aged 5-14 years eat the recommended number of fruit serves while 60% eat the recommended number of vegetable serves (29).

The Netherlands and Thailand report consumption in terms of grams per day. In the Netherlands children aged 4-17 years consume 71 grams of vegetables per day (34) while children in Thailand (35) consume 113.4 grams per day. Fruit consumption for children in the Netherlands is less than 50 grams per day (34) and 73.6 grams per day for children in Thailand (35). Although consumption in Thailand is higher than the Netherlands, consumption in both countries is less than 50% of the World Health Organisation recommendations (1).

In Australia, children’s fruit and vegetable consumption has been tracked through various surveys. Recommended daily levels of consumption of fruits and vegetables for children in Australia are two to nine serves of vegetables and two to four serves of fruit, depending on age (36). The 1985 National Dietary Survey (4), 1995 National Nutrition Survey (5) and the
2007 Australian National Children’s Nutrition and Physical Activity Survey (37) all found that the quantity of fruits and vegetables eaten by children was below recommended levels. The most recent findings in the 2007 Australian National Children’s Nutrition and Physical Activity Survey compared eating patterns with the Dietary Guidelines for Children and Adolescents in Australia (37). It highlighted the issue of inadequate fruit and vegetable consumption and made the following points:

- ‘Non-compliance was greatest for guidelines relating to saturated fat, sugar and vegetables, as well as fruit and dairy for those 9 years and over.’

- ‘A large proportion of children did not meet the recommendations for fruit serves, especially the older children in whom only 1–2 % appeared to consume 3 serves of fruit if juice was not included in the count as a fruit serve. Compliance increased to 19–25% in this group if juice was included as a fruit serve.’

- ‘Only about one-quarter of children in the younger age groups and 1–11% of the older age groups met the guideline for vegetable intake. If potatoes are excluded from the count as a vegetable, compliance is considerably worse due to the relatively high consumption of potato compared with other vegetables (37).’

These findings indicate that Australian children do not have adequate amounts of fruits and vegetables in their diets. Variety is also of concern considering that fruit juice and potato constitute a significant portion of fruit and vegetable intake (36). The issue of low fruit and vegetable consumption in Australian children requires attention. In order to develop appropriate health promotion programs to address this issue, the determinants of fruit and vegetable consumption must be well understood (2).

2.3 Determinants of children’s fruit and vegetable consumption

The issue of fruit and vegetable consumption is complex with a range of determinants at the individual, family, community and population levels. At the individual and family levels these determinants include biological factors, socioeconomic status, cognitive factors (knowledge, attitudes and beliefs), personal skills, and other behaviours. Environmental influences at all levels include social, cultural, economic, political, built and natural environments. This section explores the individual and environmental determinants of children’s fruit and vegetable consumption.

2.3.1 Individual determinants of children’s fruit and vegetable consumption

Children’s food intake is often guided by taste alone (7, 63, 70, 76-78). In the case of vegetables some people are sensitive to a specific bitter taste of the cruciferous variety such as broccoli, cabbage or brussel sprouts and this has been demonstrated to be genetically determined (38). The children who prefer bland food have been referred to as
genetic non-tasters (39) and this individual characteristic may determine their food preference or avoidance. Studies concerning children’s perceptions of bitterness or sweetness indicate that taste preferences play a role in accepting or rejecting vegetables (38, 39).

Adequate intake of fruit and vegetables is more likely to be reported by children who know the national recommendations for intake (40). Knowledge about nutrition, in particular dietary intake is therefore considered an important determinant of fruit and vegetable consumption (63-66).

Individual behaviours shape patterns of vegetable acceptance (39). Fruit and vegetable consumption has been linked to intentions related to self identity (41, 42); motivation related to personal values (41) or beliefs (43); and self efficacy related to ability and skills (41). If individuals perceive benefits through feeling good (40), cleansed and clear thinking (27) and if immediate health expectations are fulfilled (44, 45), then fruits and vegetables are more likely to be tried and consumed. Other individual behaviours relate to will power (46), choice, autonomy and control (86, 87). Reinforcement of the appropriate behaviours can be in the form of self fulfilment (47), habit (48), to satisfy hunger (40, 49), rewards or decisions about rewards (50, 51) and a pleasant feeling of satiety (8) or surroundings (41, 49). The behaviours related to personal attitudes can also create barriers to fruit and vegetable consumption.

Whilst biological factors such as taste and individual knowledge are considered to be primary determinants of fruit and vegetable consumption, less is known about other individual factors such as personal skills, or the influence of the social, cultural, economic political, built and natural environments. This gap has been acknowledged as an important research priority in order to improve the effectiveness of programs designed to increase fruit and vegetable consumption (48).
2.3.2 Environmental determinants of children’s fruit and vegetable consumption

Environmental determinants of children’s fruit and vegetable consumption explored in this section include parents, teachers and the school environment. Other determinants such as food advertising on television are not discussed in this section because they are not the focus of this research project.

Parents are the primary role models for fruit and vegetable consumption (34, 40, 41, 52). Parent role models can have a positive impact if cultural expectations are demonstrated through their food practices, which includes where and when food is eaten (53, 54). Parents provide access to fruit and vegetables by providing them directly to children or enabling them to get their own (40). Parents encourage eating fruit and vegetables through creating pleasant and positive surroundings for family meals, away from distractions of the television (70, 89, 94) especially when new foods are on offer (52).

Parenting styles, control and feeding practices (69, 78, 80, 84, 94, 97) are also important determinants of fruit and vegetable consumption. The provision of quality foods and establishing routines for healthy eating need to be established with parents from a very early age (55). Children rely on their parents to provide appropriate foods, and to encourage, support and enable them to be involved in making their own choices about healthy eating (56). One study indicates that unhealthy foods are chosen by children from a more controlling family environment (57) when restrictions of a limited healthy (2) diet were removed. Whilst encouragement from parents is a desirable determinant of fruit and vegetable consumption, it can also be a barrier if misdirected.

Exposure to fruits and vegetables has been proposed as a strategy to improve children’s liking of vegetables. Wardle and colleagues found that offering small pieces of raw red pepper to children over ten days produced increases in liking (58). The exposure was sufficient to reduce the typical neophobic response of reluctance to taste, and further exposures were required to effect changes in liking (58). This study suggests that repeatedly inviting children to taste a small amount of a previously rejected food, without emphasis on how much they eat, may be a good strategy to promote liking (34, 39). The implications of this finding can be applied to the home environment, with advice to parents to offer new fruits and vegetables in small amounts over a sustained period of time. However the process of adaptation may be slower than parents expect, leading some parents to give up offering the new fruits or vegetables before the exposure has had a chance to work (58). Exposure to new fruits and vegetables has been reported in other
studies (70, 80-82) as part of the supportive environment for fruit and vegetable consumption.

Maternal employment has been linked to a negative frequency of family meals (53, 54) while the lower socio economic status of parents has also been linked to a poorer dietary quality (53, 54). Children themselves have little control over these matters (59) relying on the adults in their lives to take care of their needs. Fruit and vegetable consumption may decrease when the availability and variety of fruits and vegetables in the home is reduced due to reductions or restrictions on income (34, 41, 43, 44, 46). Some studies have found that availability of fruits and vegetables can, however, be increased at the school food service level (60, 61).

Beyond the food service level, the school social environment is an important determinant of fruit and vegetable consumption. Teachers are able to provide alternate adult role models (34, 62) and appropriate dietary knowledge and education, taking into account the age and gender of the students (46). The social environment of schools also includes peer influences which can also be helpful when it comes to trying new foods and developing suitable decision making behaviours (70, 89, 94).

The school curriculum is another aspect of the school social environment that contributes to fruit and vegetable consumption, and teaching strategies that focus on fruit and vegetable consumption can also improve student learning. Learning activities can be encouraged through the use of foods such as fruits and vegetables, because they trigger the senses including sight (colour), sound (crunch), touch (texture), smell and taste (sweet, sour, bitter, salty or combinations of these) (63, 64). Children’s learning can also be enhanced or rewarded due to the sense activation created by engagement with an ‘edible outcome.’

Encouraging children to develop cooking skills through preparing and cooking food with them has been demonstrated to have many positive outcomes, including those related to nutrition. The development of cooking skills also contributes to empowering people with the necessary skills to purchase nutritious food (65, 66). Parents cooking with children helps develop cognitive and perceptual knowledge and mechanical skills (67) while having the benefits of influencing food choice (66, 68), self efficacy (40, 41) and opportunity for developing skills that may be needed to execute dietary changes (65). These findings suggest that health promotion programs incorporating the development of food preparation skills can have small but positive effects on fruit and vegetable consumption (66). The following section describes and critiques various approaches to health promotion,
or health promotion paradigms that can be used to increase children’s fruit and vegetable consumption.

### 2.4 Addressing health determinants through health promotion

Health promotion is the process of enabling people to increase control over, and to improve their health (15). It focuses on achieving equity in health through reducing differences in current health status and ensuring that equal opportunities and resources are available to enable people to achieve their highest health potential (15). Helping people achieve the fundamental conditions and resources for good health such as peace, shelter, education, food, income, a stable eco-system, sustainable resources, social justice and equity (15) is difficult unless people are able to take control of those things which determine their health. It is therefore a requirement of health promotion to develop practices related to health determinants which empower people. Health promotion therefore could be described as:

> ‘an enterprise involving the development over time, in individuals and communities, of basic and positive states of and conditions for physical, mental, social and spiritual health. The control of and resources for this enterprise need to be primarily in the hands of the people themselves, but with the back-up and support of professionals, policy makers and the overall political system. At the heart of this enterprise are two key concepts: one of development (personal and community), and the other of empowerment’ (69) p11).

Health promotion action therefore requires values and beliefs consistent with this ideal, and include strategies and approaches aimed at individual behaviour as well as social and economic structures (14). However current health promotion practices fall on a continuum from traditional health promotion, which is primarily aimed at individuals to prevent disease and to change risky behaviour, through to modern health promotion, which takes a broader perspective (14). The different approaches to health promotion are reflective of the paradigms in which they are based. Traditional health promotion is based in the biomedical and behavioural paradigms while modern health promotion is placed in the holistic, ecological, salutogenic health promotion paradigm (14). These paradigms are explored in this next section.

#### 2.4.1 Health promotion paradigms

A paradigm is defined as an intellectual framework of shared preconceptions and governing ideas which shapes research and analysis (12). The different views of health and health determinants described above provide different foundations from which to develop health promotion programs. There are three main paradigms evident in current health promotion practice: the biomedical health promotion paradigm, the behavioural health promotion paradigm, and the holistic, ecological, salutogenic health promotion paradigm (14).
2.4.1.1 Biomedical health promotion paradigm

The biomedical health paradigm defines health as the absence of disease, disability and physiological risk factors (14). It focuses on returning sick people to a disease free state. The biomedical health paradigm is reflected in the way western medicine views the human body as a machine, and diseases are regarded as malfunctions that need repairing by the health professional (14). The biomedical health promotion paradigm focuses primarily on the prevention and early detection of disease through strategies such as immunisation and disease screening (14). These strategies are based on biomedical theories about the nature and progress of disease.

Criticisms of the biomedical health promotion paradigm relate to its dominant focus on physical health risk behaviours and diseases, and lack of attention to mental, spiritual and social dimensions of health (14). The biomedical approach tends to concentrate on the prevention of a specific disease while its implementation attracts fee-for-service and short consultation times. This approach may create a barrier in understanding the social and economic circumstances which may contribute to the underlying cause of the problem (14). Screening for diseases and immunisation have become more common in recent decades, however it is the healthiest groups within society who are more likely to take advantage of the opportunity to be screened (14). These practices therefore could be considered restrictive in their contribution to achieving healthy communities and societies (14).
2.4.1.2 Behavioural health promotion paradigm

The behavioural health promotion paradigm focuses on increasing people’s ‘healthy’ behaviours and decreasing their ‘risky’ behaviours (14). Health promotion programs in this paradigm focus primarily on ‘lifestyle’ behaviours such as smoking, alcohol use and food consumption. Health promotion strategies target ‘high risk’ groups and involve predominantly mass media campaigns and health education strategies (14). These strategies are underpinned by behaviour change theories from the discipline of social psychology (14). The following models and theories have been used in the development of health promotion programs within the behavioural health promotion paradigm.

The Health Belief Model is an example of how many researchers have sought to explain, predict and change health behaviour through the development and application of theories from the discipline of psychology (70). This model provides an explanation of why individuals adopt or fail to adopt different health-related behaviours. Changes in behaviour will occur if the individual perceives themselves susceptible to a condition or problem, and if they believe it will have potentially serious consequences (71). The course of action required will be considered if it will reduce their susceptibility or minimise the consequences and if the benefits of taking action outweigh the costs or barriers (71). This model is considered useful to understanding the role of knowledge and beliefs in health behaviours, especially when preparing resources for health promotion programs.

Another behaviour change model is the Theory of Reasoned Action and Planned Behaviour (71, 72). This theory is used to explain human behaviour that is under voluntary control. It is based on the assumption that people are usually rational and make predictable decisions in well defined circumstances. It explains how behavioural intentions are thought to be influenced by attitudes, and these are determined by the belief in a desired beneficial health outcome (71, 72). Intentions can also be influenced by subjective norms which include what others think. This theory therefore predicts that a person is most likely to intend to adopt, maintain or change behaviour if they believe the behaviour will benefit their health and is socially desirable, and if they feel social pressures are strong enough (71, 72).

The Transtheoretical (Stages of Change) Model (71, 73) is another model of behaviour change. This model explains different stages of change which appear commonly in most behaviour change processes. It is based on change as a process and describes five basic stages of change: precontemplation, contemplation, determination, action and maintenance or relapse. The model proposes that people tend to work through these stages predictably although some move more quickly than others. This model may be considered circular
rather than linear as people can enter or exit the behaviour change process at any point. A program using this model may find it useful to explain behaviour change and predict where people are at in their stage of change by their current behaviour. This model may also be used to develop a portfolio of strategies for people at different stages of change (71).

Another useful theory is the Social Cognitive Theory (74). This theory states that the cognitive processes of the human mind are generative, creative, pro-active and self reflective. These processes enable people to construct thoughts about future courses of action to suit ever-changing situations, assess functional value, organise and strategically deploy the selected options and evaluate changes where necessary (74). The principle of reciprocal determinism describes the subtle and complex ways in which an individual, their behaviour and their environment continuously interact and influence each other (75). Observational learning, behavioural capability and self efficacy are important constructs within this theory. Observational learning happens through watching the behaviour of another person and noticing what happens as a result of that behaviour, such as objections or reinforcements from significant others. Behavioural capability is the person’s knowledge and skill to perform a behaviour, and self efficacy is the person’s confidence in performing the behaviour (74, 76). Social cognitive theory can be used to identify the underlying determinants of health behaviours such as fruit and vegetable consumption and as a model for developing health promotion programs to address those determinants. The incorporation of the principle of reciprocal determinism between the individual and their environment ensures that behaviour change programs based on this theory will address both personal and environmental determinants of the health behaviour (14, 75).

The models and theories outlined above have been used in health promotion to address risk taking behaviour within individuals and as the foundation for development mass media campaigns. These are useful to understanding health behaviour and how health promotion programs can influence individuals. The theories and models also help to understand the importance of an individual’s knowledge and beliefs, personal skills to make change and the stage that different individuals may be at throughout the program. Extensive use of these models and theories form the basis of the behavioural health promotion paradigm, however there are some limitations to this approach. Firstly, critics argue that behaviour change strategies can create an undercurrent of victim blaming which maintains that individuals are responsible for their own health status regardless of their social or economic circumstances (14). The policies and practices within this paradigm tend to provide information and direct support rather than changing people’s environments to create favourable conditions for behaviour change (14). Secondly, programs within the behavioural health promotion paradigm have tended to focus primarily on physical health,
and to a lesser extent on mental health, and have virtually ignored the importance of social and spiritual health (14). Critics of the behavioural health promotion paradigm also argue that even in programs that focus on physical and mental health, there is too much emphasis on individual behaviours and insufficient consideration of the role played by economic, social, cultural, political, built and natural environments in determining health outcomes (77).

### 2.4.1.3 Holistic, ecological, salutogenic health promotion paradigm

The holistic, ecological, salutogenic health promotion paradigm stresses that the health and well being of people is integrated within the health of communities and environments (14, 24). This paradigm includes holistic health which recognises that health includes the interrelated dimensions of spiritual, mental, social and physical health and well being (13, 24) while the science of ecology recognises that people live, work and play in multiple nested ecosystems that provide resources for living (24, 78). The salutogenic health promotion focus involves the creation of health for a sustainable future and places emphasis on factors that create and support good health, well-being, happiness and meaning in life throughout the processes of needs assessment, planning, implementation and evaluation (24, 79).

The holistic, ecological, salutogenic health promotion paradigm offers a comprehensive approach to health promotion because it requires changing the practices of social systems that have widespread detrimental effects on health, rather than solely changing the habits of individuals (75). This approach also considers ecological and sustainable principles which support healthy people living in healthy communities with clean air, water and food (78). Activities within this paradigm require building new structures for health promotion, new systems for risk reduction and greater emphasis on healthy public policy initiatives. These activities reflect the health promotion action areas outlined by the Ottawa Charter for Health Promotion (15). The Ottawa Charter emphasises building a supportive environment and strengthening community action through political action and advocacy. It also encourages creating opportunities for people to develop personal skills which will prepare them for all stages of life, and to cope with illness and injury. Health promotion activities need to be facilitated in school, home, work and community settings and be underpinned by changes in public policy (15).

The recently developed Red Lotus Health Promotion Model (24) recognises that health includes the interrelated dimensions of spiritual, mental, social and physical health and well being, and that health and ill health are not mutually exclusive and do co-exist (24). This model supports the notion that there are many determinants of people’s health and well
being (24). In addition, the model is underpinned by a system of values and principles across the phases of health promotion practice. The Red Lotus Health Promotion Model can also be used to guide the health promotion practitioner through a process of ongoing, conscious, critical reflection in order to reorientate health promotion programs towards the holistic, ecological, salutogenic health promotion paradigm (24).

The Red Lotus Health Promotion Model (24) uses the symbol of the red lotus plant to reflect the qualities and structural characteristics of modern health promotion (24). The plant structure graphically represents the components of the model which includes the stems and roots (representing the values and principles system); the pod (representing people at individual, family, community and population levels); the stamens (representing the characteristics of people including biological status, socio-economic status, knowledge, attitudes, beliefs and skills, and behaviours); and five layers of petals The petal layers represent the environmental determinants of health (social, cultural, economic, political, built and natural), and the health promotion processes of needs assessment, planning, implementation and evaluation (24). The leaves of the plant represent sustainability and future viability of a health promotion program (24). The Red Lotus Health Promotion Model is therefore beneficial in health promotion which seeks to address the individual biological and behavioural level determinants of health as well as also the environmental determinants.

The Red Lotus Health Promotion Model is consistent with the holistic, ecological and salutogenic health promotion paradigm and is therefore considered beneficial to use in any health promotion work in any setting due to its consideration of the complex nature of health issues that have multiple determinants (24). This is especially important for work within schools, as schools have complex organisational and social structures (80).

The three health promotion paradigms outlined in this section indicate how the different views of health can influence perspective and understanding about health, which in turn create differences in health related systems, programs, strategies and behaviours. The holistic, ecological, salutogenic health promotion paradigm provides an appropriate framework for health promotion programs in school settings that focus on positive health outcomes in the context of individual and environmental determinants.

2.4.2 School-based health promotion

Health promotion in schools is a concept that is based on the ideal of linking education and health for the purpose of improving the health and wellbeing of everyone in the school community (81). It is referred to as ‘Health Promoting Schools’ and has developed
substantially from an initial focus in the 1980s on health education programs designed to change the behaviour of individuals, to the holistic, ecological, salutogenic approaches defined in the Ottawa Charter for Health Promotion (81). Health Promoting Schools is part of the World Health Organisation’s Global School Health Initiative which defines a health promoting school as one which is constantly strengthening its capacity as a healthy setting for living, learning and working (81).

Recently, a call to action was delivered that challenges schools to realise their health promotion potential. Education and health experts from over 30 countries recognised that for schools to make a difference, leadership is required at national, community and school levels; and that there must be a genuine commitment to investing in education and in the health of school students and their teachers (82). This challenge suggests five broad areas of action, which include: investing in education to achieve highest possible levels of enrolment and participation; building infrastructure to create stimulating, supportive environments that foster high quality learning; investing in capacity to support professional development programmes which build the capabilities of teachers and health professionals to plan school health initiatives; implementing good practice; and harmonizing action among sustainable partnerships (82).

Health promoting schools, while being guided by the principles of equity and empowerment (83), provide a valuable environment to address some of the health determinants related to children. Schools are strategically placed to address the needs and aspirations of the wider community through collaborative health promotion programs (84). Health Promoting Schools programs are most successful when they incorporate strategies from all three components of the Health Promoting Schools model: the school curriculum, teaching and learning; the school ethos and environment; and the school-home-community interface (84).

Schools have been successful in understanding their role in health promotion and have demonstrated this through developing supportive policies within the school (85) and utilising other effective strategies such as skill-based health education, creating a supportive social and physical environment, developing community partnerships and obtaining appropriate health services (82). Evidence suggests that the implementation of a Health Promoting Schools program provides benefits to the whole school community, if the school is able to tailor its program to address the specific health needs of the region (82), and link with agencies to address these needs (86).
Teachers play an essential role in implementing a Health Promoting Schools program (41, 44, 45). Teachers are familiar with the school organisation and through the daily contact with the children are able to allow the development and practice of health related skills and behaviours. Through social interactions with their students, teachers are also able to create and support high expectations of educational attainment by students. This is relevant to health because of the strong association between good health, academic achievement and school completion (82, 84).

There has been promising progress in recent years in the development of the evidence-base for effective school health programs (82). School health promotion programs have been important agents of change for the development of programs focused on healthy eating, physical activity, mental health and social well being (9, 82, 87).

There are a number of limitations of the Health Promoting Schools model as a health promotion model for schools. Most of these limitations relate to the misunderstanding of the concept, poor implementation of programs, a lack of resources and inadequate evaluation strategies (41, 43-45, 47). The thorough implementation of the Health Promoting Schools approach is dependent on the priorities of the school and the health promotion paradigm in which the school administrators and teachers are operating. This may be the narrower biomedical or behavioural health promotion paradigm, rather than the broader holistic, ecological, salutogenic health promotion paradigm that is consistent with the Health Promoting Schools model (86).

Another example of poor implementation relates to the exclusion of the third component of the model which focuses on school-community partnerships. If partnerships in the broader community are not used, then fewer issues may be addressed and the benefits of engaging the wider community may not be realised (88). Funding for health related programs is also limiting due to the short time frames which restrict the development and reporting of the processes used and outcomes that occur in the medium to long term (83). Finally, there are a number of challenges related to evaluating Health Promoting Schools programs, including the selection of appropriate evaluation research methodologies, the establishment of appropriate evaluation criteria, and the implementation of appropriate, acceptable and affordable data collection methods (85, 87). Whilst the challenges of school based health promotion programs are well recognised, used appropriately, the Health Promoting Schools model supports the development of programs that address the determinants of health and well being. The following section describes and critiques a range of health promotion programs that have been designed to address the determinants of children’s fruit and vegetable consumption.
2.4.3 Health promotion programs to increase children’s fruit and vegetable consumption

Programs addressing the issue of inadequate fruit and vegetable consumption need to include effective health promotion strategies which address the complexity of determinants that influence the eating behaviours of children (7) and are based on relevant theory and research (9, 89, 90). Such programs need to be in line with the community’s goals and targets for prevention, protection and health promotion (15). Health promotion programs implemented in schools need to be integrated with education programs and not just regarded as add-on activities (81, 84). They should also include opportunities for the skill development of health care providers, teachers, parents and children. Resources and partnerships chosen for such programs also need to be effective in achieving the desired outcomes (91).

If the health promotion programs are to be of value to the community, they need to be based on evidence of effectiveness. Health promotion programs also need to break through traditional boundaries of government sectors and non-governmental organisations as stated in the Jakarta Declaration on Health Promotion into the 21st Century (92). Health promotion programs need to improve the ability of individuals to take action and the capacity of organisations to influence the determinants of health.

The performance of a health promotion program can be assessed in different ways. According to the Health Promotion Evaluation Framework (93), the health promotion program’s immediate effects (or impact) and/or longer term effects (or outcome) can be assessed. The impact measures are usually designed around the expected sequence of factors that may eventually lead to the desired long term change (93). The programs discussed in the following sections have all been designed to increase fruit and vegetable consumption and are critiqued on the extent to which they address the determinants of health, are based on theory, or include appropriate evaluation methods.

2.4.3.1 International programs to increase children’s fruit and vegetable consumption

Internationally, there are a number of school and community nutrition programs addressing the issue of fruit and vegetable consumption in children, which have been implemented and evaluated. These include programs in the United States in the 1990s which were based on behaviour change theories such as social cognitive theory (74) and included outcome consumption measures in the evaluation. Determinants of fruit and vegetable consumption were also reported. More recent studies in Europe have further addressed the various
determinants of fruit and vegetable consumption. A recent Asian study has provided awareness of an innovative way of working with various aspects within school environments. These studies are discussed in more detail below.

The United States programs in the 1990s were designed and extensively evaluated using evaluation frameworks that included process, impact and outcome measures. Examples include the Gimme 5 Fruit, Juice and Vegetables for Fun and Health program (94), Minnesota 5 A Day Power Plus (95), the Alabama High 5 project (61) and CATCH (96). All programs focused on changes to children’s diets and their results reported on fruit and vegetable consumption. These programs also used theory based multi-component interventions designed and implemented using social cognitive theory. While the CATCH program was more about reducing dietary fat and improving physical fitness, the components of fruits and vegetable consumption levels were reported (96).

Data collection methods used in these studies included the 24 hour food recall, which was used in 5 A Day Power Plus (95) and Catch (96), and the seven day food recall method, which was used in Gimme 5 (94). In all studies, questionnaires were administered via face to face or phone interviews, and asked parents to observe and recall what their children were eating.

The improvements in fruit and vegetable consumption levels of the participants as a result of these programs were quite small, but regarded as important for health improvement. The Gimme 5 program, conducted with fourth and fifth grade students from 1994 to 1996, increased fruit, vegetable and juice consumption by 0.2 servings per day. This result was comparable with other programs conducted in the United States at that time.

There are a number of limitations associated with using food recall as an outcome measure. Day to day dietary intake is highly variable and the time or season when the data are collected can change the types of food that are consumed (97). Other criticisms suggest that a single day is not considered representative of what is usually eaten, and intake can often be underestimated (43, 97). Inability to correctly estimate portion sizes, and inaccurate memory of foods consumed, particularly by children, are other limitations of food recall as the measure of consumption (97). Whilst the food recall may be unreliable it has been used to provide snapshots of what may have happened to a large cohort in a particular time frame (42).

A more recent program in California captured the vision of a community public-private partnership to provide all students with healthy, appealing, seasonal school meals made
from locally grown and sustainable ingredients, along with experiential learning in instructional gardens, cooking classes, and the school dining room, which connected to formal academic subjects (98). Program evaluation focused on assessing changes in knowledge, attitudes, and behaviour. Student knowledge and attitudes were assessed annually by a questionnaire, and student behaviour was assessed annually by a 3-day food diary. Household information was gathered by a parent questionnaire. The results of the program suggested that actively participating students increased their consumption of fruits and vegetables by nearly 0.5 cups (one standard serving), whereas students least exposed to the program decreased their consumption by 0.3 cups (p<0.05) (98). Students most exposed to the program also showed a significantly greater increase in preference for fruit and green leafy vegetables, compared to students least exposed to the program (p<0.05) (98).

This program addressed individual and environmental determinants of fruit and vegetable consumption which included knowledge (addressed through academic subjects); access and exposure (addressed through the provision of appealing, locally grown food for school meals); and self-efficacy in food preparation (addressed through hands on cooking classes) (98). The favourable outcome suggests that the individual and environmental determinants of fruit and vegetable consumption have been appropriately addressed.

In Europe, various programs have provided more understanding of the determinants or conditions that impact on fruit and vegetable consumption. The following examples highlight the various aspects of programs which may contribute to understanding more about the determinants of children’s fruit and vegetable consumption and how to address them.

A school based program in Wales used videos about a fruit and vegetable character, the ‘Food Dude’, as a strategy to develop knowledge of fruit and vegetable intake and encourage children to eat fruits and vegetables, in particular fruits and vegetables they had previously rejected. Rewards such as prizes, tokens and letters of encouragement were also utilised. Information about what the children needed to do to get the rewards was provided at snack time when the children were tasting and consuming new fruits and vegetables (99). This program developed a food preference learning program (100) which used physiological principles designed to influence children to try new fruits and vegetables. Program evaluation involved data collection at three points including baseline, after implementation of the rewards program, and then follow up after six months. This involved the children stating which fruit and vegetable snacks they intended eating from a selection of different fruits and vegetables and which ones they actually ate (99). Records
were kept of the types of fruits and vegetables the children ate throughout the 16 day study and followed up six months later (99). Whilst this study is limited to only a class of five to six year olds it was repeated in a couple of different schools with similar results (100).

This study reported substantial increases in children’s fruit and vegetable consumption. Fruit consumption increased from 28% of the participants consuming fruits at baseline, to 59% of the participants consuming fruits directly after the intervention phase, and remained at 59% at the six month follow up. Vegetable consumption increased from 8% of participants consuming vegetables at baseline to 39% of participants consuming vegetables after the intervention phase, and then reduced to 32% at the six month follow up (99). Although the study had relatively small number of participants, the results were considered important because they demonstrated children’s capacity to change their conceptualisations about food. The study also suggests that children have the potential to achieve long lasting transformations in their eating habits and supports the needs for action to be taken by schools, health and education agencies and government to increase fruit and vegetable consumption (99). The determinants of fruit and vegetable consumption addressed in this program related mainly to behaviour change and the use of individual rewards however, what is not reported is the influence of the social environment with their peers, teachers, parents and researchers throughout this process. This study therefore provides a snapshot of a behavioural approach to encouraging fruit and vegetable consumption, however does not contribute to understanding about the role of the environment.

The evaluation of a Scottish school based nutrition program implemented in two schools in Dundee in 1999-2000 used a multi–strategy intervention. The health promoting schools model was used to develop a range of strategies including: curriculum approaches, changes to the food service setting, and the development of parent and community networks. Curriculum approaches included the use of videos, written work, self monitoring materials, story books, and practical food preparation and tasting. Changes to the food service settings included increased provision of fruits and vegetables, poster promotions, tasting opportunities and a range of point of sale marketing. Parental and community networks were developed through the distribution of newsletters for children and parents, and teacher information sessions delivered in school assemblies, training sessions and classroom sessions (101). The evaluation methods aimed to assess cognitive and attitudinal variables related to fruit and vegetable consumption. The evaluation methods were developed using the theory of planned behaviour (72). A card sorting activity was used to assess knowledge about healthy food. Attitudes towards foods were assessed through students taste testing and then ranking foods on a five point scale (101). The foods
included fresh orange juice, carrots, tomatoes, grapes, bananas, apples, cheese filled biscuits, chocolate buttons, tomato flavoured crisps, apple pie, cola drink and jelly sweets. Consumption was measured through the use of the three day food diary.

The program had a modest but significant effect on knowledge and attitudes towards fruit consumption (101). The results also indicated a decrease in preference for foods in the high fat and high sugar categories (101). It also demonstrated significant increases in fruit consumption but little impact on vegetable consumption with total fruit and vegetable consumption increasing from 200g to 230g (101). This program only lasted nine months which was not considered to have contributed to life-long changes in eating habits, however may have impacted on the children’s diet at a crucial life stage when eating habits are formed (101). The highlight of this program was influencing environmental determinants such as exposure and opportunities to try new foods and increasing availability. The direct effect of increasing the likelihood of tasting new fruits and vegetables was reported as being helpful in developing a practical interest in tasting other fruits and vegetables. The exposure effects found in the previous United Kingdom study (99) were supported in this study.

The Pro Children project (2002 -2006) (102) was designed to assess and increase fruit and vegetable consumption among 10 to 11 year old school children and their parents. This study was conducted in nine European countries, including Austria, Belgium, Denmark, Iceland, the Netherlands, Norway, Portugal, Spain and Sweden (102, 103). It involved a comprehensive approach with many stages and phases. Strategies were developed through an intervention mapping process (104) to identify and then address the individual and the environmental determinants of fruit and vegetable consumption at home and school. The main determinants identified included personal determinants such as awareness of fruit and vegetable intake for health and well-being, positive taste preferences, awareness of own fruit and vegetable intake, awareness of recommended intake levels, self efficacy and skills for asking, preparing, obtaining and keeping fruits and vegetables, and familiarity with different fruits and vegetables (104). Environmental determinants identifies included parental facilitation and encouragement, role modelling, peer modelling and teacher support, availability and accessibility, a supportive school environment, and neighbourhood support (104).

Program strategies that addressed these determinants included classroom activities across different curriculum areas, reinforced by food preparation, taste testing and computer tailored feedback. Other strategies included a food service intervention, a family component, mass media promotion, school health service, sport and youth clubs, and point
of purchase grocery store component (104). The social cognitive theory was recognized as the appropriate behaviour theory highlighting the individual motivational factors as well as environmental opportunities (75, 104). This process enabled the active participation of the learning process at the individual and classroom level, at the school organisation level through the development of school policies, and use of new technologies such as computer tailored tools and website (104).

Data collection tools for studying the determinants of fruit and vegetable consumption and evaluating the effect of the programs were developed and validated. These included children and parent surveys at three time points over a 20 month period which consisted of the start, end, (8 months later) and follow up a year later (103). Fruit and vegetable consumption was measured through a food frequency tool developed for this purpose, while a school staff survey was developed to assess school opportunities and barriers related to fruit and vegetable consumption (103). A model was derived from Bandura’s social learning theory (74) and Ajzen and Fishbein’s cognitive expectancy theory (105) to explain variation in fruit and vegetable consumption across cultures, age groups and gender (103).

The programs were conducted in at least 20 different schools with a minimum of 1300 participants. Preliminary data analysis indicates that girls eat fruits and vegetables more frequently than boys, overall fruit and vegetable consumption is less than 50% of recommended intake, less than 60% of participants reported eating vegetables every day, there is a high availability of fruits and vegetables at home and this is associated with reported frequency of fruit and vegetable consumption (103).

Pro Children was an ambitious project implemented across multiples sites using standardised methodology to address the determinants of fruit and vegetable consumption (103). Thus far it has confirmed low fruit and vegetable consumption levels and identifies a range of individual and environmental determinants of consumption. The results from the needs assessment phase of the project provide a sound foundation for the development of effective strategies for increasing children’s consumption of fruit and vegetables (103). Some additional studies are outlined below.

One study that was conducted to find out more about parental involvement in supporting fruit and vegetable consumption was based in the Netherlands (52). This experimental study examined the psychosocial predictors of short term and long term changes in fruit and vegetable consumption. Participants were randomly assigned to the experimental or control group. In the experimental group, availability of fruits and vegetables was ensured
by providing mothers of primary school aged children with the recommended amounts of fruits and vegetables for the family, along with recipes and newsletters for a month (52). Mothers were required to make a commitment to use the amount of fruits and vegetables provided for the month of the study. This meant that consumption levels should automatically have been improved, and the psychosocial determinants of changes to intake were able to be explored. Data were collected through a food frequency questionnaire and a psychosocial and demographic questionnaire administered before and after the intervention. (52).

The results indicate that reducing the perceived cost, enhancing the intention and control that persons perceive to have over their fruit and vegetable consumption, and emphasising to mothers the health benefits of making vegetables more attractive for their children were all important psychosocial determinants of fruit and vegetable consumption (52). This study therefore provided support and encouragement to parents in the home environment and targeted the determinants such as availability and cost which have been previously recognised as barriers. The impacts of this study therefore contribute to understanding the role of parents and the associated environmental implications.

In another study within the Pro Children project, two programs were developed to address the availability and access to fruits and vegetables in the school environment. The first program involved the free distribution of fruits and vegetables to teachers for children’s consumption during school time. The second program included multiple strategies to encourage parents to provide fruits and vegetables for children’s consumption at school (60). The evaluation method involved the teachers completing a questionnaire which collected data about the two programs in relation to appreciation, psychosocial concepts and innovation characteristics. This study found that the free of charge program was implemented as intended by a large majority of teachers, who consumed the fruits and vegetables together with the children at a fixed daily moment, while the other program was less fully implemented and activities decreased over time (60). Whilst the distribution program was an effective strategy to encourage the daily habit of fruit and vegetable consumption, it did have larger economic implications due to the funding needed to support the initiative (60). The multi-component program was considered more complex with issues around the training of teachers, however it was considered a good alternative to ensure fruit and vegetable consumption was a part of the school program to help support children’s health and well-being (60).

Another study from the Netherlands, which explored the perceptions of fruit and vegetable consumption among four to twelve year olds, found that fruit and vegetable consumption
are two distinct behaviours (106). Consumption of fruit was within the children’s control though it was also dependant on availability, whereas vegetable consumption was more related to parental influences and exposure (106). It also found that children’s eating behaviour is not fully under their control but partly regulated by their social environment. Developing a habit of eating fruits and vegetables was influential in consumption, which justifies the need for classroom exposure (106). Positive parental and peer modelling has been linked to acceptance of healthy food choices (52) and this can be useful when implementing activities in school settings.

In Hong Kong, the Colourful and Bright Fruit and Vegetables Project has recently published a report on eating behaviour in school children (107). The pilot program embraced health promotion strategies based on the Health Promoting Schools model. The program took an integrated approach which involved school eating policies, school eating environments, training for staff and parents, comprehensive nutrition education materials and the active participation of students (107). The project was piloted in 10 local primary schools. Effectiveness of the project was assessed in terms of policy and environmental changes, and knowledge, attitude and behavioural changes of students and parents after one year of implementation (107). Data were collected through two sets of questionnaires (one for students from students in Grades four and five and one for their parents); an observation and weighed lunch consumption and a school survey. Baseline data were collected regarding the nutrition knowledge, eating habits and attitudes of participating students and parents. Post assessment data were collected 15 months later to assess any changes in the above parameters. The student and parent questionnaires were matched for analysis (107). Pearson’s Chi-Square Test was used to test for associations between knowledge, attitudes and fruit and vegetable consumption (107).

This study provided an example of evidence based practice to gain an insight of the determinants of fruit and vegetable consumption which may have been influenced through this project. Whilst this is a school based program the environmental determinants of home and school tend to be interrelated. This project attempted to recognise this through the methods of data analysis. Results indicate that students’ knowledge was associated with parent’s knowledge. Parents’ attitudes towards ease of sustaining healthy eating habits and own consumption were associated with: children’s fruit and vegetable consumption; parents offering of fruit and vegetable snacks; and peer attitudes towards fruit and vegetable (107). Family background, including parents’ education and income, was positively associated with fruit and vegetable consumption (107). Social determinants were also explored through the role of peers with perceived positive attitudes towards eating fruits and vegetables being associated their own consumption (107).
There are two community nutrition programs also worth exploring. Although these programs are not school based, they have considered the influence of the social environment on fruit and vegetable consumption and have created interventions to address this. They are therefore worthwhile including in this literature review.

The Healthy Directions Study (108) developed a framework to establish ‘modifying conditions’, that can independently affect the outcomes but are unlikely to be influenced by the intervention and ‘mediating mechanisms’ which have been considered useful to bring about behaviour change (108). Examples of modifying conditions included individual factors such as material circumstances; interpersonal factors such as social ties, diversity of friendship patterns, family roles; organisational factors such as job strain, social capital; neighbourhood/community factors such as safety; and societal factors such as discrimination; while the mediating mechanisms included the social context (social norms, social support) and individual determinants (self efficacy, motivation to perform behaviour) (108). This study, which used self report measures, revealed that changes in fruit and vegetable consumption were associated with social networks and supportive social norms but not with substantial financial strain (108). These findings are consistent with the findings from the school based studies described above.

The other community study was in Scotland. The Cook Well Program worked with socially disadvantaged families to help overcome practical issues such as low disposable income, limited access to good-quality food at affordable prices, and minimal cooking facilities and skills that restrict the attainment of a healthy varied diet (65). It was recognised that dealing with any one barrier to dietary change was unlikely to radically alter eating behaviour that will have developed over a lifetime, but the pilot study suggested that food skills interventions may be a useful starting point for initiating dietary change (65). In addition, this intervention may have contributed to improvements in individual determinants (such as self-esteem) and neighbourhood factors (such as increased community cohesion and capacity to develop and tackle the food supply in an area) which influence food choices (65). This intervention had a practical skills focus and the results were a promising step towards understanding their contribution towards improving dietary choice (65).

2.4.3.2 Australian programs to increase children’s fruit and vegetable consumption

2.4.3.2.1 Government programs

The Commonwealth Government aimed to address public health nutrition concerns including low fruit and vegetable consumption, through investing in Eat Well Australia 2000 - 2010 (109). This framework was developed by the Strategic Inter-Governmental Nutrition Alliance (SIGNAL) to provide a broad direction for the many partners from different sectors
who make individual contributions to the health of Australians through improving nutrition. The issue of fruit and vegetable consumption was to be addressed by a nationally integrated and long-term campaign. It also recommended specific activities for children linked with the maternal and child health initiatives for school-aged children (109). Funding through grants to address issues related to children’s diets was made available for community organisations and schools. These federally funded projects are at present supported by the Department of Health and Ageing through the Healthy Active Australia Scheme to promote healthy eating and lifestyles within the community (110). These grants aim to address individual lifestyle behaviours yet provide opportunities for programs to also address settings where healthy eating and physical eating can be promoted. The grants therefore can help create supportive school environments where children through the development of school initiatives (such as food preparation, gardening and active engagement in learning) can develop personal skills which enhance healthy lifestyles consistent with national guidelines for healthy eating and physical activity (110).

Each Australian State has also developed health promotion programs including food and nutrition health policies and strategies, nutrition education and health promotion programs within regional and specific settings (111). In Queensland, the Eat Well Queensland (112) framework was developed to guide health promotion programs and encourage stakeholders such as the food industry to support and implement the guidelines. Strategies such as Go for 2 & 5 (30) involve Queensland Health and the Fruit and Vegetable Growers Association, and provide media attention and resources to the community. Queensland Health and Education Queensland have developed and implemented programs such as Smart Choices (113) which restricts the sale of some foods through school cafeterias, and Fit and Fuelled forums (114) which support the development of teachers’ knowledge of pedagogy to address the issues of diet, physical activity and health in school settings. These programs all address environmental determinants at the national or state level with dietary guidelines, funded projects and policies for school food service and teacher professional development; social marketing and the development of industry partnerships. These are recognized as part of a supportive environment (115) for fruit and vegetable consumption.

2.4.3.2.2 Resources for nutrition programs in schools

Many resources have been developed to support schools in addressing the issue of healthy eating. The following resources can be found across a range of education and health websites and provide the nutrition knowledge around fruit and vegetables consumption levels for Australian children. These include the Dietary Guidelines for Australian Children and Adolescents (116), available through the National Health and
Medical Research Council, and the Australian Guide to Healthy Eating (36) available through the Department of Health and Ageing. Education Queensland provides support resources for schools through the healthy school initiatives which includes Smart Choices (113) and Activate (117). Nutrition Australia (118) also provides valuable resources and encouragement through the promotion of a themed Nutrition Week, ‘National Nude Food Day’, in October each year.

Another resource for Queensland children is available online through the Brisbane Produce Markets and is called Fresh for Kids (119). It comprises numerous components including: information for children, teachers and parents; support for school canteens; events; and promotional material. The different components can work together or independently to promote the consumption of fresh fruits and vegetables and an active lifestyle amongst school aged children. Another initiative by the Brisbane Markets is the Queensland Kids Fresh Net (QKFN) program (120) which is designed to help improve approaches to the education and promotion of health and nutrition in primary school children. The program encourages school children to make healthy eating choices and live active lifestyles, and targets children, their parents, teachers and tuckshop conveners. Whilst the partnership with the Brisbane Markets is a valuable resource for information, evaluation of its effectiveness is not available.

The Go for 2 and 5 (30) social marketing campaign is a current government funded program which promotes eating two fruits and five vegetables a day. The resources and promotional materials are also available to schools that provide colourful visual materials that encourage fruit and vegetable consumption for classroom and canteens. Awareness of fruit and vegetable consumption messages provided to the general population can also be linked to school education programs through student recognition and engagement in discussions about fruits and vegetables. Although, the consumption amounts used in this campaign are recommended for adult consumption, it highlights a variety of fruits and vegetables that are relevant when working with children.

Activate (117) is an on-line program designed to promote healthy eating and physical activity in primary schools in Queensland. It provides a unique and innovative framework that supports Queensland schools to provide learning, and physical and social environments to promote optimal nutrition and physical activity for students, staff and parents/carers. It aims to increase knowledge and awareness of healthy eating and physical activity among students of primary school age and the wider school community. It also promotes the adoption of healthy eating practices and physically active lifestyles by children. Teachers and schools can select resources from the program as they require.
The Queensland Association of School Tuckshops (QAST) (121) provides valuable guidance and resources to support the goal of healthy eating within the school setting. It maintains an informative website, and provides workshops and trade fairs to support the sale of healthy food. Fact sheets are available for inclusion in school newsletters. Research projects are currently being sponsored by QAST to provide more understanding about food service in schools.

If used within a school based program, these resources can support students’ learning of appropriate knowledge about fruits and vegetables, with messages reinforced through the services offered by the different organisations such as the Brisbane markets or QAST. Knowledge of recommended intake of fruits and vegetables can be developed through the use of these resources as they are also used within the community at some point of sale locations. Whilst these resources offer appropriate ideas and educational support materials, there is no guarantee that the resources are used in schools. If the resources are used, it is also uncertain of the effectiveness in supporting fruit and vegetable consumption. To address this issue, more needs to be done than the creation of resources; implementation strategies need to strategically align with policy development and appropriate partnerships need to be created, to develop evidence-based practices.

2.4.3.2.3 School based programs

There are a number of programs that have been implemented in different regions of Australia, aimed at encouraging fruits and vegetable consumption. In South Australia, the Eat Well SA project (122) was developed in 1996 in response to the (then) South Australian Health Promotion Foundation outsourcing of a state wide nutrition project. It aimed to increase the consumption of healthy food by children, young people and families in South Australia and focused on availability and promotion of healthy food in appropriate settings. The Eat Well SA project commenced the identification of cultural, physical and social environmental determinants of fruit and vegetable consumption. Whilst the project did not run specific programs in schools it formed partnerships with stakeholders such as the fruit and vegetable growers, health and education departments, and supported the development of sustainable programs within child orientated settings. Stakeholders were encouraged to participate through collaborative and sustainable actions (122) This project therefore laid the foundation for trial projects to be run by stakeholders within school settings.

The Eat Well SA project was focused on capacity building and this was the focus of its evaluation (122). The external evaluation of this project was undertaken through document analysis of plans, minutes, reports and evaluation reports and interviews with key partners.
and stakeholders (122). This process highlighted the types of activities required to develop awareness at a system level and tensions experienced through collaboration with other organisations that operates within a different paradigm (122). Whilst this project provided a model for collaborative work to promote healthy eating, and five new projects and formal partnerships were developed, there was recognition of the need to address difficult issues such as improving food security to some vulnerable groups (122).

In New South Wales, the Tooty-Fruity Vegie Program 2001-2002 (123) was a two-year health promotion program aimed at primary school children in the Northern Rivers region. It involved ten schools and was conducted by the Northern Rivers Health Promotion Unit. The program was a school based health promotion program which was developed in partnership with the NSW Department of Education and Training and Northern Rivers Health Service which aimed to promote fruit and vegetable consumption. The program included strategies related to the school environment with the addition of edible gardens and additional fruit and vegetable based items on menus in the school canteens; classroom environment with resource development and cooking activities to develop children’s knowledge and personal skills; promotions aimed at parents’ knowledge development and the inclusion of a Tooty Fruity Vegie week celebration to support the positive messages of fruit and vegetable consumption throughout the project (123).

The evaluation involved exploring the program’s impact on children’s fruit and vegetable consumption levels through a 24 hour recall survey, questionnaires for students, teachers, parents, principles and school canteen operators (123). The project was incorporated into the schools with most activities being included. The activities recalled by children as being most enjoyable included classroom lessons about fruits and vegetables, cooking activities at school, eating fruits and vegetables from canteen promotions, fruit and vegetable breaks, tasting new fruits and vegetables, growing fruits and vegetables, and homework and computer work to learn about fruits and vegetables (123). Some difficulties were experienced with the data analysis due to children from different schools having different exposure to the activities and the absence of baseline and post test data for some participants. However analysis of the available baseline and post test data provides some insight into the impact on the school and family environment of providing enjoyable experiences related to fruit and vegetable consumption (123).

Changes to consumption levels, which were assessed using a 24 hour recall diary, suggest that the project increased the proportion of children eating adequate amounts of fruit from 52% before the project to 61% after the project. On the other hand the children’s vegetable consumption was not changed positively with adequate consumption levels decreasing
slightly from 30% of participants at the beginning of the study to 27% at the end of the study (123). The project’s evaluation confirmed that the eating of fruits and vegetables are different behaviours (123). This program utilised the school environment to encourage fruit and vegetable consumption with some insights into strategies that could be utilised in other programs. Difficulties with data analysis were also recognised, suggesting that more robust techniques would be required before any firm conclusions could be drawn (123).

The Stephanie Alexander Kitchen Garden Program (124, 125) commenced at the Collingwood Primary School in 2001 through the passion of celebrity chef, Stephanie Alexander in collaboration with other stakeholders. It aimed to positively influence children’s food choices around growing, harvesting, preparing and sharing fresh, seasonal produce. In 2008, an evaluation framework was developed to review the impact of the program on attitudes, knowledge, behaviours and self efficacy in relation to cooking and gardening, willingness to try new foods, food preferences, food literacy, cooperative behaviour and wellbeing (125). Evaluation data are currently being collected through interviews with children, parents, teachers and principals. and observation of students, volunteers and teachers. The observations focus on students’ engagement with the program activities, with particular attention on the engagement of ‘non academic’ students, and the skills and confidence of students, volunteers and teachers. Results of this study are not yet available.

This program has a distinctly holistic approach to positively influencing children’s food choices by providing an edible, aromatic and beautiful kitchen garden in order to help participants appreciate how easy it is to bring joy and well-being into one’s life through growing, harvesting, preparing and sharing fresh, seasonal produce (124). The evaluation results will be worthwhile following as they will provide insight into how the determinants of fruit and vegetable consumption have been addressed through what appears to be a program that is consistent with a holistic, ecological, salutogenic health promotion paradigm.

The Fresh Kids (126) project utilised the health promoting schools framework to target specific aspects of healthy eating, in particular fruit and water consumption. Four primary schools in the inner west of Melbourne participated in the project. This project utilised the partnerships and services of a community dietician appointed to coordinate program planning; school organisation ethos to create a supportive environment to promote fruit and water to primary students through the school day through nominating a lead teacher to write annual plans and policies which support scheduled fruit and water breaks; and the
The evaluation strategy was a time interrupted series of lunch box audits. This involved teachers recording lunch box choices pre and post intervention with exact dates not being disclosed to parents or students to minimise social desirability bias (126). Results indicated a 25% to 50% increase in the proportion of children having fresh fruit for consumption. However, this does not necessarily represent actual consumption. It was found that 45% of the vegetables included in the lunch box were not consumed (126). This finding indicates that increasing availability in the lunch does not necessarily increase consumption. It does however highlight the importance of facilitating organisational change within schools to increase fruit and water consumption. Targeting specific dietary behaviour was the key strategy used to influence eating behaviour change. This is a relatively narrow focus which appears consistent with the behavioural health promotion paradigm. Changes to environmental determinants such as role modelling of eating by teachers and peers appear to be observed as an inadvertent consequence of the program rather than a deliberate part of the original program design.

Whilst these Australian programs all use different strategies to addressed the issue of children’s fruit and vegetable consumption, there are some common elements worth noting. If the programs focus on healthy eating within the school environment, children can be engaged in many ways. These include children being able to interact with their peers, teachers and other adults to observe eating behaviour and develop food preparation skills through fun, hands-on activities such as cooking classes (133-135). The programs have provided opportunities to try new foods to develop appropriate eating behaviours. This type of pedagogy encourages active involvement of students and makes use of positive peer influences, confirming the influence of the school environment as a determinant of fruit and vegetables consumption as found in other studies (27, 40, 41, 43, 115). Therefore, future programs need to realise the benefits of active involvement and positive peer influences.

2.4.3.4 Summary of programs to increase children’s fruit and vegetable consumption

Health promotion programs developed to increase fruit and vegetable consumption have utilised various settings, most commonly schools. Health promotion theories and paradigms have guided strategies, evaluation methods and their findings. Various determinants of health, in particular determinants related to fruit and vegetable consumption, have been addressed in the programs discussed. Understanding how the
strategies address the determinants of fruit and vegetable consumption would therefore be beneficial. Further clarification of some findings is required.

The programs developed have mostly utilised social cognitive theory (127), which refers to the reciprocal nature of the determinants of human functioning (72), to address the individual behaviour determinants within the environmental context of homes and schools. Many programs have included multiple strategies to address knowledge and awareness of intake (40, 41, 44); attitudes towards trying new fruits and vegetables (27, 52, 58); and confidence and personal skills to support lifelong healthy eating habits (40, 41). Examples include resources to develop awareness of intake such as the Australian dietary guidelines (116), fruit breaks and tastings within the school day (34, 107, 115, 123, 126-128) and practical classroom activities such as preparing fruits and vegetables (41, 67, 123, 129).

Whilst a broad range of strategies have been used in programs, further understanding about their impact on the determinants of fruit and vegetable consumption is required. Program evaluations would therefore require measures that examine a range of individual and environment determinants and how these interrelate with each other within the implementation of the program.

Health promotion research strategies and evaluations tend to include process, impact and outcome components and guided by models such as the Hawe, Degeling and Hall Health Promotion Evaluation Framework (93). The studies included have various research designs which included randomised, quasi-experimental designs and control groups, with pre and post intervention measurements (130) while others used a longitudinal study design to track their findings (125). Quantitative data used to assess the change in fruit and vegetable consumption as a result of the intervention have been analysed using various statistical procedures such Pearson’s Chi Square Tests on nominal variables (68, 74, 136). In other studies qualitative interview data were themed and analysed to understand why children eat different types of food (104, 106, 131). Some other determinants that may influence the evaluation process include the times between pre and post measurement, the ages of the participants and the type of data collected.

Tools used to evaluate the programs include questionnaire based surveys for students and parents, review of school lunch menu, observation and weighed lunch consumption and school feedback (94, 107, 126, 128). Fruit and vegetable consumption levels are generally collected by the recall of food intake over 24 hour, three day or seven day periods via food diaries or records, food frequency questionnaires or telephone interviews (132). These methods have limitations associated with self reporting therefore care needs to be taken when interpreting the results. Observation can be a method to verify students’ consumption
or availability of fruits and vegetables. It can also be used to assess food selection patterns (126). Focus groups were used in some programs to capture concepts to develop programs while others used ratings scales to determine the participants’ attitudes towards consumption (58, 101).

Results and findings of the programs and studies reviewed indicate that significant improvements in children’s fruit and vegetable consumption are possible if the determinants of consumption are addressed. These determinants include: parents’ fruit and vegetable consumption levels (107); availability of fruits and vegetables as snacks and lunch items (126); exposure to a gardening/ cooking program (98); perceived peer attitudes towards eating fruits and vegetables (34, 107); the taste of fruits and vegetables (133); availability of rewards (128); exposure and opportunities to try new foods (101); and availability and cost of fruits and vegetables to the family (52, 107).

Many of these determinants can be addressed within the school environment. There is evidence supporting health promotion programs that increase availability of and access to fruit and vegetables for children within the school setting (115). However more evidence of the effect of school-based health promotion programs that seek to positively influence the range of determinants of children’s fruit and vegetable consumption is required (115).

2.5 Conclusion

This literature review has examined the issue of children’s fruit and vegetable consumption and the programs that have been developed to address this issue. The review commenced with an exploration of the different perspectives of health and the conceptual frameworks used to describe the determinants of health. Children’s fruit and vegetable consumption rates in Australia and other parts of the world were described, followed by an exploration of the individual and environmental determinants of consumption. The health promotion paradigms used in current practice, and a range of health promotion programs developed to address children’s fruit and vegetable consumption internationally and in Australia were explored and critiqued.

The literature review has highlighted the determinants of children’s fruit and vegetable consumption. For some children there are significant barriers to fruit and vegetable consumption in general, and there appear to be additional barriers to vegetable consumption. One of the challenges is to find out more about the barriers and enablers of healthy eating, in particular fruit and vegetable consumption. This is recognised as an issue worldwide (1). Eating behaviour is related to many determinants and further understanding would assist with strategies to address the issue of fruit and vegetable consumption in
different cultural environments and contexts. The evaluation strategies of programs reviewed for this study found that some measured what the participants ate and the behavioural determinants that may have contributed to fruit and vegetable consumption while others have considered more broad frameworks around the social context within home and school environments where the eating patterns are developed.

Whilst the issue of inadequate fruit and vegetable consumption in children remains a challenge, evidence of the effectiveness of programs to address this issue within school settings is developing. However, more reliable evidence is required to support best practice. This means programs must include evaluation to help clarify what is known about the issue while creating opportunities for new findings. The evaluation strategies therefore need to reflect the program’s aim and objectives, and provide evidence about practices that address the determinants of children’s fruit and vegetable consumption.

School-based health promotion programs focused on addressing the determinants of fruit and vegetable consumption need to be efficient in their processes and provide quality outcomes for all involved. This means that the school setting needs to offer children opportunities to work with fruits and vegetables in ways that encourage children to try them. As children become aware of the benefits of healthy foods, the settings need to support children’s intentions and provide children with many ways to learn and practice the associated behaviours. The social environment for healthy eating therefore needs to include settings where parents and children can come together to learn and that children can be fully engaged with the enjoyment of the consumption of fruits and vegetables.

The school setting, through the utilization of the Health Promoting Schools Framework, can develop healthy eating programs that encourage fruit and vegetable consumption in the environments they create. This can be through the policies in place around eating times and places; classroom activities that present knowledge and develop skills; provide opportunities to strengthen practices of healthy eating from the home and allow for a positive culture to be developed around these messages. When the children are provided and supported with the appropriate ingredients (fruits and vegetables) then consumption issues can be addressed through strategies that are fun and meaningful. One of the strategies that has been included in a number of school based programs is children learning to prepare fruits and vegetables for their own consumption. However these programs have either not yet been evaluated, or the strategy was part of a multistrategic program, and therefore the specific effect of this strategy has not been evaluated. There is a gap in the literature therefore with respect to the impact of school based health promotion programs that use a food preparation strategy which involves parents as facilitators.
One program developed in 2005 to increase children’s fruit and vegetable consumption is the *Kids in the Kitchen* program. It was developed as a school-based health promotion project by the researcher, in her capacity as a parent of children at Chancellor State College. The researcher is also an experienced Home Economics, Early Childhood and Hospitality teacher. *Kids in the Kitchen* is a ten week program focused on developing food preparation skills required by children to prepare fruits and vegetables for consumption. The focus of this research project is the impact evaluation of the *Kids in the Kitchen* program.
3 RESEARCH DESIGN

This chapter describes the research design including the *Kids in the Kitchen* program, research aim, research objectives, methodology, theoretical frameworks, participants, ethics, and data collection and analysis methods.

3.1 Kids in the Kitchen program

The aim of the *Kids in the Kitchen* program is to improve fruit and vegetable consumption in children.

The objectives of the program are to:

1. Increase children’s knowledge about fruits and vegetables.
2. Improve children’s attitudes towards fruits and vegetables.
3. Increase the fruits and vegetables tried and eaten by children.
4. Increase children’s fruit and vegetable preparation skills.
5. Improve the environmental supports in the home for children’s consumption of fruits and vegetables.

The *Kids in the Kitchen* program is a school based health promotion program which has incorporated the Health promoting schools framework in its development and implementation. It included the different components of this model: curriculum, teaching and learning; school ethos or environment; and partnerships links with the school community. The Health Promoting Schools Model is evident in the program strategies and includes: delivering the program through existing curriculum units in grades one and five. (curriculum, teaching and learning); creating a supportive environment for children to learn about, prepare and taste fruits and vegetables (school environment); developing children’s personal skills in food preparation (curriculum, teaching and learning); and strengthening the capacity of the school community to support children’s fruit and vegetable consumption (partnership – community links).

*Kids in the Kitchen* is a program designed to address some of the determinants of children’s fruit and vegetable consumption. It has been designed to support children’s food preferences, which are often guided by taste or liking alone (8), and includes a
behaviour focus based on relevant theory. The behavioural theory utilised in many other school based nutrition programs is social cognitive theory (75). This theory was also used in the development of the *Kids in the Kitchen* program because it addresses the underlying determinants of health behaviour and methods of promoting change. Social cognitive theory is also consistent with the holistic, ecological, salutogenic health promotion paradigm because it recognises that the relationship between people and their environment is both subtle and complex. The principle of reciprocal determinism describes the way in which an individual, their environment and behaviour continuously interact and influence each other (75). This theory provides the basis for the design of the *Kids in the Kitchen* program, which addresses knowledge, attitudes and beliefs about food, observational learning, behavioural capability, self efficacy, and the social, policy and physical environments.

*Kids in the Kitchen* is facilitated by classroom teachers with the support of parent volunteers. The parent’s role is considered valuable within this program because it offers opportunities for developing positive relationships (82) within the learning environment and appropriate role models for fruit and vegetable consumption (58, 63, 87). The supportive teachers and parent volunteers are trained by the researcher at the beginning of the ten week term. The training program covers the content of the curriculum unit, and a workshop in which participants practice the recipes to be used within the unit. The workshop emphasises safe and hygienic food preparation practices and skills. The weekly activities are organised through the hospitality department of the school to provide the ingredients for use. A mobile kitchen is utilised to store the equipment necessary for the activities and provide an adult working bench. The children use the tables within the withdrawal area of the classroom to ensure they are at correct working height.

A detailed safety manual was produced for the school before commencement of the program. The Education Queensland Policy and Procedures Register (134) was used to ensure the risks associated with food preparation were minimised. The identified risks for the *Kids in the Kitchen* program were cuts, burns, falls/strains, electrocution, fire and ingestion of toxins. These are all monitored and reported in relation to the guidelines for maintaining a safe kitchen in a school setting, and for cookery and food handling.
The *Kids in the Kitchen* program works with small groups of four to six children and a parent volunteer to prepare fruits and vegetables for consumption. The parent demonstrates to the children the skills required to prepare fruits and vegetables. The parent then supervises the children as they use their own skills to prepare the fruits and vegetables safely. After the food has been prepared, children are able to eat their own creations. Questions about the food and how others relate to the experience are discussed within the small group of children. The program provides exposure (58) to fruits and vegetables, role modelling of fruit and vegetable consumption by a parent (40, 41, 46, 57, 129), peer discussion (40, 43) about fruits and vegetables, learning food preparation skills by observation and experience (40, 41).

In Grade one, *Kids in the Kitchen* is part of the curriculum unit called “What will I eat today?” In this unit *Kids in the Kitchen* focuses on developing practical skills that are needed to prepare fruits and vegetables suitable to bring to school for lunch. For this reason the food preparation unit is called “What's in my lunch box with fun and crunch?” The food preparation activities in this unit include slicing, cutting, spreading, measuring dry and liquid ingredients, stirring, pouring, grating, scraping, peeling, mashing, crushing and juicing. Examples of foods prepared include carrot and celery sticks to eat with a dip made from grated cucumber and yogurt, and face sandwiches using sprouts as hair and cherry tomatoes as eyes. The fruits used in the activities include apples, kiwi fruit, mandarins, pears, strawberries, blueberries, tomatoes and sultanas while the vegetables include carrots, celery, beans, avocado, Lebanese cucumber, lettuce, garlic and alfalfa sprouts. The *Kids in the Kitchen* activities also provide opportunities for learning outcomes in the areas of literacy and numeracy. The food preparation activities have the added benefit of developing fine motor coordination which is useful for hand writing and functional living.

In Grade five, *Kids in the Kitchen* is part of the curriculum unit called “What can food do for me?” In this unit, *Kids in the Kitchen* focuses on developing practical skills that are needed to prepare vegetables for soups. This food preparation unit is called “Kids in the Soup Kitchen.” A wide variety of vegetables are used to make puree and chunky soups. The food preparation activities in this unit include slicing, cutting, stirring, pouring, grating, scraping, peeling, blending, measuring and dicing. The vegetables, legumes and herbs included are onions, tomatoes, cannelloni beans, kidney beans, butter beans,
green beans, zucchini, cabbage, potato, spinach, parsnip, turnip, parsley, garlic, celery, carrots, dill, rosemary, bay leaves, chilli, chives, bamboo shoots, pumpkin, chervil, mushrooms, leeks, peas, red lentils, broccoli, basil, oregano, shallots, thyme, ginger, corn and bean sprouts. At the end of the term, the activities culminate in a Soup Kitchen for the school community. The Kids in the Kitchen activities provide opportunities for learning outcomes in the areas of literacy (procedural genre and reading recipes), numeracy (measurement of solids and liquids, costing and portioning), and studies of society and environment (providing nutritional food in large quantities, and the role of soup in feeding socially disadvantaged people in the community). Other skills developed through the unit include social interaction through working in a team, and working hygienically and safely.

3.2 Research aim and questions
The aim of the research was to evaluate the impact of the Kids in the Kitchen program on student participants' knowledge of fruits and vegetables; attitudes towards eating fruits and vegetables; consumption of fruits and vegetables; skills in preparing fruits and vegetables; and environmental supports in the home for consumption of fruits and vegetables.

The project had five research questions, in line with the five objectives of the Kids in the Kitchen program:

1. What was the impact of the Kids in the Kitchen program on children's knowledge about fruits and vegetables?
2. What was the impact of the Kids in the Kitchen program on children's attitudes towards fruits and vegetables?
3. What was the impact of the Kids in the Kitchen program on children's consumption of fruits and vegetables?
4. What was the impact of the Kids in the Kitchen program on children's fruit and vegetable preparation skills?
5. What was the impact of the Kids in the Kitchen program on environmental supports in the home for children's consumption of fruits and vegetables?
3.2 Research methodology

The methodology used in this project was evaluation research (93). Evaluation research assesses the value of a program against criteria relevant to the desired changes (93). Health promotion programs need to include appropriate evaluation methods in order to determine the effects that the program has on the determinants of health such as fruit and vegetable consumption (82, 87).

3.3 Theoretical frameworks

Two theoretical frameworks were used to guide the evaluation of the Kids in the Kitchen program: the Hawe Degeling and Hall Health Promotion Evaluation Framework (93) and the Red Lotus Health Promotion Model (24).

The Hawe, Degeling and Hall Health Promotion Evaluation Framework (93) was chosen as the evaluation framework for the Kids in the Kitchen program. This framework includes four components: evaluability assessment, process, impact and outcome evaluation (93). Evaluability assessment focuses on determining the type of information that will be used to make an assessment of the program and check that the program is ready for evaluation (93). Process evaluation focuses on participant satisfaction and reach, program quality and the implementation of project strategies. Impact and outcome evaluation both involve the assessment of the program effects but at different levels (93). Impact evaluation is concerned with the assessment of the immediate effects of the program and usually corresponds with the assessment of the program objectives (93). Outcome evaluation is concerned with the longer term effects of the program and usually corresponds to the program goal (93). Pre and post data are collected and then used to make judgements about the impact and outcome of a program (93).

School based health promotion programs such as Tooty Fruity (123), Gimme 5 (94) and Colourful and Bright (107) have all reported process, impact and outcome evaluation results. The Hawe, Degeling and Hall Health Promotion Evaluation Framework (93) is widely used for health promotion projects and was considered to be an appropriate framework to use for the Kids in the Kitchen program.
The impact evaluation component of the framework is the focus of this Master of Science research project. Process evaluation was conducted as part of the standard classroom practice; however the results are not reported in this thesis as they are not the focus of this research project. Evaluability assessment was undertaken by the school's planning team, consisting of the principal, head of curriculum, teachers and parents, in conjunction with the researcher. The results of the evaluability assessment are not reported in this thesis as they are not the focus of this research project. Outcome evaluation was beyond the scope of the research project.

The Red Lotus Health Promotion Model (24) provided guidance for the evaluation process in a number of ways. Firstly from a structural perspective, the evaluation component of the model describes key components of evaluation that are consistent with the Hawe, Degeling and Hall Evaluation Framework.

Secondly, the component of the Red Lotus Health Promotion Model (24) that describes the determinants of health was used to guide the development of the evaluation instruments. This ensured that the instruments assessed the impact of the program on cognitive determinants (knowledge and attitudes), behavioural determinants (preparation skills and consumption) and environmental determinants (availability in the home, and parental attitudes) of fruit and vegetable consumption.

Thirdly, the values and principles component of the Red Lotus Health Promotion Model was used to guide part of the data collection process (the skill audit) with Grade one students. The emphasis on principles such as empowerment and participation in the Red Lotus Health Promotion Model were especially important for the skill audit. To enable every Grade one student to have the opportunity to demonstrate their skills to the researcher before and after the program was beneficial for the participants to show how well they could use the equipment to prepare the selected fruit and vegetable. It was considered an appropriate strategy to evaluate the impact of the Kids in the Kitchen program because it provided an opportunity to observe the skill development of the participants within the context and intention of the program. Opportunities for the participants to perform these skills are often limited due to adult concerns about participants’ ability to perform these tasks. The skill audit was therefore carefully considered and risk management procedures put into place before implementation. The
use of the Red Lotus Health Promotion Model (24) therefore ensures inclusive practice and is consistent with health promotion best practice.

3.4 Research participants
The research participants were students in Grades one and five at Chancellor State College (135), Sunshine Coast, Queensland in 2007. Chancellor State College is a co-educational facility with around 2000 students enrolled from preschool to grade 12. It is located within the Educational Precinct of Sippy Downs on the Sunshine Coast.

The participants in the research were students in classes scheduled to work on the relevant curriculum units in semester 2 of 2007. Participants were therefore drawn from four Grade one classes and two Grade five classes. A total of 145 students were enrolled in the classes involved in the Kids in the Kitchen program.

3.5 Ethics
Permission to conduct research in a school setting was provided by the Executive Principal of Chancellor State College in accordance with Education Queensland requirements. The University of the Sunshine Coast Human Research Ethics Committee approved the research project, approval number S/07/107. Consent from a parent or guardian was sought for students to participate in the research project (Appendices A to D). An information sheet and consent form were provided to each child to take home to their parent or guardian, with a request to return the consent form the following day.

3.6 Data collection methods
Two data collection methods were used to collect quantitative evaluation data: a questionnaire and a skill audit.

The questionnaire (Appendix E) contained five parts. Part one had three questions which asked the participants about their grade, gender and favourite foods. The question about favourite food was designed to help participants start thinking about food.

Part two included photographs of 20 different fruits and 20 different vegetables which the participants were asked to identify. It also included items asking the participants to state...
whether they had tried each fruit and vegetable; liked each fruit and vegetable, and how often they ate each fruit and vegetable. The trying and liking section of the questionnaire was dichotomous asking the participants to state yes or no. How often they ate each fruit or vegetable used a five point scale from never eating it to eating every day.

Part three of the questionnaire asked the participants the extent to which they agreed with a range of statements about fruits and vegetables. This section of the questionnaire was based on the Tooty Fruity (123) questionnaire and used a five point Likert response scale from 'strongly disagree' to 'strongly agree'.

Part four asked participants to rate their skills in preparing fruits and vegetables. Participants were provided with a list of specific skills that are used to prepare different fruits and vegetables and asked to rate their own skills on a three point response scale including 'not really that good', 'ok' and 'good'.

The last part was an open ended question for the participants to make comments about fruits and vegetables, learning about them at school or about the questionnaire. It did not address any of the research questions and the results are not reported in this thesis.

The skill audit (Appendix F) was administered by the researcher. It involved each participant preparing an apple (fruit) and a carrot (vegetable) for consumption. Equipment and ingredients were available to demonstrate basic knife skills, peeling and grating. The skill audit tool was developed by the researcher. The researcher's experience in teaching Home Economics and Hospitality was utilised to prepare and implement the evaluation method which aimed to capture a snapshot of the participants' skills. Performance competency was judged through the participants' ability to perform the tasks safely and confidently. The participants were observed in their actions of food preparation and their skills were rated by the researcher as 'poor' (not sure where to start and/or not safe with techniques); 'fair' (knows what to do with the equipment but requires further instruction with safe techniques); or 'good' (knows what to do with the equipment and prepares fruit and vegetable using safe techniques).

The skill audit was initially developed for the Grade one students as an additional level of safety control for young children using sharp implements such as knives and graters.
However it was apparent that the skill audit was also a useful method for assessing changes in food preparation skills, and so the data were used as part of the impact evaluation of the program. The skill audit was not considered necessary as a safety control for Grade five students, and so was not included as part of the usual program. It was therefore only available to be used as an additional evaluation method for Grade one students.

Data collection took place within the normal school program and occurred at two time points for each grade level – before and after the implementation of the *Kids in the Kitchen* program. Grade five participants completed the pre program questionnaire on the first day of term, before commencing the unit of work and the *Kids in the Kitchen* program. Grade five participants completed the post program questionnaire in the last week of term.

Both the pre and post program questionnaires were administered by the classroom teacher in a similar way to a class test. The classroom teacher conducted this process setting guidelines for individual work. This was to ensure responses were from individuals. If the participant experienced any difficulties reading the questionnaire they raised their hand for assistance. Completed questionnaires were collected by the teacher. Once the consent process was complete the questionnaires were provided to the researcher.

As with the Grade five students, data were collected from Grade one participants at the beginning and end of the term in which the *Kids in the Kitchen* program was implemented. The Grade one participants’ data collection was also managed by their classroom teacher however required more organisation. Extra support was provided due to their lower literacy levels. Grade 11 students acted as ‘buddy’ readers and writers which enabled each participant to answer all parts of the questionnaire. The participants were individually withdrawn from class for about ten minutes to complete the questionnaire. In addition, the participants were withdrawn from class for another five to ten minute session for the skill audit to demonstrate their food preparation skills.
3.7 Data analysis methods

Data collected from each participant pre the Kids in the Kitchen program was paired with each individual participant’s post data. The coded data were entered into SPSS, version 16 (136) for analysis. Each participant’s data were entered, checked and cleaned. To ensure the quality of this process the following techniques were followed. Firstly, every tenth entry was checked to ensure all codes were correctly entered in the system. Secondly, a frequency check in SPSS was conducted on all variables to pick up any data entry errors with incorrect codes.

Descriptive statistics were calculated to determine frequency distribution, measures of central tendency and variability. Changes between pre and post time points were used to determine the impact of the Kids in the Kitchen program on the participants’ knowledge of fruits and vegetables; attitudes towards eating fruits and vegetables; consumption of fruits and vegetables; skills in preparing fruits and vegetables; and environmental supports in the home for the consumption of fruits and vegetables. The data were not normally distributed; therefore the Related-Samples Wilcoxon Signed-Rank Test was used to detect differences between the pre and post time points. The Independent-Samples Mann-Whitney U Test was used to detect differences based on participants’ grade and gender. The Pearson’s Chi-Square Test was used to detect associations between willingness to try new fruits and vegetables, and a range of behavioural and environmental determinants. The alpha for all tests was set at 0.05.

The questionnaire included photographs of twenty different fruits and twenty different vegetables which the participants were asked to identify. The number of correct responses was used as an indicator of each participant’s level of knowledge about fruits and vegetables. The extent to which participants agreed with a statement about eating fruits and vegetables everyday keeping them healthy was the second indicator of knowledge. The extent to which participants liked each fruit and vegetable, and the extent of their agreement with a number of statements relating to fruits and vegetables were used as the indicators of attitudes towards fruits and vegetables. Whether or not the participant had tried each fruit and vegetable, how often they ate each fruit and vegetable, and the extent to which participants agreed with a statement about eating raw vegetables, were used as the indicators of consumption of fruits and vegetables. The
extent to which participants agreed with a statement about their fruit and vegetable preparation skills, and participants’ self rating of their skills in preparing fruits and vegetables were used as indicators of skills in preparing fruits and vegetables. For Grade one participants, the results of their skills audit provided an additional indicator of fruit and vegetable preparation skill. The extent to which participants agreed with a number of statements relating to environmental determinants that impact on eating fruits and vegetables, such as availability of fruits and vegetables at home and encouragement from parents to eat fruits and vegetables, were used as indicators of environmental support for fruit and vegetable consumption.

3.8 Conclusion

This chapter has described the research design including an outline of the Kids in the Kitchen program, the aim, the research questions, research methodology, theoretical frameworks, participants, ethical issues, and the data collection and analysis methods. The next chapter provides the results.
4 RESULTS

Results of the impact evaluation of the *Kids in the Kitchen* program are presented in this section. It commences with the demographic data, followed by the results for each of the five research questions. This includes results related to participants’ knowledge of fruits and vegetables; attitudes towards and consumption of fruits and vegetables; skills in preparing fruits and vegetables; and environmental supports in the home for the consumption of fruits and vegetables.

4.1 Demographics

There were 92 Grade one students (aged five to six years) and 53 Grade five students (aged nine to ten years) enrolled in the classes involved in the research project. Consent to participate in the research project was obtained for 72 Grade one students, and 49 Grade five students. Seventy Grade one students (76%) and 48 Grade five students (90.5%) completed the questionnaires. The skills audit was completed by all 70 Grade one students. The difference in the number of parents who consented and the students who participated was due to student absence on data collection days. Of the Grade one student participants, 38.6% were female and 61.4% were male. Of the Grade five student participants, 50% were female and 50% were male (Figure 1).

![Figure 1: Grade group and gender of participants (n = 118)](image)

4.2 Impact on knowledge about fruits and vegetables
This section presents the results with respect to research question 1: What was the impact of the *Kids in the Kitchen program* on children’s knowledge about fruits and vegetables?

The questionnaire included photographs of twenty common fruits and twenty common vegetables which the participants were asked to identify (Appendix E). The number of correct responses was used as an indicator of each participant’s level of knowledge about fruits and vegetables. The extent to which participants agreed with a statement about eating fruits and vegetables everyday keeping them healthy was the second indicator of knowledge.

Prior to the program, participants’ median score for correct identification of fruits was 14. The participants’ median score for correct identification of vegetables was 10. The median number of fruits correctly identified (14) was significantly higher than the number of vegetables (10) \( (p=0.0001) \).

The median number of fruits correctly identified increased significantly from 14 prior to the *Kids in the Kitchen* program to 16 post the *Kids in the Kitchen* program \( (p=0.0001) \). The median number of vegetables correctly identified increased significantly from 10 to 12 \( (p=0.0001) \). As with the pre program results, there were significantly more fruits correctly identified post program (16) compared to vegetables (12) \( (p=0.0001) \).

Pre the *Kids in the Kitchen* program, the types of fruits most readily identified by participants included bananas, apples, strawberries, watermelon and grapes. These fruits were identified correctly by over 95% of the participants (Table 1). Tomatoes, oranges, pears, pineapple, kiwi fruit, avocado and mandarins were identified correctly by over 80% of the participants. Over half of the participants were able to correctly identify sultanas, rockmelon, peaches, lemons, and mango, while less than 20% of the participants were able to identify plums, honeydew and dates.

Post the *Kids in the Kitchen* program, the percentage of participants identifying some fruits increased. There were significant increases in correct identification of plums \( (p=0.002) \), mangoes \( (p=0.009) \), peaches \( (p=0.014) \), pineapple \( (p=0.023) \) and dates \( (p=0.023) \).
Pre the *Kids in the Kitchen* program, the types of vegetables most readily identified by participants included carrots, corn, potatoes, mushrooms, lettuce and onions. These were identified correctly by over 80% of participants (Table 2). Post the *Kids in the Kitchen* program the percentage of participants identifying some vegetables increased. There were significant increases in the correct identification of cucumber (*p*=0.001), radishes (*p*=0.005), chickpeas (*p*=0.005), eggplant (*p*=0.008), baby carrots (*p*=0.028), cauliflower (*p*=0.02) and sweet potato (*p*=0.031).
Table 2: Percentage of participants who correctly identified each vegetable pre and post the Kids in the Kitchen program (n=118)

<table>
<thead>
<tr>
<th>Vegetables</th>
<th>% Pre</th>
<th>% Post</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baby carrots</td>
<td>78.0</td>
<td>85.6</td>
<td>0.028 *</td>
</tr>
<tr>
<td>Capsicum</td>
<td>67.7</td>
<td>72.3</td>
<td>0.079</td>
</tr>
<tr>
<td>Carrots</td>
<td>96.6</td>
<td>99.2</td>
<td>0.102</td>
</tr>
<tr>
<td>Cauliflower</td>
<td>51.7</td>
<td>67.8</td>
<td>0.020 *</td>
</tr>
<tr>
<td>Celery</td>
<td>35.6</td>
<td>53.4</td>
<td>0.052</td>
</tr>
<tr>
<td>Chickpeas</td>
<td>7.6</td>
<td>16.1</td>
<td>0.005 *</td>
</tr>
<tr>
<td>Corn</td>
<td>94.1</td>
<td>96.6</td>
<td>0.414</td>
</tr>
<tr>
<td>Cucumber</td>
<td>37.3</td>
<td>56.8</td>
<td>0.001 *</td>
</tr>
<tr>
<td>Eggplant</td>
<td>23.7</td>
<td>44.1</td>
<td>0.008 *</td>
</tr>
<tr>
<td>Kidney beans</td>
<td>5.1</td>
<td>10.2</td>
<td>0.204</td>
</tr>
<tr>
<td>Lettuce</td>
<td>82.2</td>
<td>88.1</td>
<td>0.859</td>
</tr>
<tr>
<td>Mushrooms</td>
<td>84.7</td>
<td>88.1</td>
<td>0.456</td>
</tr>
<tr>
<td>Onion</td>
<td>81.4</td>
<td>86.4</td>
<td>0.891</td>
</tr>
<tr>
<td>Peas</td>
<td>71.2</td>
<td>69.2</td>
<td>0.398</td>
</tr>
<tr>
<td>Potato</td>
<td>87.3</td>
<td>92.4</td>
<td>0.248</td>
</tr>
<tr>
<td>Pumpkin</td>
<td>66.9</td>
<td>73.7</td>
<td>0.714</td>
</tr>
<tr>
<td>Radish</td>
<td>15.3</td>
<td>28.8</td>
<td>0.005 *</td>
</tr>
<tr>
<td>Sprouts</td>
<td>13.6</td>
<td>26.2</td>
<td>0.107</td>
</tr>
<tr>
<td>Sweet potato</td>
<td>37.1</td>
<td>45.8</td>
<td>0.031 *</td>
</tr>
<tr>
<td>Zucchini</td>
<td>37.3</td>
<td>48.3</td>
<td>0.585</td>
</tr>
</tbody>
</table>

Note: * Significant differences between pre and post program percentages (p<0.05) Related-Samples Wilcoxon Signed-Rank Test

Participants were also asked the extent to which they agreed with the statement “Eating fruit and vegetables everyday keeps me healthy”. The percentage of participants who agreed with this statement pre the Kids in the Kitchen program was 96.6% and 94.9% post the program. This difference was not statistically significant.

4.3 Impact on attitudes towards and consumption of fruits and vegetables

This section presents the results with respect to research questions 2 and 3: What was the impact of the Kids in the Kitchen program on children’s attitudes towards fruits and vegetables? and What was the impact of the Kids in the Kitchen program on children’s consumption of fruits and vegetables?
The extent to which participants liked each fruit and vegetable, and the extent of their agreement with a number of statements relating to fruits and vegetables were used as the indicators of attitudes towards fruits and vegetables. Whether or not the participant had tried each fruit and vegetable, how often they ate each fruit and vegetable, and the extent to which participants agreed with a statement about eating raw vegetables, were used as the indicators of consumption of fruits and vegetables. To enhance coherence, the percentage of participants who had tried, liked and regularly eaten different fruits (Table 3) and vegetables (Table 4) are presented together.

Table 3: Percentage of participants who had tried, liked and regularly eaten each fruit pre and post the Kids in the Kitchen program (n=118)

<table>
<thead>
<tr>
<th>Fruits</th>
<th>Tried</th>
<th></th>
<th>Liked</th>
<th></th>
<th>Eat Regularly</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>% Pre</td>
<td>% Post p value</td>
<td>% Pre</td>
<td>% Post p value</td>
<td>% Pre</td>
<td>% Post p value</td>
</tr>
<tr>
<td>Apple</td>
<td>99.1</td>
<td>99.1</td>
<td>1.000</td>
<td>92.4</td>
<td>94.1</td>
<td>0.463</td>
</tr>
<tr>
<td>Avocado</td>
<td>69.9</td>
<td>71.6</td>
<td>0.132</td>
<td>40.7</td>
<td>45.8</td>
<td>0.322</td>
</tr>
<tr>
<td>Banana</td>
<td>93.2</td>
<td>96.6</td>
<td>0.096</td>
<td>79.7</td>
<td>78.8</td>
<td>0.813</td>
</tr>
<tr>
<td>Dates</td>
<td>39.8</td>
<td>42.7</td>
<td>0.695</td>
<td>16.1</td>
<td>19.5</td>
<td>0.135</td>
</tr>
<tr>
<td>Grapes</td>
<td>93.5</td>
<td>94.0</td>
<td>0.655</td>
<td>83.9</td>
<td>86.4</td>
<td>0.542</td>
</tr>
<tr>
<td>Honeydew</td>
<td>37.8</td>
<td>37.2</td>
<td>1.000</td>
<td>16.1</td>
<td>16.9</td>
<td>0.150</td>
</tr>
<tr>
<td>Kiwi Fruit</td>
<td>74.5</td>
<td>82.9</td>
<td>0.013 *</td>
<td>61.0</td>
<td>63.6</td>
<td>0.240</td>
</tr>
<tr>
<td>Lemons</td>
<td>59.4</td>
<td>72.0</td>
<td>0.034 *</td>
<td>31.4</td>
<td>39.0</td>
<td>0.863</td>
</tr>
<tr>
<td>Mandarin</td>
<td>83.2</td>
<td>83.9</td>
<td>0.670</td>
<td>60.2</td>
<td>65.3</td>
<td>0.622</td>
</tr>
<tr>
<td>Mango</td>
<td>53.8</td>
<td>72.4</td>
<td>0.001 *</td>
<td>34.7</td>
<td>56.8</td>
<td>0.987</td>
</tr>
<tr>
<td>Orange</td>
<td>87.0</td>
<td>89.7</td>
<td>0.317</td>
<td>70.3</td>
<td>77.1</td>
<td>0.285</td>
</tr>
<tr>
<td>Peaches</td>
<td>73.3</td>
<td>74.1</td>
<td>0.491</td>
<td>54.2</td>
<td>56.8</td>
<td>0.194</td>
</tr>
<tr>
<td>Pear</td>
<td>69.0</td>
<td>83.8</td>
<td>0.0001 *</td>
<td>48.3</td>
<td>61.0</td>
<td>0.838</td>
</tr>
<tr>
<td>Pineapple</td>
<td>79.6</td>
<td>86.1</td>
<td>0.007 *</td>
<td>64.4</td>
<td>68.6</td>
<td>0.101</td>
</tr>
<tr>
<td>Plums</td>
<td>58.1</td>
<td>60.4</td>
<td>0.853</td>
<td>42.4</td>
<td>40.7</td>
<td>0.277</td>
</tr>
<tr>
<td>Rockmelon</td>
<td>64.0</td>
<td>74.8</td>
<td>0.018 *</td>
<td>38.1</td>
<td>50.0</td>
<td>0.618</td>
</tr>
<tr>
<td>Strawberry</td>
<td>90.5</td>
<td>88.8</td>
<td>0.414</td>
<td>83.1</td>
<td>81.4</td>
<td>0.155</td>
</tr>
<tr>
<td>Sultanas</td>
<td>72.7</td>
<td>85.6</td>
<td>0.011 *</td>
<td>38.1</td>
<td>44.9</td>
<td>0.083</td>
</tr>
<tr>
<td>Tomato</td>
<td>80.2</td>
<td>87.6</td>
<td>0.052</td>
<td>51.7</td>
<td>61.9</td>
<td>0.008 *</td>
</tr>
<tr>
<td>Watermelon</td>
<td>92.2</td>
<td>95.6</td>
<td>0.102</td>
<td>77.1</td>
<td>83.1</td>
<td>0.030 *</td>
</tr>
</tbody>
</table>

Note: * Significant differences between pre and post program percentages (p<0.05) Related-Samples Wilcoxon Signed-Rank Test
Table 4: Percentage of participants who had tried, liked and regularly eaten each vegetable pre and post the Kids in the Kitchen program (n=118)

<table>
<thead>
<tr>
<th>Vegetable</th>
<th>% Pre</th>
<th>% Post</th>
<th>p value</th>
<th>% Pre</th>
<th>% Post</th>
<th>p value</th>
<th>% Pre</th>
<th>% Post</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baby carrots</td>
<td>81.9</td>
<td>74.3</td>
<td>0.142</td>
<td>62.4</td>
<td>55.9</td>
<td>0.119</td>
<td>33.6</td>
<td>30.0</td>
<td>0.666</td>
</tr>
<tr>
<td>Capsicum</td>
<td>58.8</td>
<td>62.4</td>
<td>0.904</td>
<td>28.0</td>
<td>33.1</td>
<td>0.971</td>
<td>25.3</td>
<td>19.2</td>
<td>0.921</td>
</tr>
<tr>
<td>Carrots</td>
<td>95.7</td>
<td>96.6</td>
<td>0.655</td>
<td>80.5</td>
<td>79.7</td>
<td>0.430</td>
<td>42.1</td>
<td>53.5</td>
<td>0.031 *</td>
</tr>
<tr>
<td>Cauliflower</td>
<td>71.7</td>
<td>78.6</td>
<td>0.039 *</td>
<td>36.4</td>
<td>48.3</td>
<td>0.845</td>
<td>15.9</td>
<td>25.2</td>
<td>0.387</td>
</tr>
<tr>
<td>Capsicum</td>
<td>58.8</td>
<td>62.4</td>
<td>0.904</td>
<td>28.0</td>
<td>33.1</td>
<td>0.971</td>
<td>25.3</td>
<td>19.2</td>
<td>0.921</td>
</tr>
<tr>
<td>Carrots</td>
<td>95.7</td>
<td>96.6</td>
<td>0.655</td>
<td>80.5</td>
<td>79.7</td>
<td>0.430</td>
<td>42.1</td>
<td>53.5</td>
<td>0.031 *</td>
</tr>
<tr>
<td>Cauliflower</td>
<td>71.7</td>
<td>78.6</td>
<td>0.039 *</td>
<td>36.4</td>
<td>48.3</td>
<td>0.845</td>
<td>15.9</td>
<td>25.2</td>
<td>0.387</td>
</tr>
<tr>
<td>Celery</td>
<td>64.8</td>
<td>73.8</td>
<td>0.083</td>
<td>33.1</td>
<td>43.1</td>
<td>0.591</td>
<td>22.7</td>
<td>13.9</td>
<td>0.049 *</td>
</tr>
<tr>
<td>Chickpeas</td>
<td>43.5</td>
<td>39.3</td>
<td>0.827</td>
<td>17.8</td>
<td>16.9</td>
<td>0.504</td>
<td>18.4</td>
<td>15.4</td>
<td>0.318</td>
</tr>
<tr>
<td>Corn</td>
<td>92.2</td>
<td>96.5</td>
<td>0.206</td>
<td>80.5</td>
<td>78.8</td>
<td>0.967</td>
<td>34.8</td>
<td>40.5</td>
<td>0.322</td>
</tr>
<tr>
<td>Cucumber</td>
<td>71.3</td>
<td>79.4</td>
<td>0.046 *</td>
<td>31.6</td>
<td>52.1</td>
<td>0.108</td>
<td>20.7</td>
<td>26.1</td>
<td>0.059</td>
</tr>
<tr>
<td>Eggplant</td>
<td>20.8</td>
<td>32.3</td>
<td>0.020 *</td>
<td>4.2</td>
<td>6.8</td>
<td>0.504</td>
<td>8.5</td>
<td>10.9</td>
<td>0.415</td>
</tr>
<tr>
<td>Kidney beans</td>
<td>28.6</td>
<td>26.2</td>
<td>0.491</td>
<td>8.5</td>
<td>10.2</td>
<td>0.384</td>
<td>12.1</td>
<td>10.0</td>
<td>0.636</td>
</tr>
<tr>
<td>Lettuce</td>
<td>85.7</td>
<td>92.9</td>
<td>0.096</td>
<td>66.9</td>
<td>73.7</td>
<td>0.319</td>
<td>47.1</td>
<td>42.1</td>
<td>0.285</td>
</tr>
<tr>
<td>Mushrooms</td>
<td>64.9</td>
<td>62.9</td>
<td>0.835</td>
<td>25.4</td>
<td>23.7</td>
<td>0.835</td>
<td>20.6</td>
<td>8.7</td>
<td>0.857</td>
</tr>
<tr>
<td>Onion</td>
<td>69.7</td>
<td>80.9</td>
<td>0.135</td>
<td>32.4</td>
<td>36.4</td>
<td>0.630</td>
<td>10.3</td>
<td>18.0</td>
<td>0.346</td>
</tr>
<tr>
<td>Peas</td>
<td>91.3</td>
<td>90.3</td>
<td>0.593</td>
<td>66.1</td>
<td>63.6</td>
<td>0.714</td>
<td>19.7</td>
<td>25.0</td>
<td>0.378</td>
</tr>
<tr>
<td>Potatoes</td>
<td>88.5</td>
<td>96.5</td>
<td>0.008 *</td>
<td>77.1</td>
<td>84.7</td>
<td>0.387</td>
<td>54.2</td>
<td>56.4</td>
<td>0.618</td>
</tr>
<tr>
<td>Pumpkin</td>
<td>65.7</td>
<td>75.2</td>
<td>0.108</td>
<td>33.1</td>
<td>41.5</td>
<td>0.867</td>
<td>22.0</td>
<td>25.0</td>
<td>0.439</td>
</tr>
<tr>
<td>Radish</td>
<td>42.5</td>
<td>32.3</td>
<td>0.072</td>
<td>14.4</td>
<td>16.9</td>
<td>0.870</td>
<td>6.5</td>
<td>13.0</td>
<td>0.191</td>
</tr>
<tr>
<td>Sprouts</td>
<td>49.4</td>
<td>64.9</td>
<td>0.257</td>
<td>21.2</td>
<td>33.1</td>
<td>0.223</td>
<td>17.2</td>
<td>8.4</td>
<td>0.001 *</td>
</tr>
<tr>
<td>Sweet potato</td>
<td>62.5</td>
<td>69.0</td>
<td>0.513</td>
<td>42.4</td>
<td>42.4</td>
<td>0.482</td>
<td>11.3</td>
<td>22.7</td>
<td>0.395</td>
</tr>
<tr>
<td>Zucchini</td>
<td>64.9</td>
<td>63.1</td>
<td>0.532</td>
<td>27.6</td>
<td>30.5</td>
<td>0.544</td>
<td>15.6</td>
<td>21.6</td>
<td>0.325</td>
</tr>
</tbody>
</table>

Note: * Significant differences between pre and post program percentages (p<0.05) Related-Samples Wilcoxon Signed-Rank Test

4.3.1 Participants trying fruits and vegetables

Before the Kids in the Kitchen program the majority of participants reported having tried most of the fruits presented. Apples had been tried by 99% of participants, and bananas, grapes, watermelon and strawberries had been tried by over 90% of participants (Table 3). The only fruit that less than 50% of participants had tried was dates. The percentage of participants that had tried the top ranking fruits remained high post the Kids in the Kitchen program. There were also significant increases in the percentage of participants who had tried other fruits including kiwi fruit (p=0.013), lemons (p=0.034), mango (p=0.001), pear (p=0.0001), pineapple (p=0.007), rockmelon (p=0.018) and sultanas (p=0.011).
Pre the *Kids in the Kitchen* program, over 90% of participants had tried carrots, corn and peas (Table 4). More than 70% of participants had also tried baby carrots, lettuce, potato, cauliflower and cucumber. Less than 50% of participants had tried sprouts, radishes, chickpeas, kidney beans and eggplant. Post the *Kids in the Kitchen* program, there were significant increases in the proportion of participants who had tried cauliflower (p=0.039), potato (p=0.008), cucumber (p=0.046) and eggplant (p=0.020).

4.3.2 Participants liking fruits and vegetables

Participants were also asked the extent to which they agreed with statements about fruits and vegetables. The items relating specifically to fruit included: “I like trying new fruit”, and “Most fruit tastes bad”. The percentage of participants who liked trying new fruit was 81.4% pre the *Kids in the Kitchen* program and 85.6% post the program. The percentage of participants who reported that most fruit tastes bad was 27.1% pre the program and 19.5% post the program (Table 5). These differences were not statistically significant.

<table>
<thead>
<tr>
<th>Statements</th>
<th>% Pre</th>
<th>% Post</th>
<th>% Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>I like trying new fruit</td>
<td>81.4</td>
<td>85.6</td>
<td>4.2</td>
</tr>
<tr>
<td>I like trying new vegetables</td>
<td>76.3</td>
<td>74.6</td>
<td>1.7</td>
</tr>
<tr>
<td>Most fruit tastes bad</td>
<td>27.1</td>
<td>19.5</td>
<td>7.6</td>
</tr>
<tr>
<td>Most vegetables taste good</td>
<td>78.0</td>
<td>78.8</td>
<td>0.8</td>
</tr>
</tbody>
</table>

Both pre and post the *Kids in the Kitchen* program, the fruits liked by most participants were apple, strawberry, grapes, banana and watermelon (Table 3). Significant increases occurred in the proportion of participants who reported liking watermelon (p=0.030) and tomato (p=0.008) after the program.

Participants were also asked the extent to which they agreed with the statements “I like trying new vegetables” and “Most vegetables taste good”. The percentage of participants who liked trying new vegetables pre the *Kids in the Kitchen* program was 76.3% and 74.6% post the program (Table 5). The percentage of participants who reported that most vegetables taste good was 78% pre the program and 78.8% post the program. These differences were not statistically significant.
Before the *Kids in the Kitchen* program over 80% of participants liked corn and carrots and 77% liked potatoes (Table 4). Over 60% of participants liked lettuce, peas and baby carrots. All other vegetables were liked by less than 50% of the participants. Sweet potato was liked by 42%, with cauliflower, pumpkin, celery, cucumber and onion being liked by over 30% of participants. Mushrooms, zucchini, capsicum and sprouts were liked by over 20% of participants while chickpeas, radishes, kidney beans and eggplant were liked by less than 20%. Eggplant was the least liked vegetable with only 4% of the participants stating they liked it. These results were similar post the *Kids in the Kitchen* program; there no significant increases the proportion of participants who liked any of the vegetables.

### 4.3.3 Participants eating fruits and vegetables

Pre the *Kids in the Kitchen* program, bananas and apples were eaten regularly by over 45% of the participants (Table 3). Less than 10% of participants regularly ate honeydew and dates. Post the *Kids in the Kitchen* program, bananas and apples were still regularly eaten by over 50% of the participants. Significant increases from pre to post program occurred in the proportion of participants who reported regularly eating tomato (p=0.042) and mango (p=0.033), with around 10% increases in regular consumption of each fruit.

Generally low levels of regular vegetable consumption were reported by participants. Pre the *Kids in the Kitchen* program, potato was eaten regularly by 54% of the participants, while lettuce and carrots were reported to be eaten regularly by over 40% (Table 4). Corn and baby carrots were eaten regularly by over 30% of the participants. Mushrooms, pumpkin, celery, cucumber and capsicum were eaten regularly by over 20% of the participants. Less than 20% of participants regularly ate peas, cauliflower, zucchini, sweet potato, sprouts, chickpeas, kidney beans, while less than 10% of the participants regularly ate radishes and eggplant. Post the *Kids in the Kitchen* program, was a significant increase in the proportion of participants who regularly ate carrots (p=0.031). Significantly less participants reported eating sprouts (p=0.001) and celery (p=0.049) regularly.

Participants were also asked the extent to which they agreed with the statements “I eat raw vegetables”. The percentage of participants who agreed with this statement pre and post the *Kids in the Kitchen* program was 42.4%.
4.3.4 Total number of fruits and vegetables known, tried, liked and eaten regularly

The median number of fruits and vegetables correctly identified (known), tried, liked and eaten regularly were calculated. The Related-Samples Wilcoxon Signed-Rank Test was used to detect differences between the pre and post time points (Table 6). There were significant increases in the number of fruits known, tried and liked, and the number of vegetables known.

Table 6: Median number of fruits and vegetables known, tried, liked and eaten regularly pre and post the Kids in the Kitchen program (n=118)

<table>
<thead>
<tr>
<th>Fruits</th>
<th>Pre</th>
<th>Post</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Known</td>
<td>14</td>
<td>16</td>
<td>0.0001 *</td>
</tr>
<tr>
<td>Tried</td>
<td>14</td>
<td>16</td>
<td>0.0001 *</td>
</tr>
<tr>
<td>Liked</td>
<td>10.5</td>
<td>12</td>
<td>0.0001 *</td>
</tr>
<tr>
<td>Eaten regularly</td>
<td>4</td>
<td>5</td>
<td>0.05</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Vegetables</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Known</td>
<td>10</td>
<td>12</td>
<td>0.0001 *</td>
</tr>
<tr>
<td>Tried</td>
<td>4</td>
<td>5</td>
<td>0.05</td>
</tr>
<tr>
<td>Liked</td>
<td>7.5</td>
<td>8</td>
<td>0.134</td>
</tr>
<tr>
<td>Eaten regularly</td>
<td>2</td>
<td>3</td>
<td>0.719</td>
</tr>
</tbody>
</table>

Note: * Significant differences between pre and post program median totals (p<0.05) Related-Samples Wilcoxon Signed-Rank Test

The Independent-Samples Mann-Whitney U Test was used to detect differences across grade levels and gender. There were significant differences between grade levels in the number of fruits and vegetables that were tried, liked and eaten regularly at both pre and post time points (Table 7). Grade 5 students had significantly higher levels of fruits and vegetables known, tried and liked than Grade 1 students at both pre and post time points. There were no significant differences across grade levels for the number of fruits and vegetables eaten regularly at the pre-program time point. However Grade 5 students ate significantly fewer fruits (3) at the post program time point than Grade 1 students (5). At the post program time point females liked significantly more fruits (13) than males (11) and correctly identified significantly more vegetables (13) than males (12).
Table 7: Median number of fruits and vegetables known, tried, liked and eaten regularly pre and post the Kids in the Kitchen program by grade level (n=118)

<table>
<thead>
<tr>
<th>Fruits</th>
<th>Pre Grade 1</th>
<th>Pre Grade 5</th>
<th>Post Grade 1</th>
<th>Post Grade 5</th>
<th>p value</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Known</td>
<td>12</td>
<td>16</td>
<td>14</td>
<td>17</td>
<td>0.0001 *</td>
<td>0.0001 *</td>
</tr>
<tr>
<td>Tried</td>
<td>12</td>
<td>17</td>
<td>14</td>
<td>18</td>
<td>0.0001 *</td>
<td>0.0001 *</td>
</tr>
<tr>
<td>Liked</td>
<td>9</td>
<td>13</td>
<td>11</td>
<td>14</td>
<td>0.008 *</td>
<td>0.008 *</td>
</tr>
<tr>
<td>Eaten regularly</td>
<td>5</td>
<td>3.5</td>
<td>5</td>
<td>3</td>
<td>0.170</td>
<td>0.042 *</td>
</tr>
</tbody>
</table>

Vegetables

<table>
<thead>
<tr>
<th>Fruits</th>
<th>Pre Grade 1</th>
<th>Pre Grade 5</th>
<th>Post Grade 1</th>
<th>Post Grade 5</th>
<th>p value</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Known</td>
<td>9</td>
<td>13</td>
<td>10</td>
<td>16</td>
<td>0.0001 *</td>
<td>0.0001 *</td>
</tr>
<tr>
<td>Tried</td>
<td>3</td>
<td>5.5</td>
<td>3</td>
<td>7</td>
<td>0.0001 *</td>
<td>0.0001 *</td>
</tr>
<tr>
<td>Liked</td>
<td>7</td>
<td>9</td>
<td>7</td>
<td>9</td>
<td>0.009 *</td>
<td>0.009 *</td>
</tr>
<tr>
<td>Eaten regularly</td>
<td>2</td>
<td>2.5</td>
<td>3</td>
<td>3</td>
<td>0.088</td>
<td>0.942</td>
</tr>
</tbody>
</table>

Note: * Significant differences between Grade 1 and Grade 5 participants at each time point (p<0.05) Related-Samples Wilcoxon Signed-Rank Test

Table 8: Median number of fruits and vegetables known, tried, liked and eaten regularly pre and post the Kids in the Kitchen program by gender (n=118)

<table>
<thead>
<tr>
<th>Fruits</th>
<th>Pre Females</th>
<th>Pre Males</th>
<th>p value</th>
<th>Post Females</th>
<th>Post Males</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Known</td>
<td>15</td>
<td>14</td>
<td>0.088</td>
<td>16</td>
<td>16</td>
<td>0.061</td>
</tr>
<tr>
<td>Tried</td>
<td>15</td>
<td>13</td>
<td>0.120</td>
<td>17</td>
<td>15</td>
<td>0.069</td>
</tr>
<tr>
<td>Liked</td>
<td>11</td>
<td>10</td>
<td>0.312</td>
<td>13</td>
<td>11</td>
<td>0.018 *</td>
</tr>
<tr>
<td>Eaten regularly</td>
<td>4</td>
<td>4</td>
<td>0.626</td>
<td>5</td>
<td>4</td>
<td>0.149</td>
</tr>
</tbody>
</table>

Vegetables

<table>
<thead>
<tr>
<th>Fruits</th>
<th>Pre Females</th>
<th>Pre Males</th>
<th>p value</th>
<th>Post Females</th>
<th>Post Males</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Known</td>
<td>11</td>
<td>10</td>
<td>0.058</td>
<td>13</td>
<td>12</td>
<td>0.013 *</td>
</tr>
<tr>
<td>Tried</td>
<td>4</td>
<td>4</td>
<td>0.668</td>
<td>5</td>
<td>4</td>
<td>0.356</td>
</tr>
<tr>
<td>Liked</td>
<td>8</td>
<td>7</td>
<td>0.619</td>
<td>8</td>
<td>8</td>
<td>0.554</td>
</tr>
<tr>
<td>Eaten regularly</td>
<td>2</td>
<td>3</td>
<td>0.696</td>
<td>3</td>
<td>2</td>
<td>0.075</td>
</tr>
</tbody>
</table>

Note: * Significant differences between female and male participants at each time point (p<0.05) Related-Samples Wilcoxon Signed-Rank Test

In order to understand the spread of results across each variable, total numbers of fruits and vegetables known, tried, liked and eaten regularly were categorised into four categories: 0-5 fruits or vegetables; 6-10 fruits or vegetables; 11-15 fruits or vegetables; and 16-20 fruits or vegetables. The percentage of participants in each category were calculated (Table 9). Prior to the program more than half the participants (56%) correctly identified between 11 and 15 fruits, and a further quarter (29%) identified 16 to 20 fruits.
After the program more than half the participants (55%) correctly identified 16 to 20 fruits, and a further third (38%) identified 11 to 15 fruits. Before the program almost half the participants (53%) could only identify up to 10 vegetables, whereas after the program this decreased to just over a third of participants (35%).

The percentage of participants who had tried higher numbers of fruits and vegetables increased from pre to post program time points. Before the program, 41% of participants had tried 16 to 20 fruits, whereas after the program 56% of participants had tried 16 to 20 fruits. Although no participants had tried more than 11 vegetables before or after the program, the proportion that had tried 6 to 10 vegetables increased from under a third (32%) to almost one half of the participants (47%).

Before the program, one half of the participants liked between 11 and 20 fruits, increasing to almost two-thirds after the program. The proportion of participants who liked 16 to 20 vegetables doubled from 3.5% to 7%.

The proportion of participants that regularly ate between 11 and 20 fruits increased from 8% to 10%. Almost 100% of participants ate up to 10 different vegetables regularly both before and after the program.

Table 9: Number of fruits and vegetables known, tried, liked and eaten regularly pre and post the Kids in the Kitchen program (n=118)

<table>
<thead>
<tr>
<th>Fruits</th>
<th>% known pre</th>
<th>% known post</th>
<th>% tried pre</th>
<th>% tried post</th>
<th>% liked pre</th>
<th>% liked post</th>
<th>% eaten regularly pre</th>
<th>% eaten regularly post</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-5</td>
<td>0.8</td>
<td>0.0</td>
<td>5.9</td>
<td>4.3</td>
<td>10.2</td>
<td>5.1</td>
<td>60.8</td>
<td>60.2</td>
</tr>
<tr>
<td>6-10</td>
<td>14.4</td>
<td>6.8</td>
<td>21.2</td>
<td>12.0</td>
<td>39.8</td>
<td>31.6</td>
<td>31.4</td>
<td>30.1</td>
</tr>
<tr>
<td>11-15</td>
<td>55.9</td>
<td>38.1</td>
<td>32.2</td>
<td>28.2</td>
<td>32.2</td>
<td>38.5</td>
<td>7.8</td>
<td>8.8</td>
</tr>
<tr>
<td>16-20</td>
<td>28.8</td>
<td>55.1</td>
<td>40.7</td>
<td>55.6</td>
<td>17.8</td>
<td>24.8</td>
<td>0.0</td>
<td>0.9</td>
</tr>
<tr>
<td>Total</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Vegetables</th>
<th>% known pre</th>
<th>% known post</th>
<th>% tried pre</th>
<th>% tried post</th>
<th>% liked pre</th>
<th>% liked post</th>
<th>% eaten regularly pre</th>
<th>% eaten regularly post</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-5</td>
<td>9.4</td>
<td>5.9</td>
<td>67.9</td>
<td>53.2</td>
<td>29.8</td>
<td>22.8</td>
<td>83.3</td>
<td>85.1</td>
</tr>
<tr>
<td>6-10</td>
<td>43.6</td>
<td>28.8</td>
<td>32.1</td>
<td>46.8</td>
<td>44.7</td>
<td>44.7</td>
<td>15.6</td>
<td>14.9</td>
</tr>
<tr>
<td>11-15</td>
<td>35.0</td>
<td>40.7</td>
<td>0.0</td>
<td>0.0</td>
<td>21.9</td>
<td>25.4</td>
<td>1.0</td>
<td>0.0</td>
</tr>
<tr>
<td>16-20</td>
<td>12.0</td>
<td>24.6</td>
<td>.0</td>
<td>0.0</td>
<td>3.5</td>
<td>7.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Total</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>
The changes in the number of fruits and vegetables known, tried, like and eaten regularly from pre program to post program were calculated. The Independent Samples Mann-Whitney U Test was used to detect differences in the changes based on grade and gender (Tables 7 and 8). Grade 5 students had significantly greater increases in the number of vegetables known and tried than Grade 1 students. There were no significant differences in the changes based on gender.

Table 10: Changes in median number of fruits and vegetables known, tried, liked and eaten regularly by grade level pre to post the Kids in the Kitchen program (n=118)

<table>
<thead>
<tr>
<th>Fruits</th>
<th>Pre-post change Grade 1</th>
<th>Pre-post change Grade 5</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Known</td>
<td>2</td>
<td>1</td>
<td>0.053</td>
</tr>
<tr>
<td>Tried</td>
<td>1</td>
<td>1</td>
<td>0.901</td>
</tr>
<tr>
<td>Liked</td>
<td>1</td>
<td>1</td>
<td>0.255</td>
</tr>
<tr>
<td>Eaten regularly</td>
<td>1</td>
<td>0</td>
<td>0.753</td>
</tr>
</tbody>
</table>

Table 11: Changes in median number of fruits and vegetables known, tried, liked and eaten regularly by gender pre to post the Kids in the Kitchen program (n=118)

<table>
<thead>
<tr>
<th>Fruits</th>
<th>Pre-post change Female</th>
<th>Pre-post change Male</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Known</td>
<td>2</td>
<td>1</td>
<td>0.822</td>
</tr>
<tr>
<td>Tried</td>
<td>1</td>
<td>1</td>
<td>0.156</td>
</tr>
<tr>
<td>Liked</td>
<td>1</td>
<td>1</td>
<td>0.313</td>
</tr>
<tr>
<td>Eaten regularly</td>
<td>1</td>
<td>0</td>
<td>0.206</td>
</tr>
</tbody>
</table>

Note: * Significant differences between pre-post changes for Grade 1 compared to pre-post changes for Grade 5 participants (p<0.05) Independent Samples Mann-Whitney U Test
4.5 Associations between willingness to try new fruits and vegetables and other determinants

Pearson’s Chi-Square Test was used to explore associations between a willingness to try new fruits and vegetables, and other environmental and behavioural determinants of fruit and vegetable consumption. Willingness to try new fruits and vegetables pre the Kids in the Kitchen program was significantly associated with all of these items (Table 7).

Table 12: Associations between willingness to try new fruits and vegetables and other items pre the Kids in the Kitchen program (n=118)

<table>
<thead>
<tr>
<th>Association between “I like trying new fruits” and each statement</th>
<th>Association between “I like trying new vegetables” and each statement</th>
</tr>
</thead>
<tbody>
<tr>
<td>I’m good at preparing fruits and vegetables</td>
<td>I’m good at preparing fruits and vegetables</td>
</tr>
<tr>
<td>33.85 0.0001*</td>
<td>68.15 0.0001*</td>
</tr>
<tr>
<td>My parents encourage me to eat my fruit and vegetables</td>
<td>My parents encourage me to eat my fruit and vegetables</td>
</tr>
<tr>
<td>30.33 0.0001*</td>
<td>59.87 0.0001*</td>
</tr>
<tr>
<td>Eat fruit and vegetables for health</td>
<td>Eat fruit and vegetables for health</td>
</tr>
<tr>
<td>59.08 0.0001*</td>
<td>121.32 0.0001*</td>
</tr>
<tr>
<td>Most fruit tastes bad (disagree)</td>
<td>Most vegetables taste good</td>
</tr>
<tr>
<td>32.57 0.0001*</td>
<td>37.98 0.0001*</td>
</tr>
<tr>
<td>There is usually lots of fruit around at home</td>
<td>We have vegetables with dinner most nights</td>
</tr>
<tr>
<td>38.71 0.0001*</td>
<td>118.01 0.0001*</td>
</tr>
<tr>
<td>I can get my own fruit and vegetable snacks at home</td>
<td>I can get my own fruit and vegetable snacks at home</td>
</tr>
<tr>
<td>28.92 0.0001*</td>
<td>59.54 0.0001*</td>
</tr>
<tr>
<td>I eat raw vegetables</td>
<td></td>
</tr>
<tr>
<td>58.67 0.0001*</td>
<td></td>
</tr>
</tbody>
</table>

Note * Significant associations between variables (p<0.05) Pearson’s Chi Square Test
4.6  **Impact on skills in the preparation of fruits and vegetables**

This section presents results with respect to research question 5: What was the impact of the *Kids in the Kitchen* program on children's fruit and vegetable preparation skills?

Participants were asked the extent to which they agreed with a statement about their fruit and vegetables preparation skills, and to rate their skills in preparing fruits and vegetables. In addition, Grade one participants were asked to demonstrate their skills in fruit and vegetable preparation. The researcher observed the participants and assessed their fruit and vegetable preparation skill level using a skills audit.

4.6.1  **Self perception of fruit and vegetable preparation skills**

Participants were asked the extent to which they agreed with the statement “I am good at preparing fruits and vegetables”. Pre the *Kids in the Kitchen* program, 61% of participants agreed with this statement, and 70.3% agreed post the program. This was not a statistically significant difference.

Participants were provided with a list of specific skills that are used to prepare different fruits and vegetables and asked to rate their own skills. There was a significant decrease in the number of participants who stated they were not very good at using a plastic knife to prepare fruits and vegetables, from 42% pre program to 27% post program (p=0.044) (Table 13).
Table 13: Participants’ self perception of skills related to fruit and vegetable preparation (n=118)

<table>
<thead>
<tr>
<th>Type of Skill</th>
<th>Not really that good</th>
<th>OK, I only do it sometimes</th>
<th>Good, can do skill a fair bit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
</tr>
<tr>
<td>Peel with fingers pre</td>
<td>49</td>
<td>42</td>
<td>32</td>
</tr>
<tr>
<td>Peel with fingers post</td>
<td>34</td>
<td>29</td>
<td>46</td>
</tr>
<tr>
<td>Change</td>
<td>↓15</td>
<td>↑14</td>
<td>↑12</td>
</tr>
<tr>
<td>Use plastic knife pre</td>
<td>49</td>
<td>42</td>
<td>30</td>
</tr>
<tr>
<td>Use plastic knife post</td>
<td>31</td>
<td>27</td>
<td>42</td>
</tr>
<tr>
<td>Change</td>
<td>↓18</td>
<td>↓15*</td>
<td>↑12</td>
</tr>
<tr>
<td>Use paring knife pre</td>
<td>41</td>
<td>35</td>
<td>31</td>
</tr>
<tr>
<td>Use paring knife post</td>
<td>30</td>
<td>25</td>
<td>45</td>
</tr>
<tr>
<td>Change</td>
<td>↑11</td>
<td>↑10</td>
<td>↑16</td>
</tr>
<tr>
<td>Dice onion pre</td>
<td>66</td>
<td>56</td>
<td>33</td>
</tr>
<tr>
<td>Dice onion post</td>
<td>73</td>
<td>62</td>
<td>26</td>
</tr>
<tr>
<td>Change</td>
<td>↑7</td>
<td>↑6</td>
<td>↓7</td>
</tr>
<tr>
<td>Peel with peeler pre</td>
<td>32</td>
<td>28</td>
<td>36</td>
</tr>
<tr>
<td>Peel with peeler post</td>
<td>20</td>
<td>17</td>
<td>42</td>
</tr>
<tr>
<td>Change</td>
<td>↓12</td>
<td>↓11</td>
<td>↑6</td>
</tr>
<tr>
<td>Mash or crush pre</td>
<td>45</td>
<td>39</td>
<td>36</td>
</tr>
<tr>
<td>Mash or crush post</td>
<td>38</td>
<td>32</td>
<td>30</td>
</tr>
<tr>
<td>Change</td>
<td>↑7</td>
<td>↑7</td>
<td>↓6</td>
</tr>
<tr>
<td>Grate pre</td>
<td>37</td>
<td>32</td>
<td>39</td>
</tr>
<tr>
<td>Grate post</td>
<td>28</td>
<td>24</td>
<td>46</td>
</tr>
<tr>
<td>Change</td>
<td>↑9</td>
<td>↑8</td>
<td>↓7</td>
</tr>
<tr>
<td>Juice pre</td>
<td>39</td>
<td>34</td>
<td>27</td>
</tr>
<tr>
<td>Juice post</td>
<td>33</td>
<td>28</td>
<td>37</td>
</tr>
<tr>
<td>Change</td>
<td>↓6</td>
<td>↓6</td>
<td>↑10</td>
</tr>
</tbody>
</table>

Note: * Significant differences between pre and post program percentages (p<0.05) Related-Samples Wilcoxon Signed-Rank Test

The different skills were grouped in three categories: cutting; peeling and grating; and mashing and juicing. The following figures present the results of perceived skills pre and post the *Kids in the Kitchen* program. Perceptions of cutting skills are presented in Figure 2, peeling and grating skills in Figure 3 and mashing and juicing skills in Figure 4.
Figure 2: Participants’ self perception of skills of cutting pre and post the Kids in the Kitchen program (n=118)
Note: * Significant differences between pre and post program percentages (p<0.05) Related-Samples Wilcoxon Signed-Rank Test

Figure 3: The participants’ self perception skills of peeling and grating pre and post the Kids in the Kitchen program (n=118)
4.6.2 Observed food preparation skills of Grade one participants

Grade one participants were observed preparing an apple and a carrot. The participants were provided with equipment to perform these tasks. The participants were asked to show how they would use the equipment to prepare the apple and carrot.

Pre the *Kids in the Kitchen* program, 69% of participants had poor skills in cutting an apple, and no participants had good skills. Forty nine percent of participants had poor skills in cutting a carrot and 1% had good skills. There were no participants who had good skills in grating or peeling a carrot (Figure 5).

Post the *Kids in the Kitchen* program, participants’ skills had significantly improved. Thirty five percent of participants had good skills in cutting an apple \( (p=0.0001) \), 46% had good skills in cutting a carrot \( (p=0.0001) \) and 20% had good skills in grating and peeling a carrot \( (p=0.0001) \) (Figure 5).
4.7 Impact of environmental supports in the home for children’s consumption of fruits and vegetables

This section presents results with respect to the research question 4: What was the impact of the Kids in the Kitchen program on environmental supports in the home for children’s consumption of fruits and vegetables?

The extent to which participants agreed with a number of statements relating to environmental determinants that impact on eating fruits and vegetables, such as availability of fruits and vegetables at home, and encouragement from parents to eat fruits and vegetables, were used as indicators of environmental supports in the home for fruit and vegetable consumption.
Two items related to the availability of fruits and vegetables at home. The percentage of participants who agreed “There is usually lots of fruit around at home” pre the Kids in the Kitchen program was 87.3% and 81.4% post the program, and the percentage of participants who agreed “I can get my own fruit and vegetable snacks at home” pre the Kids in the Kitchen program was 82.2% and 72.9% post the program (Table 6). These differences were not statistically significant.

Two items related to encouragement from parents to eat fruits and vegetables. The percentage of participants who agreed “We have vegetables with dinner most nights” pre the Kids in the Kitchen program was 91.3% and 88.4% post the program, and the participants who agreed “My parents encourage me to eat my fruit and vegetables” pre the Kids in the Kitchen program was 83.1% and 79.7% post the program (Table 6). There were no statistically significant differences in these results.

<table>
<thead>
<tr>
<th>Statements</th>
<th>% Pre</th>
<th>% Post</th>
<th>% Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>There is usually lots of fruit around at home</td>
<td>87.3</td>
<td>81.4</td>
<td>5.9</td>
</tr>
<tr>
<td>I can get my own fruit and vegetable snacks at home</td>
<td>82.2</td>
<td>72.9</td>
<td>9.3</td>
</tr>
<tr>
<td>We have vegetables with dinner most nights</td>
<td>91.3</td>
<td>88.1</td>
<td>3.2</td>
</tr>
<tr>
<td>My parents encourage me to eat my fruit and vegetables</td>
<td>83.1</td>
<td>79.7</td>
<td>4.4</td>
</tr>
</tbody>
</table>

4.8 Conclusion

A total of 118 children participated in the evaluation. There were significant improvements in knowledge of, attitudes towards, skills in preparing and consumption of fruit and vegetables after the Kids in the Kitchen program. Recognition of dates, mango, peaches, pineapple, plums, baby carrots, cauliflower, chickpeas, cucumber, eggplant, radish and sweet potato all increased significantly. Significantly more participants had tried kiwi fruit, lemons, mango, pear, pineapple, rockmelon and sultanas, liked tomato and watermelon, and regularly ate mango and tomato. Significantly more participants had tried cauliflower, cucumber, eggplant and potatoes, and regularly ate carrots and sprouts. Significantly fewer participants regularly ate celery and sprouts.

There were significant increases in the median number of fruits known, tried and liked, and the number of vegetables known after the Kids in the Kitchen program. Grade 5
students had significantly higher levels of fruits and vegetables known, tried and liked than Grade 1 students at both pre and post time points. Grade 5 students regularly ate significantly fewer fruits (3) at the post program time point than Grade 1 students (5). At the post program time point females liked significantly more fruits (13) than males (11) and correctly identified significantly more vegetables (13) than males (12).

Prior to the program more than half the participants (56%) correctly identified between 11 and 15 fruits, and a further quarter (29%) identified 16 to 20 fruits. After the program more than half the participants (55%) correctly identified 16 to 20 fruits, and a further third (38%) identified 11 to 15 fruits. Before the program almost half the participants (53%) could only identify up to 10 vegetables, whereas after the program this decreased to just over a third of participants (35%).

Before the program, 41% of participants had tried 16 to 20 fruits, whereas after the program 56% of participants had tried 16 to 20 fruits. Although no participants had tried more than 11 vegetables before or after the program, the proportion that had tried 6 to 10 vegetables increased from under a third (32%) to almost one half of the participants (47%).

Before the program, one half of the participants liked between 11 and 20 fruits, increasing to almost two-thirds after the program. The proportion of participants who liked 16 to 20 vegetables doubled from 3.5% to 7%. The proportion of participants that regularly ate between 11 and 20 fruits increased from 8% to 10%. More than 80% of participants regularly ate between 0 and 5 vegetables pre and post the program.

Participants were provided with a list of specific skills that are used to prepare different fruits and vegetables and asked to rate their own skills. Participants’ perceptions of their skills in using a knife to prepare fruits and vegetables increased significantly. The different skills were grouped in three categories: cutting; peeling and grating; and mashing and juicing to present the range of the participant’s perceptions. Grade one participants’ observed skills in cutting and grating apples and carrots improved significantly. Before the program 69% of participants had poor skills in cutting an apple, and no participants had good skills while 49% of participants had poor skills in cutting a carrot and 1% had good skills. After the program 35% of participants had good skills in...
cutting an apple (p=0.0001), 46% had good skills in cutting a carrot (p=0.0001) and 20% had good skills in grating and peeling a carrot.

Participants’ attitudes towards trying new fruits and vegetables were strongly associated with behaviours such as eating fruit and vegetables for health or taste, and environmental determinants such as availability of fruits and vegetables at home and encouragement from parents.
5 DISCUSSION

This section presents the discussion of the research results with reference to the theoretical foundations and the literature. It discusses the impact on the participants’ knowledge about fruits and vegetables, attitudes towards and consumption of fruits and vegetables, skills in preparing fruits and vegetables and environmental supports in the home for the consumption of fruits and vegetables. It also describes the strengths and limitations of the project.

5.1 Impact on knowledge about fruits and vegetables

The *Kids in the Kitchen* program aimed to increase children’s knowledge about fruits and vegetables. Prior to the *Kids in the Kitchen* program participants knew that eating fruits and vegetables everyday was necessary for their health. Therefore the *Kids in the Kitchen* program has supported participants knowledge of fruits and vegetables and the need for their consumption. This is important because knowledge about fruit and vegetable intake is recognised as a determinant of fruit and vegetable consumption (63, 66, 70, 78). Knowledge about fruits and vegetables is also considered an important goal of nutrition education programs and necessary for changing dietary behaviour (137).

The *Kids in the Kitchen* program has also demonstrated significant increases in participants’ identification of both fruits and vegetables. The recognition of fruits and vegetables is considered a form of knowledge about food that can be developed practically (41) and is important in positively influencing food choice (65). Post the program the participants were significantly better at recognising a range of fruits and vegetables. Whilst these fruits and vegetables may or may not have been used in the *Kids in the Kitchen* program, seasonal availability may have influenced their ability to recognise fruits and vegetables. The increased variety of fruits and vegetables that the participants are able to recognise indicates that the *Kids in the Kitchen* program has had a positive impact on developing food related knowledge. This knowledge is therefore considered valuable because it supports food choice a valuable determinant in executing any dietary changes (65, 66).
5.2 Impact on attitudes towards and consumption of fruits and vegetables

The *Kids in the Kitchen* program aimed to improve children’s attitudes towards fruits and vegetables and increase the fruits and vegetables tried and eaten by children. Attitudes towards and consumption of fruits and vegetables have been linked to individual and environmental determinants; with the key individual determinant being taste and liking preferences (8, 34, 40, 41, 44, 52, 53, 138). The aversion to bitter tastes for some individuals (8) can shape patterns of vegetable acceptance (38) or create barriers to fruit and vegetable consumption. Whilst this is a major consideration there are other individual behavioural determinants and environmental determinants considered to support change to these attitudes and positively influence fruit and vegetable consumption.

The *Kids in the Kitchen* program demonstrates changes in the areas of trying, liking and eating some fruits and vegetables. In relation to taste, differences have been highlighted with fruits such as tomatoes and mangoes which were fruits reported to be liked and eaten regularly at the end time point. The taste of tomato and mango are different to the bitter vegetables mentioned in the other studies (56, 139) which may be more appealing to the participants. The reason for the increase in liking and eating may be linked to availability or exposure, which is consistent with other studies (58).

The *Kids in the Kitchen* program provided increased exposure to the different fruits and vegetables and opportunities for children to taste the foods they made without emphasis on how much they ate. This resulted in an increased number of fruits that participants had tried and liked at the end of the program, but no increase in the trying or liking of vegetables. For fruits at least, this finding is consistent with other studies that have shown that repeated exposure to new fruits and vegetables can reduce the typical neophobic response of reluctance to taste (58) and increase consumption (70, 80-82).

Other individual behavioural determinants such as intentions related to self identity (41, 42), motivation related to personal values (41) or beliefs (43) are also unable to be clarified by the *Kids in the Kitchen* program. However, the impacts of other programs (70, 80-82) suggest that for some individuals, this may be the case. Also if individuals perceive benefits through feeling good (40), cleansed and clear thinking (27) and if
immediate health expectations are fulfilled (44, 45), then fruits and vegetables are more likely to be tried and consumed. Other individual behaviours related to will power (46), choice, autonomy and control (86, 87) could still be barriers for some individuals to consume fruits and vegetables.

The *Kids in the Kitchen* program has been implemented in a school environmental setting which can support many desirable individual determinants towards fruit and vegetable consumption such as reinforcement of appropriate behaviours in the form of self fulfilment (47), habit (48) and pleasant feeling of satiety (8). The surroundings (41, 49) can also be considered beneficial. Other components of the school environment including teachers being able to provide alternate adult role models (34, 62); and peer influences, can be helpful when it comes to trying new foods and developing suitable decision making behaviours (70, 89, 94). These social environmental determinants are also important influences when considering the impacts of the *Kids in the Kitchen* program.

The *Kids in the Kitchen* program was integrated into the school curriculum which is another aspect of the social environment considered valuable as a contribution to fruit and vegetable consumption. Teaching strategies can provide appropriate dietary knowledge and education, taking into account the age and gender of the students (46) as well as focusing on improving student learning. At the end of the program the Grade five participants tried and liked more fruits and vegetables than the Grade one participants while females liked more fruits than males. Including fruits and vegetables into learning activities can trigger the senses including sight (colour), sound (crunch), touch (texture), smell and taste (sweet, sour, bitter, salty or combinations of these) (63, 64). Children’s learning can also be enhanced or rewarded due to the sense activation created by engagement with an ‘edible outcome.’

The *Kids in the Kitchen* program was designed around making all fruits and vegetables fun to prepare and eat because of the colours, textures and flavours (26). The findings of what the participants found to be least favourable was also worth consideration. Lemons, dates, honeydew and sprouts are a few fruits and vegetables in this category. The following considerations may explain these least favoured fruits and vegetables; in the case of lemons, they were extremely acidic; in the case of dates, they were dull in
appearance; honeydew may not be commonly known or available (seasonally) and in the case of sprouts, participants may not have regarded them as something they would like to eat. This is consistent with other studies that have demonstrated that appearance, taste and seasonality all influence the desirability of fruits and vegetables.

The participants were also asked the extent to which they agreed with statements about fruits and vegetables. Whilst there were no significant changes in the participants’ opinions about liking fruits and vegetables and the taste of fruits and vegetables, the results reveal that a large percentage of the participants viewed trying fruits and vegetables favourably. These findings therefore support favourable attitudes towards eating fruits and vegetables and perhaps supported the positive environment needed for reluctant individuals to try them (34, 40, 41, 43).

When considering the statement ‘I eat raw vegetables’ and the vegetables used in the program may provide an example for how individual preferences can be influenced. There were changes to the regular eating of specific raw vegetables used in the Kids in the Kitchen program. Carrots and celery were used raw in the form of dipping sticks in the Grade 1 program and the basis of a lot of the soups in the Grade 5 program. The participants’ regular eating preferences post the Kids in the Kitchen program reveals different changes. There was a significant increase in the participants who stated they ate carrots regularly while there was a significant decrease in regular eating of celery. This finding suggests that only some raw vegetables were considered acceptable for regular consumption by the participants.

As part of the Kids in the Kitchen program evaluation, the participants were asked if they ate different fruits and vegetables regularly. Whilst this is a different indicator for determining levels of vegetables and fruits consumption to indicators used in other programs, for example, 24 hour recall (4, 6, 140) this finding suggests the same low consumption rates as other programs. At the end of the Kids in the Kitchen program, some well known fruits and vegetables such as apples, bananas, grapes, tomatoes, mangoes, carrots and potatoes did show improvement in being eaten regularly. These increases also reveal that apples, bananas, carrots and potato were the most popular fruits while tomatoes, mangoes and carrots showed significant changes to regular
consumption. These results confirm well known fruits such as apples and bananas are the most commonly consumed and consistent with various nutrition surveys (4, 6, 140).

The results following the Kids in the Kitchen program related to eating fruits and vegetables reveal changes in the proportion of participants who tried, liked or regularly ate different fruits and vegetables; though not directly attribute those changes to the program. The results do not show how much of each fruit or vegetable is eaten. Neither do they confirm the influences related to the increase of these fruits and vegetables. The types of fruits and vegetables the participants consumed could be a result of seasonal availability, for example mangoes. They were readily available in the community at the time of data collection and were used in the Kids in the Kitchen program activities. This is consistent with the findings from other studies that suggest that consumption of fruit is linked to what is most commonly available (34, 40, 41, 106).

The impact of the Kids in the Kitchen program on the attitudes towards eating fruits and vegetables has been revealed through the types and number of fruits and vegetables tried and liked, and the extent of their agreement with a number of statements relating to fruits and vegetables. Indicators of consumption of fruits and vegetables were explored through the types of different fruits and vegetables the participants stated that they tried, ate and the extent to which participants agreed with a statement about ‘eating raw vegetables’.

5.3 Associations between willingness to try new fruits and vegetables and other determinants

The finding that over 75% of the participants liked trying new fruits and vegetables was considered important. Further analysis related to the environmental and behavioural influences on fruit and vegetable consumption suggest that all individual and social determinants were significantly associated with willingness to try new fruits and vegetables.

The participants who were more likely to try new fruits and vegetables were the participants who stated they are good at preparing fruits and vegetables, their parents encourage them to eat fruits and vegetables, they eat fruits and vegetables for health, they like the taste of fruits of fruits and vegetables, they have access to fruits and
vegetables in their home, and they can get fruits and vegetable snacks themselves. These findings are consistent with other studies that suggest that the motivation to try fruits and vegetables is associated with determinants such as availability (34, 40, 41, 43, 46), access (40, 41, 43) and encouragement (40, 41, 46, 58, 129).

These findings are also consistent with what was expected, based on the application of Social Cognitive Theory (74) as the behaviour change theory underpinning the design of the Kid in the Kitchen project. The underlying determinants of fruit and vegetable consumption and the methods of promoting change have been linked to the relationship between the participants and their environment. Applying the principle of reciprocal determinism (71, 133) suggests that in this study the individual, their environment and behaviour have continuously interacted and influenced each other. Working with the participants and their environment, including the school setting, has offered opportunities for exposure to fruits and vegetables in a different setting to their own homes. This has provided different opportunities for participants to consume fruits and vegetables. The social environment of schools also includes their teacher and peer influences which can also be helpful when it comes to trying new foods and developing suitable decision making behaviours (70, 89, 94).

5.4 Impact on skills in the preparation of fruits and vegetables

The skills developed through the Kids in the Kitchen program were related to food preparation of fruits and vegetables and evaluated in two ways. Firstly, the participants were asked what skills they could perform and secondly, the Grade one participants were observed by the researcher while performing the skills needed to prepare fruits and vegetables. Post the Kids in the Kitchen program, participants’ skills had significantly improved. This finding is important and unique to this study because of the many benefits of encouraging children to develop self efficacy related to ability and skills (40, 41). Preparing and cooking food for oneself has been demonstrated to have many positive outcomes, including those related to nutrition. The development of cooking skills has contributed to empowering people with the necessary skills to purchase nutritious food (54, 65, 66, 141).

The Kids in the Kitchen program utilised parent volunteers to help develop these food preparation skills. The improvement of skills in the program support the idea that parents
cooking with children helps to develop cognitive and perceptual knowledge and mechanical skills (67) while having the benefits of influencing food choice (66, 68) and opportunity for developing skills that may be needed to execute dietary changes (65). These findings support the strategy of including parents in the role of sharing cooking knowledge and skills as part of the *Kids in the Kitchen* program.

The participants of the *Kids in the Kitchen* program reported that their skills had significantly, changed through the use of a plastic knives. The most likely explanation for the improvement of the use of the plastic knife was the participants probably hadn’t considered using a plastic knife to prepare their own fruits and vegetables. The *Kids in the Kitchen* program uses a plastic knife as the first piece of equipment to develop the cutting technique safely until the participants are assessed to have demonstrated a safe level of competence. Using this equipment ensure that skills can be learned with confidence which supports the development of self efficacy in line with social cognitive theory (74).

Skill development is valuable because it enables and creates opportunities to consume fruits and vegetables. This is also related to the building of self efficacy which allows the participants more food choices (74). The strategies related to the program within the school and classroom (environmental determinants), support the student’s knowledge, confidence and skills (individual determinants). Therefore if the participants are able to prepare their own fruits and vegetables, then they can choose fruits and vegetables without having to rely on others to prepare them. The new skills can also contribute to student learning outcomes through the senses. All senses are activated through the hands-on activities and edible outcomes (64).

The participants’ appear to have under reported their own skills. The concept of underreporting is consistent with other studies such as food recall used to determine food intake (142). Observation is suggested as a better method to verify results about food consumption levels (107, 126). The audit used in this study verified the participants self perception of the skills and the ability of the participants to perform the different skills related to fruit and vegetable preparation. The difference between the self-perceived skills and the audit could indicate that the participants didn’t realise how much they had
improved. The results of this study therefore reveal how much the Grade one participants’ skills improved.

The impact evaluation of the *Kids in the Kitchen* program suggests that the food preparation activities developed knowledge of fruits and vegetables, provided opportunities to try fruits and vegetables, helped change attitudes to liking of some fruits and vegetables, changed eating behaviours and increased food preparation skills. The skill development is particularly important because it enables the participants to repeat the skills and provides further opportunities to improve knowledge, attitudes and consumption and the environment related to fruit and vegetable consumption.

### 5.5 Impact on environmental supports in the home for children’s consumption of fruits and vegetables

The extent to which participants agreed with a number of statements relating to environmental determinants were used as indicators of environmental supports in the home for fruit and vegetable consumption. These indicators include the availability of fruits and vegetables at home, and the encouragement from parents/caregivers for eating fruits and vegetables. The participants have indicated that they have a supportive home environment through their positive response rate to all questions related to their home environment. Whilst this result didn’t change during the *Kids in the Kitchen* program implementation, the role of parents to create a support environment is valuable and encouraging.

A large proportion of parents of children who participated in the *Kids in the Kitchen* program have been recognised as the primary role models for fruit and vegetable consumption which is consistent with other studies (34, 40, 41, 52). Parent role models can have a positive impact if cultural expectations are demonstrated through their food practices, which includes where and when food is eaten (53, 54), which this study appears to support. The participants have recognised that a large proportion of their parents have provided access to fruit and vegetables through providing them to children or enabling them to get their own (40) and encouraging them to eating fruit and vegetables through creating pleasant surroundings for family meals (70, 89, 94). This therefore is a valuable contribution to supporting the home environment acknowledged by others as a supportive environmental determinant of fruit and vegetable consumption.
In other studies parenting styles, control and feeding practices (69, 78, 80, 84, 94, 97) have been considered to be important determinants of fruit and vegetable consumption. The provision of quality foods and establishing routines for healthy eating need to be established with parents from a very early age (55). Children rely on their parents to provide appropriate foods, and to encourage, support and enable them to be involved making their own choices about healthy eating (56). Whilst encouragement from parents is a desirable determinant of fruit and vegetable consumption, it can also be a barrier if misdirected.

A large proportion of the participants have reported that their parents have provided encouraging home environments for fruit and vegetable consumption. The encouragement from parents is mentioned in other studies (44, 45, 80) as one of the environmental determinants related to fruit and vegetable consumption. The results suggest that the appropriate environmental determinants for fruit and vegetable consumption existed for this group of participants. Other environmental determinants that support consumption of fruits and vegetables mentioned in the literature (44, 45, 80) include access to fruits and vegetables and exposure to trying new fruits and vegetables. The design of this study has been able to capture these determinants in a limited way through asking the participants, but has been unable to verify access to fruits and vegetables or exposure to trying fruits and vegetables through family eating habits or parental consumption levels.

5.6 Strengths of the project

The research project was guided by the holistic, ecological, salutogenic health promotion paradigm (14, 24), the Health Promoting Schools Model (81, 84), the Health Promotion Evaluation Framework (93) and the Red Lotus Health Promotion Model (24). The design of the impact evaluation, including the methodology, development of data collection instruments, and the data collection process, was strengthened by the use of these models and frameworks.

The Kids in the Kitchen program was developed using the Health Promoting Schools model in its development and implementation. The program addressed the three components of the model: curriculum, teaching and learning; school ethos or environment; and partnership - community links with the school community. This process
incorporated delivering the program through existing curriculum units in Grades one and five.) (curriculum, teaching and learning); creating a supportive environment for children to learn about, prepare and taste fruits and vegetables (school environment); developing children’s personal skills in food preparation (curriculum, teaching and learning); and strengthening the capacity of the school community to support children’s fruit and vegetable consumption (partnership – community links). The utilisation of the Health Promoting Schools model guided facilitation of the program to reach the appropriate school personnel to enable the program to reach the classroom, create an appropriate positive social environment to support the children learning and involve parents in the school environment.

This research project utilised the impact evaluation component of Hawe, Degeling and Hall Health Promotion Evaluation Framework (93). The evaluation of the Kids in the Kitchen program therefore focused on the immediate effects of the program. The development of the evaluation instruments followed the steps for impact evaluation and included the determinants of fruit and vegetable consumption. The evaluation tools consisted of a questionnaire and a skill audit and addressed cognitive factors (knowledge and attitudes), skills (in the preparation of fruits and vegetables), behaviours (trying and eating), and environmental factors (availability of fruit and vegetables in the home, parental attitudes towards fruit and vegetable consumption). These determinants therefore provided the content components of the data collection tools and structure for the reporting of the results and discussion sections of the thesis.

The arrangement of the content and types of questions used in the questionnaire and skill audit was guided by engaging the participants. The skill audit was also guided by risk management. Participation and empowerment were therefore the values used to guide data collection which is consistent with the values and principles component of the Red Lotus Health Promotion Model (24).

The school’s planning team, consisting of the Principal, Head of Curriculum, teachers and parents, were all consulted prior to the impact evaluation. Decisions were made in relation to the best process to obtain parental consent and data collection methods. Projected timelines and processes were then finalised and communicated to the school team. This collaborative process is also consistent with the values and principles
component of the Red Lotus Health Promotion Model (24). The data collection process was therefore managed to meet the research aims.

The data collection process was enabled in the following ways. Firstly, by utilising the participants’ normal school program and collecting data at two time points within the school program for each Grade level, before and after the implementation of the *Kids in the Kitchen* program. Secondly, by providing assistance to read the questionnaire (Appendix E), the Grade one students were assisted by their Grade 11 ‘buddy’ readers and writers to enable them to answer all parts of the questionnaire. Lastly, all students in the targeted Grades were included in the data collection process. This was especially important for the skill audit (Appendix F) which provided an opportunity for all Grade one participants to demonstrate their skills.

The skill audit tool (Appendix F) was easy to use as an observation checklist and provided valuable raw data about individual skill competency. The skills demonstrated by the Grade one participants were able to be rated by the three standards that were clearly displayed relating to safety and confidence. This tool was useful to capture specific skills such as cutting, peeling and grating, related to the task of fruit and vegetable preparation. The process was able to consistently rate each participants’ actions. The skill audit tool was therefore able to collect specific data related to skill competence not recognised by the participants themselves.

The frameworks and models which guided the evaluation process provided appropriate structural guidance for the evaluation process. The research project has therefore been able to report on the research aims which related to the participants’: knowledge of fruits and vegetables; attitudes towards eating fruits and vegetables; consumption of fruits and vegetables; environmental supports in the home for the consumption of fruits and vegetables; and skills in preparing fruits and vegetables.

### 5.7 Limitations of the project

The limitations of this research project include its single setting and timeframe, the questionnaire design and the extent of data analysis.
This research project was limited to Chancellor State College, over a six month period from July to December 2007. The findings therefore cannot be generalised beyond this group of participants. The results of the Kids in the Kitchen program are based on a pre-test - post-test format with no follow up testing and included participants from two different Grades. This means the results are based on the Kids in the Kitchen program which ran for about ten weeks for the two different Grades. The skill audit tool was only used with the Grade one participants. These limitations could imply that the single setting limits the ability of the research to find any differences within different cultural contexts. Ten weeks is a limited time period for skills to develop and without follow up testing the sustainability of the program impacts are unknown.

The data analysis was conducted on the total number of participants (n=118). The skill audit was conducted on 72 Grade one students due to its use as a safety audit tool for this Grade only.

This research project therefore recognises that the findings are limited to Chancellor State College, Kids in the Kitchen program participants for 2007.

5.8 Conclusion

This chapter discussed the research results in reference to the theoretical foundations and the literature. It examined the impacts on the participants’ knowledge about fruits and vegetables; attitudes towards eating fruits and vegetables and consumption of fruits and vegetables; skills in preparing fruits and vegetables; and environmental supports in the home for the consumption of fruits and vegetables. It also examined the strengths and limitations of the project.

This research project provides evidence that development of food preparation skills through a classroom based strategy can have a positive impact on children’s knowledge, attitudes, consumption and skills. There were significant improvements in the participants’ knowing, trying, liking and eating fruits and vegetables at the end of the program. Attitudes towards fruits and vegetables were found to be favourable and were shown to be related to behaviours associated with trying new fruits and vegetables.
6 CONCLUSION AND RECOMMENDATIONS

The purpose of this thesis was to report on the impact evaluation of the Kids in the Kitchen school based health promotion program implemented from July to December 2007 at Chancellor State College on the Sunshine Coast, Queensland, Australia. This included: the impact on the participants’ knowledge about fruits and vegetables; attitudes towards and consumption of fruits and vegetables; skills in preparing fruits and vegetables; and environmental supports in the home for the consumption of fruits and vegetables.

The evaluation of the Kids in the Kitchen program used two tools to collect: a questionnaire and a skill audit. These tools collected information about the participants’ knowledge, attitudes, behaviour, skills and environmental determinants as well as demonstrate the skills pre and post the Kids in the Kitchen program. Data collection took place within the normal school program with Grade one and Grade five students. The evaluation strategy was guided by the holistic, ecological, salutogenic health promotion paradigm (14, 24), the Health Promoting Schools model (81, 84), the Health Promotion Evaluation Framework (93) and the Red Lotus Health Promotion Model (24).

A total of 118 children participated in the evaluation. There were significant improvements in participants’ recognition of a number of fruits and vegetables including plums, mangoes, peaches, pineapple, dates, cucumber, radishes, chickpeas, eggplant, baby carrots, cauliflower and sweet potato. There were also significant improvements in participants’ attitudes towards eating fruits and vegetables, and skills in the preparation of fruits and vegetables. Participants’ attitudes towards trying new fruits and vegetables were associated with behaviours such as eating fruit and vegetables for health or taste, and environmental determinants such as availability of fruits and vegetables at home and encouragement from parents. Overall, the findings suggest that the program has had a positive impact on participants’ knowledge, attitudes behaviours and skills related to fruits and vegetables.
6.1 **Recommendations for future research**

- Replicate the project in other schools to determine if the project is transferable to other school settings.
- Determine if there are differences in impact on participants’ knowledge, attitudes and skills based on age, gender or other factors such as socioeconomic status.
- Investigate potential links between identifying fruits and vegetables and regular eating.
- Investigate why children like some fruits and vegetables and not others.

6.2 **Recommendations for Chancellor State College**

- Inform staff and community of the positive impact that the *Kids in the Kitchen* program had on their students’ knowledge, attitudes and skills and the relevance of these findings to the determinants of children’s fruit and vegetable consumption.
- Continue to support fruit and vegetable preparation opportunities for all students in appropriate curriculum units from Prep through to Grade 12.

6.3 **Recommendations for schools as settings for health promotion**

- Use the *Kids in the Kitchen* program as an example of a school based health promotion process in practice.
- Include fruit and vegetables preparation be included as a classroom based activity in school based nutrition programs.

6.4 **Recommendations for partnerships or networks in the health promotion process**

- Use the *Kids in the Kitchen* program as an example to develop partnerships to publish the resources from the program.
- Use the *Kids in the Kitchen* program within other settings where there are opportunities for parent and children interaction such as child care centres to continue development of supportive environments for fruit and vegetable consumption.
The *Kids in the Kitchen* program has provided an example of health promotion practice in a school setting. Evidence gathered in this project has shown positive impacts on participants’ knowledge, attitudes, behaviour and skills with respect to fruit and vegetable consumption. This has provided new knowledge about the effects of a food preparation strategy on the determinants of children’s fruit and vegetable consumption. The project has highlighted the benefits of using an innovative pedagogy of hands-on food preparation activities to support dual educational and health outcomes. In summary, the findings support the notion that if children are involved in the preparation of fruit and vegetables, they are more likely to know them, try them, like them and eat them.
7 REFERENCES


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Dear Barb and Lily

EXPEDITED ETHICS APPROVAL FOR RESEARCH PROJECT – Evaluation of the Kids in the kitchen project
(Project S/07/107)

On 27 June 2007, following review of the application for ethics approval of the research project, Evaluation of the kids in the kitchen project, (S/07/107), the Chairperson of the Human Research Ethics Committee of the University of the Sunshine Coast granted expedited ethics approval for the project. The period of ethics approval is from 1 July 2007 to 30 June 2008.

Could you please note that the ethics approval number for the project is HREC: S/07/107.

The conditions of approval for this project are that you:

1. conduct the research project strictly in accordance with the research proposal submitted and granted ethics approval, including any amendments required to be made to the proposal by the Human Research Ethics Committee (except as subsequently amended and approved by the Committee or approved by delegated authority exercised by the Chairperson or a Sub-committee); and

2. inform the Human Research Ethics Committee immediately of anything which may warrant review of ethics approval of the research project, including:

- serious or unexpected adverse effects on participants;
- proposed changes in the protocol;
- unforeseen events that might affect continued ethical acceptability of the project; and

(A written report of any adverse occurrence or unforeseen event that might affect the continued ethical
acceptability of the research project must be submitted to the Chairperson of the Human Research Ethics Committee by no later than the next working day after recognition of an adverse occurrence/event.)

3. make no change to the project as approved in its entirety by the Committee, including any wording in any document approved as part of the project, without the prior written approval of the Committee for any change; and

4. provide the Committee with a written Annual Report on the research project on completion of the project by 30 June 2008, using the proforma “Annual Report on Approved Research Project Involving Humans”; and

5. if the research project is discontinued, advise the Committee in writing within 24 hours of the discontinuation; and

6. comply with each and all of the above conditions of approval and any additional conditions or any modification of conditions which may be made subsequently by the Human Research Ethics Committee.

The Human Research Ethics Committee will review the Chairperson’s grant of approval and the conditions of approval at its next meeting and should there be any variation of the conditions of approval you will be informed as soon as practicable.

You are advised that failure to comply with the conditions of approval and the National Statement on Ethical Conduct in Research Involving Humans may result in withdrawal of approval for the Project.

Should you require an extension of your period of ethics approval, please submit a written request for this purpose using the proforma “Annual Report on Approved Research Project Involving Humans”.

The Annual Report on this activity will be due by no later than 30 June 2008.

An electronic version of the proforma “Annual Report on Approved Research Project Involving Humans” may be accessed via the Staff or Student Drive or Intranet in the Human Ethics forms folder within the Research folder.

If you have any queries in relation to this matter or if you need any further information please contact me by e-mail at jthomas2@usc.edu.au or by telephone on (07) 5459 4574.

Yours sincerely
Jodie Thomas
Secretary
Human Research Ethics Committee
Appendix B

CHANCELLOR STATE COLLEGE

RESEARCH PROJECT

INFORMATION SHEET

Project Title:

_Evaluation of the “Kids in the Kitchen” Project_

**Description and purpose of the Research Project:**

Kids in the Kitchen is a health promotion project that aims to increase children's fruit and vegetable consumption by increasing their knowledge of and attitudes towards eating fruit and vegetables, and their skills in preparing fruit and vegetables for consumption. The project has been implemented at Chancellor State College since 2004. Kids in the Kitchen utilises the Health Promoting Schools Model and involve three strategies: 1. a classroom based strategy; 2. professional development for staff and volunteers; and 3. school policy around healthy eating. This research focuses on evaluating the impact and outcomes of Kids in the Kitchen at Chancellor State College in 2007. Evaluation research will be used to assess changes in children's fruit and vegetable consumption, knowledge levels, attitudes towards fruits and vegetables and food preparation skills. The evaluation research model that will be used is the Hawe, Degeling and Hall Health Promotion Evaluation Framework(1990).

This Research project will be conducted at Chancellor State College Primary Campus from July to December 2007. It will involve the students in year 5 who are studying the unit of excellence “What can food do for me?” in term 3 and the year 1 students studying “What should I eat today?” in term 4. There will be benefits of this project for the students through increasing opportunities to obtain appropriate knowledge, attitudes and food preparations skills towards the consumption of fruits and vegetables. Students will also benefit from improved health, behaviour and desire to learn and try new experiences related to food. For the volunteers and teachers there is also opportunities to learn new skills and knowledge related to food preparation. As a volunteer in the program there is also the positive influence of being involved in your child's classroom and sharing in the health related discussions alongside the activities.

Through collecting the information from the children’s activities, it is desired to gain a better understanding of the practice of health promotion within a school setting and how health
promotion strategies can be used to influence children’s fruit and vegetable consumption levels. It may assist Chancellor State College and others involved in health promotion in informing about increased understanding of pedagogy for bringing about changes in children’s fruit and vegetable consumption levels and in developing resource materials so that others can also bring about change in children’s fruit and vegetable consumption levels. Lastly, this project will contribute to the body of knowledge about health promotion in schools.

How can you be involved?

1. For students:
   a) Participate in the classroom activities in the unit of excellence
      Year 5 – “What can food do for me?”
      Year 1 - “What should I eat today?”

   b) Ask your parents to sign the consent form which allows for your work on the questionnaire and food diary at the beginning and end of the unit to be used for research purposes.

2. For parents:
   a) Sign the consent form for your student’s work on the questionnaire and food diary at the beginning and end of the unit to be included in the research data collected about the health promotion project.

   b) Attend an afternoon tea training session to find out more about Kids in the Kitchen classroom activities and the skills the children will be learning.

   c) Volunteer to supervise in the classroom activities related to food preparation.

Who will benefit from this research?

Participant Benefits
Students will benefit from improved health and wellbeing through obtaining appropriate knowledge, attitudes and food preparations skills towards the consumption of fruits and vegetables. Students will also benefit from improved healthy behaviour through a desire to learn about and try new experiences related to food.

Benefits for Others
This research project is a study towards a Masters of Science degree by the principal investigator.

What does this all this mean for you if you participate?
Voluntary Participation
Participation in this study is voluntary. You do not have to give any reason to anyone if you decide not to take part. If you do decide to volunteer but later change your mind, you may stop participation at any time without the need to provide an explanation in which case any information already provided by you will be excluded from the analysis, unless you give your permission to include this information.

Before participating in the nutritional study, we would like you to give your “informed consent” by signing the appropriate form called Consent to Participate in Research. This form is attached to this Research Project Information Sheet. This form will also have to be signed by your parents or carers. “Informed consent” means that you give your consent to volunteer because you have been fully informed of what is required of you should you choose to participate. The information provided above is supplied to help you to decide whether or not to do so.

Privacy considerations:
This study will not be possible without the willingness of yourself and other students to participate and “informed consent” will be sought from yourself and your parents prior to data collection and all aspects of this study will conform with the University of the Sunshine Coast Human Research Ethics Committee Guidelines for ethics approval for research involving humans, in particular research involving children. In addition, the required approvals will be obtained from Education Queensland for research involving school children. As researchers, we will respect the privacy and the well-being of yourself and other volunteer students throughout the study. All meetings and discussions between yourself and our research team will be at Chancellor State College only and subject to prior arrangement with the Principal, School staff and volunteer students.

Participation in the study will involve the collection of personal information such as your name, gender and school contact details through the use of a code allocated to each participant. The investigators will ensure that your personal information remains confidential. All volunteers have the right to see and correct personal information obtained during the study.

Food Diaries and Questionnaires will be de-identified prior to distribution, with the use of a code for each participant. In other words, your name will not appear on either the food diary or the questionnaire to respect your privacy.
It is likely that the de-identified data obtained from the study will be used to prepare a publication for submission to a health promotion journal, and for presentation at a health promotion conference. The Principal Investigator will provide the results of the study in written form to Chancellor State College and also at a seminar in 2008 at the University of the Sunshine Coast.
as part of her Masters Dissertation. Parents of participants will be notified of the exact date and you and other interested parties are welcome to attend.

**Further Information**

*Volunteers may contact the Principal Supervisor with regard to any matter of concern about the research on the contact number/e-mail addresses provided above.*

*If you have any complaints about the way this research project is being conducted you can either raise them with the Principal Investigator or, if you prefer an independent person, contact the Chairperson of the Human Research Ethics Committee at the University of the Sunshine Coast: (c/- The Secretary, University of the Sunshine Coast, Maroochydore DC 4558; telephone (07) 5430 1144; facsimile (07 54301111; e-mail*

*Ms Lily O’Hara, Ms Jane Gregg and the University of the Sunshine Coast, appreciate your participation in the research project.*

The investigators gratefully acknowledge the endorsement and support provided for this project by the Principal and Staff of Chancellor State College.

**Student and Principal Investigator:**

*Name:* Barbara Ritchie, Dip. T., B.Ed., Grad Dip Early Childhood  
*Position:* Masters of Science Student, Faculty of Science, Health and Education at the University of the Sunshine Coast  
*Phone:* (Mob) 0421 860 355  
*Email:* britc9@eq.edu.au

Experience: Barbara Ritchie is a trained Secondary Home Economics and Hospitality teacher at Chancellor State College. She has also completed further study in early childhood education to follow up her interest in young children's development. Barbara developed the Kids in the Kitchen project in 2004 and has implemented it each year at Chancellor State College since then. She has undertaken a comprehensive process evaluation of the project over the past two years to ensure its readiness for this impact and outcome evaluation research.
Principal Supervisors:

Name: Ms Lily O’Hara  
Position: Lecturer in Public Health, Faculty of Science, University of the Sunshine Coast  
Phone: W) (07) 54302824  
Email: lohara@usc.edu.au

Expertise: Lily O’Hara has a professional background as both a health promotion practitioner and academic. Her work has focused on: building the capacity of communities, organisations and health workers to address the determinants of health; and patterns of health related behaviours, beliefs and attitudes. Work on building capacity has included the assessment and development of infrastructure, systems and practice knowledge and skills. Work on patterns of health-related behaviours, beliefs and attitudes includes work on body image, eating behaviours, physical activity, social activity, food safety and the environmental conditions that impact on these. She has managed large-scale community health promotion projects up to the value of $250,000 per annum. She has presented many workshops, seminars and lectures for health and education professionals, community organisations and schools on contemporary health promotion issues and best-practice. Lily has presented her work at national and international conferences and published in peer-reviewed journals.

Name: Ms Jane Gregg,  
Position: Lecturer in Public Health, Faculty of Science, University of the Sunshine Coast  
Phone: W) (07) 54594639  
Email: jgregg@usc.edu.au

Expertise: Jane Gregg is a qualified teacher, health promotion practitioner and academic. Her work has focused on community-based health promotion projects across a broad range of issues, evaluation of social and environmental programs, and participatory theories of practice in education and health promotion fields. She has extensive experience in the management and operation of large multi-disciplinary evaluation research projects gained through her work as a private consultant, and managed projects up the value of $200,000 per annum. Jane has presented many workshops, seminars and lectures for a range of health and health related sectors in health promotion best practice and participatory evaluation research. Jane has a particular interest in school-based health promotion research and the facilitation of collegial learning processes.
CONSENT TO PARTICIPATE IN RESEARCH

Project Title:
*Evaluation of the “Kids in the Kitchen” Project*

**Brief Description of Research Project:**
This Research project will be conducted at Chancellor State College Primary Campus from July to December 2007. It will involve the students in year 5 who are studying the unit of excellence “What can food do for me?” in term 3 and the year 1 students studying “What should I eat today?” in term 4. It will be investigate the effect of the “Kids in the Kitchen” project has on children’s knowledge of fruits and vegetables, attitudes towards fruits and vegetables, skills of preparing fruits and vegetables and consumption of fruits and vegetables?

As a part of the Kids in the Kitchen project, a number of classroom activities have been designed for students to reflect of their own knowledge, attitudes, and skills of preparing fruits and vegetables and what fruits and vegetables they consume. This will include a questionnaire about the types of fruits and vegetables they may know and eat along with other questions about their attitudes towards eating fruits and vegetables and questions about their skills to prepare fruits and vegetables. It will also include an activity about a food diary, recalling what they ate in the previous 24 hours. The students will complete these activities at beginning and end of the unit of excellence. The information generated by the students reflections in their classroom is also ideal data for the evaluation process of the project. Permission is sort to use this data for research purposes outlined above.

**Freedom of Consent:**
I have read and understood the “Research Project Information Sheet”, which outlines the research aims, methods, and privacy aspects of this research project. “I understand that:
• I do not have to participate in this research study if I do not want to; and
• I can withdraw from the study at any time and I do not have to give any reasons for withdrawing; and
• If I do choose to withdraw from the research study at any time, information received from me or pertaining to me that was obtained prior to my withdrawal may be used as follows:
• Individual information (eg completed food diary or questionnaire) still used if permission granted,
• I will not be penalised or treated less favourably if I do withdraw from the study.
• Feedback will be made available in the form of a lay summary of the overall outcomes of the research.
• Any personal information provided by or obtained about me will be kept confidential, and only de-identified data will be used in any publication or presentations resulting from this research project.”

I understand the contents of the Research Project Information Sheet for the research project “Evaluation of the “Kids in the Kitchen” Project” and this Consent to Participate in Research form. I agree to allow my student to participate in this research project and give my consent freely. I understand that the project will be carried out as described on the Research Project Information Sheet, a copy of which I have kept. I realise that whether or not I decide to participate is my decision and will not affect my studies. I also realise that I can withdraw from the study/project at any time and that I do not have to give any reasons for withdrawing. Any questions I had about this research project and my participation in it have been answered to my satisfaction.

________________________________     _____________
Student                              Date

________________________________     _____________
Parent/Caregiver                    Date

________________________________     _____________
Independent Witness                Date

________________________________     _____________
Principal Investigator             Date
Appendix D

PRIVACY RECORD

Project Title:

*Evaluation of the “Kids in the Kitchen” Project*

The Nature of the Records of Personal Information kept by the Research Team

The personal information to be kept will include:

1. Gender, Age of participants
2. Name of participants on Record Sheet
3. Dietary information recorded in Food Diaries
4. Attitudes about food choices recorded on Questionnaires

All personal information will be kept in a locked cabinet in the office of the principal supervisor of the PI, along with hard and soft copies of the coding system to be used for de-identifying data. The PI will ensure that a participant cannot be identified from other records and publications or presentations resulting from this research project.

1. The Purpose for which each type of record is kept

1. Records of gender and age will be kept so these can be correlated with the information collected from the food diaries and questionnaire. Such records will be de-identified.

2. A record sheet of names and allocated codes will be kept to enable distribution of de-identified food diaries and questionnaires to participants.

3. The Classes of individuals about whom records are kept

Participants will be School children aged under 18 years enrolled in years 1 and 5 at Chancellor State College. Depending on the volunteers, the records kept may include those belonging to Indigenous Australians.
4. **The Period for which each type of record is kept**
Records will be kept until 31 December, 2012, when all publications resulting from the research will have been completed.

5. **The persons who are entitled to have access to the personal information contained in the records**
The participants in this research project will be able to have access to any record, created or obtained from this research project, that will be in the possession or control of the research team, and that contains personal information about them. Besides the participants, only the PI and her principal supervisor will have access to identifiable personal information. Other members of the research team will have access only to de-identified data.

6. **The conditions under which they are entitled to have that access**
As indicated in the ‘Research Project Information Sheet’, all volunteer participants have the right to see and correct personal information during the study. The PI and her principal supervisor will access data when required in order to contact participants via school administration or prepare tables of de-identified data.

7. **The steps that should be taken by persons wishing to obtain access to that information**
Participants can access their personal information at any time by Contacting the PI on the details provided on the ‘Research Project Information Sheet’. The PI and her principal supervisor will not disclose a participant’s personal information to any other party without the prior written consent of the participant.
Appendix E

Pre and Post – Health Promotion Program Child Survey

1. Which school year are you in? *(please circle one number)* 1 5

2. Are you a boy or girl? *(please circle answer)* Boy Girl

3. What are your 5 favourite foods?
   1 ........................................................................................................
   2 ........................................................................................................
   3 ........................................................................................................
   4 ........................................................................................................
   5 ........................................................................................................

4. Complete the fruit and vegetable recognition sheets. *(Separate sheets)*
   a) Write in the name of the fruit or vegetable next to the photo.
   b) Tick if you have tried the fruit or vegetable or not
   c) Tick if you liked it or not
   d) Use the following code to state how often you eat the fruit or vegetable
      1. I eat it every day
      2. I eat at least once a week
      3. I eat it sometimes
      4. I eat it rarely
      5. I never eat it
CSC - Kids in the Kitchen Program

Student ___________   Grade _____ Date _____

<table>
<thead>
<tr>
<th>Name:</th>
<th>Tried It?</th>
<th>Yes</th>
<th>No</th>
<th>Liked It?</th>
<th>Yes</th>
<th>No</th>
<th>Eat It?</th>
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</table>
### CSC - Kids in the Kitchen Program

#### Student _______ Grade _______ Date _______

| Name:          | Tasted | Liked | Eaten | | Name:          | Tasted | Liked | Eaten | | Name:          | Tasted | Liked | Eaten | | Name:          | Tasted | Liked | Eaten | |
|----------------|--------|-------|-------| |----------------|--------|-------|-------| |----------------|--------|-------|-------| |----------------|--------|-------|-------| |
|                | Yes    |        | 1 2 3 | |                | Yes    |        | 1 2 3 | |                | Yes    |        | 1 2 3 | |                | Yes    |        | 1 2 3 | |
|                | No     |       | 4 5   | |                | No     |       | 4 5   | |                | No     |       | 4 5   | |                | No     |       | 4 5   | |

| Name:          | Tasted | Liked | Eaten | | Name:          | Tasted | Liked | Eaten | | Name:          | Tasted | Liked | Eaten | | Name:          | Tasted | Liked | Eaten | |
|----------------|--------|-------|-------| |----------------|--------|-------|-------| |----------------|--------|-------|-------| |----------------|--------|-------|-------| |
|                | Yes    |        | 1 2 3 | |                | Yes    |        | 1 2 3 | |                | Yes    |        | 1 2 3 | |                | Yes    |        | 1 2 3 | |
|                | No     |       | 4 5   | |                | No     |       | 4 5   | |                | No     |       | 4 5   | |                | No     |       | 4 5   | |

| Name:          | Tasted | Liked | Eaten | | Name:          | Tasted | Liked | Eaten | | Name:          | Tasted | Liked | Eaten | | Name:          | Tasted | Liked | Eaten | |
|----------------|--------|-------|-------| |----------------|--------|-------|-------| |----------------|--------|-------|-------| |----------------|--------|-------|-------| |
|                | Yes    |        | 1 2 3 | |                | Yes    |        | 1 2 3 | |                | Yes    |        | 1 2 3 | |                | Yes    |        | 1 2 3 | |
|                | No     |       | 4 5   | |                | No     |       | 4 5   | |                | No     |       | 4 5   | |                | No     |       | 4 5   | |

| Name:          | Tasted | Liked | Eaten | | Name:          | Tasted | Liked | Eaten | | Name:          | Tasted | Liked | Eaten | | Name:          | Tasted | Liked | Eaten | |
|----------------|--------|-------|-------| |----------------|--------|-------|-------| |----------------|--------|-------|-------| |----------------|--------|-------|-------| |
|                | Yes    |        | 1 2 3 | |                | Yes    |        | 1 2 3 | |                | Yes    |        | 1 2 3 | |                | Yes    |        | 1 2 3 | |
|                | No     |       | 4 5   | |                | No     |       | 4 5   | |                | No     |       | 4 5   | |                | No     |       | 4 5   | |

| Name:          | Tasted | Liked | Eaten | | Name:          | Tasted | Liked | Eaten | | Name:          | Tasted | Liked | Eaten | | Name:          | Tasted | Liked | Eaten | |
|----------------|--------|-------|-------| |----------------|--------|-------|-------| |----------------|--------|-------|-------| |----------------|--------|-------|-------| |
|                | Yes    |        | 1 2 3 | |                | Yes    |        | 1 2 3 | |                | Yes    |        | 1 2 3 | |                | Yes    |        | 1 2 3 | |
|                | No     |       | 4 5   | |                | No     |       | 4 5   | |                | No     |       | 4 5   | |                | No     |       | 4 5   | |

| Name:          | Tasted | Liked | Eaten | | Name:          | Tasted | Liked | Eaten | | Name:          | Tasted | Liked | Eaten | | Name:          | Tasted | Liked | Eaten | |
|----------------|--------|-------|-------| |----------------|--------|-------|-------| |----------------|--------|-------|-------| |----------------|--------|-------|-------| |
|                | Yes    |        | 1 2 3 | |                | Yes    |        | 1 2 3 | |                | Yes    |        | 1 2 3 | |                | Yes    |        | 1 2 3 | |
|                | No     |       | 4 5   | |                | No     |       | 4 5   | |                | No     |       | 4 5   | |                | No     |       | 4 5   | |
5. What are your thoughts on the following?

Circle one number on each row

<table>
<thead>
<tr>
<th>Idea</th>
<th>agree a lot</th>
<th>agree a little</th>
<th>disagree a little</th>
<th>disagree a lot</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) I like trying new fruit</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>b) I like trying new vegetables</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>c) Eating fruit and vegetables every day keeps me healthy</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>d) Most fruit tastes bad</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>e) Most vegetables tastes good</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>f) We have vegetables with dinner most nights</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>g) There is usually lots of fruit around at home</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>h) I can get my own fruit and vegetable snacks at home</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>i) I’m good at preparing fruit and vegetables</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>j) I eat raw vegetables</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>k) My parents encourage me to eat my fruit and vegetables</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
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</tbody>
</table>

6. What skills do you have in preparing fruit and vegetables?

Circle one number on each row

<table>
<thead>
<tr>
<th>Skill</th>
<th>1. Not really that good (I do not do it that often)</th>
<th>2. OK (I only do it sometimes)</th>
<th>3. Good (I do this quite a bit)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Peeling some fruits with my fingers</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>b) Using a plastic knife to cut some fruits and vegetables</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>c) Using a knife and board with Adult supervision to cut up fruit and vegetables.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>d) Dicing an onion</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>e) Peeling to peel some fruits and vegetables</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>f) Mashing or Crushing fruits or vegetables to be used in a meal.</td>
<td>1</td>
<td>2</td>
<td>3</td>
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<tr>
<td>g) Grating safely to prepare some fruits and vegetables</td>
<td>1</td>
<td>2</td>
<td>3</td>
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<tr>
<td>h) Juicing a fruit or vegetable</td>
<td>1</td>
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<td>3</td>
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</table>
7. Do you want to say anything else about fruit and vegetables, learning about them at school or about this questionnaire? Please write in your comments.

___________________________________________________

___________________________________________________

___________________________________________________

THAT'S ALL THE QUESTIONS. THANK YOU FOR YOUR TIME AND INTEREST.
Appendix F

CHANCELLOR

STATE COLLEGE

University of the Sunshine Coast
Queensland, Australia

Participant code

SKILL AUDIT FOR KIDS IN THE KITCHEN

Date of observation: ...............  
Pre program skill demonstration ☐  
Post program skill demonstration ☐

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<th>Ingredients</th>
<th>Equipment</th>
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<tr>
<td>1 apple</td>
<td>Plastic Knife</td>
</tr>
<tr>
<td>1 carrot</td>
<td>Steak Knife</td>
</tr>
<tr>
<td></td>
<td>Peeler</td>
</tr>
<tr>
<td></td>
<td>Grater</td>
</tr>
<tr>
<td></td>
<td>Board</td>
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<tr>
<td></td>
<td>Apron</td>
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Procedure

1. Set up the ingredients and equipment on a table.
2. Give the following instruction to the student being assessed: “Show me how you could prepare the fruit and vegetable using the equipment provided”.
3. Record the level of skill demonstrated by the student using the following criteria. (✓) Tick the box

Assessment

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<th></th>
<th>1. Poor</th>
<th>2. Fair</th>
<th>3. Good</th>
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<tbody>
<tr>
<td></td>
<td>Not sure where to start and / or not safe with techniques</td>
<td>Knows what to do with the equipment but requires further instruction with safe techniques</td>
<td>Knows what to do with the equipment and prepares fruit and vegetable using safe techniques</td>
</tr>
<tr>
<td>Apple</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carrot</td>
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