

**Development, implementation and evaluation of a nutrition
education programme for primary school children in
resource limited settings in Pretoria**

by

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Declaration

I, Chido Linda Zambuko, declare that the dissertation presented for the degree of Master of Science in Nutrition at the University of Pretoria, is the result of my own work and has not been submitted, in partial or in full, for any other degree or professional qualification.

Name Chido Linda Zambuko

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Date

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Abstract

Background: School based nutrition education programmes play a critical role in promoting positive dietary change in children. Psychosocial mediators of behaviour change such as behaviour intentions, nutrition knowledge and self-efficacy motivate children to change nutrition behaviour.

Aim: To develop, implement and evaluate a school based nutrition education programme (NEP) tailored to the needs of seven to nine year olds living in resource limited settings in Pretoria, Gauteng Province, South Africa.

Study design: Quasi experimental without a control group.

Study setting: Two resource limited primary schools in Pretoria.

Study participants: Learners, aged seven to nine years, in Grades 1-3 from the two selected schools that met the inclusion criteria. Informed consent and assent were obtained.

Method: The NEP was developed based on analysis of the learners' dietary practices data as reported by the parents and learners. These data were collected as part of the situational analysis for a larger study and was availed to the researcher on completion of the data collection. The qualitative domain was employed to determine the nutrition education (NE) needs of the learners. The study then proceeded in two phases; Phase 1, which resulted in the development of the NEP and NE materials as informed by the literature review and the outcome of the situational analysis and guided by the Social Cognitive Theory, the South African Food Based Dietary Guidelines and the six steps for designing a NEP by Contento. In Phase 2, the NEP was implemented with a conveniently selected sample of Grade 1, 2 and 3 learners from the two schools (School 1 and 2). All participants received nine nutrition lessons over six weeks. The quantitative domain was employed to evaluate the effects of the NEP on the food choice intentions of Grade 1 learners, and self-efficacy and nutrition knowledge of Grade 2 and 3 learners. Outcomes were measured at baseline, at six weeks and at 12 months respectively. A modified validated Pathways knowledge, attitudes and behaviour questionnaire was used.

Paired t-test evaluated the effect of the NEP on the three outcomes and the independent samples test compared the differences between the schools and gender. The ANCOVA assessed the effect of school and gender on the measured outcomes, with the pre-assessment score as the

covariate. The McNemar test was used to compare differences between related percentages. The repeated measures ANOVA was used to assess the effect of time on the measured outcomes. The statistical package SPSS version 22 was used to analyse the data and a significance level of 0.05 was employed. Ethical approval was sought from the Faculties of Education and Health Sciences of the University of Pretoria (Number: **D2015/ 375A**). Approval was also sought from the Gauteng Department of Basic Education (DoBE), as well as the primary schools that were involved in the study.

Results: Situational analysis: The situational analysis revealed that the learners had unhealthy eating habits characterised by skipping breakfast, monotonous diets and high consumption of unhealthy energy dense foods in both the school and home environments. Some food groups such as legumes were completely missing from the learners' diets.

Evaluation of the NEP: Grade 1 (n=49) and Grade 2 and 3 learners (n=108), aged seven to nine years completed the study at six weeks and at 12 months. At post-assessment (six weeks), a significant improvement in the overall food choice intentions of Grade 1 learners was observed (M=0.41974 vs. M=0.5671; $P<0.0001$) (M=mean). Significant improvements were also observed in School 1 ($P=0.001$) and in School 2 ($P=0.014$) with a greater improvement in School 1. The girls in School 1 had significantly higher improvement in mean scores as compared to girls in School 2 ($P=0.0001$), while the boys in School 1 also had higher improvement in mean scores as compared to the boys in School 2, though not significant ($P=0.275$). However, at 12 months a significant decrease in the overall food choice intentions was observed from baseline to 12 months (M=0.436 vs. M=0.561 vs. M=0.446; $P=0.0002$) for Grade 1 learners.

At six weeks, a decrease for overall self-efficacy mean scores ($P=0.483$) of Grade 2 and 3 learners were observed in School 1 ($P=0.634$) and School 2 ($P=0.082$), although not significant. School 1 had non significant higher mean self-efficacy scores as compared to School 2 ($P=0.903$). The improvement in the mean self-efficacy score was significantly higher for girls in School 1 as compared to the girls in School 2 ($P=0.036$). The boys in School 2 had higher non significant mean improvement of scores as compared to the boys in School 1 ($P=0.351$). At 12 months a significant decrease in overall self-efficacy mean scores was observed from baseline to 12 months (M=0.801 vs. M=0.791 vs. M=0.735; $P=0.000$) for the Grade 2 and 3 group as a whole.

A significant improvement was observed in overall nutrition knowledge at post-assessment (six weeks) ($P=0.014$) and at follow-up (12 months) ($P=0.000$) for the Grade 2 and 3 learners. The improvement in overall nutrition knowledge mean scores in the individual schools was not significant ($P>0.05$). Higher mean nutrition knowledge scores were observed for School 1 as compared to School 2 ($P=0.687$). The girls had a significantly higher improvement as compared to the boys ($P=0.047$).

Conclusion: A tailored NEP can improve food choice intentions of Grade 1 learners and nutrition knowledge of Grade 2 and 3 learners in resource limited settings. Although knowledge was retained at follow-up but not food choice intention, further studies using randomisation, as well as assessing actual dietary behaviours are needed.

Key words: Nutrition education, self-efficacy, Social Cognitive Theory, resource limited, behavioural intent, nutrition knowledge.

Presentations arising from this study

Zambuko CL, Gericke GJ, Muchiri JW. The effect of a tailored nutrition education programme on food choice intentions of Grade 1 learners in resource limited settings of Pretoria. Poster presentation at Faculty Day, Faculty of Health Sciences, University of Pretoria. August 2016, Pretoria, South Africa.

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List of abbreviations

ANCOVA	Analysis of covariance
ANOVA	Analysis of variance
APPLES	Active Programme Promoting Lifestyle Education in School
CATCH	Child and Adolescent Trial for Cardiovascular Health
DoBE	Department of Basic Education
EO	Expected outcome
FAO	Food and Agricultural Organization
FBDGs	Food based dietary guidelines
FCI	Food Choice Intentions
HPS	Health Promoting Schools philosophy
IDF	International Diabetes Federation
KAB	Knowledge Attitudes and Behaviour
LMIC	Low and Middle Income Countries
NE	Nutrition education
NEP	Nutrition education programme
PRA	Participatory Reflection and Action
QoL	Quality of life
RTC	Randomised Control Trial
SA	South Africa
SAFBDGs	South African food based dietary guidelines
SAMRC	South Africa Medical Research Council
SANHANES	South African National Health and Nutrition Examination Survey
SCT	Social Cognitive Theory
TPB	Theory of Planned Behaviour
UP	University of Pretoria
US	Unites States
ZHJ	Zimbabwe Hand Jive

Chapter 1: Introduction

1.1 Background

Healthy eating involves eating practices and behaviours that are consistent with improving, maintaining and enhancing health (Taylor, Evers & McKenna, 2005; Haerens, Deforche, Maes, Cardon, Stevens & De Bourdeaudhuij, 2006). It is vital for optimal growth, health and wellbeing of all humans (Wang & Stewart, 2013). Individual factors, namely biological factors (age, sex), food preferences, knowledge and attitudes pertaining to health and food, and collective factors including economic, social and physical environment determine healthy eating among children and adolescents (Taylor *et al.*, 2005). Food preferences, familial factors and food environment (community, home or school) have been identified as major determinants of healthy eating in children and adolescents (Taylor *et al.*, 2005).

Unhealthy eating habits lead to dietary excesses or inadequacies which may impact negatively on the health, physical and mental development of children (Taylor *et al.*, 2005; Wang & Stewart, 2013; Faber, Laurie, Maduna, Magudulela & Muehlhoff, 2014). Unhealthy eating habits during childhood also set a stage for unhealthy eating habits in adulthood (Taylor *et al.*, 2005). In addition to the above, unhealthy eating habits and physical inactivity have been implicated in the rising epidemic levels of childhood overweight and obesity in both developed and developing countries (Taylor *et al.*, 2005; Haerens *et al.*, 2006; Baleta & Mitchell, 2014; Dudley, Cotton & Peralta, 2015). Several studies also suggest that the high prevalence of many non-communicable diseases such as diabetes and hypertension is due to unhealthy eating habits and patterns developed during childhood (Taylor *et al.*, 2005; Haerens *et al.*, 2006; Dudley *et al.*, 2015).

Research suggests that nutrition promotion is an accessible and effective tool in the development of nutrition related practices in the youth (Wang & Stewart, 2013; Kupolati, MacIntyre & Gericke, 2014b; Dudley *et al.*, 2015). Furthermore, several studies have shown that the school environment can play a major role in optimal nutrition promotion and dietary changes (Faber *et al.*, 2014) by creating a supportive environment that enables children to make healthy food choices (Wang & Stewart, 2013). Evidence has also shown that parental influences on food choices decrease when children are at school, while peer influences,

together with the school food environment, become stronger determinants of food choices (Wang & Stewart, 2013).

Due to the captive audience and the large amount of time spent at school (Wang & Stewart, 2013), in addition to the natural learning environment and numerous opportunities for peer interaction, the school environment offers scope for improvement towards promoting healthy eating (Faber *et al.*, 2014). The learners equipped with knowledge and skills are potential agents of change and can spread the messages to the larger population, thereby facilitating social change and health promotion (Wang & Stewart, 2013).

The school food environment has been documented to be a significant promoter of unhealthy eating in children and adolescents in many countries, including South Africa (Wechsler, Devereaux, Davis & Collins, 2000; Temple, Steyn, Myburgh & Nel, 2006; Briefel, Crepinsek, Cabili, Wilson & Gleason, 2009; Faber *et al.*, 2014; Pehlke, Letona, Hurley & Gittelsohn, 2015). Faber *et al.* (2014) also confirm that the school food environment is not conducive for healthy eating in poorly resourced schools in South Africa. In addition to the above, the communities surrounding these schools in South Africa are characterised by poverty, limited resources (Draper, de Villiers, Lambert, Fourie, Hill, Dalais, Abrahams & Steyn, 2010), high crime rates, alcohol and substance abuse (de Villiers, Steyn, Draper, Fourie, Barkhuizen, Lombard, Dalais, Abrahams & Lambert, 2012), which further perpetrate unhealthy eating.

Nutrition education (NE) is one of the strategies used to establish healthy eating practices in children (Dudley *et al.*, 2015). It is essential for the improvement of nutritional status, health and nutrition knowledge, attitudes and behaviours (KAB) (Kupolati *et al.*, 2014b). As defined by Contento (2007), nutrition education is “any set of learning experiences designed to facilitate the voluntary adoption of eating and other nutrition related behaviours conducive to health and wellbeing” (Contento, 2007). This study will therefore report on a nutrition education programme (NEP) designed for learners living in resource limited communities in Pretoria, South Africa.

The NEP was part of a multidisciplinary health promoting intervention that focused on the holistic wellbeing of children aged seven to nine years in resource limited communities. The study at large involved researchers from various disciplines: the Departments of Educational

Psychology, Science, Mathematics and Technology Education, Physiology and Human Nutrition at the University of Pretoria (UP).

A situational analysis for the South African context was undertaken to guide the development of the multidisciplinary intervention and data for the different aspects of the intervention were generated. These included the nutritional status/ anthropometrical status, home and school food environment, physical activity, psycho-social functioning and scholastic performance and the needs and expectations for a healthy lifestyle and intervention. Data were generated by means of questionnaires with learners and parents, and workshops with the learners and teachers based on Participatory Reflection and Action (PRA) principles. However, only data on food related practices were analysed and reported in this study.

Information from the situational analysis and the literature review guided the development of a culturally sensitive NEP, focusing on utilising schools as potential sites for social change, which was the focus of this study. A school based NEP guided by the Social Cognitive Theory (SCT) was designed and its impact on the learners' nutrition knowledge, self-efficacy and intention to choose healthy foods was evaluated.

This study therefore aimed to determine whether a theory based NEP guided by the South African Food Based Dietary Guidelines (SAFBDGs) would improve the nutrition knowledge, self-efficacy and food choice intentions (KAB) of learners aged seven to nine years in resource limited communities of Pretoria, Gauteng Province, South Africa.

1.2 Problem statement

South Africa (SA) faces both the consequences of nutritional deficiencies and excesses (double burden of malnutrition). The prevalence of obesity in adults, higher in females (38%) than males (13.3%), has risen significantly from 23.5% in 2008 to 27.2 % in 2012 as documented in the first South African National Health and Nutrition Examination Survey (SANHANES-1) of 2012 (Shisana, Labadarios, Rehle, Simbayi, Zuma, Dhansay, Reddy, Parker, Hoosain & Naidoo, 2014). Obesity/ overweight is not only rising in adults, but has also reached alarming rates in children with 22% of girls and 17% of boys in primary schools being reported to be overweight or obese in South Africa (Naidoo, Coopoo, Lambert & Draper, 2009). Furthermore, a significant proportion of children in SA (25.5%) are stunted and wasted (Shisana *et al.*, 2014). This may also contribute to the increasing adult obesity prevalence since several studies have

proposed an association between childhood stunting and excess weight gain later in life; the risk being nearly two fold in stunted children (Steyn, Labadarios, Maunder, Nel & Lombard, 2005; Naidoo *et al.*, 2009). Obesity has been proven to track from childhood to adulthood (Naylor, Macdonald, Zebedee, Reed & McKay, 2006) deeming intervention during childhood important.

South Africa records the highest prevalence rates of obesity and its co-morbidities (cardiovascular diseases, type 2 diabetes and various cancers) in Sub-Saharan Africa (Sartorius, Veerman, Manyema, Chola & Hofman, 2015). The rapid demographic and nutrition transitions have been implicated in the changes in diet and lifestyle being observed in South Africa, and the latter are associated with the rapid increase in obesity and its co-morbidities (Steyn *et al.*, 2005).

The high prevalence rate of obesity in SA, especially within the female gender, is attributed to several factors, including body image and a preference for a larger body size. A larger body size is perceived to be associated with being attractive by South African black women (Sartorius *et al.*, 2015). In addition to the aforementioned, very few overweight black South Africa women perceive themselves as overweight and associate thinness with HIV/ AIDS (Kruger, Venter, Vorster & Margetts, 2002). This has a bearing on children's nutrition attitudes and practices as parental nutrition related knowledge and attitudes influence those of their children (Sartorius *et al.*, 2015). Research evidence has found that mothers who over-emphasise their concerns about body weight are significantly more likely to pass on these attitudes to their children (Webber, Cooke & Wardle, 2010).

Unhealthy eating habits are the order of the day for many South African learners as they have easy access to school tuck-shops and informal traders (de Villiers *et al.*, 2012; Faber *et al.*, 2014). The latter mostly (70%) sell foods of low nutritive value, high in fats and sugars, inclusive of cold-drinks, chips and fried cakes. Consumption of fruits and vegetables has been reported to be as low as less than three times a week in urban primary school learners. The majority of learners (60%) live a physically inactive life, defying the recommended 30-60 minutes of moderate to vigorous activity on most days (Naidoo *et al.*, 2009).

Furthermore, the learners come from communities that are poverty stricken and lack basic resources and this, together with the high food prices and easy access to inexpensive low

nutritive value foods, drive the poor eating habits in resource limited settings in SA (Abrahams, de Villiers, Steyn, Fourie, Dalais, Hill, Draper & Lambert, 2011). De Villiers *et al.* (2012) reported that many learners are exposed to tobacco use, child abuse, neglect, crime and violence both at school and community.

School based interventions have been identified as a platform to promote healthy lifestyles in children. However, intervening in schools located in resource limited settings still poses as a challenge. The schools lack resources, have minimal parental involvement (de Villiers *et al.*, 2012) and lack policies regulating healthy lifestyles (Draper *et al.*, 2010). They usually have poorly motivated educators and learners which impede adoption of new interventions (de Villiers *et al.*, 2012). However, literature demonstrates success in school based interventions in different settings, such as the Pathways intervention conducted with American Indian Children in Arizona, New Mexico, and South Dakota. The Pathways intervention produced significant positive changes in fat intake, and food and health-related knowledge and behaviours (Stevens, Story, Ring, Murray, Cornell & Gittelsohn, 2003).

Although NE has been shown to improve nutrition KAB that may result in improved nutrition status, very little research has been done on the impact of school based NEPs in SA (Oldewage-Theron & Napier, 2011). NE interventions may be instrumental in reducing the gap between dietary recommendations and intake behaviour indicated by the rising levels of malnutrition in South Africa.

1.3 The purpose of the study

The aim of the study was to develop, implement and evaluate a school based NEP tailored to the needs of seven to nine year olds living in resource limited settings of Pretoria, Gauteng Province, South Africa.

1.4 Justification

Promotion of health during childhood is critical to the health and wellbeing of children and their future life (Wang & Stewart, 2013) as dietary habits and patterns learned in childhood have been proven to track into adulthood (Dudley *et al.*, 2015). Research has shown that school based interventions are the most effective and efficient way to promote lifelong healthy behaviours among children (Ling, King, Speck, Kim & Wu, 2014). Although there is evidence

of successful school based interventions on nutrition and physical activity, there is a paucity of literature on school based interventions done in resource limited settings in Africa (Draper *et al.*, 2010).

Globally, the largest chunk (80%) of deaths occurring due to non-communicable diseases is in Africa. The obesogenic environment, mainly an unhealthy diet and physical inactivity, and tobacco use are the major predisposing factors. Prevention of these modifiable risk factors may prevent 80% of premature stroke and type 2 diabetes (Kruger *et al.*, 2002; Naidoo *et al.*, 2009; Black, Victora, Walker, Bhutta, Christian, de Onis, Ezzati, Grantham-McGregor, Katz, Martorell & Uauy, 2013). However, there is limited information on interventions in low and middle income countries (Spittaels, Van Cauwenberghe & Maes, 2010) and very little research has been done on the impact of NEPs in lower socioeconomic populations either globally or in South Africa (Oldewage-Theron & Napier, 2011). Therefore, this study could add information to the existing body of knowledge on nutrition interventions in resource limited settings in Africa.

Many South Africans live in poverty and are food and nutrition insecure (Temple, Steyn, Fourie & de Villiers, 2011). The rise in food prices only further reduces their power in acquiring healthy foods (Temple & Steyn, 2011). Consequently, their diets are unhealthy and expose them to malnutrition (Temple & Steyn, 2011; Temple *et al.*, 2011). By using the SAFBDGs, the study would promote healthy eating habits that encourage meeting all the nutritional needs rather than simply sustaining satiety. The SAFBDGs are messages expressing dietary goals in terms of foods and not nutrients, and their development was based on an evaluation of food availability and compatibility with the cultural food intake patterns of South Africans (Schönfeldt, Hall & Bester, 2013). Therefore, the SAFBDGs are aimed at helping South Africans make healthy food choices using a variety of foods and ultimately prevent nutrition related diseases (DOH:Nutrition, 2012; Kupolati, McIntyre & Gericke, 2014a).

1.5 The layout of the dissertation

The dissertation consists of nine chapters. The Harvard (UP EMS) reference style (03/12/2015) was used for referencing throughout the entire dissertation. References are available at the end of each chapter.

Chapter 1

This chapter highlights the background and motivation for the study against which the study aims were developed.

Chapter 2

A detailed discussion of literature relevant to the development and success of school based NE is found in this chapter. Information regarding drivers and inhibitors of healthy dietary habits of primary school learners is presented as well.

Chapter 3

The methodology used to develop and implement the tailored NEP is discussed in this chapter. A brief overview of elements included in the two phases is described as well as a brief description of the situational analysis.

Chapter 4

The chapter focuses on the methodology used to analyse the situational analysis data, and reports on the outcomes.

Chapter 5

The chapter describes Phase 1 that entailed the development of the tailored theory based NEP, i.e. the instructor's manual and all materials guided by the literature review in Chapter 2, and the results of the situational analysis in Chapter 4.

Chapter 6

The implementation of the tailored theory based NEP (Phase 2) is discussed in this chapter.

Chapter 7

The results of the study are presented in this chapter.

Chapter 8

A discussion of the results of the NEP is done in this chapter

Chapter 9

The dissertation is concluded and recommendations for future research are made.

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Chapter 2: Literature review

2.1 Introduction

Eating, being a socially learned behaviour, is influenced by social pressures (CDC, 1997). Healthy eating is defined as “eating practices and behaviours that are consistent with improving maintain and/ or enhancing health” (Taylor, Evers & McKenna, 2005). Eating habits are established during childhood and have influence on short-term and future health of an individual. They also have a bearing on an individual’s growth and development and they persist into adulthood (Wang & Stewart, 2013; Zhang, Bécares, Chandola & Callery, 2015). Children’s eating habits are influenced by their peers, families, schools and communities. Unhealthy eating habits result in under-nutrition, overweight or obesity (CDC, 1997). These conditions are related to an increased risk of chronic diseases, reduced wellbeing and quality of life, as well as higher health costs in the present and future (Averett, Stacey & Wang, 2014).

Evidence shows that low income and middle income countries face the double burden of malnutrition, i.e. under-nutrition and overweight/ obesity. Although stunting in children less than five years has decreased between 1993 and 2013, high figures are still recorded in Asia and Sub Sahara Africa (Black, Victora, Walker, Bhutta, Christian, de Onis, Ezzati, Grantham-McGregor, Katz, Martorell & Uauy, 2013). The developing world has also reported an increase in the prevalence of chronic diseases due to changes in lifestyle arising from the nutrition transition (Steyn, Lambert, Parker, Mchiza & de Villiers, 2009). Cardiovascular disease is already the leading cause of mortality in developing regions such as East Asia and North Africa (Naidoo, Coopoo, Lambert & Draper, 2009; Black *et al.*, 2013).

South Africa is a developing country facing poverty, high prevalence of obesity, stunting and early nutritional deprivation (Naidoo *et al.*, 2009), thus exposing South Africans as victims of both nutritional excesses and inadequacies. Although this being the case, preventative strategies should start early in life (Habib-Mourad, Ghandour, Moore, Nabhani-Zeidan, Adetayo, Hwalla & Summerbell, 2014) because healthy eating habits are learned and adopted during childhood (King & Ling, 2015). There is substantial in-direct evidence suggesting that improving nutrition in early childhood in developing countries is a long term economic investment (Manios, Moschandreas, Hatzis & Kafatos, 1999). Interventions promoting healthy eating designed to meet conditions ideal to optimise health (King & Ling, 2015) and thereby

facilitating social change, have been suggested as strategies for intervention at childhood age. These methods address several areas such as nutrition and physical activity for optimal health, consumption of health promoting foods and dietary behavioural change issues (Kupolati, MacIntyre & Gericke, 2014b).

Research evidence has also established that nutrition related health promoting interventions targeting children can be effective in altering targeted psychosocial precursors to health behaviours and modifying the actual health behaviours (Auld, Romaniello, Jerianne, Carolyn & Hambidge, 1998). Although several studies have been done with children to promote healthy dietary behaviour, limited literature reporting on similar studies undertaken with children in resource limited settings in Africa, including South Africa (SA), is available (Oldewage-Theron & Napier, 2011).

This literature review therefore aimed to investigate and report on relevant information necessary for the planning, implementing and evaluating a NEP for learners aged seven to nine years in resource limited settings in Pretoria, Gauteng Province, South Africa. The literature review is limited to school based studies and nutrition interventions published in English between 1996 and 2016. The sources of information used for this review included journal articles, books and reports. The internet and online databases, Medline and Pub Med, were also visited. Key words for the literature search were resource limited, nutrition education, school-based, knowledge, attitudes and self-efficacy.

The literature review explored several areas to facilitate the understanding of the development and promotion of healthy eating habits in children. It gave a general background on healthy eating, including the dietary practices of South African children. The factors affecting dietary habits were discussed, including the associated consequences of unhealthy eating habits. A discussion on several strategies identified for promotion of healthy eating habits was done prior to the discussion on the main aspects that should be considered when planning a NEP for primary school children in resource limited settings.

2.2 Dietary behaviour of school going children in South Africa

Unhealthy diets and poor dietary diversity among school children have been reported in SA (Steyn, de Villiers, Gwebushe, Draper, Hill, de Waal, Dalais, Abrahams, Lombard & Lambert, 2015). Several studies in SA have shown that the diets of children and adolescents tend to be

very energy dense. Children and adolescents consume an assortment of unhealthy snacks that are high in saturated fat, total fats, sugar and salt and low in fibre and micronutrients, mostly at school and also in limited income settings (Temple, Steyn, Myburgh & Nel, 2006; Abrahams, de Villiers, Steyn, Fourie, Dalais, Hill, Draper & Lambert, 2011). Furthermore, research has shown that unhealthy diets (which also track into adulthood) and physical inactivity of schoolchildren present an emerging public health challenge (Abrahams *et al.*, 2011; de Villiers, Steyn, Draper, Hill, Dalais, Fourie, Lombard, Barkhuizen & Lambert, 2015). According to a recent study by de Villiers *et al.* (2015), unhealthy diets were identified as the most common health problem among learners in SA, and very few learners carried a lunch box to school. Most learners are also reported to be dependent on inexpensive low nutritive value foods that are easily accessed from tuck-shops and street vendors, while others spend the school day on an empty stomach (Abrahams *et al.*, 2011; de Villiers *et al.*, 2015).

2.3 Factors affecting eating habits of children

Unhealthy eating patterns can significantly increase the risk for detrimental health problems of young children (Kostanjevec, Jerman & Koch, 2013). The number of influences on people's diet is endless. Young children's eating habits are also influenced by many individual factors, i.e. biological, behavioural, psychological, and collective factors including social, community and environmental factors which are all related (Contento, 2007; Kostanjevec *et al.*, 2013; Watt, Draper, Ohly, Rees, Pikhart, Cooke, Moore, Crawley, Pettinger & McGlone, 2014). Understanding these factors is critical for the development of effective interventions intended to promote healthy eating habits (Kostanjevec *et al.*, 2013). A theoretical framework of the factors influencing eating habits in children based on the SCT is presented in figure 2.1. Four levels of influence are described below: individual influences; social environment; community settings; and societal influences.

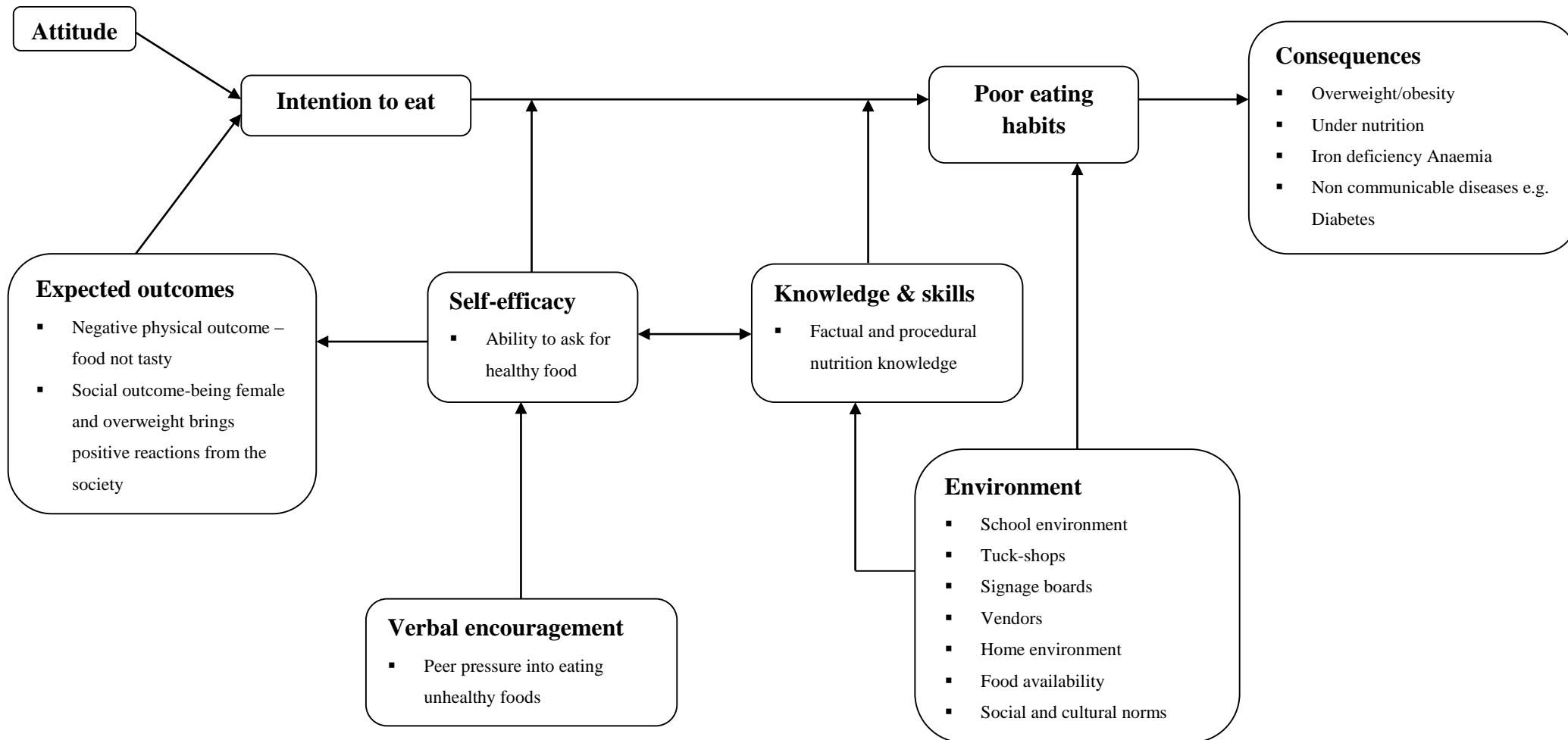


Figure 2.1: Factors affecting eating habits of children based on the Social Cognitive Theory (Adapted from Contento, 2007)

2.3.1 Explanation of the theoretical framework on factors affecting dietary habits of children based on the Social Cognitive Theory

The theoretical framework presented in figure 2.1 based on the SCT, was adopted from Contento, 2007 and modified. However, the framework cannot do complete justice to all the possible ways through which the dietary habits of learners may be influenced.

The theoretical framework was based on the idea that psychosocial factors mediate dietary behaviours. The theoretical framework shows the linkages between self-efficacy, nutrition knowledge, skills and eating habits as informed by the SCT. The SCT states that behaviour is influenced by personal factors such as beliefs, mainly expected outcomes (EOs) and self-efficacy (Tani, Kondo, Takagi, Saito, Hikichi, Ojima & Kondo, 2015). Self-efficacy is an individual's estimate of whether they will be able to perform behaviour successfully and is the major mediator of behaviour change. It is pivotal to many theories and involves both skills and confidence. Several literature acknowledge that high levels of self-efficacy lead to longer persistence of a new learned behaviour (Contento, Randell & Basch, 2002). Self-efficacy is influenced by factual and procedural nutrition knowledge possessed by an individual as well as the environment surrounding the individual. The environment may limit or facilitate behaviour (Wechsler, Devereaux, Davis & Collins, 2000). The attitudes developed by the individual through many factors, including the EOs, also influence the food choices. Expected outcomes are the reasons that make behaviour desirable. EOs are influenced by how individuals interpret information in relation to the behaviour and it has direct influence on behaviour change (Contento, 2007).

2.3.2 Individual influences

2.3.2.1 Psychological factors

Psychological factors are thoughts, feelings and other cognitive characteristics that affect the attitudes, behaviour and functions of the human mind (Contento, 2007). They are influenced by the social and cultural contexts (Contento, 2007). Psychosocial variables that predict dietary behaviour are important targets for change in NEPs (Baranowski, Cullen & Baranowski, 1999). Among the psychosocial factors, including attitudes, beliefs, knowledge, self-efficacy, taste and food preferences (Contento, 2007), self-efficacy is emphasised in the literature to be crucial in behaviour change and its maintenance in conjunction with food preferences and the child's own expectations (Pérez-Rodrigo & Aranceta, 2001; Kostanjevec *et al.*, 2013).

Although many studies have concluded that nutrition knowledge - knowing how to and why to eat - does not necessarily translate to dietary change, research has shown that it can significantly affect children's nutrition attitudes (Kostanjevec *et al.*, 2013; Wang & Stewart, 2013). Bandura (2001) also maintains that forming appropriate attitudes towards certain behaviours is important for that behaviour (Bandura, 2001). Research has documented that children with higher nutrition knowledge possess healthier eating habits and a more positive attitudes towards healthy eating as compared to those with lesser knowledge (Kostanjevec *et al.*, 2013).

2.3.2.2 Biological and behavioural factors

An individual is born with a desire or liking for sweet taste and a dislike for sour/ bitter taste (Contento, 2007). Taste (flavour, smell and texture) is a major influence on food preferences and food choices of children. Food preference is a strong positive indicator for consumption of the preferred food for both children and the youth (Taylor *et al.*, 2005). It has been proven that both experience with food (Taylor *et al.*, 2005) and physiological consequences of eating a food, have effects on the food preferences of children (Contento, 2007). Behaviours such as tobacco use, which has been reported as a common practice within the school environment in several South African schools (de Villiers, Steyn, Draper, Fourie, Barkhuizen, Lombard, Dalais, Abrahams & Lambert, 2012), and excessive alcohol consumption have been implicated in poor health status; notably in the rise of obesity and its co-morbidities (Baleta & Mitchell, 2014).

2.3.3 Social environment

2.3.3.1 Family and peers

Peer and adult models have a huge influence on the food choices and food preferences of children (Huon Gail, Wardle Jane & SzaboMarianna, 1999). Arredondo *et al.* (2006) hold the view that children's health habits are developed in the home and are dependent on the parents' actions and attitudes towards eating and physical activity (Arredondo, Elder, Ayala, Campbell, Baquero & Duerksen, 2006). The eating patterns of parents and other family members may impact positively or negatively on the eating patterns of children. Furthermore, children's nutrition knowledge can be positively influenced by positive and specific nutrition messages from the parents (Kostanjevec *et al.*, 2013). Parental nutrition knowledge therefore plays a major role in the food choices in terms of the quality of food purchased, the food availability

and the food portions offered to children. Therefore, healthy family meals and provision of healthy snacks are encouraged to promote healthy eating habits in children (Taylor *et al.*, 2005).

2.3.4 Community settings

Social structures such as religious groups and schools also influence the eating patterns of many individuals. Evidence has shown that peer influence becomes more apparent when children go to school (Wang & Stewart, 2013).

2.3.4.1 Schools

The food choices and eating patterns of children are greatly influenced by their environment, including the school, home and community environments (Abrahams *et al.*, 2011; Watt *et al.*, 2014). Schools are a critical part of the social environment that shapes young persons' eating behaviours. The availability and accessibility of food within the school food environment and the home food environment have a major influence on food choice and eating patterns of children (Taylor *et al.*, 2005). Due to the fact that most food is consumed at school and the large amount of time spent at school, the school food environment thus has a significant influence on children's eating behaviours (Wechsler *et al.*, 2000; Wang & Stewart, 2013).

The foods available in the community also influence the food that individuals purchase and eat (Van Cauwenberghe, Maes, Spittaels, van Lenthe, Brug, Oppert & De Bourdeaudhuij, 2010). Abrahams *et al.* (2011) posit that unavailability of food in the home, especially in resource limited communities, results in learners' difficulty in carrying lunch boxes to school. Thus learners either do not eat anything at school or rely on the school tuck-shop and informal traders (Abrahams *et al.*, 2011), and the school feeding programme (Faber, Laurie, Maduna, Magudulela & Muehlhoff, 2014).

2.3.4.2 Economic environment

The economic environment also has a bearing on the food choices and patterns of individuals, especially in resource limited settings. The low income families usually purchase cheaper foods in order to minimise the total income spent on food (Taylor *et al.*, 2005; Temple & Steyn, 2011). High fat and high sugar processed foods are cheaper and are more accessible to the resource limited communities as compared to healthy foods (Taylor *et al.*, 2005; Temple,

Steyn, Fourie & de Villiers, 2011; Faber *et al.*, 2014). Consequently, the unhealthy foods are easily available and accessible to children within the school and home food environments.

Low education status has been associated with unhealthy eating habits (Taylor *et al.*, 2005). Better educated parents are perceived to be better able to process and apply nutrition information than those with low education. The former are also optimistic and are more likely to seek a healthier life (Wojciech Pilecki, Kowal, Woronkiewicz, Kryst & Sobiecki, 2014). Furthermore, because education and income are highly correlated, the more educated are more likely to have higher incomes and better able to purchase healthier foods (Contento, 2007; Averett *et al.*, 2014).

2.3.5 Societal influences

2.3.5.1 Mass media, marketing and advertising

The media has been cited as a source of informal nutrition education for many individuals (Contento, 2007). Food preferences are highly malleable and marketing plays a critical role in shaping the rapidly evolving food environment (Harris, Pomeranz, Lobstein & Brownell, 2009). The media has potential to affect children's food purchases, food requests, knowledge and attitudes, and ultimately dietary practices (Taylor *et al.*, 2005). Food companies acknowledge that children and adolescents represent a huge part of their clientele, and the marketing industry has potential to shape the definition of what is acceptable and desirable to eat (Harris *et al.*, 2009).

Long hours of television watching are common among many children (CDC, 1997), and often accompanied by the intake of foods of low nutrient value (Devault, 2006). Most of the foods advertised during children's programmes are high in fat, sugar, and/ or sodium. A negligible number of advertisements are on healthy foods (CDC, 1997). Children are believed not to possess the cognitive ability to understand the biased point of view of advertising, thus their food choices can be influenced by television advertising. Children also believe that any food permitted in school is healthy (de Villiers *et al.*, 2012). Several studies have documented the predominance of promotion of energy dense low nutrient foods to children in schools, on children's websites and in magazines. Non-consequential positive outcomes are portrayed to arise from eating energy dense low nutritive value foods and these unhealthy eating behaviours are perceived to be fun and cool (CDC, 1997; Harris *et al.*, 2009). It therefore becomes of great

concern, considering the high number of primary schools in resource limited settings in South Africa, that have sponsored signage boards on school premises promoting unhealthy foods (de Villiers *et al.*, 2012).

2.3.5.2 Social and cultural norms

People are social beings who are controlled by social and cultural expectations (Orji & Mandryk, 2014). Consequently, eating patterns are influenced by our perceptions of social and cultural expectations of surrounding people (Arredondo *et al.*, 2006). Acceptable and preferred foods and different combinations of foods are often defined by culture (CDC, 1997; Orji & Mandryk, 2014). Healthful eating that deviates from cultural norms may compromise one's willingness to adhere to a healthy diet (Taylor *et al.*, 2005).

2.4 Consequences of unhealthy eating

The immediate effects of unhealthy eating habits include overweight/ obesity, under-nutrition and iron deficiency anaemia (CDC, 1997). If children learn unhealthy eating habits, they maintain them as they age and they may contribute to the development of chronic diseases (de Villiers *et al.*, 2015).

2.4.1 Overweight and obesity

Diet contributes substantially to the development of chronic non-communicable diseases, preventable diseases and premature death (Averett *et al.*, 2014; Baleta & Mitchell, 2014). Evidence suggests that the consumption of diets that are high in fat and high sugar and low in fruit and vegetable and low in milk and milk products increases the risk of obesity and other NCD risk factors (Zaborskis, Lagunaite, Busha & Lubiene, 2012). Socio-cultural, environmental and behavioural factors as well as socio-economic status are perceived to be responsible for the high prevalence of obesity in SA (Stevens, Story, Ring, Murray, Cornell & Gittelsohn, 2003; Sartorius, Veerman, Manyema, Chola & Hofman, 2015).

Obesity is a complex problem multifaceted with many factors and interactions incompletely understood. Factors associated with genetics, environment and behaviour are believed to be the causes of obesity. Obesity itself is a modifiable risk factor for chronic diseases such as type 2 diabetes and cardiovascular disease (Steckler, Ethelbah, Martin, Stewart, Pardilla, Gittelsohn, Stone, Fenn, Smyth & Vu, 2003; Stevens *et al.*, 2003), and is associated with an increased risk

of all cause mortality (Leung & Funder, 2014). It has also been observed that the prevalence of other nutrition related risk factors (hypertension, hypercholesterolaemia) for chronic disease in children is on the rise (Reddy, Resnicow, James, Kambaran, Omardien & AD, 2008; Apovian, 2013).

Childhood overweight results in both immediate and longer-term risks to health. The immediate risks include metabolic abnormalities, type 2 diabetes, high blood pressure and respiratory disorders. Childhood overweight is also a strong risk factor for adult obesity and its consequences (CDC, 1997; Black *et al.*, 2013). Being overweight during childhood and adolescence has also been associated with increased adult mortality. Studies have also found that mortality due to obesity increases progressively with increase in BMI (Lehnert, Sonntag, Konnopka, Riedel-Heller & Hans-Helmet, 2013). Research further shows that obese children (as young as age seven years), are at a higher risk of premature death in adulthood as compared to normal weight counterparts (Young, Steckler, Cohen, Pratt, Felton, Moe, Pickrel, Johnson, Grieser, Lytle, Lee & Raburn, 2008; Adab, Pallan, Lancashire, Hemming, Frew, Griffin & Barrett, 2015).

- **Health care costs**

Overweight/ obesity has direct consequences on the country's economic growth in the form of increased health care costs (CDC, 1997). Obesity is related to many co-morbidities that are associated with high medical expenditures which increase with an increase in Body Mass Index (BMI) (Lehnert *et al.*, 2013). For example, the medical costs of obesity related illnesses have been estimated at \$209.7 billion annually in the United States (US) which is equivalent to 20.6% of US health expenditures (Apovian, 2013). Apovian (2013) also concluded that obese workers spend more on health costs and are absent from work more as compared to normal weight workers. Obese patients have further been reported to accrue 30% more medical costs than non obese patients worldwide (Lehnert *et al.*, 2013). The total healthcare costs in several developed countries due to obesity has been reported to be between 2-6%, with the costs being up to 7% in some countries (Sharma, 2007). It also is estimated that malnutrition can result in a loss of 2-3% in Gross Domestic Product (Oldewage-Theron & Napier, 2011).

- **Quality of life**

Overweight and obesity affect people's wellbeing and quality of life (QoL). Obese individuals are at an increased risk of experiencing poor QoL compared with non obese individuals and this is evident in patients of all ages (Lehnert *et al.*, 2013). This may arise either due to being obese or as a result of the consequences of the numerous co-morbidities linked to being obese (Apovian, 2013).

Several studies have reported that being obese is associated with an elevated risk of poor performance in several physical functions such as climbing stairs or walking more than one km. Loss of energy, increased likelihood to smoke and sleep changes are also typical in obese patients (Apovian, 2013), as well as reduced life expectancy (Lehnert *et al.*, 2013). Obesity accounts for more than 15 million disability adjusted life years globally and a loss of 1–1.5 million years of life per annum (Sharma, 2007). Furthermore, childhood overweight and obesity have also been linked with psychosocial ramifications such as poor self-image, lowered self-esteem, depression, eating disorders and poor quality of life (CDC, 1997; Sharma, 2007).

2.4.1.1 Global prevalence

Obesity has become a global health concern (Sartorius *et al.*, 2015) with one in every three adults being overweight (WHO, 2013). Worldwide it is estimated that nearly half a billion adults are obese, while overweight and obesity constitute the fifth most common cause of death globally (Apovian, 2013; Leung & Funder, 2014). The prevalence of overweight and obesity and its co-morbidities has been observed to be rising rapidly in Sub Saharan Africa, with SA recording the highest prevalence rates due to its rapid epidemiological transition (Sartorius *et al.*, 2015). The prevalence of obesity is documented to be rising simultaneously in both adults and children globally.

The prevalence of childhood obesity/ overweight is of public health concern globally, and is reported to have affected approximately one quarter of the children worldwide (Perry, Keane, Layte, Fitzgerald, Perry & Harrington, 2015). Childhood obesity/ overweight has increased at a dramatic pace over the last few years, and 10% of school-aged children globally are overweight (Sharma, 2007). However, the situation is more alarming in low and middle income countries (LMIC), including SA, which are facing a double burden of malnutrition. Literature states that overweight/ obesity prevalence is rising while under-nutrition prevalence is on the

decrease in resource limited schools (Faber *et al.*, 2014; Pehlke, Letona, Hurley & Gittelsohn, 2015). Although over 75% of the global burden of overweight children less than five years is in LMIC. The highest overall prevalence is in high income countries. An estimated 43 million children under five years (7%) are estimated to be overweight globally, ten million children in sub-Saharan Africa and seven million in East Asia and the Pacific (Black *et al.*, 2013; UNICEF, 2013).

2.4.1.2 Prevalence in South Africa

The prevalence of obesity has increased significantly to 27.2% in 2012 from 23.5% in 2008; with the prevalence being higher in females than males in SA (Sartorius *et al.*, 2015). According to the South Africa Medical Research Council, 61% of the population is overweight, obese or severely obese and two million people have been estimated to be diabetic by the International Diabetes Federation (IDF) (Baleta & Mitchell, 2014).

The prevalence of obesity/ overweight in childhood is also increasing rapidly in SA, with higher prevalence rates in girls than boys. The black children and the mixed race children have been shown to have higher prevalence rates of obesity/ overweight as compared to the white and Indian children (Reddy *et al.*, 2008). The prevalence in South African primary school learners is reported to be as high as 22% in girls and 17% in boys (Naidoo *et al.*, 2009). Since childhood overweight has been proven to track into adulthood, these prevalence rates set a platform for future incidence of non-communicable diseases (Baleta & Mitchell, 2014).

2.4.2 Underweight and stunting

Under-nutrition, defined as failure to consume adequate energy, protein and micronutrients required to meet basic body needs for growth and development, manifests as underweight, wasting and stunting (Reddy *et al.*, 2008). South Asia and Sub Saharan Africa record the highest prevalence of stunting, underweight and wasting. Globally, stunting affects 165 million children (26%), while underweight and wasting affects at least 100 million (16%) and 52 million (8%) respectively (Black *et al.*, 2013). Overweight and stunting are equally prevalent in children under the age of nine years in SA, and the risk of overweight is nearly two fold in stunted children (Naidoo *et al.*, 2009; Shisana, Labadarios & Rehle, 2013). The issues of under-nutrition are more prevalent in rural areas, commercial farms and informal settlements in South Africa (Reddy *et al.*, 2008).

Undernourished children, even moderately undernourished, have an increased risk of becoming ill (difficulties resisting infection), have lower energy levels, are highly irritable and suffer compromised cognitive development and more likely to miss school, and therefore fall behind other learners (CDC, 1997; Oldewage-Theron & Napier, 2011). Chronically undernourished children attain lower scores on standardised achievement tests, especially tests of language ability. Research has also shown that breakfast skipping can adversely affect children's performance in problem-solving tasks (CDC, 1997).

2.4.3 Iron deficiency anaemia

Iron deficiency interferes with haemoglobin production within the body. Iron deficiency therefore increases fatigue, shorten attention span, decrease work capacity, reduce resistance to infection, as well as impair intellectual performance (CDC, 1997). Anaemia still remains a public health problem affecting 25% of the population, and 47 % of the population under five years of age globally. Regional comparisons have indicated SA to be faring much better than the rest of Africa in terms of anaemia prevalence. According to the SANHANES-1 (2012) a 63% reduction in the prevalence of under-five anaemia since 2005 was noted. A similar downward trend was also observed for primary school children in SA during the same period (Visser & Herselman, 2013; Shisana *et al.*, 2013).

2.5 Nutrition intervention strategies in primary school children

2.5.1 Multi-disciplinary collaborative approaches

Multi-disciplinary collaborative approaches to promote healthy behaviours in children are being recommended for effective nutrition interventions (Taylor, McAuley, Barbezat, Strong, Williams & Mann, 2007; King & Ling, 2015). Strong evidence of effect has been found for multi-component interventions on fruit and vegetable intakes in children, with limited evidence for educational interventions on behaviour and environmental interventions on fruit and vegetable intake. There is also limited evidence of effect on behaviour for interventions targeting children from low socio-economic status. However, evidence of effect has been found for multi-component interventions promoting a healthy diet in school aged children in the European Union countries on self-reported dietary behaviour, but none on anthropometry (Spittaels, Van Cauwenberghe & Maes, 2010).

In addition to the above, a multi-disciplinary, multi-agency, active programme promoting lifestyle education in school (APPLES), that used a population approach underpinned by the Health Promoting Schools philosophy (HPS) which links the school with family and community, showed that risk factors for obesity can be modified at school level (Sahota, Rudolf, Dixey, Hill, Barth & Cade, 2001a). Gortmaker *et al.* (1999) further concluded that a school-based interdisciplinary health behaviour intervention on diet and physical activity among children indicated effectiveness in improving dietary intake of students and reducing television viewing (Gortmaker, Cheung, Peterson, Chomitz, Cradle, Dart, Fox, Bullock, Sobol & Colditz, 1999).

Although several successes have been demonstrated with interventions with multi-component activities, they are not without challenges. Challenges in implementation and monitoring in limited resources and non commitment from staff members, due to high labour intensity and time consumption, may impede the effectiveness of the intervention (Steyn *et al.*, 2009).

2.5.2 Community based approaches

A sustainable healthy school environment can be created through a comprehensive programme involving all key stakeholders. Through integration of school and community programmes, bringing together parents, school site personnel and other community members to support a common vision, a healthy school environment can be created (Scherr, Linnell, Smith, Briggs, Bergman, Brian, Dharmar, Feenstra, Hillhouse & Keen, 2014).

Hoddinot and colleagues (2008) through the community based approach, suggested that improving nutrition in early childhood (exposing children to nutritious food) can be a long term driver of economic growth (Hoddinott, Maluccio, Behrman, Flores & Martorell, 2008). Furthermore, the use of community coaches for community capacity building during an intervention was shown to have potential to produce the greatest changes in nutrition and physical activity behaviours among those caring for four year olds (Clarke & Evans, 2015). Taylor *et al.* (2007) proposed that the use of a full time community activity co-ordinator for each intervention school for community based interventions can have a significant impact on weight gain in children during a relatively short period. However, they cited the complexity of developing community-driven partnership and initiatives as a challenge (Taylor *et al.*, 2007); an issue also noted by Allender *et al.* (2015). A community based intervention conducted with African American youths showed that after school and/ or summer programmes have the

potential to positively influence diet and physical activity behaviour. Furthermore, after school studies have generally shown a positive effect on fruit and vegetable consumption and some summer time interventions have shown trends in reduction of BMI (Barr-Anderson, Singleton, Cotwright, Floyd & Affuso, 2014).

2.5.3 Grocery store tours

Grocery store tours are facilitated group discussions where a NE session is delivered at the participants' point of food purchase (Baic & Thompson, 2007). A tour normally ranges from 30-90 minutes. Grocery store tours have shown positive changes in nutrition knowledge and behaviours in children, although more rigorous studies are required to verify effectiveness of supermarket tours (Clarke & Evans, 2015).

2.5.4 Home based interventions

Home based interventions are unique as they provide a platform to observe and intervene with the home food and activity environment. The use of a client navigator (an individual, e.g. community health care worker, responsible for building working relationships, addressing barriers and supporting participants) also offers hands on opportunities for skills building, provision of detailed education and counselling to families. Positive outcomes have been reported for family based interventions as the families work towards a common goal (Yun, Boles, Haemer, Knierim, Dickinson, Mancinas, Hambidge & Davidson, 2015).

Clarke *et al.* (2015) implemented a home based intervention using mobile phones to deliver customised nutrition information to combat obesity in children aged nine to 14 years (Clarke & Evans, 2015). A mobile application which had customised recipes and practical evidence based ideas about eating healthy according to the needs of each household was developed. The pilot test demonstrated that the application received intensive use by half of the household cooks and their children. A randomised trial has thus begun to assess household eating and anthropometric outcomes (Clarke & Evans, 2015).

2.5.5 Parent-led interventions

A parent-led intervention coupled with teaching general parenting skills related to behaviours relevant to childhood overweight has potential to show weight changes (Janicke, Sallinen, Perri, Lutes, Huerta, Silverstein & Brumback, 2008; Yun *et al.*, 2015). More convincing results

with less negative consequences have been shown in interventions directing strategies at parents, with minimal contact with the child (in younger children) (Gibbons, 2007). Evidence showed that employing the parenting skill training approach with families of Native Americans of low socio-economic status, improved effectiveness of the intervention. Furthermore, the benefits of offering parents strategies and skills applicable in other situations made the programme more appealing (Gibbons, 2007). Positive results have also been reported in a study conducted with parents of children aged two to six years. That study concluded that children's acceptance of vegetables can be improved by parent-led interventions involving daily tasting of vegetables (Wardle, Cooke, Gibson, Sapochnik, Sheiham & Lawson, 2003).

2.5.6 School based interventions

Schools offer continual regular contact with children, and thus play an integral role in promoting healthy lifestyles in children (King & Ling, 2015). They provide an environment that can promote energy balanced health behaviours (Habib-Mourad *et al.*, 2014). Pehlke *et al.* (2015) have recommended that policy focused on nutrition standards of school food programmes and foods sold within school premises should be a priority (Pehlke *et al.*, 2015), in addition to increasing access to fruits and vegetables, and encouraging learners to carry healthy lunch-boxes (Faber *et al.*, 2014).

Literature on school based interventions done in resource limited settings in Africa is very limited (Sartorius *et al.*, 2015). The school environment has been identified as one of the most effective places to intervene in children. The first school based programme conducted in Greece by Manios *et al.* (1999) was launched in 1992 and aimed to improve the children's diet, fitness and physical activity. Manios *et al.* (1999) observed positive short term changes in health knowledge, less BMI increase and increase in physical activity and fitness levels. They concluded that school based interventions have the potential to produce long term effects if continued (Manios *et al.*, 1999). According to Sahota *et al.* (2001) a school based intervention on seven to eleven year olds in Leeds had little effect on children's behaviour. The intervention resulted in an increase in consumption of vegetables and successfully produced changes at school level (e.g. ethos of the schools) (Sahota, Rudolf, Dixey, Hill, Barth & Cade, 2001b). Several school based interventions showed benefits in population subgroups such as those focusing on increasing physical activity. Such interventions have shown improvements in anthropometry in some school age children (Sahota *et al.*, 2001b; Sharma, 2007; Taylor *et al.*, 2007).

The school food environment has been identified as one of the major components of effective school based interventions in promoting healthy eating in resource limited schools (de Villiers *et al.*, 2012; Faber *et al.*, 2014). The school has been proposed as the best setting for promoting environmental and policy changes that may induce dietary and physical activity behaviour change to combat obesity (Briefel, Crepinsek, Cabili, Wilson & Gleason, 2009). Schools provide a platform for instilling healthy eating habits in children as it provides a natural learning environment, large captive audience and numerous opportunities for peer interaction (Briefel *et al.*, 2009). The behavioural changes may be maintained into adulthood (de Villiers *et al.*, 2012).

A proven model for designing comprehensive school based nutrition programmes is the health promoting schools framework (HPS). HPS integrates curriculum activities and fosters establishment of partnerships with stakeholders inclusive of the community, teachers and parents. The use of HPS in healthy eating programmes provides a platform to improve the quality of foods provided in schools as it involves the participation of all relevant stakeholders and respects the contribution of all school staff. It thus facilitates consistent delivery of nutrition messages (Sahota *et al.*, 2001a; Rana & Alvaro, 2010). The CREATE programme implemented in South Australia which was underpinned on HPS documented that participants had increased knowledge and skills on healthy eating following their participation in the programme (Rana & Alvaro, 2010).

South Africa, through its DoBE life skills orientation programme, is implementing a module on health promotion which aims to develop skills, knowledge, values and attitudes that empower learners to make informed decisions and take appropriate action. According to grade, topics designed to help learners identify healthy food choices and sources of clean water and comparison of healthy and poor dietary habits and their ramifications are learning outcomes of the module (Baloyi & Mabaleka). However, increasing stakeholder participation is imperative in enhancing the programme.

Intervening in schools located in resource limited settings still poses challenges. The schools often lack resources, have minimal parental involvement (de Villiers *et al.*, 2012), and lack policies regulating healthy lifestyles (Draper, de Villiers, Lambert, Fourie, Hill, Dalais, Abrahams & Steyn, 2010). They usually have poorly motivated educators and learners which impede adoption of new interventions (de Villiers *et al.*, 2012). However, literature

demonstrating success in school based interventions in different settings exist, for example the Pathways study that was designed to evaluate the effectiveness of a school-based, multi-component intervention to reduce obesity in American Indian children in Grades 3–5. The study reported positive changes in several psychosocial variables such as food choice intentions and knowledge related to diet and physical activity (Stevens *et al.*, 2003). The limitations of previous school based interventions include small sample size, lack of supportive school policies, lack of parental support, low intensity of interventions, as well as lack of integration in the children’s daily school routine (King & Ling, 2015).

In addition to the above, short term effectiveness of school based interventions has been reported in recent reviews; consequently recommendations are for short term effectiveness. The design and implementation of school based interventions require involvement of all stakeholders, including parents, school canteen staff, executive and non-executive staff members and other community groups for it to be effective (CDC, 1997; Questscope, 2013; Jones, Lubans, Morgan, Okely, Parletta, Wolfenden, de Silva-Sanigorski, Gibbs & Waters, 2014). Engagement of site champions has shown a positive impact on the effective implementation of school based interventions (Rana & Alvaro, 2010; Jones *et al.*, 2014).

2.5.6.1 Youth-led approaches

Youths have been engaged in advocacy for “healthy snacking zones” in schools in order to combat obesity. The youths are involved in the assessment of food related practices such as classroom parties, student rewards and in the drafting of policies for healthier alternatives which they present to their school authorities. A positive effect on the school food environment and the youths themselves has been noted (Clarke & Evans, 2015).

2.5.6.2 School based nutrition education

Cognitive knowledge does not necessarily translate into good dietary practices (Reverdy, Chesnel, Schlich, Köster & Lange, 2008). NEPs have been implemented through caregivers, trained professionals and advisors, as well as trained teachers. Their effectiveness is also based on theories such as the SCT and the health promotion model as they are foundation for behavioural change (Contento, 2007). Literature acknowledges the crucial role played by teachers in school based nutrition education (Auld *et al.*, 1998; Kupolati *et al.*, 2014b; Dudley, Cotton & Peralta, 2015). Research has also shown that NE implemented to students by trained

teachers to be superior to that implemented by nutritionists and to be more easily sustained once established (Kupolati *et al.*, 2014b). Teachers have been noted to be overwhelmed already with academic commitments and thus may serve as a barrier to effective implementation of intervention (Taylor *et al.*, 2007).

2.5.6.3 School based gardening

Initial studies on a garden based NEP have shown positive effects on nutrition knowledge and behaviour (Parmer, Salisbury-Glennon, Shannon & Struempfer, 2009), and are gaining in popularity (Robinson-O'Brien, Story & Heim, 2009). Garden based NE is a promising strategy for increasing preferences and improving dietary intake of fruits and vegetables. It has potential to increase willingness to taste fruits and vegetables among young children. However, due to limited empirical evidence in this area, further research is required to determine programme effectiveness and impact (Robinson-O'Brien *et al.*, 2009).

A study done in south eastern US with predominantly second-grade male children showed that NE, that included a gardening component, improved vegetable preference more (Parmer *et al.*, 2009). Although comprehensive strategies are required to increase vegetable intake, school gardens have potential to impact positively on primary school children's willingness to taste vegetables (Robinson-O'Brien *et al.*, 2009).

The modern food environment comprises of a vast amount of eating out, genetically modified products and very few people growing food (Harris *et al.*, 2009). Local production of fruits and vegetables through the school gardens may increase their access within the school food environment (Faber *et al.*, 2014). As learners have hands-on exposure during planting, harvesting and preparation, consumption patterns of fruits and vegetables may change positively (Robinson-O'Brien *et al.*, 2009). In addition to the above, school based gardening provides a platform for learning about gardening and eating healthy (Faber *et al.*, 2014), and has potential to impact positively on preference (Robinson-O'Brien *et al.*, 2009) and consumption of fruit and vegetable (Parmer *et al.*, 2009). However, due to the paucity of research based evidence, evaluating the impact of participation in garden programmes on nutritional outcomes (Robinson-O'Brien *et al.*, 2009) is concluded to just have potential.

2.5.6.4 Lunch box behaviour

A higher dietary diversity and consumption of more regular meals were observed in children who carried a lunchbox to school than those who did not (Abrahams *et al.*, 2011). A study done with Grade 8 Finnish learners proposed that modifying the lunchbox content may increase fibre intake and fruit and vegetable consumption, and improving the quality of snacks can reduce sugar intake (Hoppu, Lehtisalo, Kujala, Keso, Garam, Tapanainen, Uutela, Laatikainen, Rauramo & Pietinen, 2010). Very few learners in poorly resourced South African schools carry lunchboxes. These lunch boxes usually contain bread/ sandwich (Faber *et al.*, 2014) and therefore lack in most food groups.

2.6 Important elements to consider for an effective Nutrition Education Programme

Promotion of healthy eating habits is critical during childhood since dietary patterns developed during childhood have been shown to track into adulthood. Therefore, prevention strategies are best targeted at children (Pérez-Rodrigo & Aranceta, 2001; Sahota *et al.*, 2001a; Ling, King, Speck, Kim & Wu, 2014; Dudley *et al.*, 2015). It has also been proven that it is difficult to change eating behaviour due to its complex nature (Wang & Stewart, 2013; Watt *et al.*, 2014). Therefore, provision of effective age appropriate, culturally relevant, fun, participatory NE that involves social learning strategies during the early years of life is a key strategy to promoting lifelong healthy eating practices (CDC, 1997; Pérez-Rodrigo & Aranceta, 2001; Oldewage-Theron & Napier, 2011).

A NEP should be comprehensive and accessible to learners from childhood to adolescence (CDC, 1997). Nutrition education is defined as “any set of learning experiences designed to facilitate the voluntary adoption of eating and other nutrition-related behaviours conducive to health and well-being” (Contento *et al.*, 2002). SA children need NE to help them develop lifelong eating patterns consistent with the recommended dietary guidelines –the SAFBDGs. The following aspects should be considered in the development of a relevant and effective NEP for children in resource limited settings.

2.6.1 Appropriate setting

The settings approach has gained popularity in health promotion as it recognises the importance of specific settings in influencing health (Pérez-Rodrigo & Aranceta, 2001). Schools provide

the most effective and efficient way to reach a large segment of the population, including children, school staff, families and community members (Pérez-Rodrigo & Aranceta, 2001; Amaro, Viggiano, Di Costanzo, Madeo, Viggiano, Baccari, Marchitelli, Raia, Viggiano & Deepak, 2006; Racey, O'Brien, Douglas, Marquez, Hendrie & Newton, 2016). They also offer continuous, intensive contact with children (Dudley *et al.*, 2015), a natural learning environment and numerous opportunities for peer interaction and can therefore be a useful channel for promoting and instilling healthy eating habits in children (Wechsler *et al.*, 2000; Faber *et al.*, 2014). The school environment also provides a platform to educate learners about healthy eating through modern play based educational methods rather than through prohibitions or advice (Amaro *et al.*, 2006).

Schools provide opportunities to practise healthy eating and educate learners on how to resist peer pressure that discourages healthy eating. School teachers can also utilise their instructional skills to facilitate the adoption of healthy eating habits as many children now make dietary intake decisions independent of their parents (CDC, 1997).

2.6.2 Address the needs and interests of the target audience

For NE to be effective, it should address the exact needs and issues of concern of the target group (Contento, 2007; Muchiri, Gericke & Rheeder, 2009). A limited understanding of the current situation is likely to impede the development of an effective NEP. It is therefore essential in any nutrition promotion intervention to ascertain the contextual and cultural setting to health behaviour of the particular population group under study. The relevance and effectiveness of a NEP is ensured through the assessment of the nutrition needs and issues particular to the community in collaboration with key school and community based constituents (Lhussier, Bangash, Dykes, Zaman & Lowe, 2011; de Villiers *et al.*, 2012). Tailoring interventions to individual characteristics, level of dietary intake, risk of poor nutrition, readiness to change, self-efficacy and socio-demographic aspects can enhance effectiveness of an intervention (Pérez-Rodrigo & Aranceta, 2001).

Identification of perceived needs and barriers to healthy dietary behaviour may be achieved through a needs assessment (Pérez-Rodrigo & Aranceta, 2001; Contento, 2007; Muchiri, 2013). It facilitates understanding of the learners' as well as teachers' attitudes towards and perceptions of food and nutrition, including motivation. Simple methods that can effectively identify critical areas for action to improve nutrition should be used (Snowdon, Schultz &

Swinburn, 2008; Steyn *et al.*, 2009). Such methods include structured interviews, observations, focus groups based on participatory reflection and action principles with the students and key stakeholders (Pérez-Rodrigo & Aranceta, 2001). These methods may be useful in this respect as they engage the local community in issues regarding their own health (Snowdon *et al.*, 2008; Questscope, 2013). The Healthkick formative assessment carried out in Western Cape SA used structured interviews and observations and concluded that the school environment is not always conducive to healthy eating, sufficient physical activity or the prevention of tobacco use (de Villiers *et al.*, 2012).

2.6.2.1 Participatory Reflection and Action

The support and involvement of school leaders, community leaders and parents in the implementation and sustenance of a NEP is critical (CDC, 1997). Participatory Reflection and Action (PRA) is one of the new models that has proven successful in increasing the potential impact and efficiency interventions. It employs a methodology of extensive community participation and integration in all stages to learn from, and with community members in order to understand the complexities and dimensions of the subject at hand. The outputs of a PRA study are the results of fully participatory work between a large number of organisations, individuals, the target group, local community and institutions in the community (Questscope, 2013). PRA creates an environment for collective action as the community members are deeply involved in the analysis and evaluation of data, and the development of programmes based on the research findings.

2.6.3 Culturally relevant activities

Culture informs and influences a group's behaviour, values, norms and practices. It is a major determinant of how people understand, interpret and respond to various experiences (Orji & Mandryk, 2014). The perceptions about food choices and eating practices and the food markets commonly used by an individual are a reflection of one's cultural values. The cultural differences in eating attitudes and behaviours imply that an individual's cultural orientation may influence the attitudes and behaviours around healthy eating (Contento, 2007; Orji & Mandryk, 2014). Therefore, tailoring interventions to the cultural and contextual setting promotes the success of interventions (Lhussier *et al.*, 2011).

Learners from different cultural groups have different food related attitudes and habits that should be considered when developing a NEP. The success of the programme depends on whether the learners believe that the programme is relevant to their lives or not (CDC, 1997). This is confirmed by literature that reports positive results for culturally sensitive interventions such as the Pathways study, a school based intervention carried out with America Indian children, which employed culturally relevant and age-appropriate instruments. The Pathways study showed a positive effect on obesity related knowledge, attitudes and behaviours (Steckler *et al.*, 2003; Stevens *et al.*, 2003). To promote cultural sensitivity of school based nutrition intervention, food based dietary guidelines (FBDGs) have been used in the development of messages and or the curriculum, as well as the preferred medium of instruction in all communications, including intervention delivery (Steckler *et al.*, 2003; Draper *et al.*, 2010; Oldewage-Theron & Napier, 2011).

2.6.4 Developmentally appropriate

NE messages should be developmentally appropriate and providing practical advice to help children make informed food choices. The messages should be more targeted and simple to adopt (Wang & Stewart, 2013) to accommodate the children's reading ability and age related limitations in terms of memory and attention (Huon Gail *et al.*, 1999). The delivery should be in a way children can understand and be equipped with skills and knowledge required to strengthen healthy eating habits (Pérez-Rodrigo & Aranceta, 2001).

Therefore, nutrition promotion strategies for children must be creative, engaging/ participatory, inexpensive, fun and extensively distributed to make them more effective (Pérez-Rodrigo & Aranceta, 2001). They should expose children to many healthy foods and provide a platform to build skills in choosing healthy foods. The lessons must put emphases on the positive effects of healthy eating and not the negative consequences of unhealthy eating (CDC, 1997). Several teaching strategies have been identified, but the most effective strategies for facilitating healthy eating in primary school children are enhanced curricula (NEP beyond existing health curricula delivered by teachers or specialists), cross-curricula (NEP delivered across two or more traditional primary school subjects) and experiential learning approaches (Dudley *et al.*, 2015). A vast number of teaching methods can be used according to learning objectives such as classroom discussions, role plays, worksheets, drama or healthy eating song creation, demonstrations, posters and food tasting activities (Pérez-Rodrigo & Aranceta, 2001). The use of actual food, food models or photographs, demonstrations, video-clips and web-based

programmes are examples of effective media for NE which can increase motivation and learning (Contento, 2007; Vermeer, 2014). Individuals need reminders to motivate them to take action which can be realised through a various ways, for example fridge magnets, posters, brochures, bookmarks, and pencils with messages (Contento, 2007).

2.6.5 Clear goals

A goal is the representation of a desired end state (Forwood, Ahern, Hollands, Ng & Marteau, 2015). Goals help to shape the design of the educational activities and learning experiences required to achieve behaviour change (Contento, 2007; Draper *et al.*, 2010), which is the ultimate goal of NE (Contento *et al.*, 2002; Briefel *et al.*, 2009). Furthermore, goals involving self engaging properties are strong motivators of action (Contento *et al.*, 2002). Positive dietary behaviour change in terms of food choices and eating habits, as well as mediators of change such as nutrition self-efficacy, knowledge, attitudes and skills are expected outcomes (Kostanjevec *et al.*, 2013; Kupolati, McIntyre & Gericke, 2014a). Current scientific knowledge indicates that a focus on behaviour is a key determinant in the success of NEP (CDC, 1997). Research evidence has also shown that targeting single behaviours with comprehensive strategies is more effective as children are less likely to adopt numerous lifestyle changes all at once (Wang & Stewart, 2013).

2.6.6 Appropriate content

Effective NE requires that the message be made salient and directly relevant to the target group (Huon Gail *et al.*, 1999). Messages for a NEP are usually based on food guides in the form of wheels, pyramids, food targets (simple guide where healthiest foods are in the centre two circles and one aims to stay closer to the centre of the food target rather than the outer circle), food plate, standard block (a block represents a specified amount of a nutrient and a meal is assembled by combing blocks to a recommend total number of blocks) (Smith & Smitasiri, 1997; Auld *et al.*, 1998) and food based dietary guidelines (Oldewage-Theron & Napier, 2011; de Villiers *et al.*, 2015).

Food guides present a practical daily plan for food selection for use by the general public. Their functionality and impact depend on their developmental process and fit with the target audience's perceived needs and desire. Although most food guides probably need revision, one

that makes sense to the target audience is a valuable addition to the curriculum (Smith & Smitasiri, 1997; Hosmer, Dwyer & Villarroel, 1997).

Learners' nutritional status may be optimised by following the recommendations outlined by FBDGs. Schools can help nations meet their health objectives by enabling young learners adopt practices that are in line with the guidelines. It has been documented that United States' primary school educators acknowledged the health benefits for children following dietary guidelines (Vermeer, 2014). Children should eat a wide variety of foods in the right quantities, therefore the messages should provide information on these topics (CDC, 1997; Oldewage-Theron & Napier, 2011).

FBDGs recommend that children eat a variety of foods thus are useful in message development. However, the latter does not address portion size, therefore simple portion size estimation aids such as the Zimbabwe hand jive are useful in this respect (Oldewage-Theron & Napier, 2011). Poor hygienic practices have been implicated in the development of under-nutrition as reported in a study done in the North West Province of SA (Steyn, Labadarios, Maunder, Nel & Lombard, 2005). It becomes paramount to include advice on personal and food hygiene in the message delivered to learners.

- **Food based dietary guidelines**

FBDGs are messages that express dietary goals in terms of foods and are based on an evaluation of food availability and compatibility with the cultural food patterns of the area (DOH:Nutrition, 2012). The SAFBDGs were developed for healthy South Africans seven years and older to promote healthy eating habits among South Africans. They are simple positive evidence based statements that facilitate development of healthy eating plans using a variety of foods (DOH:Nutrition, 2012) and are listed below: (i) Enjoy a variety of foods, (ii) Drink lots of clean, safe water, (iii) Make starchy foods part of most meals, (iv) Eat plenty of vegetables and fruit every day, (v) Eat dry beans, split peas, lentils and soya regularly, (vi) Fish, chicken, lean meat or eggs could be eaten daily, (vii) Drink milk, maas or yoghurt every day, (viii) Use fat sparingly: choose vegetable oils rather than hard fats, (ix) Use salt and foods high in salt sparingly, (x) Use sugar and foods and drinks high in sugar sparingly, and (xi) Be active every day.

- **Estimation of portion size**

Several tools are available to estimate the portion size of foods an individual should eat such as food models and the plate model (Oosthuizen, Oldewage-Theron & Napier, 2011; Oldewage-Theron & Napier, 2011). It is not always convenient to use scales, cups and spoons despite them being the most accurate methods of measuring portion sizes (Cordialis, 2015). Simple inexpensive tools are required in resource limited settings to promote their use in the communities. Some of the simple tools are summarised in table 2.1.

Table 2.1: Simple portion size estimation aids

Tool	Discussion
The plate model	It uses the plate to estimate how much starch, meat and vegetables one should be eating. Half the plate is vegetables, a quarter starches and the rest protein foods (Zelman, 2012).
The Zimbabwe hand jive (ZHJ)	The ZHJ uses hands as a means to estimate the appropriate food portion size. This is a fun and convenient method for children since they always have their hands. One portion of fruit should be the size of one's fist and the amount of starch, e.g. pap should be no more than two fists. The palm of the hand measures the amount of cooked meat one should eat. The size of a vegetable portion is one's two cupped hands, and one cupped hand measures the legumes or high fat foods, e.g. ice cream one should eat. The size of the thumb measures the amount of peanut butter one should use (Cordialis, 2015).
Portion size go to guide	The method uses ordinary items and parts of the hand to estimate food portion size. Meat should be the size of a deck of cards; carbohydrate portions the size of a tennis ball; fat, the size your thumb; and vegetables is a free for all (Zelman, 2012).
Go mini	It encourages individuals to eat out of a small bowl, with smaller utensils and cups to make the meal appear 'fuller' (Houliston, 2014).

2.6.7 Theory based behaviour change

Research evidence has shown that nutrition knowledge alone does not necessarily lead to dietary behaviour change (Contento, 2007; Kostanjevec *et al.*, 2013; Kupolati *et al.*, 2014b). Ideally, interventions should encompass both environmental and individual behaviour change strategies (Wechsler *et al.*, 2000) to facilitate change of behaviour. Increasing evidence

suggests that health education strategies, that are theory driven with clear behavioural focus, are elements conducive to successful programmes (Pérez-Rodrigo & Aranceta, 2001; Glanz & Bishop, 2010; Dudley *et al.*, 2015). Theories provide a rationale for how an intervention will achieve the desired changes (CDC, 1997).

Health behaviour theories describe the relations among variables influencing behaviour and specify targets for facilitating behaviour change, as well as predictability for expected outcome (Achterberg & Miller, 2004; Contento, 2007). They are useful in explaining the dynamics of health behaviours, the processes for changing behaviours and the effects of external influences on the behaviours (Story, Neumark-Sztainer & French, 2002). Some of the theories used in NE for primary school learners, namely the SCT (Sharma, 2007) and the Theory of Planned Behaviour (TPB) are discussed below.

2.6.7.1 Social Cognitive Theory

The SCT is the most commonly used theory in interventions for children (Van Cauwenberghe *et al.*, 2010). It explains behaviour as a dynamic and reciprocal interaction between personal factors, environmental influences and behaviour component (Tani *et al.*, 2015), enforcing self-efficacy and decision making skills (Pérez-Rodrigo & Aranceta, 2001). The SCT emphasises self-efficacy, modelling (observational learning), reciprocal determinism (bi-directional influences), behavioural capability (knowledge and skills to change behaviour), expectations (beliefs about likely result of action), functional meaning (personal meaning attached to behaviour) and reinforcement (responses to a person's behaviour that increases or decreases the chances of its recurrence) (Contento, 2007).

Children are believed to acquire appropriate behaviour through identification and imitation of relevant models within their environment and being rewarded for appropriate behaviour according to the social learning theory. The SCT prioritises the role of behavioural and cognitive skills, self-efficacy beliefs, and outcome expectancies in behaviour change. CATCH, a school based intervention based on the SCT that targeted personal factors, showed significant increase in diet knowledge and intention to eat healthier (Steyn *et al.*, 2009). High-5-project is another school based project that was based on the SCT and was conducted with children aged eight to nine years and targeted personal and behaviour factors. The study showed significant effects in children on self-efficacy and knowledge. A significant increase in fruit and vegetable

consumption at year one and two was also reported (Luepker, Perry, Osganian, Nader, Parcel, Stone & Webber, 1998; Steyn *et al.*, 2009).

Any behaviour is likely to take place when one believes they can and possess the necessary skills to perform and have positive expectations about the consequences of carrying out the behaviour. The SCT focuses on the mechanisms by which behaviour is assumed to be acquired. Interventions based on the SCT will assume that essential strategies include modelling and reinforcement, as well as self-efficacy beliefs (Huon Gail *et al.*, 1999).

2.6.7.2 Theory of Planned Behaviour

The Theory of Planned Behaviour (TPB) has been found to be very useful in understanding food choices and health and dietary behaviour (Contento, 2007). The TPB assumes that individuals make decisions in a reasonable manner and attitudes are formed after careful consideration of available information (Conner & Sparks, 2005). The relations between beliefs, attitudes, intentions and behaviour are the core emphasis of the TPB. The link between intention and behaviour reflects the fact that people tend to engage in behaviours they intend to perform.

The TPB proposes that the proximal determinants of behaviour are intention to engage and perceptions of control over the behaviour (Conner, Norman & Bell, 2002; Conner & Sparks, 2005). Attitudes (overall evaluations of the behaviour), subjective norms (beliefs about whether the one they regard as important, thinks they should engage the behaviour or not) and perceived behavioural control (perceptions about the extent of ease in performing the behaviour) determine the intentions of individuals to engage a behaviour (Conner & Sparks, 2005). In a study by Conner *et al.* (2001) the TPB was used as a theoretical framework to predict individuals' (attending health promotion clinics) intentions to eat a healthy diet and subsequent healthy eating behaviour over a prolonged period of six years. They concluded that interventions to promote health outcomes through changing various aspects of healthy eating should target attitudes and perceived behavioural control to increase healthy eating intentions since intentions were found to be predictive of healthy eating over considerable time periods (Conner *et al.*, 2002).

The TPB was employed as the basis to assess beliefs, attitudes and knowledge related to fruit and vegetables in a school based intervention conducted with children aged six to eleven years

in Scotland. Generally, the study found significant increases in fruit intake and but had little impact on vegetable intake (Anderson, Porteous, Foster, Higgins, Stead, Hetherington, Ha & Adamson, 2005). In another physical activity and healthy eating study with Grade 7 and 8 learners in Belgium, the TPB was used to evaluate the intentions, attitudes, self-efficacy, social support, knowledge, benefits and barriers related to physical activity and eating habits. The study showed significant positive intervention effects on physical activity in both genders and on fat intake in girls (Haerens, Deforche, Maes, Cardon, Stevens & De Bourdeaudhuij, 2006).

2.6.8 Comprehensiveness of programme

A strong consistent message is most likely received by learners if healthy eating is promoted through a comprehensive school health programme (Taylor *et al.*, 2007). The latter provides learners with knowledge, attitudes and skills required to make positive health decisions as well as the environmental support to maintain healthy behaviours. Combining classroom lessons and access to healthy foods and social support, inclusive of family and community members, is necessary to effect lasting changes in learner's eating behaviours (CDC, 1997; King & Ling, 2015).

2.6.9 Training of change agents

Nutrition education can utilise change agents such as teachers, parents, paraprofessionals and nutritionists and dietitians (Kupolati *et al.*, 2014b; Vermeer, 2014). Trained teachers implemented the school based NEP conducted in the Vaal region in SA to promote healthy eating habits (Oldewage-Theron & Egal, 2009). The Health-E-Pals, a school based nutrition and physical activity intervention, employed nutritionists as change agents (Habib-Mourad *et al.*, 2014).

Providing nutrition educators with adequate pre-service and ongoing in-service training that focuses on both content and teaching strategies for behavioural change increases the extent to which the curriculum is implemented (CDC, 1997), which in turn affects the likelihood that learner's eating behaviours will change. It also facilitates acquisition of comprehensive knowledge and teaching practices (e.g. promotion of nutritious food habits using motivation) necessary for the achievement of the objectives of a programme (Vermeer, 2014). Furthermore, sensitising and educating parents/ caregivers about healthy eating practices promote positive outcomes.

2.6.10 Programme duration and contact time

Behaviour change is a complex process and formation of healthy dietary habits in children takes time and thus may be difficult to achieve with short term interventions (one week long) (Wang & Stewart, 2013). Literature has reported that the duration of interventions in children varies between one week and five years (Van Cauwenberghe *et al.*, 2010; Wang & Stewart, 2013). Although school-based interventions longer than six months in duration tend to be more successful (Edmundson, Parcel, Feldman, Elder, Perry, Johnson, Williston, Stone, Yang & Lytle, 1996; Hill, 2010; Sharma, 2011), limited information is available with regards to the recommended contact time and intervention periods for nutrition education programmes for children.

Rana and Alvaro (2010) propose longer duration for school based healthy eating programmes (at least one year) (Rana & Alvaro, 2010). However, these long duration interventions have several limitations, including difficulties in gathering and maintaining momentum in implementing strategies within a period of one school year, and limited funding. However, research evidence shows that effective childhood interventions, aiming to improve fruit and vegetable consumption and general eating patterns, have potential to produce positive changes in a short term period (Huon Gail *et al.*, 1999). It is crucial to develop target group tailored interventions with strategies to support and maintain the cultured habits for longer periods (Wang & Stewart, 2013) .

Contact sessions may occur daily, weekly or even monthly (Witt & Dunn, 2012; Vermeer, 2014). For short duration studies, weekly or daily frequency of contact have been shown to be most effective (Racey *et al.*, 2016). According to Steckler *et al.* (2003) the allocated contact time for each lesson of 45-60 minutes for the Pathways study was inadequate for the planned lessons. Therefore, many teachers needed additional time to complete the classroom lessons and consequently more days than the planned were required (Steckler *et al.*, 2003). Adequate time should be allocated for NE lessons in order to realise positive stable changes in eating behaviour of the learners. According to Contento (2007), an increase in nutrition knowledge in school interventions can be achieved in approximately eight hours (Contento, 2007). More lessons on nutrition have resulted in more positive behavioural changes (CDC, 1997). Due to time restrictions in the school schedules, limiting NE to a few behaviours is more effective (CDC, 1997; Contento, 2007).

2.6.11 Assessment of interventions

Assessment of the intervention is concerned with evaluating the effectiveness and efficiency of an intervention (Pérez-Rodrigo & Aranceta, 2001). Its success is influenced by the level of motivation of the implementers and recipients (Young *et al.*, 2008). Although evaluation information is often missing or incomplete in studies, it is important in enhancing the effectiveness of a programme (Pérez-Rodrigo & Aranceta, 2001; Contento, 2007). Assessments are often necessary to facilitate decision making by determining whether:

- (i) the intervention achieved its goals and objectives;
- (ii) the message, content, educational strategies and activities were appropriate for the target group;
- (iii) the implementation followed the plan; and
- (iv) the intervention had an effect on the target behaviour(s).

Ideally, monitoring and evaluation of the interventions should be continuous from the beginning to the end, hence different evaluation measures and instruments should be developed for each stage (Contento *et al.*, 2002; Vermeer, 2014). Assessment of interventions should be done as both (i) an assessment of the process, and (ii) an assessment of the outcome in accordance to the programme purpose (Contento, 2007).

2.6.11.1 Process evaluation

Assessment of process is increasingly being used in studies to help explain the weaker aspects of programme performance and obtaining feedback for programme improvement (Pérez-Rodrigo & Aranceta, 2001). Evaluation of process focuses on assessing if the programme implementation is taking place as planned (fidelity), quality control and monitoring which leads to identification of unforeseen outcomes and lessons learned. Evaluation measures to assess programme dose (amount of intervention that was delivered), reach (number of those intended who received the intervention), penetration, utilisation and external competency factors should be developed for each intervention component (Pérez-Rodrigo & Aranceta, 2001; Young *et al.*, 2008). Assessment of process further facilitates the separation of the effects of each component, as well as explaining the probable relationships that could generate a combined effect (Hill, 2010).

The assessment of process may be performed through structured observations, questionnaires, completion logs, meetings and interviews with stake holders involved (Auld *et al.*, 1998; Young *et al.*, 2008; Vermeer, 2014). Several tools for assessment of the process have been used. These include attendance sheets (to monitor participant attendance to the programme), checklist of activities (to check completion and adoption of activities), participant evaluation forms, logbooks, classroom observations, information from peer educators, school meal observations (to track dose and fidelity of programmes (Auld *et al.*, 1998; Luepker *et al.*, 1998). For the HealthKick primary school nutrition intervention conducted in SA to promote healthy eating habits, a record of all intervention activities/ events planned and carried out was captured on an excel spreadsheet. Focus group discussions were held with school staff at each school and semi-structured interviews were carried out with principals and school staff involved with the school nutrition programme, tuck shops and vegetable gardens (de Villiers *et al.*, 2015). That study used process evaluation to gauge the programme uptake by schools, the usefulness and appropriateness of the resources and the adequacy of the support offered, delivery of the lessons, as well as the attendance to either educational or training sessions offered.

▪ **Attrition vs. Retention**

Attrition refers to a decrease in the number of participants during the course of a programme due to factors such as loss to follow-up and drop out while retention refers to the participants who remain part of the programme until completion (Prinz, Smith, Dumas, Laughlin, White & Barrón, 2001; Hoddinott *et al.*, 2008). Attrition has an effect on the effectiveness of interventions and compromises the generalisability of results by compromising participants' exposure to the intervention by creating groups that are non-representative of the population under study and reducing statistical power (Prinz *et al.*, 2001; Hoddinott *et al.*, 2008). Therefore understanding the factors that affect attrition is key to improve retention.

Attrition rates are influenced by a several factors that include the setting, socioeconomic status, learners relocating to a different school district or state, being suspended from school, drug rehabilitation, poor health, outmigration from the school, data cleaning, lack of parental consent, absenteeism and no shows or refusals (Neumark-Sztainer, Story, Hannan & Rex, 2003). Effective programmes should therefore include elements that promote participation. The use of community settings such as schools and community centres may reduce attrition by providing a convenient location easily accessed by participants, i.e. parents and learners. Such settings also reduce burden on the participants to access intervention sites as they may be

limited by transport cost. This is confirmed by literature which states that disadvantaged participants (poor socio-economic status) are more likely to be lost to follow-up (Prinz *et al.*, 2001). In addition to the above, strategies such as utilising parents as leaders in interventions (parent led interventions) and providing parents with other general parental skills relevant to the intervention, have been shown to promote participation thereby minimising attrition (Gibbons, 2007). The use of follow-up letters that appreciate participants and reminding them of the next follow-up, is another method that has been documented to minimise attrition, thereby promoting retention (Finch, Yoong, Thomson, Seward, Cooney, Jones, Fielding, Wiggers, Gillham & Wolfenden, 2015; Yun *et al.*, 2015).

2.6.11.2 Assessment of the outcome

Outcome evaluation assesses the efficacy of the education programme on the target population in comparison to the intended outcomes through the collection of data by using either experimental or quasi-experimental design evaluation tools (Vermeer, 2014). The assessment of outcome is done to determine whether the behavioural goals have been achieved and observed differences resulted due to the intervention. Outcomes can be evaluated as short term, medium term and long term outcomes respectively. Contento *et al.* (2002) reported that the most commonly used evaluation measures in behavioural focused studies with school going children were knowledge and skills, behavioural capabilities and potential psychosocial mediators (self-efficacy, outcome expectancies, behavioural intention) (Contento *et al.*, 2002).

Measuring instruments commonly used include participant questionnaires, surveys and self reports (Contento, 2007). In a school-based nutrition education programme conducted in KwaZulu Natal, participants completed a questionnaire to measure KAP towards nutrition and physical activity, and participated in a battery of fitness tests before and after the interventions (Naidoo *et al.*, 2009). In another school based nutrition education programme, outcome variables were measured using plate waste (provides an estimate of food consumed), food recall/ record (to assess dietary behaviour), surveys (to assess knowledge of the food guide pyramid) and interviews (to assess nutrition knowledge in children and assess teacher perspectives of the programme (Auld *et al.*, 1998).

2.6.11.3 Follow-up evaluations

Follow-up periods of an intervention may be categorised as short term if less than three months, medium-term between three and 12 months and long-term when the follow-up period is beyond 12 months with evidence of improvements over a longer period of time (Vermeer, 2014). Follow-up evaluation of nutrition interventions should be long term if sustainable lasting effects are to be determined (Wang & Stewart, 2013; Vermeer, 2014). Evaluation measures should be appropriate to the target group, purpose, duration and power of the intervention, i.e. different tools may be needed to evaluate short term interventions versus long term (Contento *et al.*, 2002). Valid evaluations have potential to increase parental and community support for NE (CDC, 1997). Food frequency questionnaires, self-registered questionnaires, 24 hour recalls, food consumption surveys have been used in follow-up assessments. Changes in consumption patterns and body composition, are some of the indicators assessed at follow-up (Kain, Uauy, Albala, Vio, Cerda & Leyton, 2004; Contento, 2007). Kain *et al.* (2004) employed a food frequency questionnaire to explore specific food consumption patterns at follow-up (Kain *et al.*, 2004).

According to Racy *et al.* (2016), a distinct lack of follow-up evaluations for many studies has been observed. This creates a gap as it is unknown whether the observed changes following the interventions are maintained, thereby questioning the high degree of effectiveness of published school-based interventions (Racey *et al.*, 2016). Follow-up assessments are necessary to determine retention of programme effects such as retention of knowledge and retention of intentions to choose healthy foods.

Follow-up evaluations assessing retention of knowledge may be done using questionnaires. Oosthuizen *et al.* (2011) used the same questionnaire used at baseline and post-assessment to assess knowledge retention among children at nine months follow-up and found retention for some topics (Oosthuizen *et al.*, 2011). Long term retention of knowledge may be improved by using real food items and delivering the different activities of the NEP in spaced out short time intervals (Vermeer, 2014). Furthermore, the use of influential role models and delivery of consistent messages across all settings have been reported to increase knowledge retention (Mikkelsen, Husby, Skov & Perez-Cueto, 2014). Retention of intentions to choose healthy foods has been assessed in studies such as CATCH. The latter observed retention of intentions to choose healthy foods after three years of teacher taught school based nutrition education conducted with Grades 3-5 (Edmundson *et al.*, 1996). A similar result was reported in the

Pathways study, a school based NEP which also reported sustained effects on food choice intentions after three years (Stevens *et al.*, 2003).

2.6.11.4 Assessing behaviour change vs. Assessing intention to change

Assessing behaviour change and assessing intention to change are carried out as part of the assessment of outcome(s). Intentions involve cognitive motivations that imply a future behavioural choice or action (Toporoff, French, Story, Himes, Snyder, DuBray, Rock & Hunsberger, 1997). Intention to change is a key mediator of behaviour and is therefore assessed as part of short term outcomes, i.e. changes in the mediators of the targeted behaviours. Intentions to change are key indicators of the level of motivation and are closely linked to the actual behaviour (Stevens *et al.*, 2003), which is assessed as a midterm outcome (Contento, 2007). Mediating variables may be assessed by questionnaires such as a 5 point agreement scale where theory constructs are operationalised as a series of questions or statements to which participants respond to. In the ‘It’s all about kids’ study, a two point scale questionnaire was used to assess the food choice intentions of learners. Learners responded to questions on what they would do in different situations with regards to food choices (Devault, 2006).

For most interventions, due to their duration and intensity, assessing mediators of targeted behaviours serve as good indicators of behaviour change, especially if a strong relationship between the mediator and behaviour is well established (Contento, 2007). The use of intended behaviour measures is based on the fact that they are sensitive indicators for assessing nutrition education interventions (Toporoff *et al.*, 1997).

2.7 Summary

Unhealthy diets and physical inactivity of school children present an emerging public health challenge globally, including in SA (Abrahams *et al.*, 2011; de Villiers *et al.*, 2015). This is confirmed by the escalating burden of malnutrition and associated consequences, including increased risk for chronic diseases, reduced wellbeing, retarded growth and development. Although children’s eating habits are learned and developed during childhood, they are influenced by several factors, including families, peers and environment. Considering that childhood eating habits persist into adulthood, intervention strategies should be established to promote healthy eating habits and should target children (Wang & Stewart, 2013; Averett *et al.*, 2014; King & Ling, 2015).

Nutrition education is instrumental in promoting healthy eating habits in learners, parents and adults. In a review by Steyn *et al.* (2009) consistent improvements were found in nearly all school based interventions evaluated (Steyn *et al.*, 2009). The most successful interventions have included a educator taught (trained) curriculum component, a supportive school environment, parental or family involvement, and provision of healthy foods at school (Abrahams & Steyn, 2011). Identifying and understanding why and how an intervention can be effective in a particular group of people is paramount for success. Therefore, tailoring interventions to the needs of the target group and underpinning them with appropriate theories of behaviour change are key elements to the effectiveness of school-based NEP. In addition, a NEP's sensitivity to the culture and developmental readiness of the learners to learn is an advantage to its acceptability. Its structure should be acceptable to both the schools and learners. Community involvement during the entire programme, inclusive of its evaluation, concretises ownership and ensures sustainability (Vermeer, 2014).

Another important component of NEPs is the evaluation of programmes. The latter is necessary to assess their effectiveness and efficiency, and should be ongoing. In order to establish and explain the weaker aspects of programme performance and obtain feedback for programme improvement, process evaluation should be done (Pérez-Rodrigo & Aranceta, 2001). An outcome evaluation should also be done to determine whether behavioural goals have been achieved and whether observed changes resulted due to the programme (Contento *et al.*, 2002; Vermeer, 2014). Furthermore, follow-up assessments evaluating retention of programme effects should be done to determine if any sustainable lasting effects remain long after programme completion (Wang & Stewart, 2013; Vermeer, 2014).

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Chapter 3: Methodology

3.1 Introduction

The eating habits of children may be improved through NE focused on improving psychosocial mediators of behaviour change. This study therefore developed and implemented a tailored nutrition education programme (NEP) that proceeded in two phases and utilised both the qualitative and quantitative methods of enquiry. A brief overview of the study (figure 3.1) is discussed in this chapter which includes:

- Objectives of the study
- Study approach
- Setting and population
- Situational analysis
- Phase 1: Planning and development of the nutrition education programme
- Phase 2: Implementation and evaluation of the nutrition education programme
- Definitions of the key concepts used throughout the study
- References

The detailed description of the methods used in each phase is discussed in the subsequent chapters 4, 5 and 6 for the situational analysis, phase 1 and phase 2 respectively.

3.2 Main objective

- To determine whether a tailored NEP, using the SAFBDGs would improve the nutrition related knowledge, self-efficacy and food choice intentions of seven to nine year olds in resource limited settings in Pretoria, Gauteng Province, South Africa.

3.2.1 Specific objectives

The objectives are presented as they were executed in each phase:

Analysis of the situation

- To determine the nutrition education needs of learners aged seven to nine years (Grade 1–3) in resource limited settings in Pretoria.

Phase 1: Planning and development of the Nutrition Education Programme

- To develop a NEP (based on the SAFBDGs) tailored to the nutrition education needs of seven to nine year olds (Grade 1–3) in resource limited settings in Pretoria.
- To develop age appropriate learning materials and activities for a NEP for learners aged seven to nine years (Grade 1–3) in resource limited settings in Pretoria.
- To develop an instructor’s manual guided by the SCT and guidelines from the FAO’s Nutrition education for the public (Hosmer, Dwyer & Villarroel, 1997; Smith & Smitasiri, 1997).

Phase 2: Implementation and evaluation of the Nutrition Education Programme

- To conduct a pre-intervention assessment of the learners’ nutrition related knowledge, self-efficacy and food choice intentions.
- To implement the NEP to learners aged seven to nine years (Grade 1–3) in resource limited settings in Pretoria.
- To evaluate the effectiveness of the NEP with respect to changes in nutrition related self-efficacy, knowledge and food choice intentions at six weeks (post intervention).
- To assess the retention of intervention effects at 12 months (follow-up).
- To determine the differences in measured outcomes between the two schools and gender groups.

3.3 Research approach

As shown in figure 3.1, this study was done in two phases that were preceded by an analysis of the learners’ dietary practices data that were obtained from the parents and the learners in the situational analysis done for the large study. Phase 1 involved the planning and development of the NEP, and Phase 2 involved the implementation and evaluation of the NEP.

The analysis of the learners’ dietary practices data was done in the qualitative domain. Qualitative methods produce in-depth information regarding a phenomenon and thus were more appropriate to address the objective to determine the NE needs of the learners. Participants freely give their views allowing the researcher to better understand the participants’ needs (Swift & Tischler, 2010; Pilnick & Swift, 2011). Thematic analysis was employed in the analysis of the learners’ dietary practices data obtained from the parents and learners.

Phase 1 resulted in the development of the NEP based on the SCT and the SAFBDGs, being guided by the theory based procedural model for designing nutrition education as described by Contento (Contento, 2007). An empirical inquiry was not required.

Employing a quasi experimental study design, the quantitative domain was used to address the objectives of Phase 2. A quantitative approach, that involves the gathering of empirical data in order to explain a phenomena, was employed to explain the effects of the NEP on specified outcomes using empirical evidence gathered from the before, after and follow-up assessments (Joubert, Ehrlich, Katzenellenbogen & Abdool Karim, 2007).

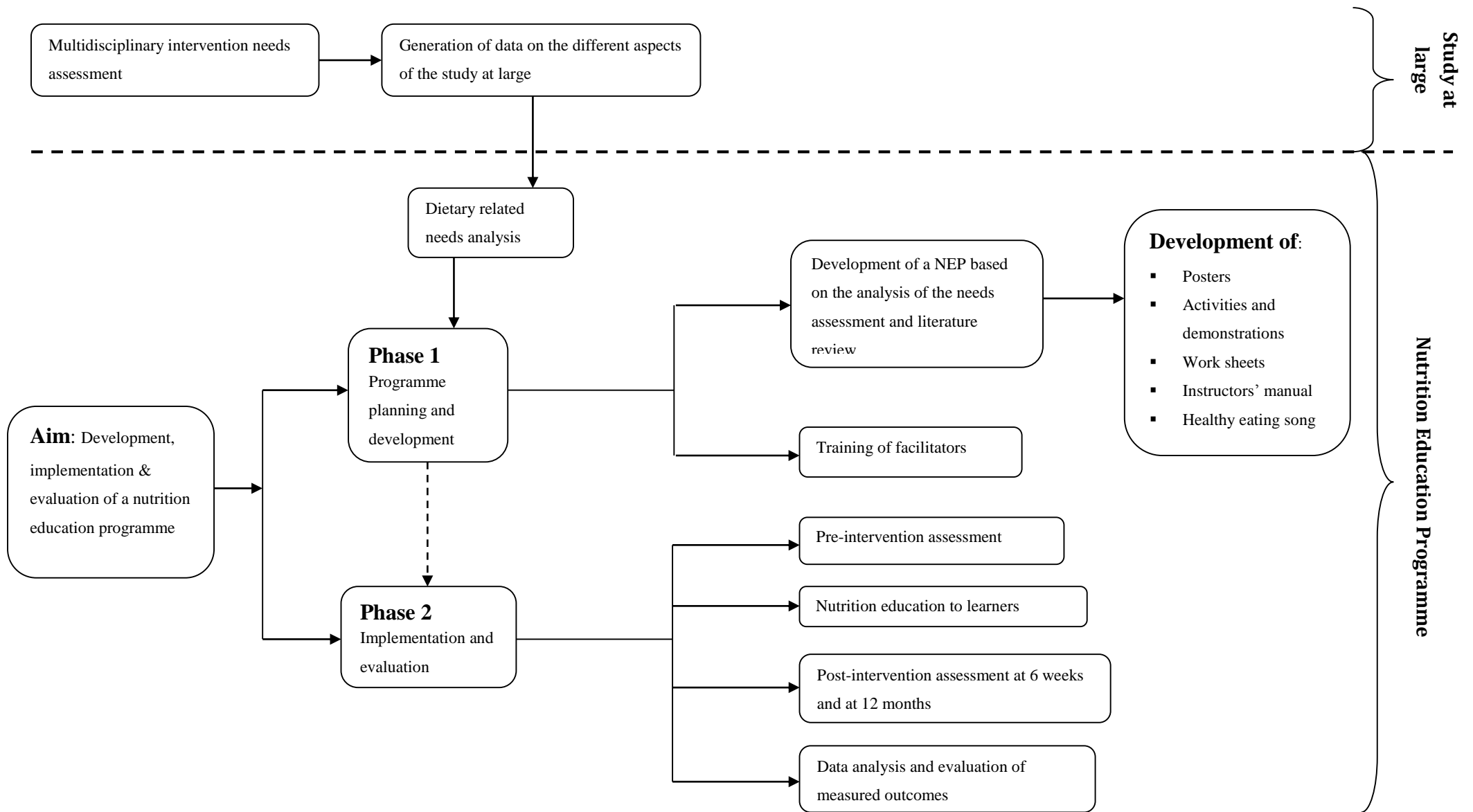


Figure 3.1: Outline of the study phases

3.4 Study setting and population

The study was conducted at two primary schools, about 16 km apart, with learners from limited resource communities. The selection of the two schools was done by the Gauteng DoBE as part of the larger study. The languages spoken in the setting are Northern Sotho, isiZulu, Tswana, Afrikaans, English and Tsonga.

The two schools are public urban section 21 schools as classified by the South African Department of Basic Education (DoBE). They are both located in the City of Tshwane, Pretoria (Capital City of South Africa) that forms the local government of the Northern Gauteng Province of South Africa. The schools manage their own finances acquired from school fees, government subsidy and other donors. The study sample (N=244) was composed of primary school learners aged seven to nine years in Grade 1-3 from the two schools. Figure 3.2 shows the study site location.

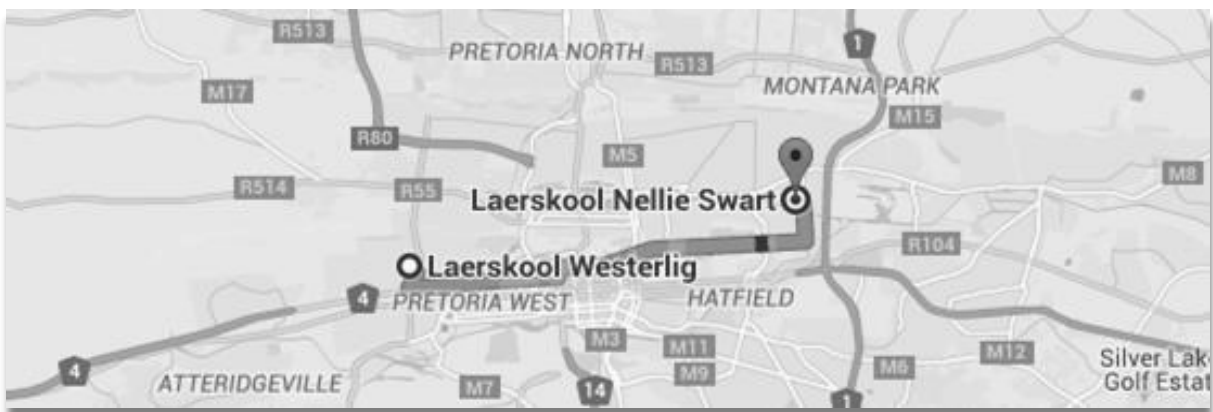


Figure 3.2: The study sites

3.5 Situational analysis

The aim of this stage was to assess and interpret the dietary practices data of the learners to determine the nutrition education needs of the learners aged seven to nine years in the resource limited settings in Pretoria. The dietary practices data were a subset of the data obtained for the study at large that were available to the researcher on completion of the data collection. The dietary practices data were collected from the parents and learners, and were analysed by the researcher in the qualitative domain. Thematic analysis was employed since it involves the identification, analysis and description of patterns within qualitative data (Burnard, Gill,

Stewart, Treasure & Chadwick, 2008; Fade & Swift, 2011), leading to the identification of the needs of the learners. The detailed discussion of this stage is done in Chapter 4.

3.6 Phase 1: Planning and development of the nutrition education programme

The aim of Phase 1 was to develop a culturally appropriate theory based NEP, tailored to the needs of learners aged seven to nine years, as well as the planning and preparation for the implementation thereof. The results of the analysis of the dietary practices and information from the literature review informed the development of the NEP. The process was guided by the steps for designing theory based nutrition education as described by Contento (Contento, 2007) and the SAFBDGs (Schönfeldt, Hall & Bester, 2013; Kupolati, McIntyre & Gericke, 2014).

Classroom teaching materials that were developed in response to the outcomes of the situational analysis and information from the literature review included learners' worksheets, visual aids in the form of posters, food demonstrations, food displays and a healthy eating song. The materials were simple and cost-effective that learners could take home. The development of the instructor's manual (based on the SAFBDGs) was guided by the SCT and guidelines from the FAO's nutrition education for the public (Hosmer *et al.*, 1997; Smith & Smitasiri, 1997).

Planning and preparation for implementation, which involved the training of facilitators, printing of all materials and purchasing of materials for food demonstrations and displays, were done in Phase 1. The detailed discussion of Phase 1 is found in Chapter 5.

3.7 Phase 2: Implementation and evaluation of the nutrition education programme

The aim of Phase 2 was to implement the developed culturally appropriate theory based NEP to learners aged seven to nine years in Grades 1-3. Phase 2 also aimed to evaluate the effect of the NEP on the food choice intentions of Grade 1 learners, and on the nutrition related self-efficacy and knowledge of Grade 2 and 3 learners.

A quasi-experimental design without a control group, which utilised a quantitative approach, was employed. Quasi-experimental designs are more realistic in practice settings, especially

where it is not feasible to do a randomised control trial (RCT), though they do not account for confounding factors. These study designs are often used as they correspond to programme evaluation elements often linked to public health interventions. They normally take up a pre-assessment and post-assessment approach, where (i) a non-randomised control group not receiving the intervention is compared with the intervention group, or (ii) a single group receives the intervention and the outcome of interest is compared before and after (Contento, 2007; Joubert *et al.*, 2007). Due to only two schools participating in the study and logistical limitations such as time tabling and staffing requirements, a RCT was not feasible for this study. Therefore a single group pre-assessment and post-assessment design was chosen.

A conveniently selected sample of learners aged seven to nine years received NE for six weeks and assessments were done at baseline, endpoint (six weeks) and follow-up (12 months) using a modified Pathways KAB questionnaire (Stevens, Cornell, Story, French, Levin, Becenti, Gittelsohn, Going & Reid, 1999). Although process evaluation was not done due to feasibility issues, measures were put in place to ensure the delivery of lessons was done as intended. Only immediate outcomes (food choice intentions, nutrition related self-efficacy and knowledge) were measured for this study. Chapter 6 gives the full description of Phase 2.

3.8 Conceptualisation

A conceptual framework of the study is presented in figure 3.3.

3.8.1 Conceptual framework

Outcome variables included immediate outcomes such as changes in nutrition knowledge, nutrition self-efficacy and food choice intentions that were assessed at baseline, six weeks and 12 months. Intermediate outcomes such as changes in dietary practices were not assessed due to the short duration of the NEP.

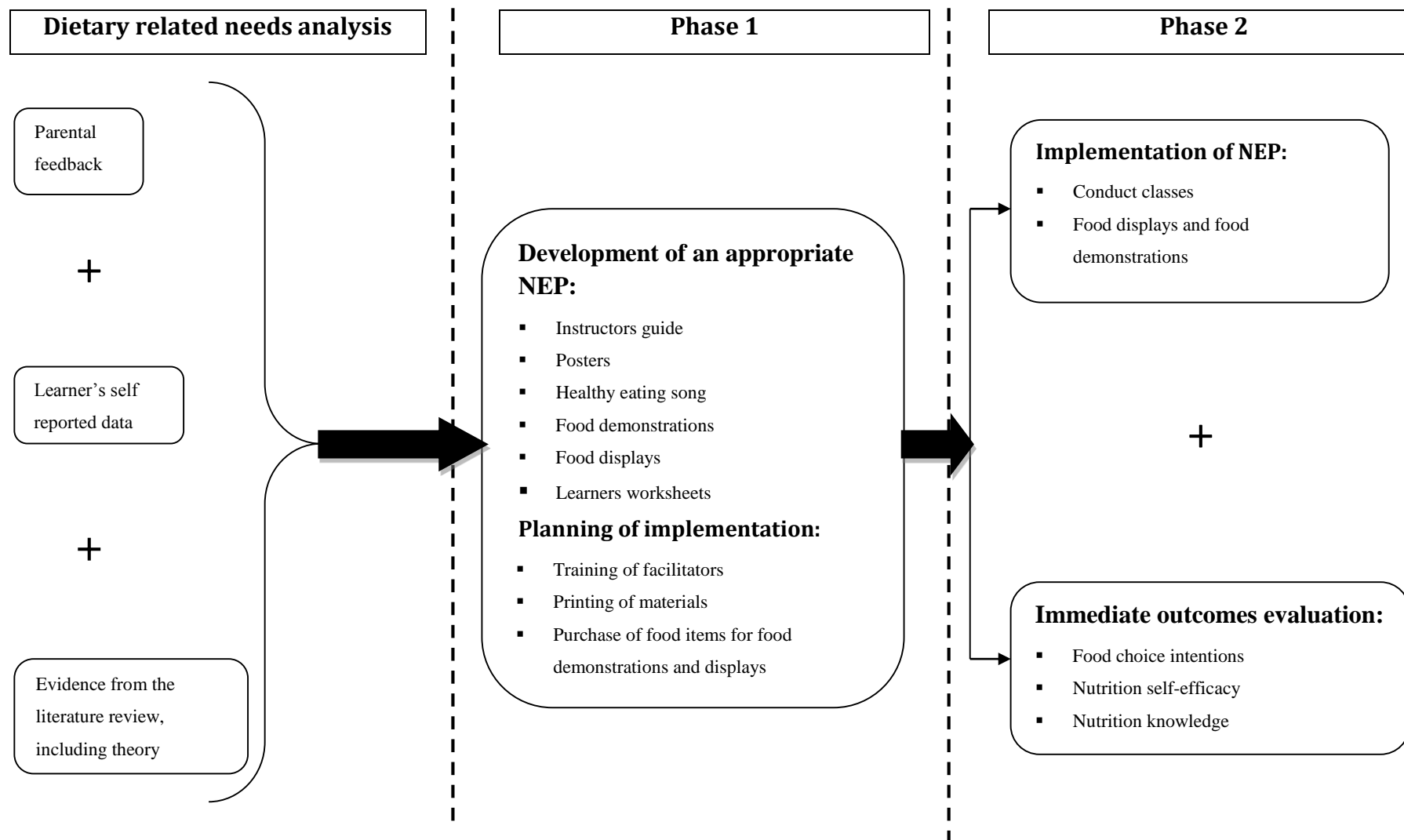


Figure 3.3: Conceptual framework of the nutrition education programme

3.8.2 Definition of terms

The operational definitions of the key concepts used in the study are given in table 3.1.

Table 3.1: Definition of key concepts used in the study

Concept	Operational definition
Nutrition education programme	A set of activities designed to facilitate adoption of healthy eating behaviours that are conducive to health and wellbeing (Contento, 2007)
Resource limited setting	A geographical location typically characterised by poverty, low income individuals, less developed infrastructure (transportation, buildings), over-burdened health system and few trained/skilled personnel (Team Design I, 2014)
Situational analysis	A systematic process of investigating the learners' lifestyle to assess the state of current nutrition related issues of concern, needs or gaps (de Villiers, Steyn, Draper, Fourie, Barkhuizen, Lombard, Dalais, Abrahams & Lambert, 2012)
Instructor's manual	Tools, notes and ideas (based on the SCT) designed to assist instructors' in helping learners grasp the main ideas and concepts of healthy eating
Posters	A large print, including graphical and textual elements, that can be pinned to the wall to communicate healthy eating messages
Healthy eating song	The healthy eating song intended to teach children about the importance of healthy eating
Food demonstrations	A 'how' to presentation for making simple healthy snacks
Food displays	Healthy foods relevant to the lesson put in a place where learners can easily see and identify during each lesson
Enhanced curriculum	Special nutrition education that may be delivered by specialists or teachers (Dudley, Cotton & Peralta, 2015)
Learners	Pupils who participated in the NEP
Public urban section 21 schools	Schools in South Africa that manage their own finances, academic and sports curriculum (ETB)
Dietary practices	Habitual decisions of individuals or group of people regarding what foods they eat (Preedy & Watson, 2010)
Outcome evaluation	Measures program effects in the target population by assessing the progress in the outcomes or outcome objectives that the program is to achieve (Pérez-Rodrigo & Aranceta, 2001; Contento, 2007)
Nutrition knowledge	Knowledge of concepts and processes related to nutrition and health (Contento, 2007)
Nutrition self-efficacy	One's belief in one's ability to succeed in eating healthy (Bandura, 2001)
Food choice intention	The motivation required to choose healthy foods (Conner, Norman & Bell, 2002)

3.9 Ethical consideration

The study at large obtained ethical approval from the Research Ethics Committees of the Faculties of Education and Health Sciences of the University of Pretoria (Number: **D2015/375A**) (Appendix A). Approval was also sought from the Gauteng DoBE, as well as the primary schools that were involved in the study.

Parents of participating learners gave written informed consent for their children to take part in the study (Appendix B) and all child participants gave assent (Appendix C). All data collected were identified through codes to maintain confidentiality. Participation was voluntary. Non consenting learners were relocated to a different classroom by their teachers prior the NEP lessons thus only consenting learners were present in classrooms during the NEP lessons. Information was clearly explained to make it easy to understand. Questionnaires were availed in the learners' preferred languages, English and Afrikaans. Participants were assured of no potential harm in participating in the study. The study findings were disseminated to key stake holders and confidentiality of identities and information was maintained.

3.10 Delimitations of the study

- The study took place in two resource limited schools in Pretoria selected as part of the study at large.
- Learners, aged seven to nine years, in Grades 1-3 were involved in the study.
- The situational analysis was based on dietary practices data obtained from the project at large.
- All lesson material (content and activities) was delivered within 20 minutes over nine lessons.
- The content of learning materials was limited to the SAFBDGs.
- Only three mediators of behaviour (food choice intentions in Grade 1 learners, and nutrition self-efficacy and nutrition knowledge in Grade 2 and 3 learners) were assessed as outcomes.

3.11 Assumptions

The assumptions of the study were that:

- The participants would provide honest and truthful responses.
- Children have the potential to develop their own wellbeing.

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Chapter 4: Analysis of the situation

4.1 Introduction

This section reports on the analysis of the learners dietary practices qualitative data obtained from the parents and learners (figure 3.1). These data (Appendix D) were a subset of the situational analysis data obtained for the study at large. The data set contained qualitative information on the foods consumed by learners on a daily basis and the food items that the learners had eaten on the data collection day. The learners' eating practices were identified with reference to the SAFBDGs. The process of analysing the situational analysis data is reported as follows:

- Aim
- Data management and analysis
- Results
- Discussion
- Strengths and limitations
- Conclusions
- Recommendations
- References

4.2 Aim

The aim was to analyse and assess the dietary practices data obtained from the situational analysis in order to determine the nutrition education needs of learners aged seven to nine years from resource limited settings in Pretoria, School 1 and School 2.

4.3 Data management and analysis

Data on the food items consumed by the learners from the two schools on a daily basis as reported by the parents, as well as self-reported data on food items that the learners had eaten on the data collection day, were availed to the researcher after completion of the study at large's situational analysis data collection (Appendix D). The data were collected using semi-structured open ended questionnaires. The two data sets were analysed separately, beginning with the data reported by the parents. Data were captured on an excel spreadsheet and thematic

analysis was performed by the researcher using the following process (Burnard, Gill, Stewart, Treasure & Chadwick, 2008):

Step 1: Analysing the data obtained on the foods consumed

The researcher read the data on the foods consumed daily several times in order to discover the main groups of food consumed by learners, guided by the SAFBDGs. The foods were coded by food groups, and foods from similar food groups were put together (table 4.1). The same process was followed in the analysis of the learners' self-reported dietary practices.

Step 2: Generation of themes and categories within the data

Within the food groups consumed, the foods were grouped as either healthy (those whose consumption should be encouraged) or unhealthy (those whose consumption should be in moderation/ minimal) (table 4.2). The process was repeated in an attempt to verify and confirm the themes and to discover more themes. All main themes as guided by the SAFBDGs were collected together, and similar food groups were grouped together. Similar food groups were grouped into categories.

Step 3: Refining the themes and categories

Overlapping and similar categories were refined and grouped together. The themes and categories were further refined and reduced in number to two categories by grouping themes together.

This process resulted in the identification, analysis and description of patterns within the data (Fade & Swift, 2011).

4.4 Results

The results of the analysis of the dietary practices are presented in line with the aim to determine the nutrition education needs of the learners using the dietary practices reported by the parents and children.

4.4.1 Dietary practices of the learners (obtained from parents)

The analysis of the dietary practices data (table 4.1) indicated that most learners had unhealthy eating habits (dietary practices) on a daily basis. The foods consumed daily by learners in both

schools seemed not to be in line with the SAFBDGs (table 4.2). The learners in both schools consumed mostly high fat foods, high sugary foods and high salt foods. It was revealed that learners consumed many unhealthy foods on a daily basis which included take away foods, muffins, vienna, fries, hotdogs muffins, scones, pastries, biscuits, hamburger, pizza, chocolate, sweets, sodas, cookies, candy.

Some learners from both schools were reported to go to school without eating breakfast. None of the learners were reported to be consuming dry beans, split peas, lentils and soya on a daily basis. The consumption of milk, yoghurt and maas was not common in both schools, despite the SAFBDG recommendation of their consumption on a daily basis. Although School 1 learners were reported to consume high fat foods at breakfast, learners in School 2 were not. Consumption of fruit and vegetables was also not a common practice, especially in School 2 which seemed not to consume fruits or vegetables during lunchtime. Take-away foods were eaten on a daily basis, mostly at dinner time by learners from both schools. None of the learners were reported to consume healthy oils, except for learners in School 1, who indicated that they consumed healthy oils such as nuts on a daily basis at lunch time.

Although learners consumed foods from most food groups, within food group variety was limited. The diet seemed monotonous and lacked diversity.

Table 4.1: Foods consumed by learners according to food groups as reported by parents

Food groups	Foods consumed by the learners on a daily basis	
Breakfast	School 1	School 2
Nothing	Skipping breakfast	Skipping breakfast
Fruits & vegetables	Fruits, vegetables, soup	Fruit , soup
Starchy foods	Bread, soft porridge, cereal	Bread, soft porridge , cereal
Dry beans, peas, lentils, soya	-	-
Chicken, fish, meat & eggs	Eggs , cheese	Eggs, fish, cheese
Water & water based drinks	Tea, coffee	Water, tea, coffee
Milk, yoghurt, maas	Milk , yoghurt	Milk, yoghurt
Fat & oil	Vienna , fries , Wimpy, hotdogs, muffins, scones & pastries	Vienna
Sugar	Biscuits	-
Lunch		
Fruits & vegetables	Fruits, vegetables, fruit juice	Fruit juice
Starchy foods	Bread, porridge, sandwiches, rice	Bread , pasta
Dry beans, peas, lentils, soya	-	-
Chicken, fish, meat & eggs	Chicken, eggs, cheese, fish	Eggs , cheese
Water & water based drinks	Water	Water , tea
Milk, yoghurt, maas	Yoghurt	Yoghurt
Fat & oil	Nuts, hamburger , pizza, hotdogs, vienna, muffins, scones & pastries, Chips & crisps	Fries , muffins, scones & pastries, vienna, Chips & crisps, hot dogs
Sugar	Cookies , candy, chocolate	Chocolate, sweets, sodas
Dinner		
Fruits & vegetables	Vegetable, fruit juice, soup	Vegetables, fruit, soup
Starchy foods	Rice, pasta, samp	Rice, pasta
Dry beans, peas, lentils, soya	-	-
Chicken, fish, meat & eggs	Chicken, eggs, fish, mince, stew, beef	Chicken, fish , beef
Water & water based drinks	Water	Water, coffee
Milk, yoghurt, maas	-	yoghurt
Fat & oil	Fries, hamburger, pizza, KFC, Nando's, McDonalds, Chips & crisps	Pizza , muffins, scones & pastries, KFC
Sugar	Sodas	Cookies, sodas

Table 4.2: Food groups consumed by learners categorised as healthy vs. unhealthy

Main category	Sub category
Foods that are good to consume <i>(healthy)</i>	Starchy foods Fruits & vegetables Chicken , meat, fish & eggs Milk, maas, yoghurt Water & water based drinks Little healthy fat
Foods that can be harmful when too much is consumed <i>(unhealthy)</i>	High fat foods High sugar foods and drinks High salt foods

4.4.2 Self-reported dietary practices of the learners

According to the self-reported data on the foods consumed on the data collection day by the learners, most learners consumed unhealthy foods (table 4.3). The most commonly consumed food groups were fat and oil(s) and starchy foods. Within the fat/ oil food group, none of the learners consumed foods rich in healthy oils. The most commonly consumed high fat foods were take away foods, including “KFC” and hotdogs. Furthermore, none of the learners consumed the food groups: dry beans, peas, lentils, soya; water and water based drinks, and milk, maas yoghurt on the day. Within the starchy food group, most learners consumed bread and fewer learners ate breakfast cereal or porridge. Some learners consumed fruits and vegetables; apples being the fruit that was eaten by most learners. The consumption of foods from the food group chicken, meat, fish & eggs was low. Within group variety for most food groups was low and the diets seemed monotonous and lacked diversity.

Table 4.3: Self reported food items consumed by learners grouped according to food groups

Vegetables and fruit	Starchy foods	Dry beans, peas, lentils, soya	Chicken, fish, meat, eggs	Water and water based drinks	Milk ,maas yoghurt	Fat & oil	Sugar
Apple (13)	Bread (32)	-	Eggs (3)	-	-	Pizza (25)	Cupcakes (4)
Juice (3)	Pap (8)		Chicken (2)			KFC (18)	Cake (2)
Vegetables (2)	Cornflakes (6)		Meat (2)			Hotdog (14)	Chocolate drink (1)
Carrots (1)	Sandwich (5)					Pie (11)	Jam (1)
Banana (1)	Toast (4)					Burger (9)	Ice Cream (1)
Fruit (1)	Noodles (3)					Chips (11)	Cake (1)
Grapes (1)	Bun (2)					Fish (2)	Red Cake (1)
Strawberry (1)	Porridge (1)					Bacon (2)	Sweets (1)
	Popcorn (1)					Cheese (2)	
						Steers (1)	
						Ribs (1)	
						Vienna (1)	
						Nando's (1)	
						Polony (1)	

*(number) refers to the frequency of consumption for each food item

4.5 Discussion

Healthy eating in childhood facilitates growth and development, cognitive development and general wellbeing (DOH:Nutrition, 2012). Research has shown that most South Africans, including children, weigh either less than or more than they should (Steyn, Lambert, Parker, Mchiza & de Villiers, 2009). Therefore, SAFBDGs were developed to help South Africans aged five years and older to make healthy food choices using a variety of foods (DOH:Nutrition, 2012). The analysis of the learners' dietary practices data was therefore based on SAFBDGs and was done to determine their NE needs.

The learners in both schools generally had unhealthy eating habits characterised with common consumption of unhealthy, energy dense foods. This result is confirmed by the learners' self-reported food choices recorded on the data collection day and the report from the parents which showed that learners commonly consumed unhealthy energy dense foods. This pattern of dietary behaviour is consistent with research studies in South Africa that also showed that learners from resource limited settings consumed mostly unhealthy energy dense foods (Abrahams, de Villiers, Steyn, Fourie, Dalais, Hill, Draper & Lambert, 2011; de Villiers, Steyn, Draper, Fourie, Barkhuizen, Lombard, Dalais, Abrahams & Lambert, 2012). The learners' diets were monotonous and lacked variety, thereby confirming the results by Steyn, de Villiers, Gwebushe, Draper, Hill, de Waal, Dalais, Abrahams, Lombard & Lambert, 2015. They also reported that numerous children from resource limited areas had very little diversity in their diets (Steyn, de Villiers, Gwebushe, Draper, Hill, de Waal, Dalais, Abrahams, Lombard & Lambert, 2015).

The foods consumed on a daily basis by the learners were not in agreement with the recommended SAFBDGs which state that individuals should enjoy a variety of foods. This was evidenced by the results which showed that the learners' diets were monotonous. Similar results were documented in a study by Oosthuizen *et al.* (2011), where very little dietary variety was evident before and after an intervention for children aged nine to thirteen years from the Vaal region in South Africa (Oosthuizen, Oldewage-Theron & Napier, 2011). Furthermore, the high consumption of unhealthy energy dense foods, especially high fat and high sugary foods and drinks, which is not in line with the SAFBDGs, is of great concern considering the increasing prevalence of childhood obesity worldwide, including South Africa. This phenomenon has been linked with increased consumption of unhealthy energy dense foods (Naidoo, Coopoo, Lambert & Draper, 2009; Baleta & Mitchell, 2014).

The parents also reported that it was common practice for the learners to consume unhealthy foods, including take away food such as “KFC” and pizza at dinner time. The self-reported data also confirmed the common consumption of take away food by the learners. This finding is consistent with the results from studies on food consumption which also reported that children from Australia mostly consumed fruit juices, carbonated drinks, pizza, chips, and fried potatoes (Magarey, Daniels & Smith, 2001; Bowman, Gortmaker, Ebbeling, Pereira & Ludwig, 2004). In addition to the fact that children from low-income areas have very little influence on their food choices (foods eaten on a daily basis) (Oosthuizen *et al.*, 2011; Steyn *et al.*, 2015), research has shown that the home food environment is to a great extent modelled by the parent (Taylor, Evers & McKenna, 2005; Hesketh, Waters, Green, Salmon & Williams, 2005). Dinner foods are usually consumed at home with the parents, therefore this result indicated a need to involve parents in NE in-order to achieve positive results (King & Ling, 2015).

Equipping parents with nutrition related knowledge and skills by involving them in NEPs may positively influence children’s eating habits (Başkale & Bahar, 2011). Considering that the parents model the home food environment, increasing parental nutrition knowledge may address children’s dietary practices such as skipping breakfast and carrying of lunch boxes. This study, and others (Story, Neumark-Sztainer & French, 2002; Abrahams *et al.*, 2011; Faber, Laurie, Maduna, Magudulela & Muehlhoff, 2014), have shown that skipping breakfast is common in learners despite the well-known adverse effects on their cognitive abilities and school performance. Therefore, improving parental nutrition knowledge may promote the carrying of healthy lunchboxes by learners as research has shown that learners in SA usually do not carry lunchboxes and those who do, usually carry unhealthy foods (Abrahams *et al.*, 2011). In turn, the need by learners to purchase unhealthy energy dense foods that are easily available within the school food environment (Faber *et al.*, 2014) may be minimised.

Within food group variety was low, e.g. most learners consumed apples within the fruit and vegetables food group. Furthermore, only learners from School 1 were reported to consume healthy oils, and only in the form of nuts despite the many sources of healthy oils. Although learners ate foods from most food groups, some food groups were completely missing from the diet on a daily basis, e.g. dry beans, split peas, lentils and soya. However, dry beans, split peas, lentils and soya are recommended to be consumed regularly and not daily. Thus the parents could have deliberately left them out as foods not consumed on a daily basis. Such monotonous

diets may have negative effects on the children's development and general wellbeing (Oosthuizen *et al.*, 2011).

The analysis also showed that learners ate mostly fish, chicken, meat or eggs every day. Since meats can be afforded, NE utilising the SAFBDGs is essential to encourage the consumption of other food groups that are lacking in their diets. However, FBDGs lack the aspect of portion size and serving size suggestion (Oldewage-Theron & Napier, 2011), therefore it becomes of paramount importance that NE based on FBDGs in-corporates the use of portion size estimation aids in order to minimise under- and overconsumption of some food groups (Oldewage-Theron & Napier, 2011).

These short comings within the dietary practices informed the target areas and areas for emphasis in the NEP.

4.6 Strengths and limitations

The findings from the situational analysis provide an in-depth understanding of the daily dietary practices of primary school learners from resource limited settings in Pretoria. The data collection methods (semi-structured open ended questionnaires and workshops based on PRA principles) allowed data on food choices to be obtained in a relatively easy way compared to conventional dietary intake methods. The data collection was done with different groups (parents and learners) which allowed input from different individuals, thereby increasing the credibility of the data. In addition to the above, involving parents in the situational analysis (providing data) is a positive way to obtaining their buy-in for the intervention. Furthermore, it gives insight into issues that learners would find difficult to share.

Self-reported data on the food choices made on the data collection day were collected from the learners. The daily dietary practices data were obtained from the parents on behalf of the learners. Therefore, some food choices that learners made at school that the parents might not be aware of could have been missed from the foods eaten on a daily basis by the learners. The situational analysis was done as part of the larger study and the dietary practices data were availed to the researcher upon completion of data collection. The dietary practices data provided were partially analysed (not verbatim) and thus the trustworthiness of the data could have been compromised. However, to ensure trustworthiness of data, two different sources of information were used i.e. the parents and the learners (Muchiri, 2013). Furthermore, data on

the barriers and motivators of different dietary practices were not obtained. In addition to the above, although self-reporting surveys represent a cheap way of collecting data, it is also prone to bias. Thus the data collected relied on the honesty of the participants.

4.7 Conclusions

The aim of the situational analysis was to determine the NE needs of the learners in resource limited settings. This qualitative exploration of the dietary practices of the learners suggested that the learners had unhealthy eating habits (high consumption of unhealthy energy dense foods both in the school and home environment, skipping meals, monotonous diets). NE is a strategy that could promote healthy eating habits. In order to realise positive effects of a NEP, parental involvement is key in addition to promoting the adherence to the SAFBDGs as dietary problems were also in the home environment (Pérez-Rodrigo & Aranceta, 2001).

4.8 Recommendations

The planning of the NEP should focus on improving the learners' eating habits in line with the SAFBDGs (incorporating portion size estimation aids) and increasing parental nutrition knowledge and skills.

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Chapter 5: Development of the Nutrition Education Programme

(Phase 1)

5.1 Introduction

The development of a culturally appropriate theory based NEP tailored to the needs of learners aged seven to nine years took place in Phase 1. The planning and preparation for implementation was also done in this phase. The six steps for designing theory based nutrition education as described by Contento (2007) guided the development and planning of the NEP. The SAFBDGs (Vorster, Love & Browne, 2001; Schönfeldt, Hall & Bester, 2013; Kupolati, McIntyre & Gericke, 2014) were also utilised. The outcome of the situational analysis and information from the literature review informed the development of the NEP. Chapter 5 is discussed as follows:

- Aims and objectives
- Procedure for the development of the nutrition education programme
- Arrangements for implementation
- Identification and training of facilitators
- References

5.2 Aims and objectives

5.2.1 Aim

The aim of Phase 1 was to develop a culturally appropriate theory based NEP tailored to the needs of learners aged seven to nine years, as well as preparation for the implementation thereof.

5.2.2 Objectives

The objectives of Phase 1 were to:

- develop a NEP (based on the SAFBDGs) tailored to the nutrition education needs of seven to nine year olds (Grade 1-3) in resource limited settings in Pretoria,
- develop age appropriate learning materials and activities for a NEP for learners aged seven to nine years (Grade 1-3) in resource limited settings in Pretoria, and

- develop an instructor's manual guided by the SCT and guidelines from the FAO's Nutrition education for the public (Smith & Smitasiri, 1997; Hosmer, Dwyer & Villarroel, 1997).

5.3 Procedure for the development of the nutrition education programme

The literature review, together with the findings of the situational analysis, guided the development of the NEP. The following steps were followed in the development of the NEP (Contento, 2007).

5.3.1 Step one: Situational analysis and identification of behaviour of concern

5.3.1.1 Situational analysis

The analysis of the learners' dietary practices data (as reported by both parents and learners) revealed that on a daily basis (table 4.1):

As reported by parents:

- skipping breakfast was a common practice in learners from both schools;
- learners from both schools consumed mostly high fat foods;
- none of the learners consumed any legumes (dry beans, split peas, lentils or soya);
- in School 1 high fat foods were commonly consumed during breakfast;
- in School 2 fruits and vegetables seemed not to be consumed during lunchtime;
- learners in both schools mostly consumed high sugar foods at lunchtime; and
- take away foods were consumed at dinner time by learners from both schools.

As reported by learners:

- none of the learners consumed any legumes (dry beans, split peas, lentils or soya);
- no water or dairy consumption;
- learners consumed mostly high fat foods and starchy foods;
- none of the learners consumed foods rich in healthy oils;
- common consumption of take away food; and
- very few learners consumed fruit and vegetables.

5.3.1.2 Identification of priority behaviours

The dietary behaviours chosen for addressing by the NEP were identified from the situational analysis and the literature. These were the behaviours articulated in the SAFBDGs which are: (i) Enjoy a variety of foods, (ii) Drink lots of clean, safe water, (iii) Make starchy foods part of most meals, (iv) Eat plenty of vegetables and fruit every day, (v) Eat dry beans, split peas, lentils and soya regularly, (vi) Fish, chicken, lean meat or eggs could be eaten daily, (vii) Drink milk, maize or yoghurt every day, (viii) Use fat sparingly: choose vegetable oils rather than hard fats, (ix) Use salt and foods high in salt sparingly, (x) Use sugar and foods and drinks high in sugar sparingly, and (xi) Be active every day. As revealed by the situational analysis, the dietary practices of the learners were unhealthy and were not aligned with the recommended SAFBDGs. The SAFBDGs were developed to give an indication of what a person should be eating in terms of foods rather than nutrients, and provide a basic framework to use when planning meals or daily menus for South Africans (SA), five years and older (Vorster *et al.*, 2001; DOH: Nutrition, 2012). Therefore these dietary guidelines coupled with portion size awareness were the most appropriate approach to induce nutrition behaviour change in primary school learners aged seven to nine years.

5.3.1.3 The programme goal

The goal for this programme was to encourage healthy eating among children from resource limited settings through the implementation of the NEP for a period of six weeks.

5.3.1.3.1 Objective

The objective was to:

- increase food choice intentions, nutrition self-efficacy and nutrition knowledge towards making healthy food choices in line with the SAFBDGs.

5.3.2 Step two: Identification of potential mediators for healthy eating habits

Multiple levels of influence affect the dietary behaviours of children (figure 5.1). According to the literature, the mediators of healthy eating habits in children include individual factors and environmental factors. Individual factors are developed within an individual and are related to the personal meanings individuals attach to food. They include biological (hunger), behavioural

(meal and snacking patterns) and psychological (self-efficacy, food preferences) factors (Story, Neumark-Sztainer & French, 2002; Kostanjevec, Jerman & Koch, 2013). Environmental factors include social, community and environmental factors which affect dietary behaviours through modelling, social support and re-enforcements (Story *et al.*, 2002; Contento, 2007). These factors are constantly interacting, and influence the behaviour of individuals. Among psychosocial mediators of behaviour change in children, self-efficacy, food preference and the child's own expectations are considered key (Kostanjevec *et al.*, 2013). Environmental factors such as the family, peers and the school environment also have a bearing on the food choices and food preferences of children. All these are interrelated and influence the eating habits of children (Arredondo, Elder, Ayala, Campbell, Baquero & Duerksen, 2006).

Potential mediators of behaviour selected for intervention target in this study were individual factors, i.e. self-efficacy, nutrition knowledge and behavioural intent (figure 5.1). These mediators have been identified from the literature as key in children's diet related behaviours (Kostanjevec *et al.*, 2013). Abrahams *et al.* (2011) reported that SA primary school learners who had higher nutrition self-efficacy demonstrated better nutritional behaviour. Furthermore, they were more prepared to make healthier food choices in the future and identified minimal barriers to eating healthily (Abrahams, de Villiers, Steyn, Fourie, Dalais, Hill, Draper & Lambert, 2011). According to a study by Venter and Winterbach (2010), nutrition knowledge was associated with healthy eating habits in South African mid-adolescent children (Venter & Winterbach, 2010).

5.3.2.1 Explanation of the modified theoretical framework on the factors affecting dietary habits of children based on the Social Cognitive Theory and the target areas for the nutrition education programme

Figure 5.1 is a theoretical framework showing the factors affecting the eating habits of learners, how they are related and the resulting negative consequences. The dotted arrows represent the factors targeted by the NEP and the anticipated desired outcomes after intervention. The most straight forward causal pathways as informed by the situational analysis for primary school children in this study and the literature are shown based on the SCT. In this model, children's eating behaviour is conceptualised as a function of individual and environmental influences with emphasis placed on the potential influence of individual factors.

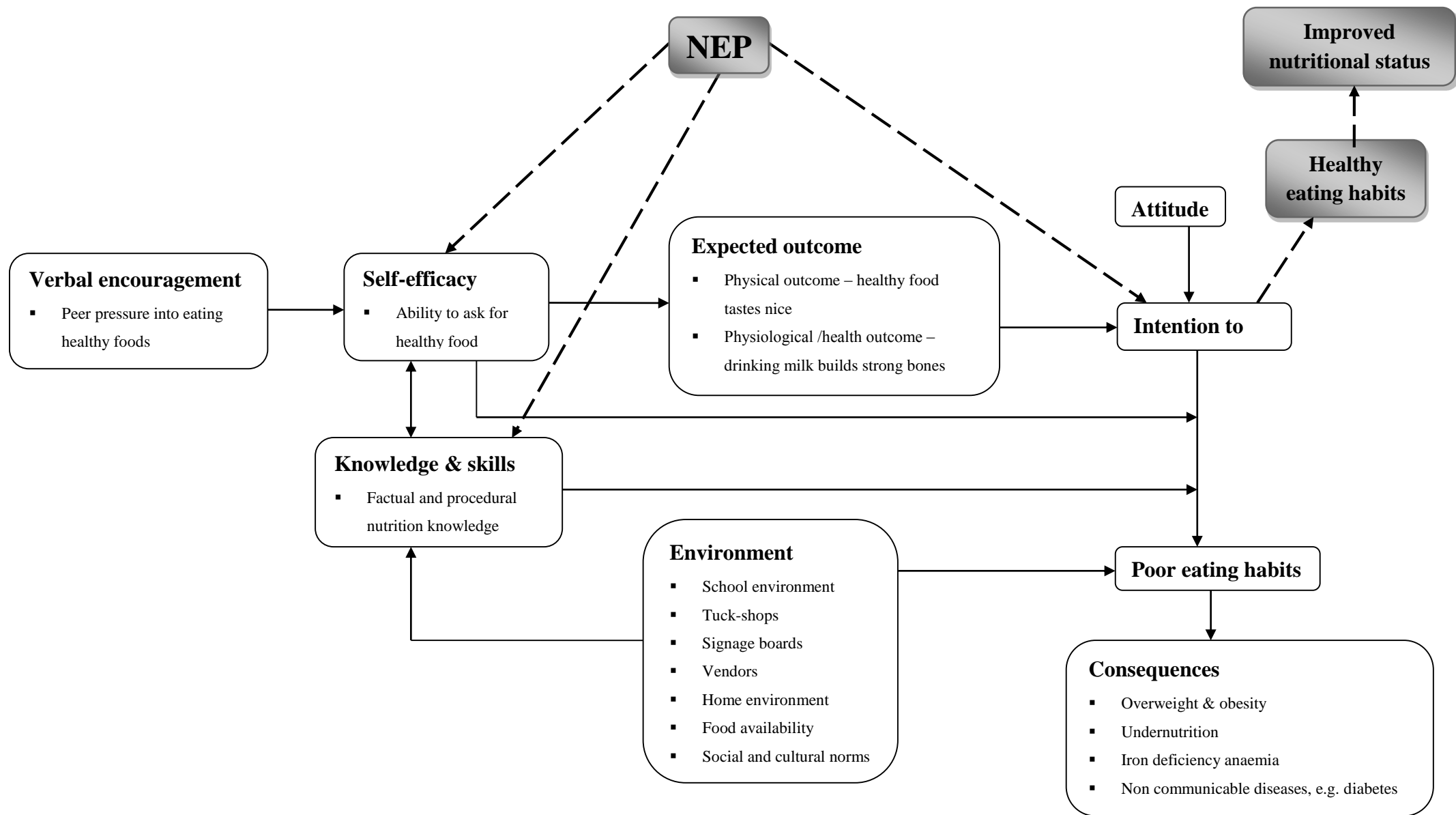


Figure 5.1: Modified theoretical framework on the factors affecting eating habits of children based on the Social Cognitive Theory (Adapted from Contento, 2007) and the target areas for the nutrition education programme

5.3.3 Step three: Selection of theory and its application

Behaviour change is a process that occurs in two phases; i.e. motivational and action phases, and several theories are useful in both phases. The motivational phase is a thinking phase where an individual synthesises information regarding beliefs and outcome expectations such as perceived benefits of taking an action leading to development of an intention to act. In the action phase, the intentions are turned into actions (Contento, 2007; Vermeer, 2014). Due to the short duration of the programme, the programme could only address the personal mediators of behaviour useful in both the motivational phase and action phase (nutrition related knowledge, self-efficacy and behavioural intentions).

The SCT was selected due to its emphasis on self-efficacy, which is a key mediator of behaviour change in children. The SCT proposes that behaviour is a dynamic and reciprocal interaction between personal factors, environmental influences and the behaviour component (Tani, Kondo, Takagi, Saito, Hikichi, Ojima & Kondo, 2015). The SCT is the most commonly used theory for studies involving school age children and it highlights the importance of self-efficacy (confidence and skills to engage behaviour) in behaviour change (Edmundson, Parcel, Feldman, Elder, Perry, Johnson, Williston, Stone, Yang & Lytle, 1996; Pérez-Rodrigo & Aranceta, 2001). Children are subject to social pressure from peer and adult models, the media and school environment to eat unhealthy foods, therefore confidence and skills are important in promoting positive behaviour change (Taylor, Evers & McKenna, 2005; Abrahams *et al.*, 2011; Kostanjevec *et al.*, 2013). Furthermore, quality curriculum interventions (based on behavioural theories) have been found to produce positive changes in nutritional knowledge, physical activity and eating behaviours of young people (Wechsler, Devereaux, Davis & Collins, 2000; Glanz & Bishop, 2010; Dudley, Cotton & Peralta, 2015).

Within the motivational phase, personal decision making and motivational factors are important in order to develop an intention to act. Self-efficacy, together with expected outcomes and attitudes which are constructs within the SCT, has been proven in many studies to be an important motivator of dietary change (Contento, 2007). The emphasis within the action phase is changing dietary behaviour. Learners with strong intentions form implementation intentions, while those with weak intentions may need reminders. At this stage, food and nutrition knowledge and skills in addition to self-efficacy and self-regulation skills, which are also constructs within the SCT, are important to facilitate the ability to take action (Conner & Sparks, 2005; Contento, 2007).

The SCT constructs made use of in this study, i.e. observational learning and modelling; outcome expectations, self-efficacy, and behavioural capability are described in table 5.1.

Table 5.1: Selected constructs of the Social Cognitive Theory and their application in this study

Theory Construct	Definition	Application
Observational learning & modelling	Observational learning & modelling refers to learning from watching and copying significant others and the attached consequences (Chadwick, Crawford & Ly, 2013).	<ul style="list-style-type: none"> ▪ Facilitator conducts food demonstrations while learners watch. ▪ Locally available healthy foods were displayed for learners to see.
Outcome expectations	Beliefs about anticipated outcomes from carrying out behaviour (Conner & Sparks, 2005).	<ul style="list-style-type: none"> ▪ Discuss the benefits associated with following each guideline within the SAFBDGs through active and fun methods and take home worksheets. ▪ Talk about the importance of (the perceived benefits) eating healthy on the overall health, e.g. messages about benefits of drinking milk such as strong bones. ▪ Talk about importance of portion size control for a healthy body using simple and widely applicable methods (minimising barriers in portion size control outside the home).
Self-efficacy	Self-efficacy refers to the confidence one has to successfully execute the intended behaviour (Auld, Romaniello, Jerianne, Carolyn & Hambidge, 1998; Stevens, Cornell, Story, French, Levin, Becenti, Gittelsohn, Going & Reid, 1999).	<ul style="list-style-type: none"> ▪ Facilitator demonstrates how to perform tasks such removing chicken skin from chicken meat. ▪ Facilitator encouraged learners to gradually make small changes in dietary behaviours.
Behavioural capability	Behavioural capability refers to the food and nutrition knowledge necessary to understand the behaviour and skills required to perform and or change the behaviour (Contento, 2007; Kupolati <i>et al.</i> , 2014).	<ul style="list-style-type: none"> ▪ Offer information on the application SAFBDGs in daily food choices. ▪ Facilitator demonstrates how to carry out tasks such as removing chicken skin from chicken meat. ▪ Offer information regarding the use of simple, widely applicable portion size estimation aids and demonstration on how to apply & use them.

5.3.4 Selection of programme components

The components that were selected for this programme included a classroom curriculum and home work activities (table 5.2). The classroom curriculum was accompanied by context appropriate NE materials, food displays, food demonstrations and a healthy eating song. Promotion of healthy eating through comprehensive approaches that include a classroom curriculum and parental involvement has shown positive results in measured variables such as nutrition related knowledge and self-efficacy (Edmundson *et al.*, 1996; Faber, Laurie, Maduna, Magudulela & Muehlhoff, 2014; Habib-Mourad, Ghandour, Moore, Nabhani-Zeidan, Adetayo, Hwalla & Summerbell, 2014). Therefore, the classroom component coupled with home work activities was chosen for this study. The take home worksheets would provide a platform for parental involvement in the study. Learners would be encouraged to work on the activities together with their parents.

Table 5.2: Components of the nutrition education programme

Component		Time frame	Tools
Classroom	Educational session (Nine lessons)	20 minutes/ lesson for six weeks	Posters
			Instructor's manual
	Activities	At each lesson	Food displays
			Food demonstrations
Song and dance			
Home work activity		Given to each learner at the end of each lesson to work with parents at home	Student activity worksheets

5.3.4.1 Nutrition education materials and activities

Age appropriate NE materials which included posters, an instructor's manual, food displays, food demonstrations, learner's worksheets and a healthy eating song were developed as part of the NEP.

5.3.4.2 Posters

Posters are large prints, which include graphical and textual elements, which can be pinned to the wall to communicate healthy eating messages. Ten posters were developed, one listed with

all the eleven SAFBDGs, and nine with specific guidelines. Graphical elements representing the messages conveyed by the guideline were included on each poster. Furthermore, the graphical elements were relevant to South African settings and also included locally available food pictures known to the learners. In addition, short simple messages regarding the benefits of the healthy eating guideline were included. A set of the posters was later availed to each of the class teachers to be hung on the wall to serve as constant reminders of the healthy eating key messages to the learners (Appendix E).

5.3.4.3 Instructor's manual

The instructor's manual titled *Healthy eating and the South African Food Based Dietary Guidelines*, composed of tools, notes and ideas (based on the SCT) designed by the researcher to assist facilitators in helping learners grasp the main ideas and concepts of healthy eating (Appendix F). The manual covering nine lessons included a layout of the method of delivery for each lesson starting with the objectives. The lesson plan which included an explanation of the activities (food demonstrations and displays for the lesson, the healthy eating song and the activity sheet for each lesson) was described last. The development of the instructor's manual was based on the SCT and guided by the guidelines from the FAO's nutrition education for the public (Smith & Smitasiri, 1997; Hosmer *et al.*, 1997).

The NEP also built on the health promotion module being offered by the Gauteng DoBE (through its life orientation skills programme) using simple cost effective tools which delivered culturally appropriate healthy eating messages. The NEP provided further knowledge and skills to use locally available foods to make informed decisions towards a healthy diet. The NEP lessons were done during normal learning times either before or after break.

5.3.4.4 Food displays

Culturally appropriate healthy foods relevant to each lesson were shown during each lesson. The food items were chosen to be used as examples of the food groups under discussion and learners handled, identified and described them. Utilisation of actual food items has been shown to increase motivation and knowledge in NEPs with preschool children (Vermeer, 2014).

5.3.4.5 Food demonstrations

Several presentations to be carried out by the facilitator were planned. These included a ‘how to’ presentation for making simple healthy snacks and how to make foods more healthy, e.g. removing chicken skin from chicken meat, washing hands with soap as an example of hygiene practices necessary during food handling. Food demonstrations stimulate knowledge, motivation, and enhance learning in learners (Nyapera, 2012; Scherr, Linnell, Smith, Briggs, Bergman, Brian, Dharmar, Feenstra, Hillhouse, Keen, Nguyen, Nicholson, Ontai, Schaefer, Spezzano, Steinberg, Sutter, Wright, Young & Zidenberg-Cherr, 2014; Vermeer, 2014).

5.3.4.6 Healthy eating song

The healthy eating song intended to teach children about the importance of healthy eating. The healthy eating song was developed based on the SAFBDGs and each of the guidelines was included in the healthy eating song (Appendix G). Learners were exposed to healthy eating song and dance since they learn better through fun, singing and dancing (Auld *et al.*, 1998).

5.3.4.7 Learner’s worksheets

Learner’s worksheets would be comprised of tasks and activities they would work on with their parents at home (Appendix H). An age appropriate worksheet was developed for each lesson and was related to the messages to be delivered during the lesson. Nutrition education tools that provide interactive and problem solving activities such as word searches and matching food items to food groups have been reported to increase long lasting change in nutrition behaviour (Oldewage-Theron & Egal, 2009). Therefore, word searches, puzzles and food-food group matches were included in the learner’s activity sheets. The worksheets were for take home and to be worked on by the learners together with their parents as recommended by research evidence (Oldewage-Theron & Napier, 2011).

5.3.5 Step four: Educational goals and objectives

The educational and learning objectives addressed by the NEP are presented in table 5.3.

Table 5.3: Educational and learning objectives for the nutrition education programme

Educational objectives	
<ul style="list-style-type: none"> ▪ To increase awareness on the importance of healthy eating through the classroom curriculum, nutrition education materials and a healthy eating song. ▪ To increase the motivation to choosing healthy foods in the various food groups through the classroom curriculum, healthy eating song and nutrition education materials. ▪ Facilitate ability to act; choose less fatty snacks by providing opportunities to gain knowledge and skills related to eating healthy through the classroom curriculum and demonstrations. 	
Learning objectives	
Lesson 1 Be active your own way	<ul style="list-style-type: none"> ▪ To understand what it means to be active ▪ Identify the types of activities learners can do within their schools and communities ▪ Know the benefits of being active
Lesson 2 Enjoy a variety of foods	<ul style="list-style-type: none"> ▪ To know the meaning of variety ▪ To recognise the 7 food groups and name them ▪ To know the benefits of eating a variety of foods
Lesson 3 Make starchy food a part of most meals	<ul style="list-style-type: none"> ▪ Identify the different types starchy foods ▪ To know the benefits of eating starchy foods ▪ Identify whole gains
Lesson 4 Eat plenty of vegetables and fruit every day	<ul style="list-style-type: none"> ▪ Know what it means to eat plenty of vegetables and fruit ▪ Identify some vegetables and fruits commonly eaten in the community
Lesson 5 Eat dry beans , split peas and soya regularly	<ul style="list-style-type: none"> ▪ Identify different types of beans ▪ To know the importance of beans , lentils split peas and soya
Lesson 6 Fish chicken lean meat could be eaten daily	<ul style="list-style-type: none"> ▪ Identify the different types of meats ▪ To know the benefits of meat in the diet
Lesson 7 Healthy drinks	<ul style="list-style-type: none"> ▪ Identify different sources of water ▪ Identify low fat milk, maas and yoghurt ▪ To know the benefits of drinking water, taking low fat milk, maas and yoghurt
Lesson 8 Use fat sparingly: choose vegetable oils rather than hard fats	<ul style="list-style-type: none"> ▪ Identify foods high in fat and foods with healthy fats ▪ To know the benefits of eating foods low in fat ▪ To remove excess fat from foods
Lesson 9 Use very little	<ul style="list-style-type: none"> ▪ To identify foods high in salt ▪ To identify foods and drinks high in sugar ▪ To increase awareness of the consequences of eating too many salty and sugary foods

5.3.6 Step five: Theory based strategies chosen for the nutrition education programme

Theory based educational strategies refer to evidence based instructive approaches used to address the potential mediators of behaviour change, while their practical use, is referred to as education activities (Contento, 2007). A combination of education strategies and activities were planned to be employed in this study. These included the enhanced curriculum approach and the game (fun) based which was developed for learners to simultaneously enjoy and encourage desired behaviours (CDC, 1997; Dudley *et al.*, 2015). Table 5.4 shows the strategies and activities that were used to enhance motivation and facilitate behavioural intentions for healthy eating, as well as to increase the awareness of concerns and risks associated with unhealthy eating habits.

Table 5.4: Educational activities used in the nutrition education programme

Strategy	Description of the educational activities	Theory construct
Provision of 'how to' knowledge through active participation	<ul style="list-style-type: none"> ▪ Discussion with learners emphasising the positive, appealing aspects of healthy eating patterns rather than negative elements of unhealthy eating ▪ Provide nutrition information through colourful posters and engaging learners in discussions ▪ Provide nutrition information through problem solving by addressing pros and cons of engaging in behaviour ▪ Learners work on activities given in the worksheets ▪ Healthy food items on display to allow for familiarisation by learners during each lesson ▪ Expose learners to healthy snacks. Provide a healthy snack pack after each lesson which they would consume during the break time ▪ Learners are engaged in the healthy eating song and dance that encourage healthy eating and act out some behaviours associated with healthy eating 	Behavioural capability Behavioural intent
Learning through watching	<ul style="list-style-type: none"> ▪ Discussion and demonstration on how to overcome barriers to eating healthy, e.g. how to remove excess fat from chicken meat ▪ Learners actively involved in some demonstrations 	Self-efficacy Modelling
Oral commitment and persuasion	<ul style="list-style-type: none"> ▪ Learners are encouraged to engage the healthy behaviour orally and openly in class, e.g. how many will ask for brown bread at breakfast tomorrow? ▪ Encourage learners to take up learned behaviours ▪ Use of incentives such as verbal praise to reinforce healthy eating ▪ Learners to work on activities in worksheets with parents at home 	Behavioural intent Self-efficacy
Provision of 'why to information' through fun participatory methods	<ul style="list-style-type: none"> ▪ Provision of why to nutrition information through messages describing the advantages of healthy eating ▪ Provision of why to nutrition information through images showing the consequences of unhealthy eating 	Behavioural intent Self-efficacy

5.3.7 Step six: Evaluation

Evaluation is necessary to determine whether the programme was implemented as had been planned, as well as its effect on the targeted variables (Pérez-Rodrigo & Aranceta, 2001).

Evaluation should be done at all stages of the programme and thus should include both process evaluation and evaluation of the outcome (Vermeer, 2014). Evaluation of process focuses on assessing whether the programme was implemented as intended as well as quality control, while assessment of outcome assesses the effect of the programme on the target variables (Pérez-Rodrigo & Aranceta, 2001; Haerens, Deforche, Maes, Cardon, Stevens & De Bourdeaudhuij, 2006; Hill, 2010).

Due to feasibility constraints, only the outcome evaluation was planned for the programme to measure changes in mediators of behaviour. However, measures such as the training of facilitators, provision of a training material package required per lesson at the start of each day, and debriefing sessions at the end of each day to ensure smooth delivery of the programme (CDC, 1997) were put in place to ensure the delivery of lessons as intended.

The NEP planned to evaluate short term outcomes of the programme, i.e. nutrition self-efficacy, nutrition knowledge and behavioural intent. The outcomes were to be assessed at pre-intervention, post-intervention (six weeks) and at follow-up assessment (12 months) using a quasi-experimental design without a control group. Due to the developmental differences between the learners, two different instruments were chosen; one for Grade 1 learners (to measure food choice intentions only) and another one for Grade 2 and 3 learners (to measure nutrition knowledge and nutrition self-efficacy only) to carry out the pre-assessment, post-assessment and follow-up assessment. Both instruments were adopted from the Pathways knowledge, attitudes and behaviours questionnaire (Stevens *et al.*, 1999). To monitor parental involvement, the facilitators checked the learners' homework sheets for completion and whether their parents had assisted.

5.4 Implementation arrangements

The preparations for implementation included the identification and training of the facilitators and travel arrangements to and from the schools. Approval for conducting the study in the schools and consultations with the schools were done as part of the project at large.

5.4.1 Identification and training of the facilitators

Research has shown that NE implemented by trainers from outside the school has greater success at improving the diet quality of primary school children as compared to that

implemented by teachers (Jemmott III, Jemmott, O’Leary, Ngwane, Icard, Bellamy, Jones, Landis, Heeren & Tyler, 2011; Steyn, de Villiers, Gwebushe, Draper, Hill, de Waal, Dalais, Abrahams, Lombard & Lambert, 2015). Therefore, nutrition professionals (nutritionists and dietitians) from the University of Pretoria acted as facilitators. They were invited for a one day training programme that was held on the 23rd of August 2015 at the Department of Human Nutrition, University of Pretoria. All materials (instructor’s manual, posters, worksheets, both questionnaires: availed in both English and Afrikaans and the programme for the training) were printed for each participant.

All the facilitators received one day training on the delivery of the NEP as well as administration of the questionnaires. English was the medium of instruction used during the training session and all facilitators were proficient in English. The latter was used as the medium of instruction as it was preferred by the majority of the learners at the two schools. Each facilitator was given a copy of the instructor’s manual and the team worked through the manual together. The researcher facilitated the training and the following areas were discussed (CDC, 1997):

- the role and responsibility of each facilitator,
- a standard protocol for administration of the questionnaires for Grade 1, and Grades 2 and 3 respectively,
- familiarisation and explanation of the content of the posters and learner worksheets,
- familiarisation with the instructor’s manual content, and
- age appropriate teaching skills guided by the instructor’s manual.

5.5 Conclusion

Phase 1 resulted in the development of a theory based NEP tailored to the nutrition education needs of learners aged seven to nine years. Two components, classroom curriculum and homework activities, were selected for the study as they have been shown to result in positive outcomes with regards to nutrition related knowledge and self-efficacy when utilised in NEPs (Edmundson *et al.*, 1996). Age appropriate learning materials, which included ten posters (based on the SAFBDGs), ten learner’s worksheets, and an instructor’s manual were developed. Two questionnaires adapted from the Pathways KAB questionnaire (Stevens, Story, Ring, Murray, Cornell & Gittelsohn, 2003) were selected for assessment of food choice intentions in Grade 1 learners, and nutrition self-efficacy and nutrition knowledge in Grade 2

and 3 learners at baseline, six weeks and 12 months. As preparation for implementation, the facilitators received one day training on questionnaire administration and delivery of the NEP.

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Chapter 6: Implementation and evaluation of the Nutrition Education Programme (Phase 2)

6.1 Introduction

Implementation and evaluation of the culturally appropriate theory based NEP was done in the final phase (Phase 2). The phase is presented in three chapters: (i) chapter 6: aims and methodology, (ii) chapter 7: results, and (iii) chapter 8: discussion and recommendations. Chapter 6 is presented in the following manner:

- Aims and objectives
- Methods
- Components of the Nutrition Education Programme
- Implementation of the Nutrition Education Programme
- Validity and reliability of the instruments
- References

6.2 Aims, objectives and research hypothesis

6.2.1 Aim

The aim of Phase 2 was to implement a culturally appropriate theory based NEP tailored to the needs of learners aged seven to nine years (Grade 1-3) in resource limited settings of Pretoria, and to evaluate its effect on the food choice intentions of Grade 1 learners, and on the nutrition related self-efficacy and knowledge of Grade 2 and 3 learners. The Ethics Research Committee of the Faculties of Education and Health Sciences of the University of Pretoria (**Number: D2015/375A**) approved the study as highlighted in Chapter 3.

6.2.2 Objectives

The objectives of Phase 2 were to:

- conduct a pre-intervention assessment of the learners' nutrition related knowledge, self-efficacy and food choice intentions,
- implement the tailored NEP to learners aged seven to nine years in resource limited settings in Pretoria,

- evaluate the effectiveness of the NEP with respect to changes in nutrition related self-efficacy, knowledge and food choice intentions at six weeks (post intervention),
- assess the retention of intervention effects at 12 months (follow-up), and
- determine the differences in measured outcomes between the two schools and gender.

6.2.3 Research hypothesis

- Six week tailored nutrition education would significantly improve the nutrition knowledge and food choice intentions and self-efficacy of primary school learners aged seven to nine years and the improved outcomes would be retained at 12 months follow-up.

6.3 Method

6.3.1 Study design

A quasi-experimental design without a control group was employed as discussed in Chapter 3.7. Learners from both School 1 and School 2 received NE and supporting materials such as worksheets for a period of six weeks. Assessments of outcomes were done at baseline, at six weeks and at 12 months to evaluate the effectiveness of the NEP.

6.3.2 Study setting

The study took place in two resource limited primary schools from Pretoria, South Africa as highlighted in Chapter 3.

6.3.3 Selection of schools

The two schools that participated in the study were selected by the Gauteng Department of Basic Education (DoBE).

6.3.4 Population and sampling

6.3.4.1 Study participants

The participants were learners aged seven to nine years in Grades 1-3 from the selected two schools (School 1 and School 2) that met the inclusion criteria. The population included boys and girls, mainly from two ethnic groups (blacks and whites).

6.3.4.2 Inclusion criteria

- Learners aged seven to nine years in Grades 1-3 from the selected schools.
- Learners with assent and parental informed consent.

6.3.4.3 Exclusion criteria

- Learners in Grades 1-3 but not within the age range (seven to nine years).
- Learners without assent and parental informed consent.

6.3.5 Sampling

A convenience sampling method was used in the selection of the participants. This sampling method allowed for the selection of participants who were easily accessible (i.e. present in class) and met the inclusion criteria, i.e. learners who were seven to nine years old in Grades 1-3 in the two schools. A total of 244 participants who were selected had parental consent and assented to participate in the study.

6.4 Researchers and facilitators

There were eight facilitators (including the researcher) who were involved in the implementation of the NEP (one male, seven females). Four were dietitians and the other four were nutritionists (two lecturers, five Masters' students and one PhD student). All were from the Department of Human Nutrition from the University of Pretoria.

6.5 Implementation of the Nutrition Education Programme

The NEP had two components: (i) a classroom curriculum, and (ii) home work activities (Chapter 5, table 5.2). The classroom component was accompanied by age appropriate NE education materials such as colourful posters, food displays, food demonstrations and a healthy eating song. Learner's worksheets were used for the homework activity. The nine classroom lessons were delivered in six weeks (table 6.1). The following topics were covered (i) Be active your own way everyday, (2) Enjoy a variety of foods, (3) Make starchy foods a part of most meals, (4) Eat plenty of vegetables and fruit everyday (5) Eat dry beans, split peas, lentils and soya regularly, (6) Fish, chicken, lean meat and eggs could be eaten daily, (7) Healthy drinks, (8) Use fat sparingly; choose vegetable oils rather than hard fats, and (9) Use very little salt and sugar.

The trained facilitators used the instructor's manual and the developed NE tools and activities to deliver the NEP to the learners. One of the facilitators delivered the NEP in Afrikaans to the Afrikaans speaking learners, while the other seven delivered the NEP in English. The lessons commenced on 24 August and ended on the 30 September 2015.

An assessment of the learners' nutrition knowledge, self-efficacy and food choice intentions was done before the first lesson was delivered (pre-intervention/ baseline) and after completion of the last lesson (post-intervention assessment) and 12 months later (follow-up assessment).

The facilitators worked in pairs. Each pair was provided with a training package per lesson for each day (the instructor's manual, poster for the session, learner's worksheets, display and demonstration materials and print outs of the healthy eating song for each learner). Each pair was allocated a small group of learners to work with in School 1, while in School 2 one facilitator led a large group through the lesson with the other facilitators moderating in the group.

As recommended in the literature, for greater effectiveness, the NEP should be between six weeks and five months long and with a minimum of weekly contact sessions and focused on delivery at the level of the whole class (Racey, O'Brien, Douglas, Marquez, Hendrie & Newton, 2016). This study lasted six weeks and all lessons were guided by the instructor's manual. Lessons were done twice a week for three of the weeks and once a week for the other three weeks. Each lesson lasted 20 minutes and began with a recap of the previous lesson and ended with learners getting a take home activity. Interactive activities, simulations, and reflections were used in teaching the learners about each of the eleven SAFBDGs and how to estimate appropriate portion sizes by using hand symbols (ZHJ) (Cordialis, 2015). Learners took part in singing and dancing to the healthy eating song at the end of each lesson. Learners received snack items before departure, which included a fruit juice or fruit and or a muffin or sandwich. The health value of the snacks was daily explained. Lessons were done during school hours, just before break time or just before lunchtime. Debriefing sessions after each session were undertaken with the facilitators to ensure the smooth flow of the programme.

After the completion of the NEP (at six weeks) each of the 20 class teachers, for the classes that participated, was given a set of the nine laminated posters (lesson one to nine). These

posters were to be stuck to the classroom walls so that learners may have continued access to the messages; a strategy for enhancing knowledge retention.

Table 6.1: Nutrition Education curriculum by week

Week	Topic	Activities
1	Lesson 1 Be active your own way everyday	<ul style="list-style-type: none"> ▪ Introduction and overview of the NEP ▪ Focused on promoting an active lifestyle ▪ Concept illustrated using a poster showing pictures of active children ▪ Take home worksheets; learners expected to identify pictures showing active and not active individuals ▪ Singing and dancing to the healthy eating song
	Lesson 2 Enjoy a variety of foods	<ul style="list-style-type: none"> ▪ Focused on promoting the consumption of a variety of foods from the different food groups (seven) ▪ A poster showing the food groups and the foods items for each food group used ▪ Different real food items were displayed ▪ Take home worksheets; learners expected to identify the different food groups and allocate the different foods provided to the appropriate food group ▪ The ZHJ used to facilitate estimation of portion size different food items ▪ Singing and dancing to the healthy eating song
2	Lesson 3 Make starchy foods a part of most meals	<ul style="list-style-type: none"> ▪ The different food items in this group taught ▪ A poster showing the different starchy foods used ▪ The ZJH used to estimate portion size ▪ Different real starchy food items were displayed ▪ Take home worksheets; learners expected to identify the different starchy foods including whole grain foods ▪ Singing and dancing to the healthy eating song

...continue...

Table 6.1: Nutrition Education curriculum by week continued...

Week	Topic	Activities
	<p>Lesson 4</p> <p>Eat plenty of vegetables and fruit everyday</p>	<ul style="list-style-type: none"> ▪ A poster emphasizing on eating different colours of fruits and vegetables everyday ▪ Focused on the functions and importance for good health ▪ The ZJH used to estimate portion size ▪ Different real fruits and vegetables were displayed ▪ Take home worksheets: Learners expected to identify fruits and vegetables among other foods items ▪ Singing and dancing to the healthy eating song
<p>3</p>	<p>Lesson 5</p> <p>Eat dry beans , split peas, lentils and soya regularly</p>	<ul style="list-style-type: none"> ▪ The health benefits of eating beans regularly and the serving suggestions were discussed ▪ The ZJH used to estimate portion size ▪ A poster showing the different types of beans, peas, lentils was used ▪ During the lesson, learners identified real beans, lentils and split peas. Each learner collected a sample of each and attached a name tag to each sample ▪ Take home worksheets: learners were expected to identify and correctly name the different legumes shown and to identify the type of legume used in the mixed meals shown ▪ Singing and dancing to the healthy eating song
	<p>Lesson 6</p> <p>Fish, chicken, lean meat and eggs could be eaten daily</p>	<ul style="list-style-type: none"> ▪ The functions of protein foods in the body, ways of removing excess fat were the focus of this topic ▪ A poster showing the different types meat and the types of meat individuals are discouraged from eating ▪ The ZJH used to estimate portion size ▪ A demonstration on how to wash hands done ▪ Demonstration on how to remove chicken skin from chicken meat ▪ Take home worksheets: learners had to find their way to healthy meats through a maze ▪ Singing and dancing to the healthy eating song

....continue...

Table 6.1: Nutrition Education curriculum by week continued...

<p>4</p>	<p>Lesson 7</p> <p>Healthy drinks</p>	<ul style="list-style-type: none"> ▪ Based on two SAFBDGs (i) Drink lots of clean safe water (ii) Drink milk, maas and yoghurt ▪ Encouraged learners to drink sufficient water everyday and carrying a water bottle to school everyday and the benefits ▪ Information on the different low fat dairy products learners could afford and their function were imparted to the children ▪ A poster with the two dietary guidelines showing the different sources for each ▪ Take home worksheets: learners were to find names of healthy drinks in a word search puzzle ▪ Different types of healthy drinks were displayed ▪ Singing and dancing to the healthy eating song
<p>5</p>	<p>Lesson 8</p> <p>Use fat sparingly; choose vegetable oils rather than hard fats</p>	<ul style="list-style-type: none"> ▪ Examples of fatty foods and the consequences of consuming too many fatty foods were discussed ▪ The ZJH used to estimate portion size ▪ Emphasised on using very little ▪ A poster showing unhealthy high fat foods and healthy fat foods was used ▪ Different real low fat foods were displayed ▪ Take home worksheets: learners were to identify and colour in low fat foods and cross out high fat foods among other foods ▪ Singing and dancing to the healthy eating song
<p>6</p>	<p>Lesson 9</p> <p>Use very little</p>	<ul style="list-style-type: none"> ▪ Based on two SAFBDGs (i) Use salt and foods high in salt sparingly (i) Use sugar and foods and drinks high in sugar sparingly ▪ Focused on the use of salt in food and the consequences of too many sweets and drinks in the diet ▪ Different real low salt and low sugar foods were displayed ▪ The ZJH used to estimate portion size ▪ Take home worksheets: learners were to identify and circle low fat and low sugar foods and drinks ▪ Singing and dancing to the healthy eating song

6.6 Data collection instrument

A modified version of the Pathways knowledge, attitudes and behaviours questionnaire (Stevens, Cornell, Story, French, Levin, Becenti, Gittelsohn, Going & Reid, 1999) was used to evaluate the effect of the NEP on the food choice intentions of Grade 1 learners (Appendix I), and on nutrition related self-efficacy and knowledge of Grade 2 and 3 learners (Appendix J). The original questionnaire was designed for American Indian primary school learners to measure knowledge, attitudes and behaviours related to diet and physical activity. The questionnaire was validated in fourth grade American Indian children from Arizona, New Mexico, and South Dakota (Stevens, Story, Ring, Murray, Cornell & Gittelsohn, 2003).

For this study the researcher used only three scales from the questionnaire (table 6.2), and these scales had been modified for cultural appropriateness and local language. For example, the word “recess” in the original questionnaire was replaced with “break time” in the self-efficacy questionnaire. The pathways KAB questionnaire has informed several questionnaires used in previous South Africa studies (Abrahams, de Villiers, Steyn, Fourie, Dalais, Hill, Draper & Lambert, 2011; de Villiers, Steyn, Draper, Hill, Gwebushe, Lambert & Lombard, 2016) and has been used successfully in Grade 3 learners (Luepker RV, Perry CL & Osganian V, 1998; Stevens *et al.*, 2003). The Pathways KAB questionnaire was chosen for this study since this type of questionnaire been proven to be sensitive to the effects of school based interventions and can successfully be used in an ethnically diverse learner population (Stevens *et al.*, 1999). The scales adopted for this study, namely nutrition knowledge, self-efficacy and food choice intentions, were chosen based on certain constructs of the SCT considered to be determinants of behaviours underlying obesity-related risk factors, e.g. to assess nutrition knowledge, the question “what milk contains least fat” was asked. The scales assessed intentions to choose healthful foods, self-efficacy to make healthy food choices and knowledge of high fat foods (Stevens *et al.*, 1999). The dietary measures were also in line with the concepts emphasised by the SAFBDGs, specifically reducing consumption of dietary fat and sugared beverages and increasing consumption of healthful lower-fat foods.

The internal consistency for the scales (food choice intentions and self-efficacy) was above the acceptable value of 0.7 and thus were suitable for this study (Stevens *et al.*, 1999). However, the Cronbach’s Alpha for nutrition knowledge was less than 0.7 (table 6.2).

The food choice intentions was the only scale used in Grades 1 as these learners were found to have challenges with understanding the questions for self-efficacy and nutrition knowledge. For Grades 2 and 3 only self-efficacy and nutrition knowledge were measured and food choice intentions were excluded. The questionnaires were available in both English and Afrikaans.

Table 6.2: Reliability (Cronbach’s Alpha) and sample questions in the Pathways KAB questionnaire (Stevens *et al.*, 1999)

Scale	Measured	Number of questions	Cronbach’s Alpha	Response set	Example of question
Food choice intentions	Which food the learner would choose in different situations	8	0.76	Paired choice	What will you choose for breakfast?
Food self-efficacy	Self-efficacy to choose foods lower in sugar and fat	11	0.76	4 point ordinal : I know I can, I think I can, I am not sure, I know I can not	I can ask for mealie without butter (margarine)
Nutrition knowledge	Knowledge of the concepts introduced in nutrition class	7	0.56	Forced choice with 3 answer options	What milk contains the least fat?

6.7 Data collection

Data were collected through self-administered questionnaires (Appendices I and J) before (baseline) and after the implementation (six weeks) of the NEP and 12 months later (follow-up). The class teachers were not present for data collection but were responsible for separating learners with consent from those without. The pre-intervention assessment was done on the first day of contact with the learners before lesson 1 began. The facilitator introduced the NEP to the learners and explained what was expected of them. The learners were encouraged not to call out answers nor copy from each other. To minimise copying, learners were asked to sit as far as possible apart from each other. The questionnaires were distributed to learners in the classrooms and the questions and their answer options were read aloud for the learners by the facilitator. The learners followed along and responded on their own questionnaires by circling the preferred response. The assessment took an average of ten minutes to complete. The same process was followed in School 1 and School 2. The learners’ age and gender were provided by the class teachers.

6.8 Data management

The facilitators collected all the questionnaires after ten minutes and checked for their completeness. All questionnaires were handed to the researcher to double check for completeness and were kept under lock and key at the Department of Human Nutrition University of Pretoria.

All data were captured on EXCEL in duplicate by two different research assistants and then coded and scored. The two data sets were compared using excel and incorrect entries were rectified using the original data. The data was cleaned and then exported to a statistical software package (SPSS version 22) by the researcher.

6.9 Data analysis

Two questionnaires were used: (i) to assess behavioural intent related to nutrition (Grade 1 learners), and (ii) to assess nutrition knowledge and self-efficacy (Grade 2 and 3 learners). The data for all learners outside the age range (seven to nine years) were excluded from the analysis.

For missing data, where one question was missing in a scale, the mean score for all learners for that question was imputed. Where more than one question was missing for a scale, the data for that learner were excluded for that scale (Stevens *et al.*, 1999). There were seven out of 244 learners' data where a mean score was imputed or was excluded. This was done for a total of 16 questions in both pre-intervention assessment and post-intervention assessment. Only 0.4% of the learners had more than one question in a scale missing.

Each question was set to a scale of 0.0 to 1.0; 1.0 being the score for the healthiest option and 0.0 the least healthy option. The mean score for each scale was computed and reported. Therefore, if a learner answered with the correct answer for each of the questions on the eight item food choice intentions scale, the mean score would be 1.0. If answered with the in-correct answer for each of questions the mean score would be 0.0 (Stevens *et al.*, 2003).

The data were assessed for normality using the Shapiro Wilks test and the level of skewness (table 7.1). A measured variable was considered skewed if the skewness score was either greater than -1 or greater than 1, i.e. $-1 < \text{skewness score} > 1$. Parametric statistics were employed in the analysis of the data. The power of the study was calculated using repeated measures ANOVA. Cronbach's alpha was calculated for each of the scales to assess internal

consistency. The independent samples t-test was used to compare the baseline mean scores between the schools and the genders.

Questions from the food choice intentions questionnaire were separated in order to determine the effect of the NEP on the intention to choose a healthy take-away, intention to choose a healthy drink, intention to choose healthy snacks and intention to choose a healthy breakfast. For example, questions 1, 2, 3, 6 and 7 from the questionnaire were used for the intention to choose a healthy snack. Similarly, the self-efficacy questionnaire was separated to determine self-efficacy to choose less fat foods and self-efficacy to choose less sugary foods.

The effect of the NEP with respect to changes in nutrition related knowledge, self-efficacy and behaviour intent was measured using paired t-tests. The independent samples t-test was used to compare differences between pre-intervention assessment and post-intervention assessment mean scores by gender and between schools for all three scales. The McNemar test was used to compare differences between related percentages. To determine whether the associations between the NEP and measured outcomes were modified by gender and or school, an analysis of co-variance with the pre-assessment score as the covariate was performed. The assessments were done up to post-intervention and not follow-up as the objective at follow-up was to assess retention of outcomes. One way repeated measures ANOVA was used to assess the effect of time on the measured outcomes. Effect of time was also measured by school and by gender for all outcomes, except food choice intentions due to the small sample size. The statistical package SPSS version 22 was used to analyse the data and a significance level of 0.05 was employed.

6.10 Process evaluation

Process evaluation is useful in appraising whether programme implementation was done according to plan (Young, Steckler, Cohen, Pratt, Felton, Moe, Pickrel, Johnson, Grieser, Lytle, Lee & Raburn, 2008). As a result of feasibility constraints such as limited contact time, the evaluation of process was not done for this study. The delivery was standardised as much as practically possible between groups. However, some differences occurred depending on group needs, e.g. the difference in the infrastructural set up of the schools resulted in learners in School 2 receiving the NEP in larger groups as compared to School 1. Debriefing sessions with facilitators provided information on the coverage of content in each session.

6.11 Validity and reliability measures

- A validated questionnaire was used (Stevens *et al.*, 2003)
- The Cronbach's alpha reliability test was used to measure the internal consistency of the questionnaires (table 6.3).
- All facilitators were trained in questionnaire administration to ensure consistency in the testing of each group of learners.
- Facilitators were also trained on the implementation of the NEP using the instructor's manual to standardise the delivery of lessons.
- To increase reliability, questionnaires were in the learners' preferred language of instruction, i.e. English and Afrikaans.

6.12 Assumptions to implementation

- Learners would be present for period of implementation as well as post-intervention assessment (six weeks) and follow-up assessment (12 months)
- Learners' cooperation to complete in an honest manner

6.13 Conclusion

Implementation of the NEP took place in Phase 2 as had been planned. The learners' food choice intentions, nutrition related self-efficacy and knowledge were assessed at baseline, post-intervention (six weeks) and at follow-up (12 months). The NEP was delivered to the learners over six weeks in nine lessons which lasted 20 minutes each. The effectiveness of the NEP was evaluated with respect to changes in the measured outcomes by gender and by school at six weeks and 12 months.

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Chapter 7: Results

7.1 Introduction

This chapter starts with a description of the biographic characteristics of the participants followed by the outcomes associated with the measured variables, namely food choice intentions, nutrition self-efficacy and nutrition knowledge.

Two different instruments were used for data collection: one for Grade 1 learners, and one for Grades 2 and 3 learners, therefore the results are reported separately. The results are reported as follows: per school (School 1 and School 2) and for the schools combined, and also by gender and by grade. Firstly, the performance from baseline to post-intervention (six weeks and 12 months), as well as per question is described followed by the effect of the NEP with respect to changes in the measured variables. The effect of time from baseline (pre-intervention assessment) to six weeks (post-intervention assessment) to 12 months (follow-up assessment) is discussed. Effect of time was explained as follows: small if the partial eta square = 0.01, medium if the partial eta square = 0.06 and large if the partial eta square = 0.14 (Cohen, 1988).

The results for both the Grade 1 learners, and Grades 2 and 3 learners follow the same order. Each question was set to a scale of 0.0 to 1.0 and the mean score for each scale is reported, 1.0 being the healthiest answer and 0.0 the least healthy answer. The level of significance was set at $P=0.05$.

7.2 Power of the study and normality of data

The power of the study was assessed using repeated measures ANOVA and ranged from 0.108 to 0.989 (table 7.1). The power to detect effect was the highest for food choice intentions, followed by the power to detect changes in nutrition knowledge. The power to detect changes in self-efficacy was the lowest. Parametric tests were employed as the data were approximately normally distributed.

The test for internal consistency indicated that some scales (food choice intentions and nutrition knowledge) had very low Cronbach's Alpha values at baseline. The low reliability may have limited the ability to detect change by introducing unwanted error. However, self-efficacy had good reliability (table 7.2).

Table 7.1: Normality of the measured variables

Measurement Scale	Power		Skewness		Shapiro Wilk test	
			Statistic	Std. Error	Statistic	P value
Food choice intentions	0.989	Pre-test	- 0.254	0.304	0.946	0.008205
		Post-test	- 0.265	0.304	0.917	0.000474
		Observed change	- 0.390	0.304	0.961	0.048765
Self-efficacy	0.108	Pre-test	- 0.254	0.214	0.967	0.003011
		Post-test	- 0.124	0.214	0.971	0.007103
		Observed change	- 0.294	0.214	0.978	0.038021
Knowledge	0.697	Pre-test	- 0.096	0.214	0.983	0.111235
		Post-test	- 0.227	0.214	0.975	0.018096
		Observed change	0.086	0.214	0.977	0.026716

Table 7.2: Reliability (Cronbach's Alpha) of the questions in the modified Pathways KAB questionnaire

Scale	Cronbach's Alpha		
	Pre-test	Post-test	Follow-up
Food choice intentions	0.052	0.497	0.455
Food self-efficacy	0.721	0.617	0.702
Nutrition knowledge	0.279	0.429	0.547

7.3 Biographic characteristics of the participants

Table 7.3 shows that there were 244 participants who consented and participated in the study, of which 27% were in Grade 1 and 73% were in Grades 2 and 3. The proportions from each school were nearly equal, with 47% from School 1. The age range was seven to nine years with a mean age of 8.06 years for all learners and a mean age of 7.13 years for learners in Grade 1. Learners in School 1 were generally older than learners in School 2 is shown by the higher mean age (8.24 vs. 7.92) years. There were 91 boys, with a higher proportion being from School 2 (55.9%). Of the 116 girls, the majority were from School 2 (58.6%). The participants who were present for both the baseline and post-intervention assessments were 190, which gave a participation rate of 77.9%. At the 12 months follow-up assessment, 157 participants were

present, giving a participation rate of 64.3%. Therefore, the attrition rate at post-intervention was 22.1% and 35.7% at follow-up, respectively.

Table 7.3: Participants' demographic characteristics (N=244)

	Mean age (years)	Gender				Grade 1		Grades 2&3	
		Males		Girls		n	%	n	%
		n	%	n	%				
School 1 (n=115)	8.24 ± 0.735	41	45.1	48	41.4	23	34.8	92	51.7
School 2 (n=129)	7.92 ± 0.859	50	54.9	68	58.6	43	65.2	86	48.3
Overall (N=244)	8.06 ± 0.821	91	100	116	100	66	100	178	100
P value	0.005 ^b	0.672 ^a				0.007 ^b			

•54 (30.3%) cases had missing data •P value ^a derived from Chi-square ^a •P value ^b derived from ANOVA

7.4 Food choice intentions for Grade 1 learners

7.4.1 Overall performance from baseline to follow-up assessments

The learners' performance is shown in table 7.4. From baseline to post-intervention more than half of the learners had an increase in mean scores for food choice intentions. Less than a quarter (24.2%) did not show any change in mean scores, while less than 20% (17.7%) had a decrease in the mean score. From post-interventions to the follow-up assessment, only a third (34.8%) had increased mean scores for food choice intentions, while another third (30.3%) had decreased means scores. Less than 20% (16.7%) did not show any change in mean scores.

Table 7.4: Performance of Grade 1 learners on food choice intentions from baseline to follow-up in both schools (N=66)

Food choice intentions	Post-intervention		Follow-up	
	n	%	n	%
Missing	4	0.06	13	19.7
Improved	36	58.1	23	34.8
No changes observed	15	24.2	10	16.7
Decreased	11	17.7	20	30.3
P value	0.0001		0.0001	

•P values derived from ANOVA

7.4.2 Correct response by question of Grade 1 learners for food choice intentions from baseline to follow-up in both schools

Table 7.5 and figure 7.1 show that the number of learners who chose the correct response was more at the post-intervention assessment than at the pre-intervention assessment for most questions, except for question 8. At pre-intervention assessment, the proportion of participants who chose the correct response ranged from 21.2% to 66.8%, and at the post-intervention assessment ranged from 37.1% to 66.1%. Figure 7.1 shows that fewer learners chose the correct response at the post-intervention assessment than at the pre-intervention assessment for question 8 (Which would you choose to drink? Options: Diet soda or soda pop). Question 2 (What will you do? Options: Eat corn with butter or corn without butter) was well answered at both the pre-intervention assessment and post-intervention assessment with more than 60% choosing the correct response. As can be seen in figure 7.1, the greatest improvement was for question 5 (Which would you order at a fast food restaurant? Options: A regular hamburger or extra big hamburger) which had more learners choosing the correct response at the post-intervention assessment than at the pre-intervention assessment figure 7.1 (33.6%). Question 5 and question 8 were poorly answered by most learners at the pre-intervention and post-intervention assessments respectively. Only 21.2% of the learners chose the correct response at the pre-intervention assessment for question 5, while less than 40% of learners chose the correct answer at the post-intervention assessment for question 8.

The number of learners who chose the correct response at 12 months follow-up decreased for all questions (table 7.5 and figure 7.1). The proportion of learners who chose the correct response at follow-up ranged from 33.3% to 54.4%. The greatest decrease was for question 6 (Which food would you ask the adults in your house to buy? Options: A bag of oranges or a bag of chips) shown by a drop of 26.4% from the post-intervention assessment to follow-up. The number of learners who chose the correct response at follow-up dropped below those at the pre-intervention assessment for five out of eight questions.

Table 7.5: Pre-, post-intervention and follow-up assessment: correct response by question for food choice intentions by Grade 1 learners in both schools (N=66)

Scale	Question	Pre-test (n=66)		Post-test (n=62)		Follow-up(n=57)	
		Frequency	%	Frequency	%	Frequency	%
Food choice intentions	1	29	43.9	38	61.3	31	54.4
	2	44	66.7	41	66.1	29	50.8
	3	27	40.9	36	58.1	20	35.1
	4	29	43.9	27	43.5	20	35.1
	5	14	21.2	34	54.8	19	43.9
	6	29	43.9	37	59.7	25	33.3
	7	27	40.9	35	56.5	26	45.6
	8	27	40.9	23	37.1	19	33.3

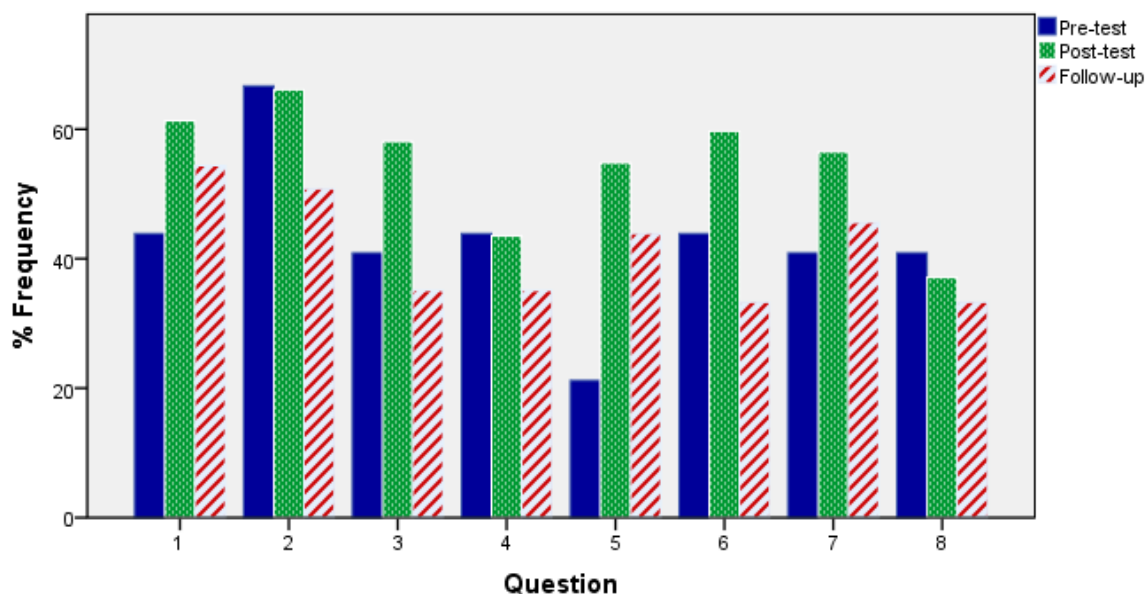


Figure 7.1: Pre-, post-intervention and follow-up assessment: correct response by question of Grade 1 learners for food choice intentions in both schools (N=66)

7.4.3 Effect of the programme on food choice intentions: baseline to follow-up

The paired t-test was employed to assess the effect of the NEP with respect to changes in food choice intentions of the learners from baseline to six weeks. A mean score for food choice intentions greater than 0.5 was considered good, excellent when equal to one, and average if

equal to 0.5. A mean score was considered deteriorating in the wrong direction if less than 0.5, and poor when equal to zero. M refers to mean score.

Table 7.6 shows the mean scores and the P values for food choice intentions overall and per school. All mean scores for food choice intentions were good at the post-intervention assessment except for food choice intentions in School 1 which remained poor (M=0.467). The mean scores for food choice intentions increased significantly from the baseline to post-intervention (M=0.42944 vs. M=0.54637; P=0.0001) for the group as a whole. There was also a significant increase in mean scores for food choice intentions in both School 1 (M=0.53750 vs. M=0.71250; P=0.001) and School 2 (M=0.37798 vs. M=0.46726; P=0.014). Intentions to choose healthy snacks also increased significantly from the baseline to post-intervention (M=0.471 vs. M=0.603; P=0.0001).

Table 7.6: Mean score of Grade 1 learners for positive food choice intentions from baseline to post-intervention in both schools (N=62)

	n	Pre-test		Post-test		P value
		Mean	S.D	Mean	S.D	
Food choice intentions(overall)	62	0.429	0.178	0.546	0.295	0.000
Intentions to choose healthy snacks	62	0.471	0.235	0.603	0.277	0.000
Food choice intentions in School 1	20	0.538	0.152	0.712	0.158	0.001
Food choice intentions in School 2	42	0.378	0.167	0.467	0.230	0.14

• P value derived from paired t-tests

One way repeated measures ANOVA was used to compare the learners' food choice intentions scores at the pre-intervention, post-intervention and follow-up assessments (table 7.7). A significant effect for time was observed; there was a change in the learners' overall food choice intentions scores across the three different time periods, baseline (time 1), at six weeks (time 2) and at 12 months (time 3) [Wilks' Lambda=0.696, F=10.259, P=0.0002, partial eta squared=0.304]. The result imply a very large significant effect for time regarding the changes observed over time for food choice intentions (Cohen, 1988).). A significant effect for time was also observed in School 1 [Wilks' Lambda=0.362, F=12.956, P=0.000, partial eta squared=0.618] and School 2 [Wilks' Lambda=0.801, F=3.591, P=0.04, partial eta squared=0.199]. The overall food choice intentions mean scores increased from baseline to six weeks and dropped significantly at 12 months (M=0.546 vs. M=0.446; P=0.000) (figure 7.2). A similar trend was

also observed with the mean scores for intention to choose healthy snacks, although not significant (M=0.603 vs. M=0.484; P=0.05) and the mean food choice intentions scores for both School 1 (M=0.712 vs. M=0.493; P=0.00) and School 2 (M=0.467 vs. M=0.419; P=0.04). The learners' food choice intentions changed over time for both schools.

Table 7.7: Mean scores of Grade 1 learners for positive food choice intentions from baseline to follow-up in both schools (N=49)

	n	Pre-test		Post-test		Follow-up		p value
		Mean	S.D	Mean	S.D	Mean	S.D	
Positive food choice intentions(overall)	49	0.436	0.169	0.561	0.231	0.446	0.231	0.000
Positive intentions to choose healthy snacks	49	0.612	0.229	0.492	0.275	0.484	0.294	0.05
Positive food choice intentions in School 1	18	0.534	0.147	0.708	0.166	0.493	0.259	0.000
Positive food choice intentions in School 2	31	0.379	0.156	0.476	0.222	0.419	0.213	0.04

• P value derived from ANOVA

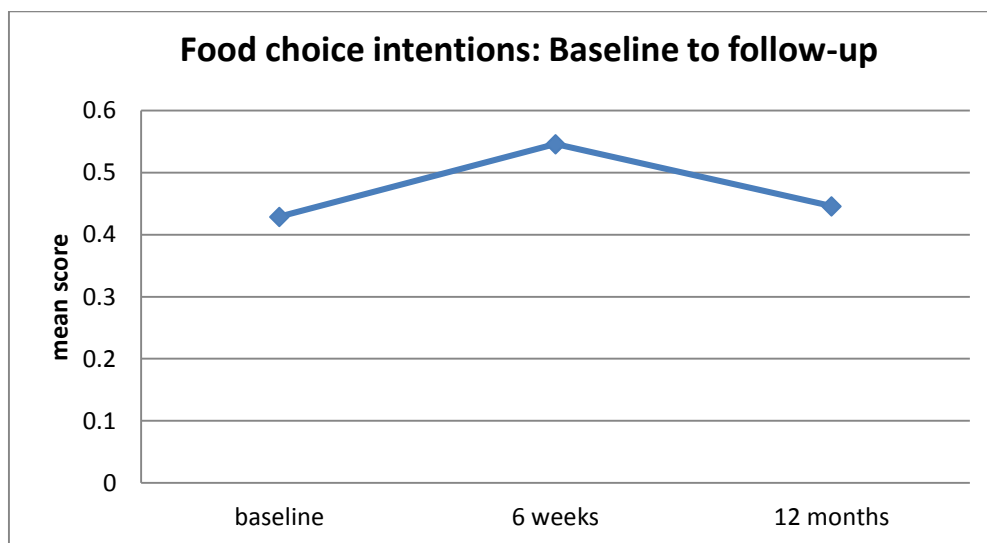


Figure 7.2: Effect of the programme on overall food choice intentions: baseline to follow-up for both schools (N=62)

The performance at the different times was significantly different between the schools and genders P=0.001 (figure 7.3a and figure 7.3b) [Wilks' Lambda=0.671, F=10.782, P=0.0002, partial eta squared=0.329]. Girls in both schools had an increase in mean scores from time 1 to time 2, and a decrease from time 2 to time 3. A similar result was noted for boys in both schools.

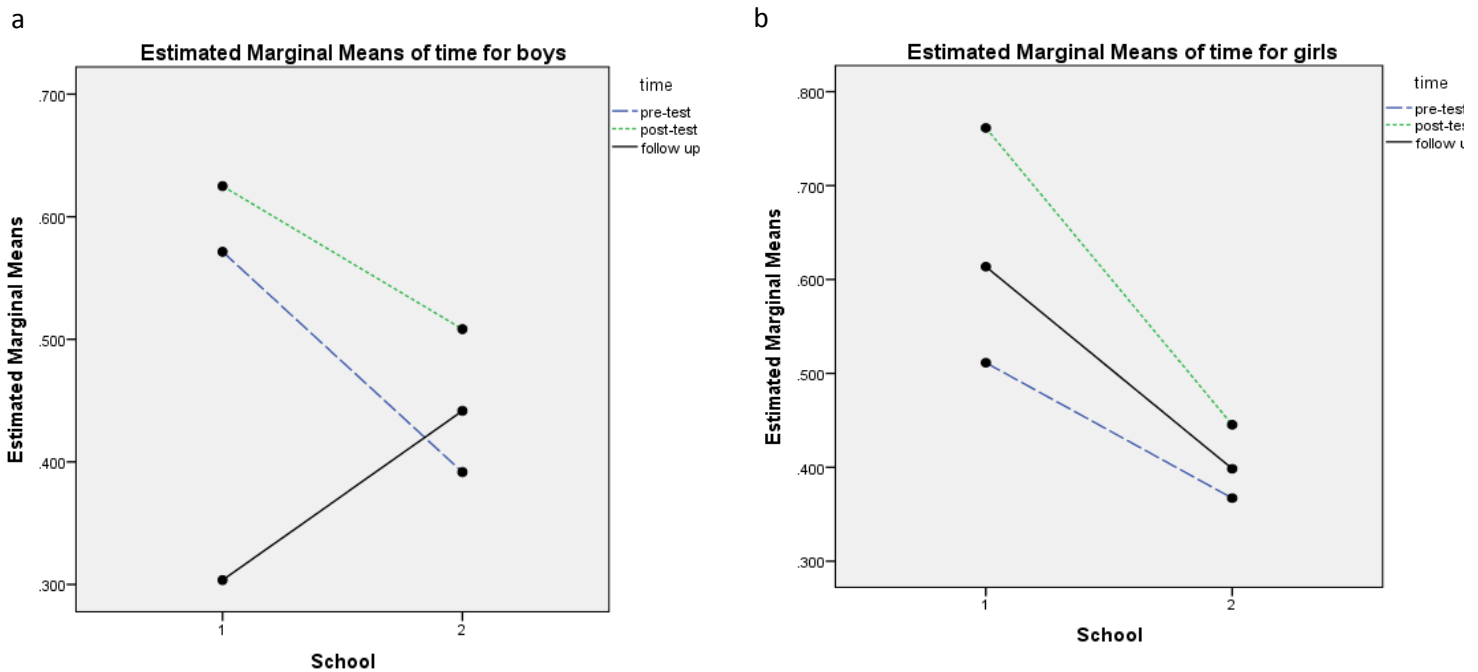


Figure 7.3(a and b): Estimated marginal means of time on overall food choice intentions by Grade 1 learners in both schools baseline to follow-up (N=49) (a) boys (b) girls

The McNemar test was used to compare frequencies for specific food choice intentions from baseline to post-intervention and from post-intervention to follow-up. As can be seen in table 7.8, from the baseline to follow-up the proportion of learners intending to choose healthier take away foods increased significantly (22.6% vs. 54.8%; $P=0.001$). However, a significant decrease was observed from the post-intervention to the follow-up assessments (54.8% vs. 28.8%; $P=0.008$). There was a decrease in both the proportion of learners intending to choose a healthy breakfast (45.2% vs. 43.5%; $P=1.0$) and those intending to choose healthy drinks (40.3% vs. 37.1%; $P=0.856$) from the baseline to the post-intervention assessment. Further decreases were observed in intentions to choose a healthy take away (54.8% vs. 28.8%; $P=0.008$), intentions to choose a healthy breakfast (43.5% vs. 30.3%; $P=0.068$), and intentions to choose healthy drinks (37.1% vs. 28.8%; $P=0.17$) from the post-intervention assessment to follow-up assessment.

Table 7.8: Specific positive food choice intentions of Grade 1 learners from baseline to post-intervention in both schools (N=62)

Positive food choice intention	Pre-test		Post-test		P value	Follow-up		P value
	n	%	n	%		n	%	
Intention to choose healthier take away	14	22.6	34	54.8	0.001	19	28.8	0.008
Intention to choose a healthy breakfast	28	45.2	27	43.5	1.00	20	30.3	0.068
Intention to choose healthy drinks	25	40.3	23	37.1	0.856	19	28.8	0.17

• P value derived from Mcnemar's test

As is shown in table 7.9, generally girls and boys in the two schools responded differently at both the pre-intervention and post-intervention assessments. School 1 had higher mean scores at both the pre-intervention and post-intervention assessments as compared to School 2. The girls in School 1 had significantly higher mean scores at the post-intervention assessment as compared to the girls in School 2 (M=0.760 vs. M=0.427; P=0.0001). School 1 had higher overall food choice intentions mean scores as compared to School 2 at the follow-up assessment, although not significant.

Table 7.9: Mean positive food choice intentions scores of Grade 1 learners by school and gender from baseline to follow-up in both schools (N=66)

Food choice intentions		School 1			School 2			Mean Difference	P Value
		n	Mean	S. D.	n	Mean	S. D.		
Pre-Test	Boys	7	0.571	0.122	17	0.397	0.178	0.174	0.028
	Girls	16	0.500	0.171	25	0.380	0.142	0.120	0.019
	Overall	23	0.521	0.158	42	0.387	0.156	0.144	0.001
Post-Test	Boys	7	0.625	0.239	17	0.507	0.231	0.118	0.275
	Girls	13	0.760	0.062	24	0.427	0.208	0.333	0.000
	Overall	20	0.713	0.158	42	0.467	0.221	0.245	0.000
Follow-Up	Overall	21	0.494	0.239	32	0.414	0.212	0.080	0.207

• Gender data missing for some learners

• P value derived from t-tests

An analysis of co-variance was performed to determine the effect of gender and school on the observed change after controlling for the pre-intervention assessment score. Table 7.10 shows a significant interaction between school and gender (P=0.023). It further shows that school had

a significant effect on the change in mean scores for food choice intentions. Figure 7.4 shows an interaction between gender and school, indicating that the girls and boys performed differently in each of the schools. The girls in School 1 had a larger increase in the mean score from the baseline to post-intervention as compared to the boys.

Table 7.10: Effect of gender and school on observed change in overall positive food intentions scores from baseline to post-intervention adjusting for pre-test score in both schools (N=61)

	Pre-test		Gender		School		Gender*school	
	Partial Eta Squared	P Value	Partial Eta Squared	P Value	Partial Eta Squared	P Value	Partial Eta Squared	P Value
Food choice intentions	0.126	0.006	0.015	0.357	0.095	0.018	0.088	0.023

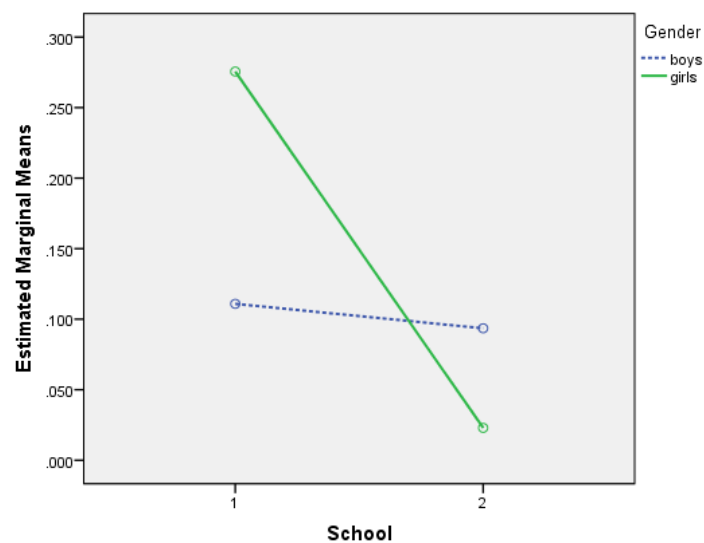


Figure 7.4: Estimated marginal means of improvement on overall positive food choice intentions by Grade 1 learners in both schools (N=61)

7.5 Self-efficacy for Grades 2 and 3 learners

7.5.1 Overall performance from baseline to follow-up assessments

The proportion of learners who had an increase in mean scores for self-efficacy from the baseline to post-intervention was significantly less (43.0%) than those who decreased (48.4%) in their self-efficacy (table 7.11). Very few learners (6.2%) showed no changes in mean scores.

From the post-intervention to follow-up assessments, the proportion of learners with increased mean scores for self-efficacy decreased (43% vs. 20.2%), as well those with decreased mean self-efficacy scores from post-intervention to follow-up. The proportion of learners who showed no changes from post-intervention to follow-up also decreased to only 4%.

Table 7.11: Performance of learners in Grade 2 and 3 from baseline to follow-up assessments for both schools (N=178)

Nutrition self-efficacy	Post-intervention		Follow-up	
	n	%	n	%
Missing	50	28.1	64	36.0
Improved	55	43.0	36	20.2
No changes observed	11	8.6	7	3.9
Decreased	62	48.4	71	39.9
P value	0.0001		0.0001	

• P value derived from ANOVA

7.5.2 Correct response by question of learners in Grade 2 and 3 for self-efficacy from baseline to follow-up in both schools

Although the difference in the percentage of learners who chose the correct response at the pre-intervention and post-intervention assessments was very small, the percentage of learners with correct responses were fewer at the post-intervention assessment than the pre-intervention assessment for most of the questions. However, positive results were observed for some questions, such as question 11 (I can rather buy a fruit than a packet of chips at the tuck-shop), where quite a number of learners chose the correct response at the post-intervention assessment than the pre-intervention assessment (pre-test: 48.3% vs. post-test: 66.7%). This positive effect was not present at the follow-up assessment as shown by the drop of 17.7 % for the same question (figure 7.5). Question 2 (I can play hard during break) and question 9 (I can ask for a sugar free fizzy cold drink rather than a common fizzy drink) were the most poorly answered for this scale as is shown by the drop of greater than 10% for both questions from the pre-intervention assessment to the post-intervention assessment. A positive result was noted for question 2 where an increase of 18.1% was observed at the follow-up assessment (table 7.12). A general decrease in the self-efficacy mean scores was observed from the post-intervention assessment to the follow-up assessment. Despite the decrease observed from the pre-

intervention assessment to the post-intervention assessment, an increase was noted at the follow-up assessment (56.2% vs. 51.9% vs. 53.0%) for question 3 (I play a lot everyday).

Table 7.12: Pre-, post-intervention and follow-up assessment: correct response by question for self-efficacy of Grade 2 and 3 learners in both schools (N=178)

Scale	Question	Pre-test (n=178)		Post-test (n=129)		Follow-up (n=149)	
		Frequency	%	Frequency	%	Frequency	%
Nutrition Self-efficacy	1	146	82.0	100	77.5	92	61.7
	2	93	52.2	52	40.3	87	58.4
	3	100	56.2	67	51.9	79	53.0
	4	90	50.6	65	50.4	76	51.0
	5	117	65.7	91	70.5	104	69.8
	6	102	57.3	76	58.9	81	56.4
	7	99	55.6	70	54.3	77	51.7
	8	75	42.4	57	44.2	61	40.9
	9	87	49.2	48	37.2	51	34.2
	10	99	55.6	77	59.7	75	50.3
	11	86	48.3	86	66.7	73	49.0

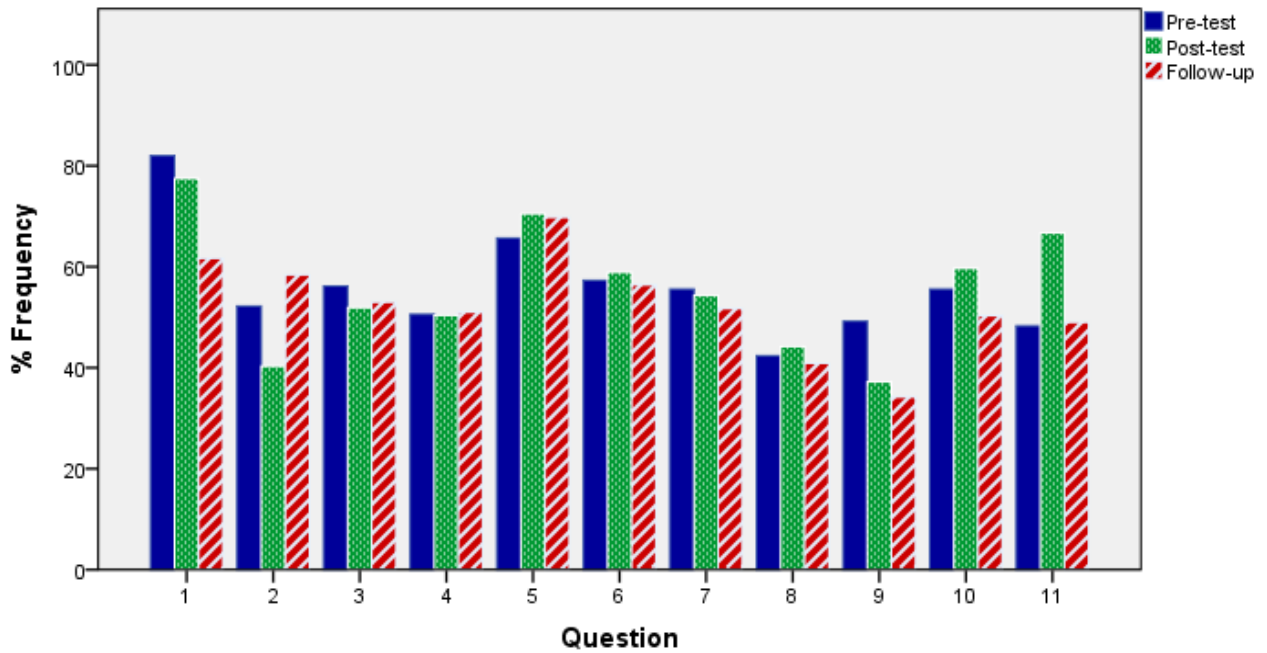


Figure 7.5: Pre-, post-intervention and follow-up assessments: correct responses by question for self-efficacy of Grade 2 and 3 learners in both schools (N=178)

7.5.3 Effect of the programme on self-efficacy: baseline to follow-up

The paired t-test was used to assess the effect of the NEP on the self-efficacy of learners. The mean scores for nutrition self-efficacy decreased ($M=0.80415$ vs. $M=0.79616$; $P=0.483$), though not significantly from the baseline to post-intervention assessments in both schools (table 7.13). The mean scores for self-efficacy related to less fatty foods increased ($M=0.7666$ vs. $M=0.79688$; $P=0.078$), while those for self-efficacy related to less sugary foods decreased ($M=0.80426$ vs. $M=0.79167$; $P=0.432$), though not statistically significant for both self-efficacy items. The increase in overall mean self-efficacy scores in School 1 ($M=0.79$ vs. $M=0.798$; $P=0.634$) and the decrease in School 2 ($M=0.823$ vs. 0.794 ; $P=0.082$) was not significant.

Table 7.13: Mean scores for self-efficacy from baseline to post-intervention for Grades 2 and 3 learners in both schools (N=128)

Scale	n	Pre-test		Post-test		P value
		Mean	S.D	Mean	S.D	
Food self-efficacy (overall)	128	0.804	0.126	0.796	0.119	0.483
Less fat foods self-efficacy	128	0.767	0.175	0.797	0.153	0.078
Less sugar foods self-efficacy	129	0.804	0.155	0.792	0.154	0.432
Self-efficacy in School 1	73	0.790	0.127	0.798	0.123	0.634
Self-efficacy in School 2	55	0.823	0.123	0.794	0.115	0.082

• P value derived from paired t-tests

As shown in table 7.14, one way repeated measures ANOVA was used to compare the scores by school; at baseline, post-intervention and at follow-up assessments. There was a significant effect for time; there was a change in the learners' overall self-efficacy scores across the three different time periods baseline: (time 1), at six weeks (time 2) and at 12 months (time 3) [Wilks' Lambda=0.833, F=10.563, P=0.00006, partial eta squared= 0.167]. Overall self-efficacy mean scores continued to decrease significantly from the post-intervention assessment to the follow-up assessment. A greater decrease was observed in School 2 as compared to School 1, although not significant (P=0.424). This result implies a large effect for time for the observed decrease in self-efficacy mean scores (figure 7.6) (Cohen, 1988).

Table 7.14: Mean scores for self-efficacy from baseline to follow-up for Grades 2 and 3 learners in both schools (N=108)

Scale	n	Pre-test		Post-test		Follow-up		P value
		Mean	S.D	Mean	S.D	Mean	S.D	
Food self-efficacy (overall)	108	0.801	0.127	0.791	0.121	0.735	0.139	0.000
Less fat foods self-efficacy	110	0.758	0.176	0.801	0.144	0.722	0.207	0.001
Less sugary foods self-efficacy	110	0.801	0.158	0.787	0.149	0.757	0.158	0.133
Self-efficacy in School 1	63	0.781	0.126	0.787	0.125	0.742	0.145	0.424
Self-efficacy in School 2	45	0.828	0.124	0.798	0.117	0.727	0.132	

• P value derived from ANOVA

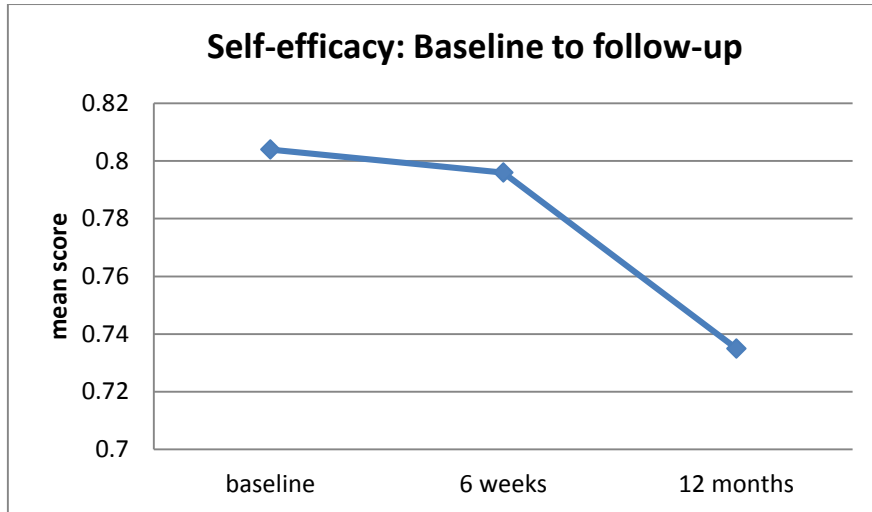


Figure 7.6 (a and b): Effect of the programme on overall self-efficacy: baseline to follow-up for both schools (128)

There was a significant decrease in self-efficacy mean scores over time ($P=0.00008$) in both schools. The performance at the different times was significantly different between the genders $P=0.001$ (figure 7.7a and figure 7.7b) [Wilks' Lambda=.794, $F=10.664$, $P=0.00008$, partial eta squared =0.206]. Girls in both schools showed decreases in mean scores from time 1 to time 2 to time 3 (figure 7.7a), as well as the boys in School 2 (figure 7.7b). However, boys in School 1 had an increase in mean scores from time 1 to time 2, and a decrease from time 2 to time 3.

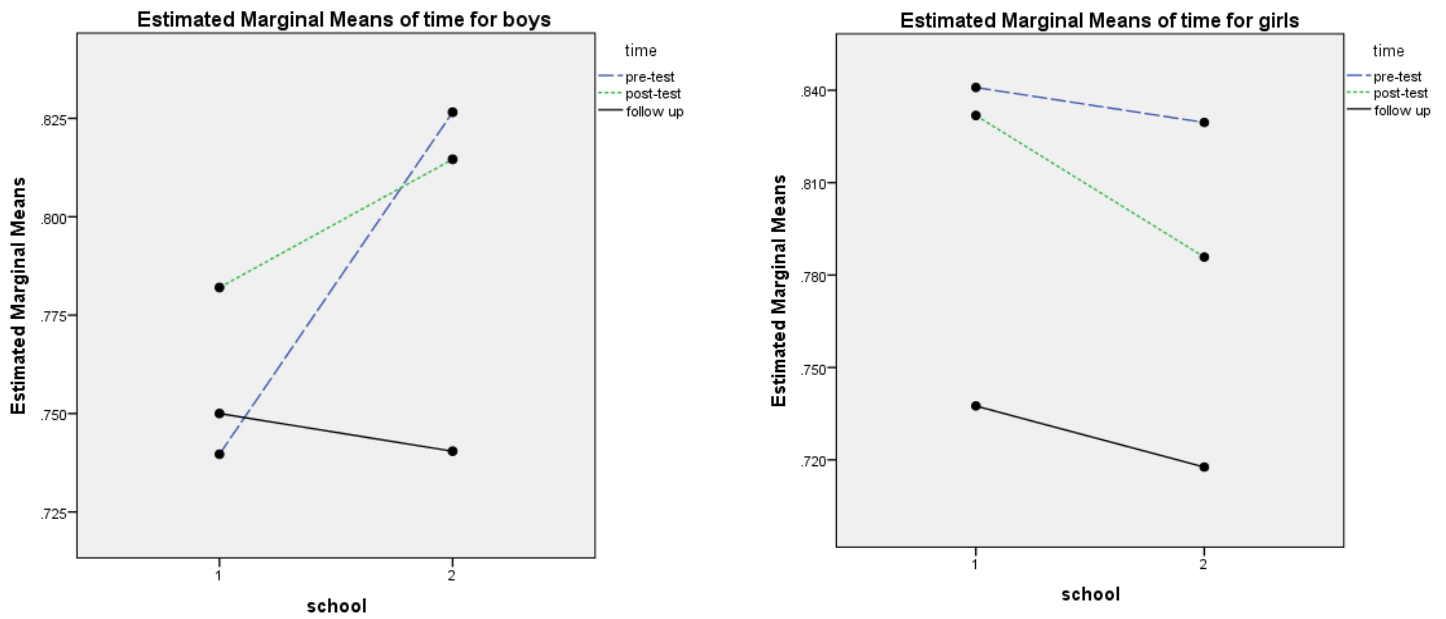


Figure 7.7(a and b): Estimated marginal means of time on overall self-efficacy of Grade 2 and 3 learners in both schools (N=108) (a) boys (b) girls.

There was no significant difference between the schools or gender both at the pre-intervention assessment and the post-intervention assessment in the mean self-efficacy scores as revealed by the data for the independent samples t-test (table 7.15), except for the girls. The girls in School 1 had significantly higher mean scores compared with the girls in School 2 at both the pre-intervention and post-intervention assessments. The slight differences in mean self-efficacy scores between School 1 and School 2 were not significant at the follow-up assessment (M=0.746 vs. M=0.725; P=0.360). Although the girls had higher mean scores as compared to boys in both schools, the differences were not significant.

Table 7.15: Mean self-efficacy scores by school and gender at baseline, post-intervention and follow-up for Grade 2 and 3 learners in both schools (N=177)

Nutrition self-efficacy		School 1			School 2			Mean difference	P value
		n	Mean	S.D	n	Mean	S.D		
Pre-test	Boys	34	0.763	0.152	34	0.822	0.115	-0.063	0.074
	Girls	32	0.869	0.104	42	0.791	0.143	0.078	0.008
	Overall	92	0.798	0.133	85	0.803	0.135	-0.005	0.824
Post-test	Boys	24	0.785	0.125	25	0.816	0.104	-0.020	0.351
	Girls	25	0.848	0.122	32	0.779	0.119	0.069	0.036
	Overall	73	0.798	0.122	56	0.795	0.134	0.003	0.903
Follow-up	Boys	28	0.746	0.150	28	0.635	0.219	-0.009	0.711
	Girls	26	0.748	0.135	38	0.727	0.168		
	Overall	77	0.746	0.144	72	0.725	0.137	0.041	0.127

• Gender data missing for some learners

• P value derived from t-tests

This is also confirmed by the analysis of co-variance (table 7.16) that shows that neither school ($P=0.156$) nor gender ($P=0.498$) or their interaction ($P=0.255$) had a significant effect on the change in mean score for self-efficacy from the baseline to post-intervention. Learners in School 1 performed better than the learners in School 2 (figure 7.8a). School had a significant effect on self-efficacy related to less fatty foods ($P=0.006$) (table 7.14) and both the boys and girls in School 1 had higher improved mean scores as compared to the learners in School 2 (figure 7.8b). As for self-efficacy related to less sugary foods, an interaction between school and gender was observed ($P=0.014$) (table 7.16). The boys in School 2 had higher improved mean scores as compared to the boys in School 1 (figure 7.8c).

Table 7.16: Effect of gender and school on observed change in scores from baseline to post-intervention adjusting for pre-test score in both schools (N=104)

	Pre-test		Gender		School		Gender*school	
	Partial Eta Squared	P Value	Partial Eta Squared	P Value	Partial Eta Squared	P Value	Partial Eta Squared	P Value
Self-efficacy	0.277	0.000	0.005	0.498	0.020	0.156	0.013	0.255
Self-efficacy: less fat	0.425	0.000	0.011	0.289	0.075	0.006	0.010	0.328
Self-efficacy: less sugar	0.349	0.000	0.01	0.32	0.001	0.756	0.059	0.014

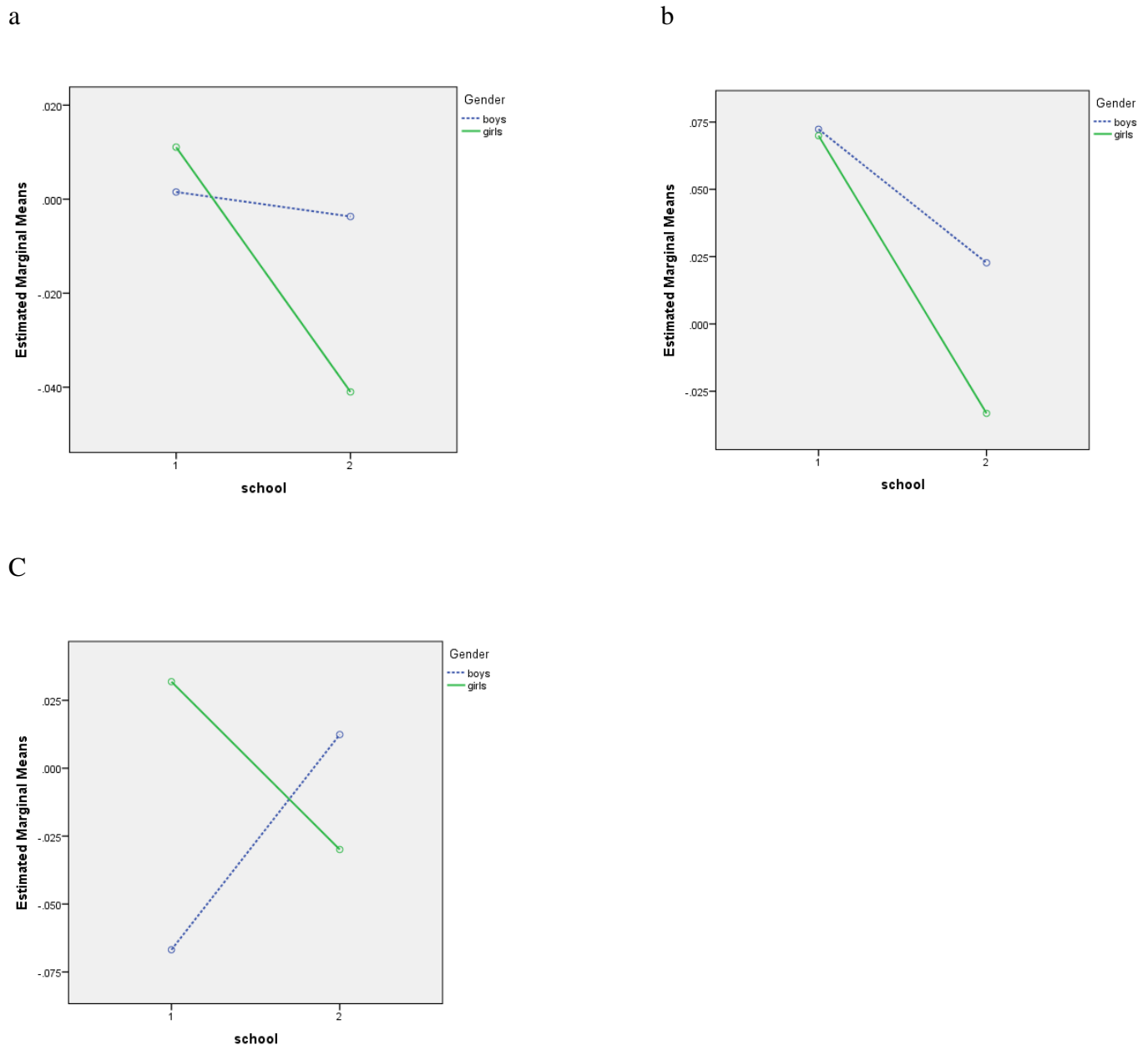


Figure 7.8 (a, b and c): Estimated marginal means of improvement for overall self-efficacy (a), self-efficacy related to less fat foods (b) & self-efficacy related to less sugary foods (c)(N=128)

7.6 Nutrition knowledge of Grade 2 and 3 learners

7.6.1 Overall performance from baseline to follow-up assessments

The majority of learners (46.1%) had increased their nutrition knowledge mean scores from the baseline to post-intervention, while 38.3% had decreased their mean scores. Very few (15.6%) showed no changes (from the baseline to the post-intervention assessments). Most

learners had increased nutrition knowledge mean scores (43%) and very few had decreased mean scores (12.8%). About one tenth (10.6%) showed no changes.

Table 7.17: Performance of learners in Grade 2 and 3 from baseline to post-intervention assessment on nutrition knowledge in both schools (N=128)

Nutrition knowledge	Post-intervention		Follow-up	
	n	%	n	%
Missing	50	28.1	60	33.5
Improved	59	46.1	77	43.0
No changes observed	20	15.6	19	10.6
Decreased	49	38.3	23	12.8
P value	0.0001		0.0001	

• P value derived from ANOVA

7.6.2 Correct responses by question of learners in Grade 2 and 3 from baseline to follow-up on nutrition knowledge for both schools

Generally, more learners chose the correct response at the post-intervention assessment than the pre-intervention assessment for the nutrition knowledge questions. The increase in the number of learners choosing correct responses was clearly visible for question 1 (What food is more healthy to eat), question 2 (Which one tell that your body has had healthy exercise), question 3 (What food contains least fat) and question 7 (Which one is the most healthy snack) (figure 7.9). Question 5 (What can you do to remove extra fat from mince meat) was poorly answered by many learners, evidenced by the drop from the pre-intervention assessment to the post-intervention assessment (pre-intervention assessment: 31.6% vs. post-intervention assessment: 24.8%) (table 7.18). More learners chose the correct response at the follow-up assessment for six out of seven questions. A decrease (post-intervention assessment to follow-up) in the number of learners choosing the correct response was noted in question 1 (post-intervention assessment: 69.8% vs. follow-up: 67.1%).

Table 7.18: Pre-, post-intervention and follow-up assessments: correct responses by question for nutrition knowledge of Grade 2 and 3 learners in both schools (N=129)

Scale	Question	Pre-test (n=178)		Post-test (n=129)		Follow-up (n=149)	
		Frequency	%	Frequency	%	Frequency	%
Nutrition knowledge	1	99	55.9	90	69.8	100	67.1
	2	75	42.4	67	51.9	109	73.2
	3	47	26.6	43	33.3	70	47.0
	4	42	23.7	30	23.3	79	53.0
	5	56	31.6	32	24.8	56	37.6
	6	82	46.3	63	48.8	97	65.1
	7	87	49.2	73	56.6	101	67.8

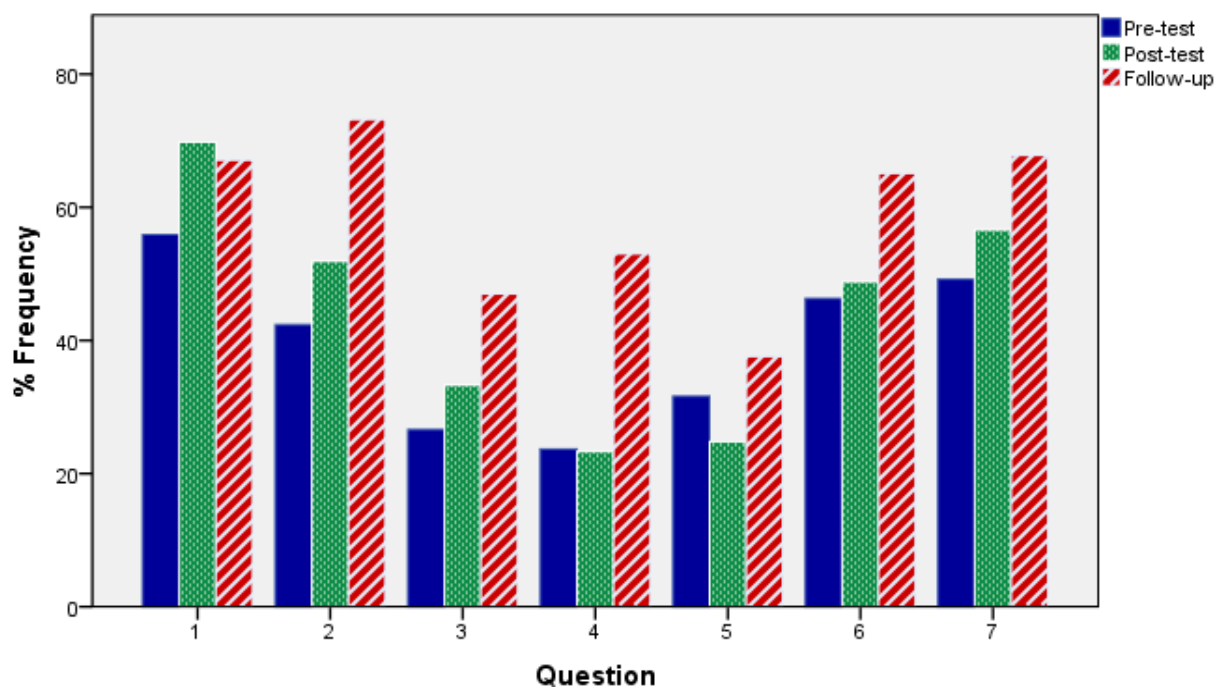


Figure 7.9: Pre-, post-intervention and follow-up assessments: correct response for nutrition knowledge by question of Grade 2 and 3 learners in both schools (N=129)

7.6.3 Effect of the programme on nutrition knowledge: baseline to follow-up

The effect of the NEP on nutrition knowledge was assessed using the paired t-test. The mean scores increased significantly from the baseline to post-intervention (M=0.52455 vs. M=0.57701; P=0.014) (table 7.19). The mean scores also increased in both School 1 (M=0.53620 vs. M=0.58904; P=0.057) and School 2 (M=0.50909 vs. M=0.56104; P=0.123), and it was not significant in both schools.

Table 7.19: Mean scores for nutrition knowledge from baseline to post-intervention on Grade 2 and 3 learners for both schools (N=128)

	n	Pre-test		Post-test		P value
		Mean	S.D.	Mean	S.D	
Nutrition knowledge	128	0.525	0.180	0.577	0.192	0.014
Nutrition knowledge in School 1	73	0.536	0.181	0.589	0.196	0.057
Nutrition knowledge in School 2	55	0.509	0.179	0.561	0.189	0.123

• P value derived from paired t-tests

One way repeated measures ANOVA was employed to compare nutrition knowledge scores by school; at baseline (time 1), at six weeks (time 2) and at 12 months (time 3) (table 7.20). A significant effect for time was observed [Wilks' Lambda=0.623, F=37.745^b, P=0.000, partial eta squared= 0.377]; there was a change in the learners' overall nutrition knowledge scores across the three different time periods, before, after and at follow-up. There was a significant (P=0.000) increase in overall nutrition knowledge scores over time in both schools (figure 7.10). The differences in mean scores between the School 1 and School 2 were not significant (P=0.687). The results imply a very large effect for time in relation to changes in nutrition knowledge over time (Cohen, 1988).

Table 7.20: Mean scores for nutrition knowledge from baseline to follow-up on Grade 2 and 3 learners for both schools (N=108)

Nutrition knowledge	n	Pre-test		Post-test		Follow-up		P value
		Mean	S.D	Mean	S.D	Mean	S.D	
Nutrition knowledge	108	0.520	0.177	0.582	0.196	0.730	0.188	0.000
Nutrition knowledge in School 1	63	0.531	0.179	0.587	0.203	0.732	0.189	0.687
Nutrition knowledge in School 2	45	0.503	0.176	0.574	0.189	0.727	0.190	

• P value derived from ANOVA

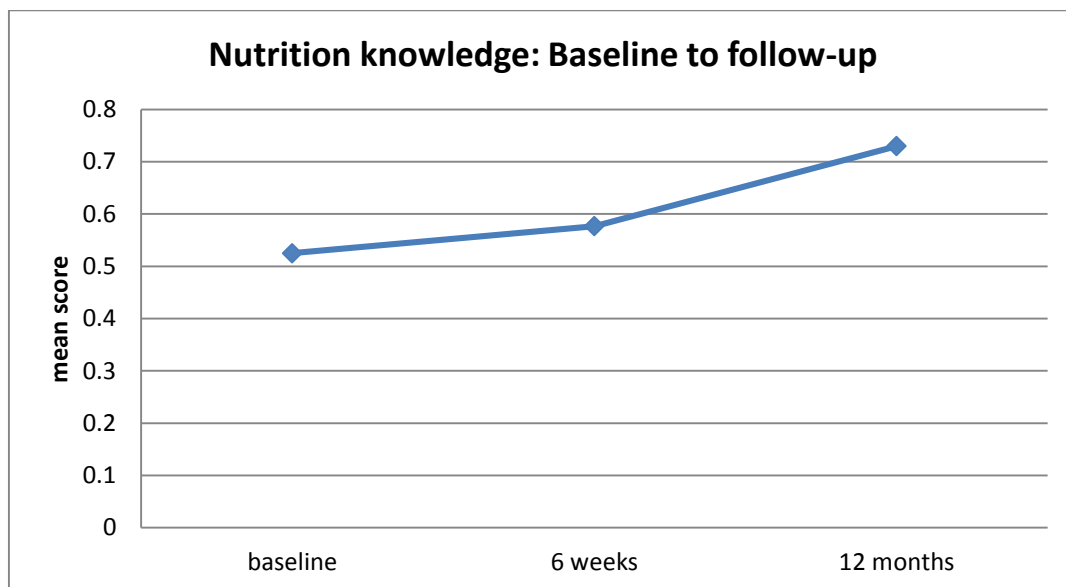


Figure 7.10: Effect of the programme on overall nutrition knowledge: baseline to follow-up for both schools (N=128)

The performance at the different times was significantly different between the schools and genders $P=0.000$ (figure 7.11a and figure 7.11b) [Wilks' $\Lambda=0.570$, $F=31.307$, $P=0.000$, partial eta squared= 0.430]. The boys in School 1 had a decrease in scores from time 1 to time 2 and an increase from time 2 to time 3, while the boys in School 2 had an increase in scores from time 1 to time 2 to time 3 (figure 7.11a). The girls in both schools showed increases in scores from time 1 to time 2 to time 3 (figure 7.11b).

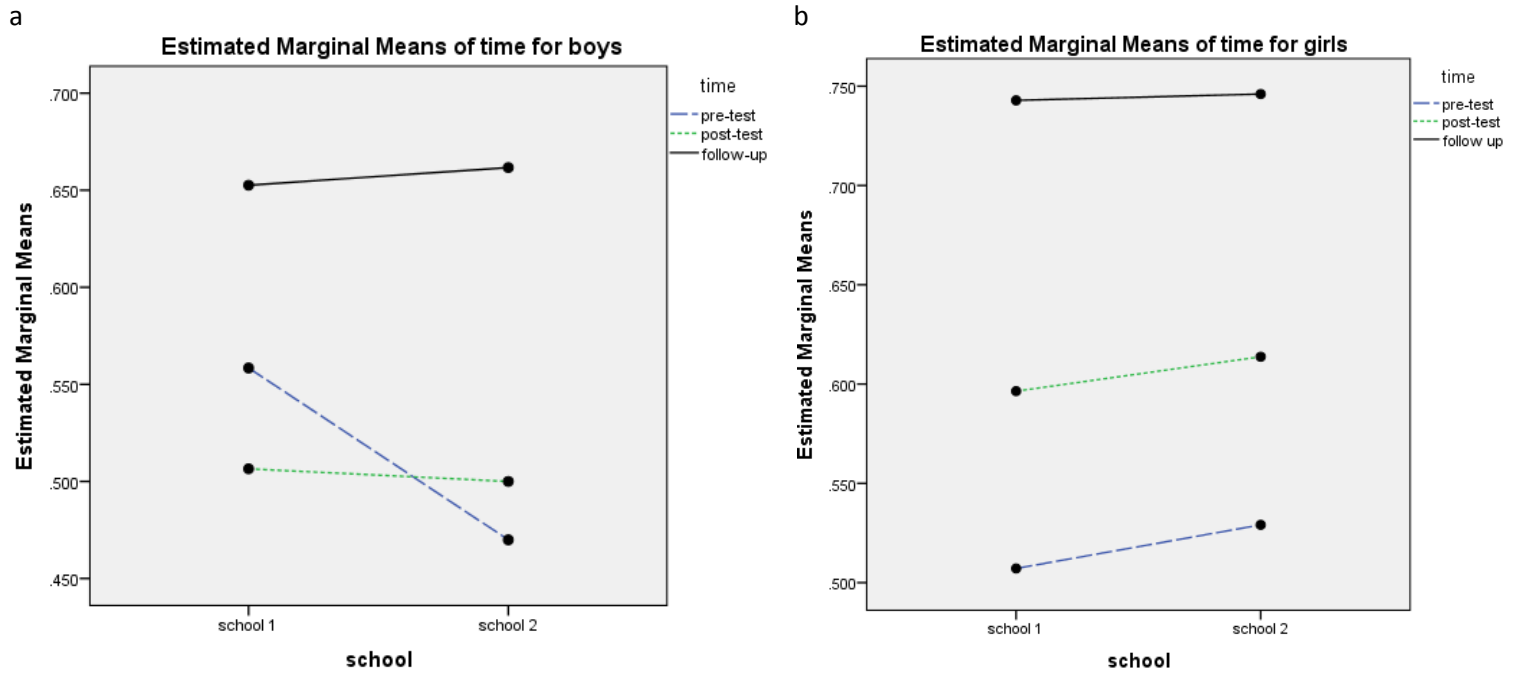


Figure 7.11: Estimated marginal means of time on overall nutrition knowledge of Grade 2 and 3 learners in both schools (N=108); (a) boys (b) girls.

Generally, there were no significant differences between the schools and between the genders at both the baseline and post-intervention assessments (table 7.21). However, the girls had a significantly higher mean score for nutrition knowledge than the boys at the post-intervention (M=0.51179 vs. M=0.59023; P=0.047). The difference at 12 months follow-up assessment between the nutrition knowledge mean scores was not significant between School 1 and School 2 (M=0.72 vs. M=0.668; P=0.111). The mean scores were significantly higher in girls as compared to boys in both schools (P=0.02).

Table 7.21: Mean nutrition knowledge scores by school and gender at baseline, post-intervention and follow-up for Grade 2 and 3 learners for both schools (N=177)

Nutrition Knowledge		School 1			School 2			Mean difference	P value
		n	Mean	S.D	n	Mean	S.D		
Pre-test	Boys	34	0.554	0.168	33	0.461	0.164	0.088	0.032
	Girls	32	0.545	0.188	42	0.544	0.204	0.001	0.993
	Overall	92	0.546	0.183	85	0.498	0.183	0.047	0.087
Post-test	Boys	24	0.512	0.184	24	0.524	0.196	-0.008	0.882
	Girls	25	0.594	0.186	32	0.587	0.174	0.007	0.881
	Overall	73	0.589	0.196	56	0.560	0.187	0.029	0.395
Follow-up	Boys	29	0.630	0.217	28	0.635	0.219	-0.109	0.02
	Girls	26	0.760	0.147	38	0.727	0.168		
	Overall	78	0.720	0.196	72	0.668	0.201	0.052	0.111

• Gender data missing for some learners

• P value derived from t-tests

The interaction between school and gender was not significant on the observed change ($P > 0.05$) (table 7.22). Although the girls performed better than the boys in both schools, no interaction between gender and school was observed (figure 7.12).

Table 7.22: Effect of gender and school on observed change in scores from baseline to post-intervention adjusting for pre-test score (N=104)

	Pre-test		Gender		School		Gender*school	
	Partial Eta Squared	P Value	Partial Eta Squared	P Value	Partial Eta Squared	P Value	Partial Eta Squared	P Value
Knowledge	0.41	0.000	0.037	0.056	0.000	0.838	0.001	0.719

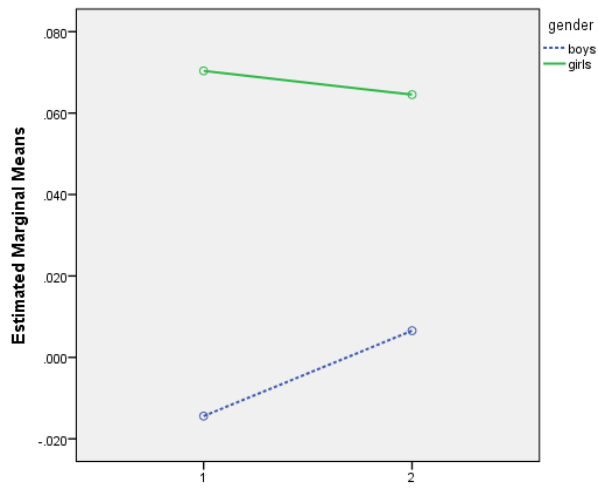


Figure 7.12: Estimated marginal means of improvement on overall nutrition knowledge of Grade 2 and 3 learners in both schools (N=104)

References

Cohen, J. 1988. *Statistical power analysis for the behavior science*. New York: New York: Academic Press.

Chapter 8: Discussion

8.1 Introduction

This study is among the few nutrition education programmes that have been done in primary schools in South Africa to promote healthy eating habits in learners (Oosthuizen, Oldewage-Theron & Napier, 2011; Oldewage-Theron & Napier, 2011; Steyn, de Villiers, Gwebushe, Draper, Hill, de Waal, Dalais, Abrahams, Lombard & Lambert, 2015). Only immediate outcomes were assessed in this study. Although a process evaluation could not be done due to feasibility constraints, measures such as the training of facilitators, provision of a training material package required per lesson at the start of each day, and debriefing sessions at the end of each day to ensure smooth delivery of the programme (CDC, 1997) were put in place to ensure the delivery of lessons as intended.

Self-efficacy and knowledge are some of the personal dispositions and cognitions that increase and decrease the likelihood of engaging in a given behaviour. Behavioural factors such as behavioural intent, directly affect the actions (Stevens, Story, Ring, Murray, Cornell & Gittelsohn, 2003). This study hypothesised that tailored nutrition education would bring about improvement in the nutrition knowledge and food choice intentions and self-efficacy of primary school learners. The NEP exposed a homogenous group (with respect to age) of Grade 1, Grade 2 and Grade 3 learners from resource limited communities to a classroom curriculum combined with food displays, food demonstrations, learner's worksheets and a healthy eating song that targeted these mediators of behaviour change. Using a pre-test and post-test quasi-experimental design without a control group, the evaluation (at baseline, six weeks and 12 months), using a modified version of the Pathways KAB questionnaire, found that six weeks of the NE significantly increased food choice intentions and nutrition knowledge immediately following the intervention, but not nutrition self-efficacy. It also showed sustained effects on nutrition knowledge, and not food choice intentions and self-efficacy at 12 months. As desired, at baseline, the results showed that the schools were much the same except for the significant differences between School 1 and School 2 in food choice intentions.

Overall, the results of this study are consistent with a number of classroom based NE programmes that have been conducted globally and have shown positive results in measured outcomes (Luepker, Perry, Osganian, Nader, Parcel, Stone & Webber, 1998; Stevens *et al.*,

2003; Powers, Struempler, Guarino & Parmer, 2005; Devault, 2006; Oldewage-Theron & Napier, 2011; Abrahams & Steyn, 2011).

The discussion proceeds in the following format:

- The effect of the NEP on the food choice intentions of Grade 1 learners
- The effect of the NEP on the self-efficacy of Grade 2 and 3 learners
- The effect of the NEP on the nutrition knowledge of Grade 2 and 3 learners
- The strengths and limitations
- Conclusions
- Recommendations for future research
- References

8.2 Effect of the NEP on food choice intentions of Grade 1 learners aged 7-9 years

The most positive result from the study was with the food choice intentions. The NEP resulted in an improvement of the food choice intentions of the learners as hypothesised in this study. There was a significant ($P=0.0001$) improvement in the mean scores for food choice intentions from baseline to post-intervention for all learners, i.e. there was a general increase in learners' intentions to choose more healthy foods across all questions, which is consistent with other school based programmes (Edmundson, Parcel, Feldman, Elder, Perry, Johnson, Williston, Stone, Yang & Lytle, 1996; Dollahite, Hosig, White, Rodibaugh & Holmes, 1998). An increase in food choice intentions was also reported with the 'It's all about kids' study which also focused on promoting healthy eating and physical activity. That study used the same instrument used to measure the food choice intentions of the learners in this study. In that study learners were exposed to NE and showed a significant increase in the mean scores for the intervention group (Devault, 2006). However, the increase observed in food choice intentions at post-assessment in this study failed to persist to follow-up as shown by the significant decrease at 12 months in both schools.

The observed increase in the learners' food choice intentions may have stemmed from the age appropriate educational content and materials that were fun and culture sensitive (Oldewage-Theron & Egal, 2009; Başkale & Bahar, 2011). The latter could have encouraged learners to learn the knowledge and skills required to motivate one to take action (Glanz & Bishop, 2010).

Although not measured, the importance of having fun in the classroom should not be overlooked. Children in this study looked forward to the weekly nutrition activities and were motivated to participate. Fun or play is a necessary component for the adoption of internal motivation in children which has been shown to further their learning (Harter, 1992; Auld, Romaniello, Jerianne, Carolyn & Hambidge, 1998; Başkale & Bahar, 2011).

The decrease in mean food choice intentions scores may be due to attrition (absenteeism of the learners from school) which increased from post-intervention assessment to follow-up assessment by 19%. This high attrition rate may have reduced the statistical power and compromised the effectiveness of the NEP (Prinz, Smith, Dumas, Laughlin, White & Barrón, 2001; Hoddinott, Maluccio, Behrman, Flores & Martorell, 2008).

With respect to the specific food choice intentions, a decrease in intention to choose healthy drinks was observed. This result may be due to the type of drinks (diet coke) in reference in this question, which may have been misunderstood and is not common among this age group. Although learners' intentions to choose a healthy breakfast also decreased, the intention to choose healthy snacks increased significantly in both genders and schools ($P=0.000$).

The effect of the NEP on the learners' food choice intentions was not consistent by gender or school. The girls showed greater improvement as compared to the boys. This outcome is consistent with other health education programmes concerning eating practices and physical activity that have shown girls to be more receptive as compared to boys (Perry, Bishop, Taylor, Murray, Mays, Dudovitz, Smyth & Story, 1998). The increase in food choice intentions was greater in learners from School 1 than School 2. One factor that may have contributed to this difference is that learners in School 1 received their lessons in smaller groups as compared to School 2 due to limited space in School 2. The use of smaller groups is likely to improve the effectiveness of a nutrition education intervention (Contento, 2007). In addition to the above, the medium of instruction used may have contributed to this difference. It has been proven that learners understand better and express themselves well when a more familiar language is used as a medium of instruction (Brock-Utne, 2007). Apart from two Afrikaans speaking classes from School 1 who were taught in Afrikaans, all other learners were taught in English which was not their first language. Therefore, the Afrikaans speaking learners could have attributed to the difference in food choice intentions mean scores between the two schools though the majority by far in School 1 were English speaking.

8.3 Effect of the NEP on self-efficacy of Grade 2 and 3 learners aged 7-9 years

Increasing learners' self-efficacy is a fundamental part in behaviour change, since self-efficacy motivates people to act (Kostanjevec, Jerman & Koch, 2013). Self-efficacy is very important for a change in behaviour to take place and be maintained (Contento, 2007), and is an important mediator of the relation between knowledge and behaviour. This study postulated that the NEP would improve the nutrition self-efficacy of the learners. However, there was an insignificant decrease in the mean score for nutrition self-efficacy from baseline to post-intervention (mean difference = -0.008) for both genders. The decrease was larger in School 2 (22.9%) as compared to School 1 (0.8%). A further significant decrease in self-efficacy was seen at follow-up, with the differences between School 1 and School 2 being insignificant.

The results from this evaluation with regards to nutrition self-efficacy resemble the results observed in the Pathways study that exposed learners in Grades 3-5 to NE aimed at improving the nutrition knowledge and practices related to healthy eating and physical activity. This study used the same instrument to assess nutrition self-efficacy as that study and also reported a decrease in mean nutrition self-efficacy scores at post-intervention assessment (Stevens *et al.*, 2003). This outcome is also collaborated by the results documented in the Healthkick nutrition intervention that focused on improving healthy eating and physical activity in Grade 4 learners (Abrahams & Steyn, 2011).

This study and previous studies seem to indicate that NE has a negative effect on self-efficacy. The theoretical components used in the study become questionable and possibly highlight that a gap in NE may be detrimental to learners' self-efficacy. The decrease may also be related to a failure in the curriculum to effectively identify outstanding barriers faced by learners in choosing foods that are healthy. A real decrease could have occurred indicating a flaw in the methods used which were limited to modifying personal factors. One reason that could account for this decrease in mean scores for self-efficacy is that experimental learning for the learners was limited. Experimental learning is a strong evidence based strategy for improving the nutrition knowledge of primary school children which is required to promote nutrition self-efficacy (Edmundson *et al.*, 1996; Dudley, Cotton & Peralta, 2015). However, most food demonstrations were carried out by the facilitators due to the limited contact time that was

availed for the study per lesson. Furthermore, due to limited contact time, checking of the home worksheets that exposed learners to problem solving activities was also not optimal.

In addition to the above, the study did not modify the school food environment neither did it focus on improving the social environment including the home environment. The latter has been reported to have profound influence in supporting and maintaining children's behaviour change (Watt, Draper, Ohly, Rees, Pikhart, Cooke, Moore, Crawley, Pettinger & McGlone, 2014). The school food environment in most South African schools has signage boards that promote unhealthy foods and also unhealthy choices are easily accessible (de Villiers, Steyn, Draper, Fourie, Barkhuizen, Lombard, Dalais, Abrahams & Lambert, 2012). Furthermore, peer influence on behaviour becomes more important to learners when in the school environment (Wang & Stewart, 2013). Learners are subject to negative peer influence regarding food choices, especially at school, and thus could have comprised their nutrition self-efficacy leading to the decrease in mean scores. Such societal influences could have undermined the self-efficacy of the learners leading to the decrease in mean scores.

Another possible reason for the negative outcome on self-efficacy may be the short duration of the NEP. Six weeks were probably not long enough to cause sufficient improvements in the outcome. This is confirmed by literature that reports that most successful interventions have been implemented for longer than six months (Wang, 2016). Furthermore, the larger decrease in School 2 may be due to the fact that learners received the NEP in larger groups which may have compromised the effectiveness of the programme (Contento, 2007).

Although there was a general decrease in the number of learners choosing the correct responses across questions from baseline to follow-up assessment, the questions that demonstrated increases were on self-efficacy related to buying fruits and vegetables. This outcome suggests that the NEP may have had an effect on self-efficacy related to choosing fruits and vegetable. The programme provided motivation through educating the learners on the different locally available fruits and vegetable using food displays and how they can be incorporated into the diet (Glanz & Bishop, 2010). However, these positive effects were not present at the follow-up assessment.

Other school based NEPs have shown positive results on nutrition self-efficacy. The Health-E-PALS is one school based NEP whose purpose was to promote healthy eating and physical

activity in learners aged nine to eleven years from Lebanon. That study used experimental learning strategies such as food tasting and snack preparation and found increases in nutrition self-efficacy (Habib-Mourad, Ghandour, Moore, Nabhani-Zeidan, Adetayo, Hwalla & Summerbell, 2014). A study by Nader et al. (1996) that aimed at improving the diet and physical activity of children by involving family in the programme, also found an increase in learners' nutrition self-efficacy as adult participation increased (Nader, Sellers, Johnson, Perry, Stone, Cook, Bebachuk & Luepker, 1996).

8.4 The effect of the NEP on nutrition knowledge of Grade 2 and 3 learners aged 7-9 years

As in other school based NEPs (Luepker *et al.*, 1998; Powers *et al.*, 2005; Başkale & Bahar, 2011; Carraway-Stage, Hovland, Showers, Díaz & Duffrin, 2015), this study found increases in nutrition knowledge of the learners. The results confirm the hypothesis that the NEP would improve the nutrition knowledge of the learners. There was an increase in the mean score for nutrition knowledge from baseline to post-intervention (mean difference=0.052). Similar findings have been observed with a NEP carried out with learners aged seven to nine years from resource limited settings of the Vaal region of South Africa that reported an improvement in the nutrition knowledge of the learners (Oldewage-Theron & Egal, 2009). Furthermore, Kaledo, which was game based NE done in Naples in Italy, also showed improvement in nutrition knowledge of children aged eleven to 14 years (Amaro, Viggiano, Di Costanzo, Madeo, Viggiano, Baccari, Marchitelli, Raia, Viggiano & Deepak, 2006).

A number of factors could have attributed to the favourable result observed in this study. The study employed a quality curriculum (mainly based on the SCT) to promote nutrition knowledge of primary school learners and realised a positive though small effect. This is confirmed by reports stating that ten to 15 hours are required to realise “large” effects in programme-specific knowledge (Powers *et al.*, 2005). However, this study exposed learners to just three hours of NE and thus realised a small but significant increase in overall nutrition knowledge (P=0.014). This further confirms the notion that a well planned theory based curriculum in school based NE programmes can increase the nutrition knowledge of primary school learners (Powers *et al.*, 2005; Dudley *et al.*, 2015).

The NEP created opportunities for active participation and learning for the learners through problem solving and facilitated discussion. Each learner had a small copy of the colourful

poster under discussion at each lesson which encouraged their participation during the discussions and increased attention of the learners. Furthermore, real food items were brought along to each lesson as supporting visuals which may have improved motivation and understanding of the messages as well retention (Contento, 2007; Vermeer, 2014). In addition to the above, the active participation of parents at all stages of the NEP inclusive of the situational analysis and implementation, enhanced their buy-in in this NEP and enhanced the fostering of the nutrition messages learned at home. The knowledge retention is confirmed by the follow-up results that reflected sustained effects and additional increase on nutrition knowledge at 12 months follow-up assessment.

The age appropriate play activities, educational materials such as posters, worksheets and food materials used in this study are likely to have been pivotal in the improvement of nutrition knowledge of primary school learners (Başkale & Bahar, 2011; Dudley *et al.*, 2015). The healthy eating song and visual aids based on the SAFBDGs helped the learners to relate messages to their usual practices, cultural identity and local environment. Furthermore, Baskale and Bahar (2011) posit that education based on various food groups facilitates improvement of children's nutritional knowledge (Başkale & Bahar, 2011). Therefore, the use of food groups according to the SAFBDGs to educate children on variety in the diet in this study could have resulted in improvement of the learner's nutrition knowledge.

Although the majority of learners had increased mean nutrition knowledge scores, the girls in both schools, showed a larger increase than the boys at post-intervention assessment as well as at the follow-up assessment. It further confirms the results by Perry *et al.* (1998) that girls are more receptive to health education programmes related to eating practices and physical activity than boys (Perry *et al.*, 1998).

The mean nutrition knowledge score was significantly higher at follow-up than at baseline and post-intervention assessments. The increase was significantly higher in School 2 as compared to School 1. The difference could have arisen from the extent to which the teachers chose to utilise the posters post-intervention i.e. the teachers in School 2 could have emphasised the poster content or encouraged learners to read or refer to the posters more than the teachers in School 1. The gains in nutrition knowledge at post-intervention assessment remained present at follow-up, which is consistent with the findings of other school based programmes (Demetriou, Sudeck, Thiel & Höner, 2015). These sustained and additional positive effects

could be attributed to the fact that learners had continued access to the messages taught during the NEP. Each class teacher was provided with the nine laminated copies of posters used in the NEP to hang on the classroom walls. Furthermore, as highlighted in the literature review in chapter 2, the delivery of consistent messages in both schools could have facilitated the gain in nutrition knowledge observed (Mikkelsen, Husby, Skov & Perez-Cueto, 2014).

8.5 Strengths

- This study is one of the few studies that clearly show the practicability of implementing a successful school-based NEP, despite the many contextual challenges hampering low socio-economic communities that are stricken with poverty, high crime rates and alcohol abuse (Oosthuizen *et al.*, 2011).
- Although the best method of engaging parents is yet unknown, direct methods are more superior to indirect method (Sherman & Muehlhoff, 2007; Habib-Mourad *et al.*, 2014). The home work taken home (in addition to parental involvement in the situational analysis) seemed to be a successful strategy for indirectly involving parents and families in NEP.
- The NEP utilised expertise from outside the schools (nutritionists and dietitians). Most success with improved primary school children's diet has been found with external expertise (Jemmott III, Jemmott, O'Leary, Ngwane, Icard, Bellamy, Jones, Landis, Heeren & Tyler, 2011; Steyn *et al.*, 2015). Therefore, teaching was done by facilitators (not teachers) in this study.
- The NEP was implemented by trained facilitators which ensured consistent delivery of the NEP to the learners. Furthermore, the range of materials provided for facilitators was designed to minimise any effects of possible facilitator-delivery variability between the schools. The facilitators were given a training package for each lesson at the beginning of each lesson day.
- Each learner was given a copy of the colourful poster during lessons and it enhanced their active participation. Learners may be encouraged and inspired by the direct positive information and experiences acquired during the education programme.
- Each class teacher, for all the classes that took part in the study, was given a set of the nine laminated posters to put up on the wall in their classrooms after the NEP was completed. This facilitated the reinforcement of the acquired knowledge even after the NEP had been completed.

8.6 Limitations

- Due to the few number of schools involved in the study, and other logistical issues, a quasi experimental design, without a control group, was used in the study instead of a RCT. This design is usually the most practical design although the randomised control trial (RCT) is the gold standard (Joubert, Ehrlich, Katzenellenbogen & Abdool Karim, 2007). This design is prone to confounding. Only information related to grade, school, gender and age was collected therefore factors such as ethnicity may have also influenced the outcomes.
- Furthermore, a significant number of learners were absent for both the post-intervention assessment and at follow-up assessment (attrition rate 22.1% vs. 35.7% respectively). This reduced the sample size and the power to detect differences.
- The results are limited to effects on mediating factors for behaviour change and lack information on behavioural effects such as actual dietary intake.
- The questionnaires used in the evaluation were not pre-tested for this sample, although previous studies offer predictive validity (Luepker *et al.*, 1998; Stevens *et al.*, 2003).
- The socio-economic status of the parents was not assessed. Although the setting was resource limited, variations in socio-economic status could have been present and could have influenced the outcome. Parental education level has been proven to be associated with social and economic status of the family and the children's school achievement (Kostanjevec *et al.*, 2013). Furthermore, parental involvement was not fully assessed and thus could have resulted in undefined differences in the outcomes.

8.7 Conclusion

A six weeks long NEP led to significant increases in intentions to choose healthful foods and nutrition knowledge, but not nutrition self-efficacy immediately following the programme. Sustained effects were seen on nutrition knowledge at follow-up assessment (12 months). This outcome is consistent with several studies that have also focused on nutrition related personal and behavioural factors that also showed favourable results for nutrition related knowledge, attitudes and behavioural intent (Luepker *et al.*, 1998; Stevens, Cornell, Story, French, Levin, Becenti, Gittelsohn, Going & Reid, 1999; Devault, 2006).

The girls were more responsive to the NEP as compared to boys for food choice intentions, nutrition self-efficacy and nutrition knowledge. School 1 performed better than School 2 for all scales (food choice intentions, nutrition self-efficacy and nutrition knowledge).

Overall, the outcome of the study is promising. It demonstrates that tailored school based NEPs can improve mediators of change for healthy eating behaviour in learners from resource limited primary schools. However, more work is needed to enhance sustenance of food choice intentions, to identify barriers to learner's self-efficacy and encourage boys to appreciate NEPs more.

8.8 Recommendations

- A more rigorous study design with a larger sample size to be carried out with a similar population to establish whether using developed materials can corroborate the reported outcomes.
- To do a validation study of the data collection instruments (modified Pathways KAB questionnaires) in a similar population of primary school learners from resource limited settings.
- The outcomes of the study may not be generalisable to all settings; therefore the study should be carried out with a similar population from a rural setting.
- Studies with children should use age appropriate colourful NE materials that are fun and engage learners during learning. These encourage learners to actively participate in lessons as was shown in this study. Learners were encouraged to participate and paid more attention during the classroom discussions.
- Nutrition education should be delivered to learners in smaller groups as School 1 had better results as compared to School 2, which used big group teaching.

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Chapter 9: Executive summary, conclusions and recommendations

9.1 Introduction

Multiple factors have been found to influence the eating habits of children (Kostanjevec, Jerman & Koch, 2013; Watt, Draper, Ohly, Rees, Pikhart, Cooke, Moore, Crawley, Pettinger & McGlone, 2014). Psychosocial mediators of nutrition behaviour are also critical in influencing children's food choices (Baranowski, Cullen & Baranowski, 1999). Therefore addressing these factors through NE at an early age may influence the children's food choices, even in later life. This study thus endeavoured to target some of the nutrition behaviour mediators through a tailored NEP. This chapter presents a summary of the study, the strengths, the limitations and recommendations for future research.

9.2 Aims and objectives

The aim of the study was to develop, implement and assess the impact of a theory grounded, school based six week long NEP tailored to the needs of seven to nine year olds living in resource limited settings of Pretoria, Gauteng Province, South Africa in order to improve the food choice intentions of Grade 1 learners, and nutrition related self-efficacy and knowledge of Grade 2 and 3 learners.

The study was implemented in two phases, based on a situational analysis. Phase 1 entailed the planning and development of the NEP, and Phase 2 the implementation and evaluation. Each phase had its own specific objectives (figure 9.1).

The study was conducted from August 2015 to September 2015, and utilised both the quantitative and qualitative research domains. The study obtained ethical approval from the Faculties of Health Sciences and Education (Number: **D2015/375A**) of the University of Pretoria (Appendix A). Informed consent was obtained from the parents/ caregivers (Appendix B), and assent from the children (Appendix C).

9.3 Study setting and population

The study was carried out in two schools (School 1 and School 2) from resource limited settings in Pretoria and involved 244 learners aged seven to nine years in Grade 1, 2 and 3. Convenience sampling was used for obtaining the sample.

9.4.1 Situational analysis

The aim of this stage was to determine the nutrition education needs of learners aged seven to nine years in resource limited settings in Pretoria. The dietary practices data (collected from the parents and the learners) were available to the researcher on completion of the situational analysis done for the whole study at large. Thematic analysis was employed in the analysis of the dietary practices data.

9.4.1.1 Findings of the situational analysis

The situational analysis revealed that:

- On daily basis, learners had unhealthy eating habits characterised by breakfast skipping and consumption of energy dense foods. Variety in the diet seemed very minimal.
- Some food groups, such as dry beans, split peas, lentils or soya were not consumed.

9.4.2 Phase 1: Development of the Nutrition Education Programme

The aim of Phase 1 was to develop a theory based culturally relevant NEP for learners age seven to nine years from resource limited communities in Pretoria. The specific objectives were to: (i) develop a NEP (based on the SAFBDGs) tailored to the nutrition education needs of the learners, (ii) develop age appropriate learning materials and activities for the NEP, and (iii) develop an instructor's manual guided by the SCT and guidelines from the FAO's Nutrition education for the public (Hosmer, Dwyer & Villarroel, 1997; Smith & Smitasiri, 1997).

An appropriate literature review and the outcome of the situational analysis informed the development of the NEP. The planned NEP had the following features:

- Aimed at promoting adherence to the dietary behaviours encouraged by the SAFBDGs through improved mediators of behaviour, i.e. knowledge, self-efficacy and behavioural intent.
- Guided by chosen constructs of the SCT.
- Theory based strategies, activities and educational goals.
- Age appropriate nutrition education materials.
- Guided by the six steps for designing theory based nutrition education as described by Contento (2007).

- The NEP comprised of two components: (i) the classroom curriculum, and (ii) the home activities.
- Training of facilitators (dietitians and nutritionists).

9.4.2.1 Outcome of Phase 1

The following NE materials and activities were developed:

- Tailored nutrition education programme.
- Ten colourful age appropriate posters, one listing all the eleven SAFBDGs and nine showing each of the SAFBDGs (Appendix E).
- An instructor's manual to assist the facilitators in helping learners grasp the main ideas and concepts of healthy eating. The manual clearly outlines the method of delivering each lesson (Appendix F).
- Nine age appropriate learner's worksheets comprising of tasks and activities the learners could complete with their parents at home (Appendix H).
- The healthy eating song which taught learners about the importance of healthy eating (Appendix G).
- Food displays of healthy foods relevant to each lesson were put in a place where learners could easily see and identify during each lesson.
- Food demonstrations on how to make simple healthy snacks.
- A total of eight facilitators were trained in the questionnaire administration and delivery of the NEP.

9.4.3 Phase 2: Implementation and evaluation of the Nutrition Education Programme

The aim of Phase 2 was to implement a culturally appropriate theory based NEP tailored to the needs of the learners and to evaluate its effect on the food choice intentions and nutrition related self-efficacy and knowledge. The specific objectives were to: (i) conduct a pre-intervention assessment of the learners' nutrition related knowledge, self-efficacy and food choice intentions, (ii) implement the NEP to learners aged seven to nine years in resource limited settings in Pretoria, (iii) evaluate the effectiveness of the NEP with respect to changes in nutrition related self-efficacy, knowledge and food choice intentions at six weeks, (iv) assess the retention of intervention effects at 12 months, and (v) determine the differences in measured outcomes between the two schools and gender.

The implementation was done for six weeks and followed a quasi-experimental design without a control group. All learners (N=244) of which 27% were in Grade 1, received the nine lessons. All lessons were delivered consistently in both schools as had been planned. Learners in School 1 received the lessons in small groups, while learners in School 2 received the lessons in bigger groups due to limited space available for the intervention. The two Afrikaans speaking classes in School 1 received the NEP in Afrikaans and the other learners received the lessons in English. Assessments were done using a modified validated Pathways KAB questionnaire (Stevens, Story, Ring, Murray, Cornell & Gittelsohn, 2003) to assess the effect of the NEP with respect to changes in nutrition related self-efficacy and knowledge in Grades 2 and 3, and food choice intentions in Grade 1 at baseline, six weeks (post-intervention) and 12 months (follow-up). Assessments were done on the same day for both settings.

The paired t-test was used to measure the effect of the NEP with respect to changes in nutrition related knowledge, self-efficacy and food choice intentions. The independent samples t-test was employed to compare the outcomes between schools and gender. The McNemar test was used to compare differences between related percentages, while the ANCOVA was used to evaluate the effect of gender and school on the pre-intervention and post-intervention assessments scores. One way repeated measures ANOVA was used to evaluate the effect of time on the measured outcomes. Level of significance was set at 0.05. The statistical package SPSS version 22 was used.

9.5 Delimitations of the study

- The study took place in two resource limited schools in Pretoria.
- Learners, aged seven to nine years, in Grades 1-3 were involved in the study.
- The situational analysis was based on dietary practices data obtained from the project at large.
- All lesson material (content and activities) was delivered within 20 minutes over nine lessons.
- The content of the learning materials was limited to the SAFBDGs.
- Only three mediators of behaviour (food choice intentions in Grade 1 learners, and nutrition self-efficacy and nutrition knowledge in Grade 2 and 3 learners) were assessed as outcomes.

9.6 Assumptions

The assumptions of the study were that:

- the participants would provide honest and truthful responses, and
- children have the potential to develop their own wellbeing.

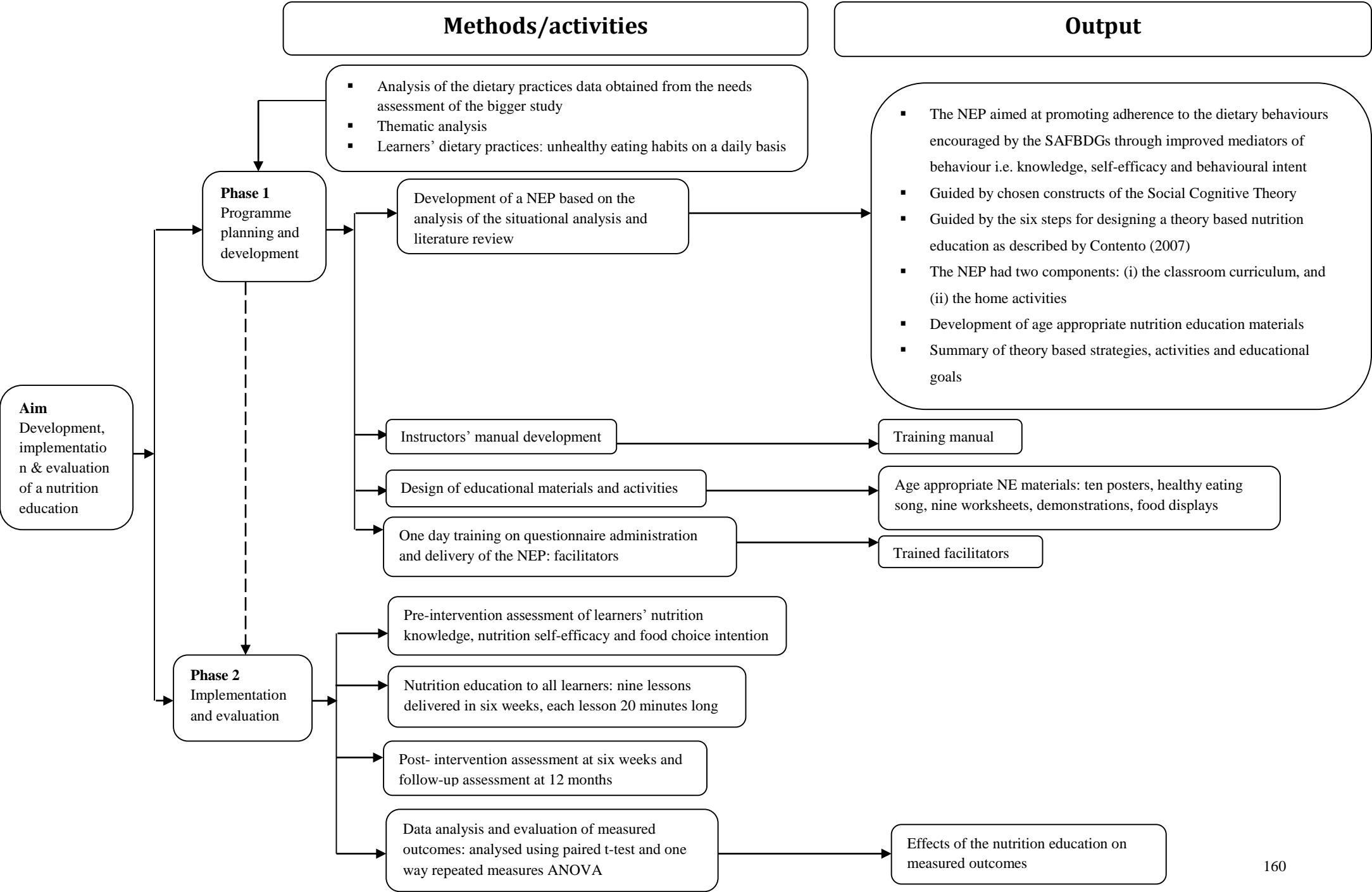


Figure 9.1: Summary of the nutrition education programme

9.7 Main findings

Of the 244 learners who participated in the study, 190 (32.6% Grade 1) were present at the post-intervention assessment (six weeks) and 157 (36.3% Grade 1) were present at the follow-up assessment (12 months). The attrition rate was (22.1%) at post-intervention and (35.75%) at follow-up.

9.7.1 Effect of the nutrition education programme on the food choice intentions of Grade 1 learners

- There were significantly more learners with improved mean scores for overall food choice intentions [58.5%; $P=0.0001$] as compared to those with no changes or decreased intentions [24.2%, 17.7%] at six weeks.
- Overall, more learners chose the correct response at post-intervention (54.6%) as compared to baseline (42.8%) and the follow-up assessment (41.4%).
- A significant improvement for overall food choice intention ($P=0.000$) at six weeks and a significant decrease at 12 months ($P=0.000$) were found.
- Overall intentions to choose healthy snacks also increased significantly ($P=0.000$) at six weeks and decreased (not significantly) at the follow-up assessment ($P=0.05$).
- The proportion of learners with an intention to choose healthier take aways increased significantly ($P=0.001$) at six weeks.
- There was a non-significant decrease in both the proportion of learners intending to choose a healthy breakfast ($P=1.0$) and in the proportion intending to choose healthy drinks ($P=0.856$) at six weeks.
- There was a significant increase in overall food choice intention in School 1 ($P=0.001$) and in School 2 ($P=0.014$) at six weeks.
- School 1 had significantly higher mean scores as compared to School 2 ($M=0.713$ vs. $M=0.414$; $P=0.000$) at six weeks but not significant at follow-up ($M=0.494$ vs. $M=0.414$; $P=0.207$).
- For girls, School 1 had significantly higher mean scores as compared to School 2 ($M=0.76$ vs. $M=0.427$; $P=0.000$), while for boys, School 1 had higher means scores as compared to School 2, though not significant ($M=0.625$ vs. $M=0.507$; $P=0.275$) at six weeks.
- There was an effect for time from baseline to the follow-up assessment for food choice intentions ($P=0.0002$).

9.7.2 Effect of the nutrition education programme on the self-efficacy of Grade 2 and 3 learners

- There were significantly more learners with decreased mean scores for overall self-efficacy [48.8%; $P=0.0001$] as compared to those with no changes or improved [8.6%, 43.0%] at six weeks.
- Overall, few learners chose the correct response at follow-up (52.2%) as compared to post-intervention (55.6%) and baseline (55.8%).
- There was a non-significant decrease for overall self-efficacy at six weeks ($P=0.483$) and a significant decrease at follow-up ($P=0.000$).
- A non-significant increase for self-efficacy related to less fatty foods ($P=0.078$) at six weeks and a significant decrease at follow-up ($P=0.001$) was found.
- A non-significant decrease for self-efficacy related to less sugary foods ($P=0.432$) at six weeks and at follow-up ($P=0.133$) was found.
- There was a non-significant decrease in overall self-efficacy in both School 1 ($P=0.634$) and School 2 ($P=0.082$) at six weeks.
- School 1 had higher mean scores (not significant) as compared to School 2 at both post-intervention ($M=0.798$ vs. $M=0.795$; $P=0.903$) and follow-up ($M=0.742$ vs. $M=0.727$; $P=0.424$).
- For girls, School 1 had significantly higher mean scores as compared to School 2 ($M=0.848$ vs. $M=0.779$; $P=0.036$), while for boys School 2 had higher mean scores as compared to School 1, though not significant ($M=0.816$ vs. $M=0.785$; $P=0.351$) at six weeks. At follow-up, there was no significant difference between the girls or the boys ($P=0.953$).
- There was an effect for time from baseline to follow-up for nutrition self-efficacy ($P=0.000$).

9.7.3 Effect of the nutrition education programme on the nutrition knowledge of Grade 2 and 3 learners

- There were significantly more learners with improved mean scores for overall nutrition knowledge [46.1%; $P=0.0001$] as compared to those with no changes or decrease in nutrition knowledge [15.6%, 38.8%] at six weeks.
- Overall, more learners chose the correct response at follow-up (58.7%) as compared to post-intervention (44.1%) and baseline (38.9%).

- A significant improvement for overall nutrition knowledge ($P=0.014$) at six weeks and 12 months ($P=0.000$) was found.
- A non-significant improvement in overall nutrition knowledge in both School 1 ($P=0.057$) and School 2 ($P=0.123$) at six weeks was found.
- School 1 had higher mean scores as compared to School 2 ($M=0.589$ vs. $M=0.560$; $P=0.395$) at post-intervention, while School 2 had higher mean scores as compared to School 1 at follow-up ($M=0.718$ vs. $M=0.714$; $P=0.687$), though not significant at both times.
- There was a significantly higher increase in mean scores in girls as compared to the boys at six weeks ($P=0.047$) and at 12 months ($P=0.02$).
- There was an effect for time from baseline to follow-up for nutrition knowledge ($P=0.000$).

9.8 Strengths

- The development and planning of the NEP was based on constructs of the SCT which has been shown to be essential in improving the self-efficacy and behavioural intent of children (Luepker, Perry, Osganian, Nader, Parcel, Stone & Webber, 1998; Steyn, Lambert, Parker, Mchiza & de Villiers, 2009).
- Although the best method of engaging parents is yet unknown, direct methods are more superior to indirect methods (Habib-Mourad, Ghandour, Moore, Nabhani-Zeidan, Adetayo, Hwalla & Summerbell, 2014). The home work taken home seemed to be a successful mechanism for indirectly involving parents and families in the NEP (Sherman & Muehlhoff, 2007).
- A detailed analysis of the data was performed using appropriate methods, thus provided strong evidence of the effect of the NEP on the mediators of nutrition behaviour change (Powers, Struempler, Guarino & Parmer, 2005).
- The study used both the qualitative and quantitative methods of inquiry. The methods facilitated the in-depth understanding of the learners' nutrition behaviours prior the development and implementation of the NEP, and the effects of the NEP on the learners' mediators of nutrition behaviours.
- Retention of knowledge and other outcomes over a longer period of time was measured, i.e. follow-up assessment at 12 months.

9.9 Limitations

- The quasi-experimental design places the findings from this study in an untenable position compared with a randomised controlled trial. Due to the lack of a control group, the effects of intervention may be attributed to confounding factors such as socio-economic status or environment. Only information related to grade, school, sex and age was collected, therefore factors such as ethnicity might also have influenced the outcomes.
- Due to time constraints, piloting of the NEP was not possible.
- The process evaluation of the NEP was not done due to feasibility constraints and thus it is difficult to ascertain fidelity, reach or dose of the NEP.
- The results are limited to effects on mediating factors for behaviour change and lack information on behavioural effects such as actual dietary intake.
- The composite scores (e.g. nutrition self-efficacy) had fairly low Cronbach's alpha values (less than the targeted 0.7). The low reliability limits the ability to detect change by introducing unwanted error.
- The validity of the scales has not been formally assessed in this sample, although previous research offers support for the predictive validity of the scales (Stevens, Cornell, Story, French, Levin, Becenti, Gittelsohn, Going & Reid, 1999; Devault, 2006).
- The population was from urban resource limited settings therefore the results are not generalisable to all Grade 1-3 school learners in South Africa.

9.10 Conclusion

It is well established knowledge that children can establish healthy eating habits from the age of six years up to 12 years (Oosthuizen, Oldewage-Theron & Napier, 2011). The situational analysis revealed that the learners in this study had unhealthy eating habits. Therefore, this theory based tailored NEP targeted the mediators of nutrition behaviour, and led to significant increases in intentions to choose healthful foods in Grade 1 learners, and nutrition knowledge in Grade 2 and 3 learners, but not in nutrition self-efficacy in Grade 2 and 3 learners immediately following the programme. Sustained effects were seen on nutrition knowledge and not nutrition self-efficacy and intentions to choose healthful foods at the follow-up assessment. Although more reinforcement of the messages over time is likely needed to sustain some of the gains made in this six week nutrition education programme, the study strengthens

the fact that the school is an ideal environment for children to learn and adopt healthy nutrition behaviours.

A theory based NEP tailored to the nutrition education needs of learners aged seven to nine years (Grade 1-3) was successfully developed in Phase 1 of the study. The SCT was used in this study and its constructs were translated into strategies that effectively improved some of the mediators of nutrition behaviour in primary school learners. The outcomes of this study thus confirm that the SCT can be effectively applied to school based NE.

Involving all relevant key stake holders in NEPs, inclusive of parents, teachers, canteen staff and community leaders, fosters reinforcement of lessons learnt into the home environment and the community at large. Involving the parents in NEPs has been proven to promote healthy eating habits in children. Children's eating habits are developed in the home environment and are mainly dependent on the parental nutrition attitudes and practices. Therefore, the active involvement of parents in programmes ensures their success (Taylor, Evers & McKenna, 2005; Arredondo, Elder, Ayala, Campbell, Baquero & Duerksen, 2006; Racey, O'Brien, Douglas, Marquez, Hendrie & Newton, 2016). By involving the parents in the situational analysis in this study enhanced their buy-in in the NEP and aided with clarity on the reported dietary practices of the learners. This enhanced the fostering of the nutrition messages learned at home.

9.11 Recommendations for future practice

As a result of this study, the following recommendations are suggested for future school based NEPs:

- Future studies should be more intense and longer in duration (at least six months) (Edmundson, Parcel, Feldman, Elder, Perry, Johnson, Williston, Stone, Yang & Lytle, 1996; Hill, 2010; Sharma, 2011) for positive results to be realised and sustained longer to ensure learners continue to enjoy the educational benefits of the programmes. Learning through repetition (the learners receive several sessions of the NE) is more likely to improve the psychosocial mediators of behaviour change (Wagner, Meusel & Kirch, 2005). Therefore a longer contact time per session is recommended to ensure that all planned activities are completed, and longer duration of the NEP to ensure that learners receive more NE, and learning through repetition.

- A holistic approach to addressing psychosocial factors is recommended. All stakeholders within the school should be involved in the NEP. As shown in this study, involving parents in the situational analysis produced more precise dietary practices data of the learners and the take home work helped to engage parents. Parents should be involved in NEPs to foster reinforcement of lessons learnt into the home environment. The school teachers, canteen staff among others, should be involved to facilitate modification of the school food environment and encourage the adoption and sustenance of the healthy dietary habits in learners. Furthermore, increasing the nutrition knowledge and confidence of the parents and all school staff to choose healthy foods may benefit both the learners and the entire community by increasing their intentions to choose healthy foods and the implementation thereof.
- Studies with children should use age appropriate colourful NE materials (both graphics and messages) that are fun and engage learners during learning, and encourage them to actively participate in lessons as was shown in this study. Learners were encouraged to participate and pay more attention during the classroom discussions.

9.12 Recommendations for future research

- There are various factors that influence the eating habits of primary school learners that were not addressed in this study, e.g. the school food environment. Therefore future studies should include modification of the school food environment.
- The questionnaire used in this study was not validated for this population and some scales had fairly low Cronbach's alpha values. Therefore it is recommended that future studies do a validation of the data collection instruments for primary school children from resource limited settings in South Africa.
- The process evaluation of the NEP was not done due to feasibility constraints and thus it was difficult to ascertain if programme implementation took place as had been planned (fidelity) or identify any unforeseen outcomes and lessons learned, as well as the assessment of the reach or dose of the NEP. Assessment of process is necessary to help explain the weaker aspects of programme performance and obtaining feedback for programme improvement (Pérez-Rodrigo & Aranceta, 2001).
- It is recommended that a more rigorous study design with a larger sample size should be carried out with a similar population to establish whether using developed materials can corroborate the reported outcomes. The quasi-experimental design used for this

study places the findings in an untenable position compared with a randomised controlled trial. Due to the lack of a control group, the effects of intervention may be attributed to confounding factors such as socio-economic status, media, or environment.

- To improve external validity, the study should be carried out in similar populations from rural settings, as well as settings without resource constraints.

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GAUTENG PROVINCE

EDUCATION
REPUBLIC OF SOUTH AFRICA

For administrative use:
Reference no. D2016 / 399 A
Enquiries: Diane Bunting 011 843 6503

GDE AMENDED RESEARCH APPROVAL LETTER

Date:	19 February 2016
Validity of Research Approval:	19 February 2016 to 30 September 2016
Previous GDE Research Approval letter reference number	D2015 / 375 A dated 13 January 2015 D2014 / 309 A dated 27 November 2013 and D2013 / 223 dated 29 October 2012
Name of Researcher:	Professor C.J. Botha
Address of Researcher:	526 Suider Street; Pretoria North; 0182
Telephone / Fax Number/s:	082 074 9611; 012 420 5511
Email address:	karien.botha@up.ac.za
Research Topic:	Schools as sites for social change: Facilitating adjusted behaviour in resource-constrained communities by empowering children
Number and type of schools:	THREE Primary Schools
District/s/HO	Gauteng North

Re: Approval in Respect of Request to Conduct Research

This letter serves to indicate that approval is hereby granted to the above-mentioned researcher to proceed with research in respect of the study indicated above. The onus rests with the researcher to negotiate appropriate and relevant time schedules with the school/s and/or offices involved. A separate copy of this letter must be presented to the Principal, SGB and the relevant District/Head Office Senior Manager confirming that permission has been granted for the research to be conducted. However participation is VOLUNTARY.

The following conditions apply to GDE research. The researcher has agreed to and may proceed with the above study subject to the conditions listed below being met. Approval may be withdrawn should any of the conditions listed below be flouted:

CONDITIONS FOR CONDUCTING RESEARCH IN GDE

1. The District/Head Office Senior Manager/s concerned, the Principal/s and the chairperson/s of the School Governing Body (SGB.) must be presented with a copy of this letter.

filed
2016/02/22

1

Making education a societal priority

Office of the Director: Education Research and Knowledge Management ER&KM)

9th Floor, 111 Commissioner Street, Johannesburg, 2001
P.O. Box 7710, Johannesburg, 2000 Tel: (011) 355 0500

**REQUEST FOR PARTICIPATION AND INFORMED CONSENT
PARENTS / CAREGIVERS**

Dear Sir/Madam

We are conducting a research project titled *Supporting primary school children's holistic well-being by means of a multi-disciplinary health promoting intervention*. This involves presentation of a programme to Grade 1 to 3 learners, focusing on their general health and well-being. We will include topics like physical fitness, healthy eating, a healthy lifestyle and feeling good about oneself, when presenting information and activities on these topics to the learners in the third school term. Our project involves a partnership between the University of Pretoria, South Africa and Fordham University, New York City, and is undertaken in schools in the Pretoria area (South Africa) and the Bronx (New York City, United States of America).

For us to be able to plan the programme that we will present to the learners, we first require some input from the learners, as well as their parents and teachers. With this letter we would like to obtain your permission (1) for your child to participate in the project, and (2) for your participation. Both you and your children will be requested to complete questionnaires and participate in workshop sessions before and after the programme we present, which will be recorded in the form of posters, photographs and recordings. Your participation in the project is voluntary and you may thus withdraw from the project at any time if you wish to do so. All information you provide will be treated confidentially and your name, or that of your child, will not be made public to anyone or when we present the findings of the project. We will use pseudonyms to protect your and your child's identity, as well as that of the school. You will also not be asked to provide any information that could result in your identity being made public. Participants will have full access to any of the collected data during their

involvement, as well as to the final results of the project. The collected data will be stored at the University of Pretoria and Fordham University for 15 years.

As such, we will at all times respect your dignity and promote the well-being of all participants. Participants will not be harmed in any way and may benefit from gaining knowledge and skills on a healthy lifestyle, making the right choices and looking after their own well-being. Individual debriefing by a trained educational psychologist will be incorporated in the event of an emotional response from any participant. These participants will also be referred for follow-up counselling sessions.

If you are willing to participate and/or agree that your child may participate in this project, please sign the attached page to indicate your consent, i.e. that you agree to participate willingly and that you understand that you may withdraw from the project at any time. Please return the signed page to school as soon as possible, as we will not be able to involve your child in any session if we have not received your signed form.

If you give permission for participation, your child will be involved in workshop sessions on Monday 1 June 2015, during school hours. In addition, we will conduct a session with all parents on Monday 1 June at 17:00 at Westerlig primary school. Your participation will be highly appreciated!

Warm wishes



Prof Ronel Ferreira
University of Pretoria, South Africa
ronel.ferreira@up.ac.za
[0832587747](tel:0832587747)

28 May 2015



Dear Ronél

Please see my decisions below.

	YES	NO
My child may participate in the project		
You may take photographs of my child while he/she is involved in workshop activities, without publishing his/her face at any stage		
I will participate and attend the session on the 1 st of June 2015 at 17:00 at Westerlig primary school		

Child's name and surname

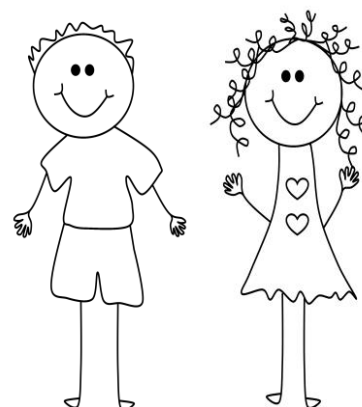
Grade of child Home language

Parent/caregiver signature

Date



Faculty of Education



Research assent form

Good morning everyone, we hope you are well!

Today we would like you to help us with some research we are going to do here at your school. You and your friends play a very important role in our research. Without you, we cannot do the research, because you have all the answers we are looking for.

What is research?

Research helps us to learn new things. First a question is asked. Then we try to answer the question. Today we are also going to ask you some questions about your daily life. Remember all your answers will be correct, there are no wrong answers. You are also welcome to ask us questions any time during the activities.

Why are we doing this research?

We are doing this research to learn more about you, how fit you are, what you like to eat and how you feel about certain things in your life.

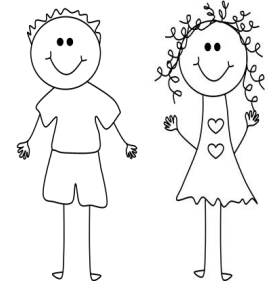
What would happen if you take part in our research?

During the activities we are going to ask you to tell us what makes you happy and what makes you sad at home, in the school, about yourself and when you are with your friends. We are also going to

do some exercises, which are going to be a lot of fun! Some of us will ask you if we can take your blood pressure, but you really don't need to be afraid of anything. It will not hurt you and we will first show you how we are going to do it.

Could bad things happen if you take part?

We will try our best to make sure that no bad things happen to you.



Could the research help you?

We think the research may help you to learn more about being healthy and making healthy choices. We also brought you something to eat and to drink.

Important things you need to remember

- You can decide if you want to take part in the activities
- You can say 'yes' or 'no'
- No one will be upset or angry if you say 'no'
- You can say 'no' at any time
- We will take good care of you no matter what you decide

Thank you for listening to me, while I talked about our research.

If you want to be part of the research I talked about, please write your name below. This is just to show that we talked about the research and that you want to take part in the activities.

Name of participant:

Grade:

Appendix D *Dietary practices data availed from the overall project needs assessment*

What do your children eat on a daily basis?					
School A			School B		
Breakfast	Lunch	Dinner	Breakfast	Lunch	Dinner
Tea	Water	Soup	Cereal	Tea	Pasta
Eggs	Fruit juice	Fruit juice	Coffee	Vienna	Beef
Soup	Nuts	Soda	Milk	Fruit	Vegetables
Cheese	Chocolate	Nandos'	Soft porridge	Fruit juice	Chicken
Fries	Pizza	Chicken	Tea	Eggs	Water
Coffee	Fruit	McDonalds	Water	Cheese	KFC
Yoghurt	Fish	Pasta	Eggs	Yoghurt	Sodas
Biscuits	Rice	Rice	Yoghurt	Sweets	Soup
Wimpy	Hamburger	Fish	Vienna	Bread	Fish
Bread	Porridge	Mince	Fish	Muffins/scones/ Pastries	Rice
Fruit	Cookies	Chips/crisps	Fruit	Pasta	Pizza
Nothing	Hotdogs	Pizza	Bread	Water	Cookies
Hotdog	Yoghurt	Samp	Soup	Chips/crisps	Fruit
Vegetables	Cheese	Stew	Cheese	Sweets	Coffee
Milk	Chips/crisps	KFC	Nothing	Sodas	Yoghurt
Vienna	Chicken	Eggs		Fries	Muffins/scones/ pastries
Muffins/scones/ pastries	Vegetables	Vegetables		Chocolate	
Cereal	Candy	Beef		Hotdog	
Soft porridge	Sandwiches	Hamburger			
	Eggs	Fries			
	Bread	Water			
	Vienna				
	Muffins/scones/ pastries				

Appendix E

Posters

Healthy eating-South African Guidelines

To grow well and to be strong and healthy follow these guidelines



- 1. Be active**
- 2. Enjoy a variety of foods**
- 3. Make starchy foods part of most meals**
- 4. Eat plenty of vegetables and fruit everyday**
- 5. Eat dry beans, split peas, lentils and soya regularly**
- 6. Fish, chicken, meat or eggs could be eaten everyday**
- 7. Drink milk, maas or yoghurt everyday**
- 8. Drink lots of clean safe water**
- 9. Use fat sparingly; choose vegetable oils rather than hard fats**
- 10. Use salt and foods high in salt sparingly**
- 11. Use sugar and foods and drinks high in sugar sparingly**



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Lesson 1: Be active your own way everyday



Get up
Get out
Be active

❖ **Moving your body helps make your bones stronger and your heart healthy**

❖ **Play, dance and do sports and enjoy it everyday**



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Human Nutrition Department

Lesson 2: Enjoy a variety of foods

- ❑ Eat different foods at each meal everyday to stay healthy
- ❑ Go for 5 or more different food groups at each meal

Food groups



Lesson 3: Make starchy foods part of most meals



maize meal



bread



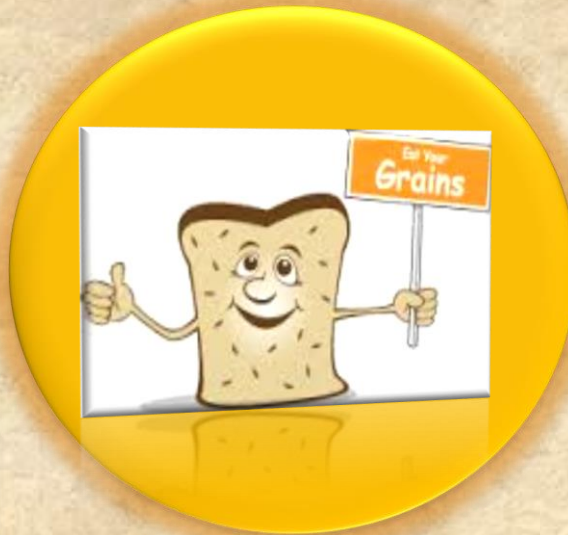
popcorn



maltabella



soft porridge



green mealies



rice



samp



potatoes



oats



cornflakes

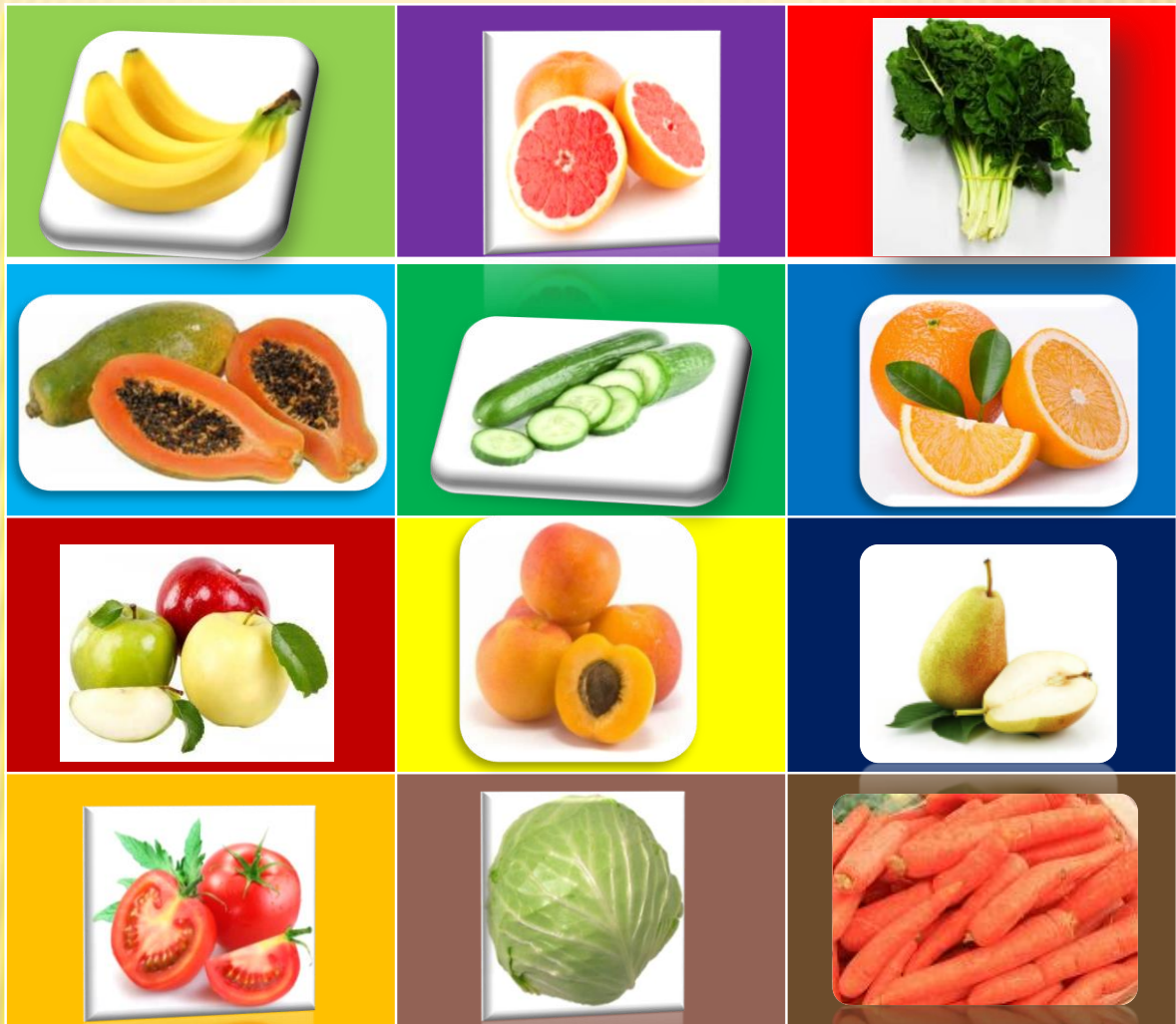
- ❑ Starchy foods provide energy for study, work and play
- ❑ Whole grains like whole wheat bread are good for you



Lesson 4: Eat plenty of vegetables and fruit everyday



Eat different colours everyday



- ❑ Eating vegetables and fruits everyday, helps you from getting sick
- ❑ It is fun to try new fruits and vegetables, just take a bite!



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Lesson 5: Eat dry beans, split peas, lentils and soya regularly



dry beans



split peas



lentils



soya

Enjoy meals that include beans regularly



- Eat dry beans, split peas, lentils or soya for growth and body building
- Enjoy meals that include sugar beans or lentils or soya like samp and beans every week
- They help you feel full longer and help keep the body healthy



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Lesson 6: Fish, chicken, lean meat or eggs could be eaten daily



Processed meat



Eat fish, chicken, lean meat and eggs for growth and body building

Choose meat with little or no fat and always remove chicken skin before eating

Eat less of processed foods like Vienna and hotdogs



Lesson 7: Healthy drinks



Drink lots of
clean, safe
water



- Water helps our joints move freely
- Drink clean safe water when you are thirsty and after meals
- Carry a water bottle to school

Drink milk,
maas or
yoghurt



- Milk, maas or yoghurt prevent tooth decay and makes our bones stronger
- Take low fat drinking yoghurt as a drink



Lesson 8: Use fat sparingly; choose vegetable oils rather than hard fats

Beware of bad fats



✗ Foods that are high in fat



✓ **Choose** foods containing fats that are good for you



- Fats provide the body energy
- Not all fats are good for you, choose fats from fish, nuts and seeds
- Choose foods that are low in fat



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Lesson 9: Use very little

Use salt and foods high in salt sparingly

Foods high in salt



- Eating too much salt can lead to high blood pressure
- Enjoy your meals without adding extra salt

Use sugar and foods and drinks high in sugar sparingly

Foods high in sugar



- Eating too much sugar may cause tooth decay
- Only take foods and drinks high in sugar once in a while



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Appendix F

Instructor's manual

INSTRUCTOR'S MANUAL

Healthy eating

and

The South African food based dietary guidelines



Faculty of Natural and Agricultural Sciences

Faculty of Health Sciences

Department of Human Nutrition

Developed by: Chido L. Zambuko

Supervisors: Ms Gerda Gericke

Dr. Jane Muchiri

INSTRUCTOR'S MANUAL

Contents

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Use sugar and foods and drinks high in sugar sparingly	
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Introduction

This instructor's manual was developed to address nutrition education needs of 7-9 year old learners in resource limited settings in Tshwane Pretoria. The study is based on the social cognitive theory and aims to determine whether nutrition education using South African food based dietary guidelines will improve the eating habits of learners 7-9 year old in resource limited settings in Tshwane Pretoria.

The manual has 9 nine lessons and 9 worksheets for each lesson. It also has included the Zimbabwe hand jive (portion size estimate) which should be used during the lessons in-order to emphasise on the recommended portion sizes.

For each of the nine (9) lessons, you will find

- I. Overall aim and objectives of the lesson
- II. Lesson plan comprising of
 - The lesson- each has clear instructions
 - Handout - worksheets the learners can work on individually and take home as a take home flyer

On the first day the facilitator should do the following:

- Introduce yourself and create a free and friendly learning environment e.g. say something interesting / funny about yourself
- Explain the importance of healthy eating(make reference to the poster)
 - Mention that healthy eating is eating different types of food to make your body strong and healthy
 - Mention that for the next 5 weeks we are going to talk about healthy eating and being active using the South African food based dietary guidelines

Zimbabwe hand jive

Portion size estimate



Protein: Size of your palm and the thickness of your little finger

Palm of hand = 90-120g

- Cooked beef
- Cooked poultry
- Cooked pork
- Cooked fish
- Cooked wild game
- Cooked fowl
- Canned fish



One cupped hand = ½ cup

- Cooked vegetables
- Fruit salad
- Nuts
- Beans
- Pasta
- Rice
- Samp
- High fat snacks
 - Ice-cream
 - Pudding



Fat: The size of your thump

Thump = 1 table spoon

- Peanut butter
- Salad dressing
- Dips

Zimbabwe hand jive

Portion size estimate



1 fist= ½ cup solid food or 1 cup liquid

- Beverages
- Starches : 1 ½ fists
 - Pap
- Fruit : 1 fist
- Yam
- Potatoes



Vegetables: as much as you can hold in both opened hands

2 cupped hands = 1 cup

- Raw vegetables
- Mixed dishes/stews/soup
- High fibre, low fat grains



Tip of the thumb= 1 teaspoon

- High fat spreads
- Margarine
- Butter
- Mayonnaise
- Oil

INSTRUCTOR'S MANUAL

LESSON 1: BE ACTIVE

Aim: To encourage children to be active everyday in their own way

Objectives

At the end of the lesson learners should be able to:

- I. Understand what it means to be active
- II. Identify the types of activities they can do within their schools and communities
- III. Know the benefits of being active

Lesson plan

Lesson (8 minutes)

- **Define** what it means to be active
 - moving your body
 - demonstrate being active (brisk walking, jumping, running) and not active (sitting on a chair)
- **Explain** why it is important to be active
 - makes your bones stronger and your heart healthy
 - make you feel ready to learn in school
- **Discuss** some examples of activities they can do at school and within their communities
 - Playing, Dancing, Walking, Cycling with friends, Helping with household chores
 - Sports : Ask learners the types of sports offered at their school and encourage them to take part
- **Ask** learners less active activities that they are aware of
 - Watching television, sleeping , just sitting
 - Playing video games or computer games
- **Emphasize** that they should be active everyday and minimize less active activities.
- **Encourage** learners to start playing an active game during break time
- **Singing and dancing to the healthy eating song**

Hand out (7 minutes)

- Explain to the learners that they should identify pictures showing physical activity and those not showing physical activity activities and write the appropriate description, active and not active under each picture.

Lesson 1 worksheet: Be active

Be active

Instructions

Write **active** or **not active** under each picture

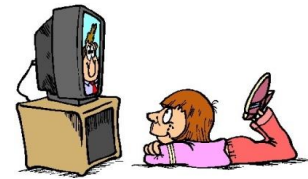
























INSTRUCTOR'S MANUAL

LESSON 2: ENJOY A VARIETY OF FOODS

Aim: To encourage children to eat a variety

Objectives

At the end of the lesson learners should be able:

- I. To know the meaning of variety
- II. To recognise the 7 food groups and name them
- III. To know the benefits of eating a variety of foods

Lesson plan

Review of lesson 1 (3 minutes)

- Ask learners about what they learned in lesson 1 about being active
- Remind them that they should be active everyday and minimise less active activities
- Ask learners the activities they are now engaged in

Lesson (9 minutes)

- **Show** the learners the enjoy a variety of foods poster to introduce the food groups
 - Mention that eating a variety foods means eating different types of foods everyday
- **Explain** why they should eat a variety of foods
 - To stay healthy
 - To build our bodies
 - For energy
 - To prevent diseases
- **Explain** to the children that all foods we eat fit in 7 groups.
 - Ask the learners how many food groups they can see from the poster
- **Name** each group
- **Discuss** the heading for each group
 - What foods might be in each group (**show them an example of each food for each food group provided and name it**)
 - What foods can they name and place in their correct food group
- **Encourage** learners to increase the variety of foods in the diet and include at least 5 different groups at each meal
- **Singing and dancing to the healthy eating song**

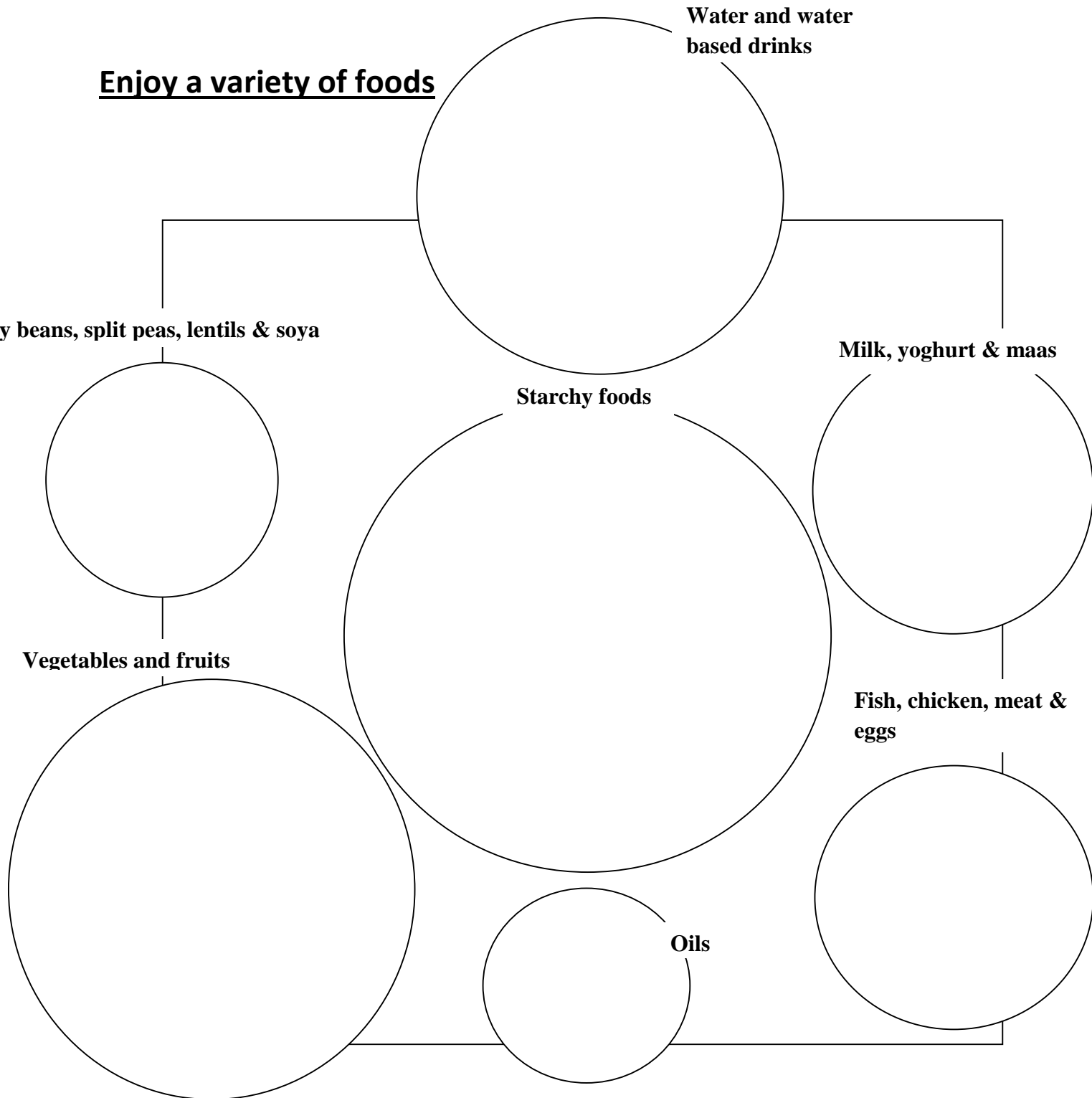
Hand out (8 minutes)

- **Ask** the learners to
 - I. colour the different food groups as stated
 - II. cut out the different food pictures and stick them on the correct food group

Lesson 2 work sheet: Enjoy a variety of foods

Part 1

Enjoy a variety of foods



INSTRUCTOR'S MANUAL

Instructions: 1. Colour the food groups

- Water and water based drinks - **blue**
- Dry beans, split peas, lentils and soya - **brown**
- Starchy foods - **orange**
- Vegetables and fruits - **green**
- Milk, yoghurt and maas - **purple**
- Fish, chicken, meat and eggs - **red**
- Oils – **yellow**

Part 2

2. Cut out the different foods and place them in their correct food groups



soya



bread



peanuts



yoghurt



cabbage



beef



sugar beans



tea



popcorn



spinach



avocado



fish



chicken



butternut



bananas



eggs



Soft porridge



milk



water



lentils

INSTRUCTOR'S MANUAL

LESSON 3: MAKE STARCHY FOODS PART OF MOST MEALS

Aim: To encourage learners to make starchy foods part of most meals

Objectives

At the end of the lesson learners should be able to:

- I. Identify the different types starchy foods
- II. To know the benefits of eating starchy foods
- III. Identify whole grains

Lesson plan

Review of lesson 2 (4 minutes)

- Ask learner what they learned about eating a variety of foods everyday
- Ask learners how they have started including variety in their diet
- Remind them that eating a variety of foods is eating different kinds of foods everyday

Lesson (9 minutes)

- **Show** the learners the poster on make starchy foods part of most meals
- **Ask** learners to identify and name the different starchy foods on the poster
- **Explain** why starchy foods are important
 - They provide energy for work, study and play
- **Help** learners identify whole grain foods on the poster
 - Maltabella ,Oats , green mealies, pop corn, whole wheat bread
 - **Show examples of whole grains provided and help them identify them**
- **Explain** to learners that whole grains are good for them
 - They provide energy
 - They help prevent constipation
 - They help prevent chronic diseases such as diabetes and some cancers
- **Encourage** learners to eat healthy starchy foods with most meals
 - For example whole wheat bread instead of doughnuts
 - **Singing and dancing to the healthy eating song**

Hand out (7 minutes)

- Explain to learners that for each picture, choose a word among the three provided that best describes the picture
- Circle all pictures showing whole grain foods

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Lesson 3 work sheet: Make starchy foods part of most meals

Make starchy foods part of most meals

Instructions

What food am I?

- I. Choose the word that best describes each picture.
- II. Circle whole grain foods

			
<p>orange malta-bella salad</p>	<p>corn maize-meal beans</p>	<p>cake eggs rice</p>	<p>polony cornflakes lentils</p>
			
<p>carrots oats burger</p>	<p>apple milk bread</p>	<p>potatoes rice water</p>	<p>banana soft porridge bread</p>
			
<p>coffee hot dog popcorn</p>	<p>maize-meal pizza potato</p>	<p>cabbage buns tea</p>	<p>macaroni butternut sweets</p>

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LESSON 4: EAT PLENTY OF VEGETABLES EVERYDAY

Aim: To encourage learners to eat plenty of fruits everyday

Objectives

At the end of the lesson learners should be able to:

- I. Know what it means to eat plenty of vegetables and fruit
- II. Identify some vegetables and fruits

Lesson plan

Review of lesson 3 (5 minutes)

- Ask learners what they learned about making starchy foods part of most meal
- Ask learners the types of whole grains they can eat for breakfast
- Remind them that starchy foods provide energy for work , study and play

Lesson (10 minutes)

- **Show** the learners the poster on eat plenty of vegetables and fruit everyday to introduce the lesson
- **Explain** why they should eat plenty of vegetable and fruits everyday
 - Prevent you from getting ill
- **Ask** the learners to name
 - vegetables and fruits they can see in the poster
 - the colour of the vegetables and fruits
- **Emphasize** on the different colours of vegetables and fruit and encourage learners to choose different colours of vegetables and fruits everyday (variety)
- **Show the learners the examples provided**
- **Summarise** on the different vegetables and fruits and their different colours
- **Encourage** learners to
 - carry fruits to school
 - to try new fruits and vegetables
 - ask their parent to prepare a snack including a vegetable for school
 - **Singing and dancing to the healthy eating song**

Hand out (5 minutes)

- Explain to learners that they should:
 - a) Circle all the foods they identified as fruits
 - b) Circle all the foods they identified as vegetables

Lesson 4 worksheet: Eat plenty of vegetables everyday

Enjoy plenty of vegetables and fruit everyday

Instructions

1. Circle the correct answer

a) Which of these foods are fruits



banana



chips



pears



oranges



sweets



apricot



apples



fat cakes

b) Which of these foods are vegetables



cabbage



butternut



pie



spinach



cake



cucumber



tomatoes



carrots

INSTRUCTOR'S MANUAL

LESSON 5: EAT DRY BEANS, LENTILS, SPLIT PEAS AND SOYA REGULARLY

Aim: To encourage learners to eat dry beans, lentils, split beans and soya regularly

Objectives

At the end of the lesson learners should be able:

- Identify different types of beans
- To know the importance of beans , lentils split peas and soya

Lesson plan

Review of lesson 4 (3 minutes)

- Ask learners what they learned about eating plenty of vegetables and fruits
- Ask learners when they should eat vegetables and fruits
- Remind learners to ask their parents to make them a snack including vegetables and to carry a fruit to school

Lesson (13 minutes)

- **Show** the learners the poster on 'dry beans, split peas, lentils and soya' and then the different beans provided
- **Ask** them to identify the beans provided in the bowls and name them
- **Refer** to the poster
 - mention that they should eat dry beans, split peas, lentils and soya every week
- **Explain** the benefits
 - they help to build your body and make you grow
 - they help you feel full for longer
 - they keep your body healthy
- **Help** learners identify meals including beans on the poster and the type of beans used
- **Encourage** learners to eat beans through meals like samp and beans and lentil soup with rice every week
- **Demonstration**
 - Provide learners with 3 small plastic bags
 - Ask learners to collect a spoon of each of the beans provided and place in the plastic bags provided
 - Ask learners to correctly label their beans package with the names provided
 - **Singing and dancing to the healthy eating song**

Hand out (4 minutes)

- **Ask** learners to
 1. Identify the pictures of beans and rearrange the misspelt names
 2. Draw a line to match the beans and the meals

INSTRUCTOR'S MANUAL

Lesson 5: Eat dry beans, lentils, split peas and soya regularly

Eat dry beans, split peas ,lentils and soya

Instructions

1. Identify the different beans by rearranging the misspelt

words



ysao

--	--	--	--

kadeb enabs



--	--	--	--	--	--	--	--	--	--

lpsti epsa



--	--	--	--	--	--	--	--

insltel



--	--	--	--	--	--	--	--

2. Match the ingredients with the meals



INSTRUCTOR'S MANUAL

LESSON 6: FISH, CHICKEN, LEAN MEAT OR EGGS COULD BE EATEN DAILY

Aim: To encourage learners to:

- choose meat with little or no visible fat
- eat less of processed foods

Objectives

At the end of the lesson learners should be able:

- Identify the different types of meats
- To know the benefits of meat in the diet

Lesson plan

Review of lesson 5 (3 minutes)

- Ask learners what they learned about dry beans, split peas, lentils and soya
- Remind learners that they should eat beans every week

Lesson (13 minutes)

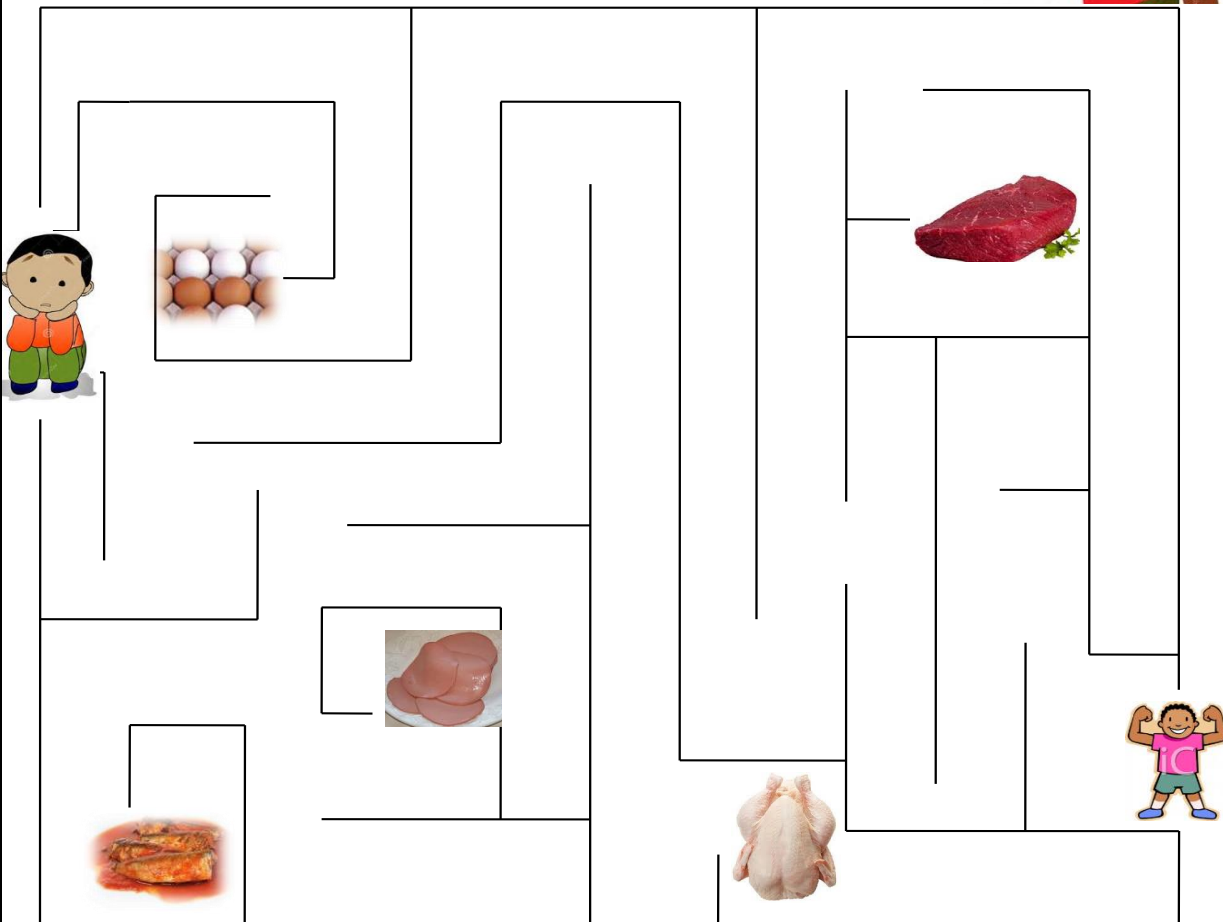
- **Show** the learners the poster on ‘ fish, chicken, lean meat or eggs’
- **Ask** learners to identify the foods shown on the poster and any other types of meat not shown
- **Explain** the benefits of meat in the diet
 - For growth and body building
- **Explain** that they should choose lean meat and always remove chicken skin because fat from meat is not good for health
- **Encourage** learners to choose meat that is not processed because they have too much salt which is not good for health
 - Instead of polony sandwich choose boiled egg(or fish) mayonnaise (little) or use boiled mince
- **Demonstration**
 - Removing skin from chicken
 - **Singing and dancing to the healthy eating song**

Hand out (4 minutes)

- Explain to learners that they should :
 1. Find their way to the stated foods and avoid the processed meats
 2. Find their way out of the maze

Lesson 6 worksheet: Fish, chicken, lean meat or eggs could be eaten daily

Fish, chicken, lean meat or eggs could be eaten daily



Instructions

a) Find your way to the following foods:

Eggs

Fish

Lean meat

Chicken

b) Find your way out of the maze



INSTRUCTOR'S MANUAL

LESSON 7: HEALTHY DRINKS

Aim: To encourage learners to:

- drink lots of clean safe water
- drink milk, maas or yoghurt everyday

Objectives

At the end of the lesson learners should be able to:

- Identify different sources of water
- Identify low fat milk, maas and yoghurt
- To know the benefits of drinking water ,taking low fat milk, maas and yoghurt

Lesson plan

Review of lesson 6 (3 minutes)

- Ask what learners learned about fish, chicken, lean meat and eggs
- Remind learners to choose lean meat and always remove the chicken skin

Lesson (12 minutes)

- **Show** learners the poster on 'healthy drinks'
- **Ask** learners to identify and name what they see
- **Ask** learners what kind of milk they drink at home
- **Explain** to learners the benefits of drinking milk, maas and yoghurt everyday
 - Prevents tooth decay
 - Makes our bones strong and healthy
- **Promote** a gradual change in drinking less sugary drinks and more lower fat milk, maas, low fat yoghurt (**show the learners the examples provided**)
- **Ask** learners how often they drink water
 - At least 6 cups of clean safe water everyday
- **Ask** learners the sources of water around them
 - Tap water and a water bottle with water brought from home
- **Ask** learners what they can do to drink lots of water everyday
 - Carry a water bottle to school
 - Drink water every time you are thirsty instead of cold drinks and oros
- **Explain** to learners the benefits of drinking lots of water
 - Helps your joints move freely and helps remove waste products from the body
- **Encourage** learners to drink lots of clean safe water, unsweetened tea and diet drinks instead of sugary drinks such as sodas
- **Singing and dancing to the healthy eating song**

Hand out (5 minutes)

- Explain to learners that they should find the 6 healthy drinks in the word puzzle

Lesson 7 worksheet: Healthy drinks

Healthy drinks



D	G	Y	J	K	T	C	G	H	T
F	R	U	I	T	J	U	I	C	E
D	H	H	M	F	B	M	X	Z	A
S	M	K	A	Z	X	F	V	M	F
Q	W	W	A	T	E	R	M	I	V
D	E	O	S	P	P	I	Y	L	F
A	D	H	T	T	U	I	I	K	B
S	Y	O	G	H	U	R	T	C	V

Instructions

Find healthy drinks:

Milk

Fruit Juice

Water

Yoghurt

Tea

Maas



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LESSON 8: USE FAT SPARINGLY

Aim: To encourage learners to:

- use fats sparingly
- choose low fat foods

Objectives

At the end of the lesson learners should be able to:

- Identify foods high in fat and foods with healthy fats
- To know the benefits of eating foods low in fat

Lesson plan

Review of lesson 7(3 minutes)

- Ask learners what they learned about healthy drinks
- Encourage them drink low fat milk and water instead of cold drinks and oros
- Remind them that they should drink at 6 cups of clean safe water everyday

Lesson (10 minutes)

- **Show** the learners the poster on 'use fat sparingly'
- **Explain** that they should very little fat everyday (**make reference to the thump portion size from the hand jive**)
- **Ask** learners to identify the foods high in fat and the foods containing healthy fats
- **Explain** the benefits of eating healthy fats
 - They provide the body energy
- **Explain** why foods high in fat are not good for you
 - They make your heart weak
 - May lead to overweight/obesity
- **Show the learners the examples of foods containing healthy fats provided**
- **Encourage** learners to choose fats from fish, nuts and seeds (refer to the poster)
- **Singing and dancing to the healthy eating song**

Handout (7 minutes)

- Explain to learners that they should
 1. Identify the foods low in fat and colour them with the colour of their choice
 2. Put a cross on the foods high in fat

Lesson 8 worksheet: Use fat sparingly

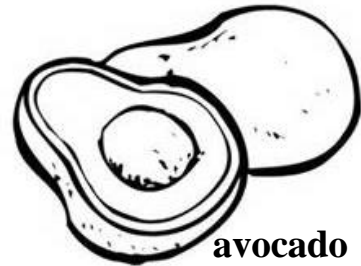
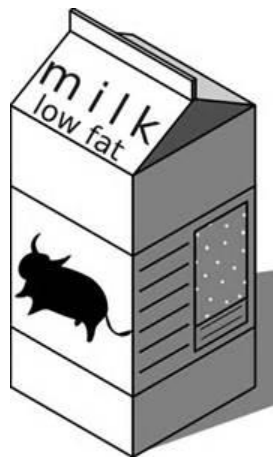
Use fat sparingly: choose vegetable oils rather than hard fats

Instructions

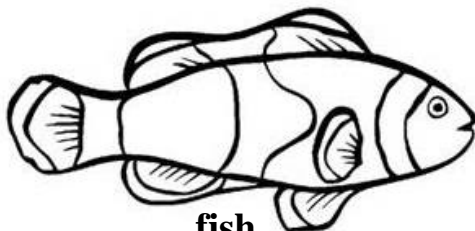
- I. Colour the foods that are low in fat
- II. Put a cross on the foods that are high in fat



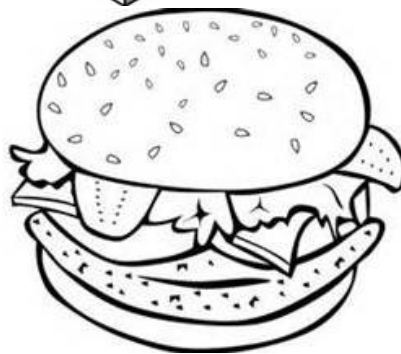
chips



avocado



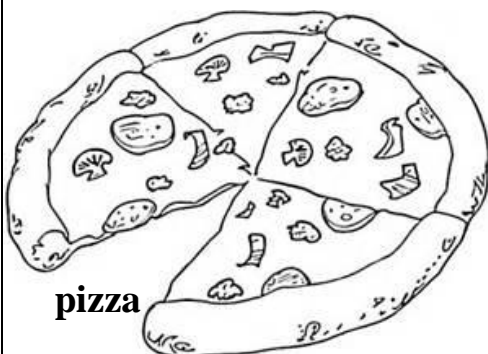
fish



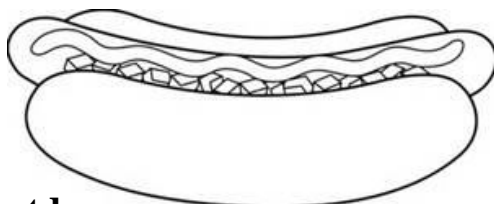
burger



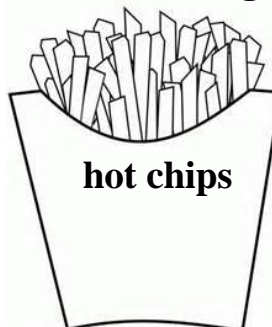
vegetable oil



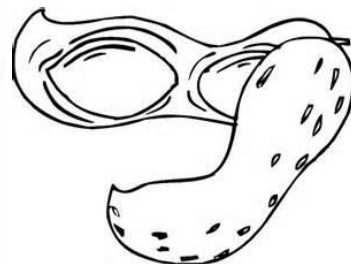
pizza



hotdog



hot chips



peanut

INSTRUCTOR'S MANUAL

LESSON 9: USE VERY LITTLE

Aim: To encourage learners to:

- use salt sparingly
- use sugar and foods and drinks high in sugar sparingly

Objectives

At the end of the lesson learners should be able to:

- To identify foods high in salt
- To identify foods and drinks high in sugar
- Should be aware of the consequences of eating too many high salt and high sugar foods

Lesson plan

Review of lesson 8 (3 minutes)

- Ask learners what they learned about using fat sparingly
- Ask learners to name foods high in fats and those with healthy fats
- Remind the learners how much fat they should eat (**thump**)

Lesson (13 minutes)

- **Show** learners the poster on 'use very little'
- **Ask** learners to identify the foods and drinks shown on the poster
- **Ask** learners to identify food high in salt
- **Explain** why eating too much salt is not good for them
 - Can lead to high blood pressure
- **Encourage** learners to choose less salty healthy foods such as un-salted nuts, or un-salted popcorn instead of simba chips and nik-naks
- **Ask** learners to identify foods and drinks high in sugar
- **Explain** why eating too many foods and drinks high in sugar is bad for their health
 - May cause tooth decay
 - May lead to overweight/ obesity
- **Emphasize to** learners to take foods and drinks high in sugar once in while
- **Encourage** learners to take water and low fat milk instead of cold drinks
- **Show the learners examples of low salt and low sugar foods and drinks provided**
- **Singing and dancing to the healthy eating song**

Hand out (4 minutes)

- Explain to learners that they should circle foods that help them to follow each rule:
 1. Eat foods low in sugar
 2. Eat foods low in salt
- Put an x on foods:
 1. High in sugar
 2. High in salt

Lesson 9 worksheet: Use very little

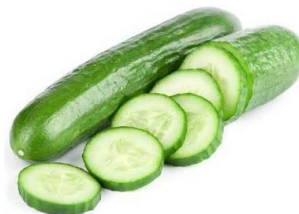
Use very little

Instructions

Which food is healthful?

- I. Circle the food you should eat to help you follow each rule.
- II. Put an x on the foods : a) high in sugar
b) high in salt

1. Eat foods low in sugar



2. Eat foods low in salt



unsalted



References

1. Kupolati MJ, MacIntyre U, Gericke G. Contextual Nutrition Education Manual for Teachers (grades 5 and 6). University of Pretoria. 2014
2. www.nutrition.org.uk – Food a fact of life ,2011
3. Department of health, directorate: Nutrition. South African Guidelines for healthy eating for adults and children over the age of seven years, Pretoria, 2004.
4. Department of health, directorate: Nutrition. South Africa Guidelines for healthy eating information for consumers, Pretoria, 2012.
5. Department of health: republic of South Africa .South Africa's food guide: Supporting the guidelines for healthy eating
6. Department of health, directorate: Nutrition. Guidelines for healthy eating information for nutrition educators. Pretoria, 2012

The healthy eating song

Healthy eating is good for you

E-I-E-I-O

Variety of food is the way to go

E-I-E-I-O

With starches, fruits and vegetables

E-I-E-I-O

Meat and beans, water and milk

Little fat, little sugar and little salt

E-I-E-I-O

Healthy eating is good for you

E-I-E-I-O

Chorus: And be active by dancing

Be active by running

Be active by jumping



Healthy eating is good for you

E-I-E-I-O

Variety of food is the way to go

E-I-E-I-O

Starches for energy

Fruit and veggies for protection

Fish and eggs for body building

E-I-E-I-O

Chorus: And be active by dancing

Be active by running

Be active by jumping



Portion size for one meal

starches/fruit



vegetables



cooked meat



beans/nuts



fat-peanut butter



oil/margarine/mayonnaise



Appendix H

Learner's worksheets

Be active

Instructions

Write **active** or **not active** under each picture

















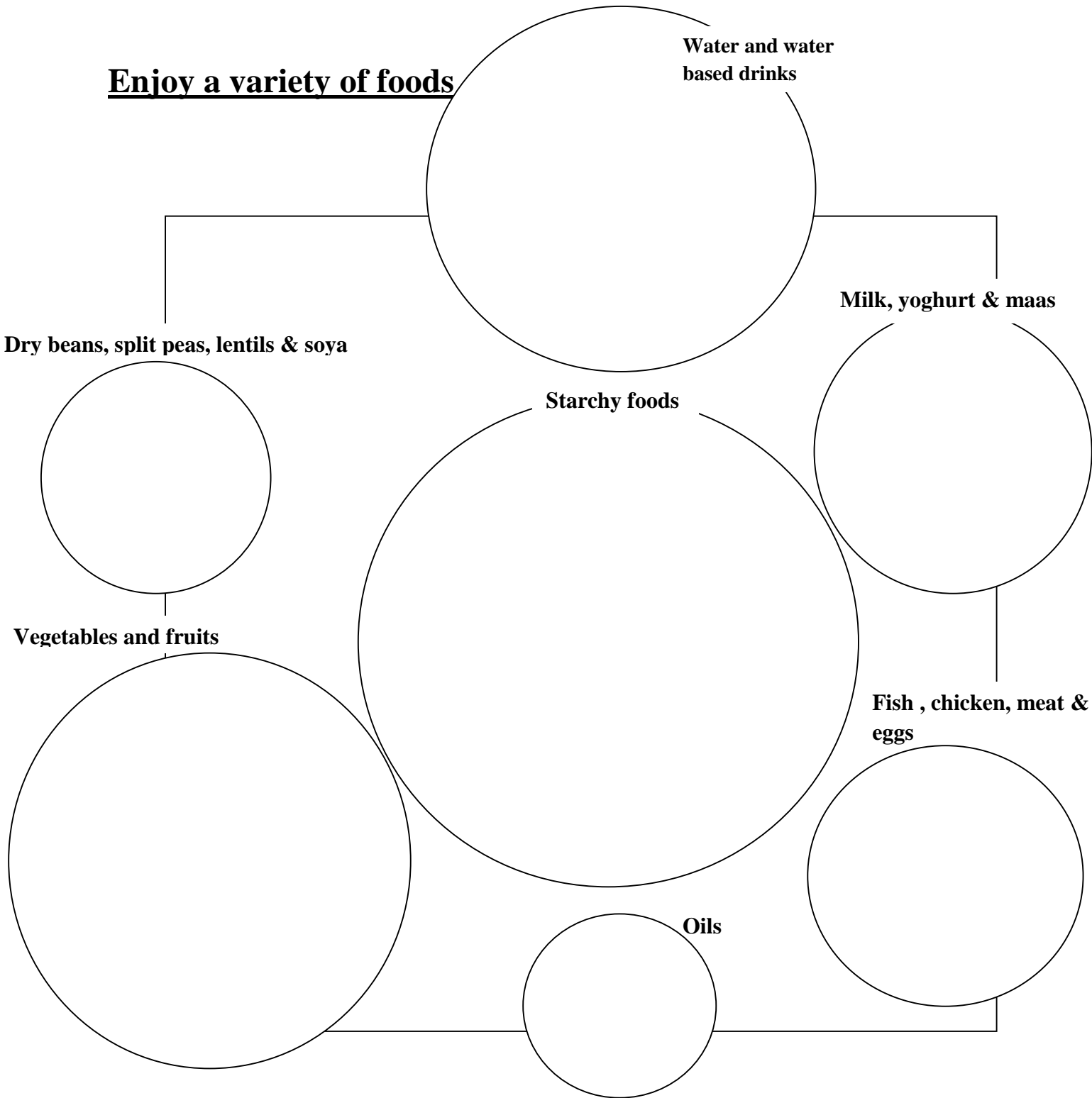








Enjoy a variety of foods



Instructions: 1. Colour the food groups

- a. Water and water based drinks - **blue**
- b. Dry beans, split peas, lentils and soya - **brown**
- c. Starchy foods - **orange**
- d. Vegetables and fruits - **green**
- e. Milk, yoghurt and maas - **purple**
- f. Fish, chicken, meat and eggs - **red**
- g. Oils - **yellow**

2 Cut out the different foods and place them in their correct food groups



soya



bread



peanuts



yoghurt



cabbage



beef



sugar beans



tea



popcorn



spinach



avocado



fish



chicken



butternut



bananas



eggs



Soft porridge



milk



water














lentils

Make starchy foods part of most meals

Instructions

What food am I?

- I. Choose the word that best describes each picture.
- II. Circle whole grain foods

			
<p>orange malta-bella salad</p>	<p>corn maize-meal beans</p>	<p>cake eggs rice</p>	<p>polony cornflakes lentils</p>
			
<p>carrots oats burger</p>	<p>apple milk bread</p>	<p>potatoes rice water</p>	<p>banana soft porridge bread</p>
			
<p>coffee hot dog popcorn</p>	<p>maize-meal pizza potato</p>	<p>cabbage buns tea</p>	<p>macaroni butternut sweets</p>

Enjoy plenty of vegetables and fruit everyday

Instructions

1. Circle the correct answer

a) Which of these foods are fruits



banana



chips



pears



oranges



sweets



apricot



apples



fat cakes

b) Which of these foods are vegetables



cabbage



butternut



pie



spinach



cake



cucumber



tomatoes



carrots

Eat dry beans, split peas ,lentils and soya Instructions

1. Identify the different beans by rearranging the misspelt words

ysao



--	--	--	--

kadeb enabs



--	--	--	--	--	--	--	--	--	--

lpsti epsa



--	--	--	--	--	--	--	--

insltel

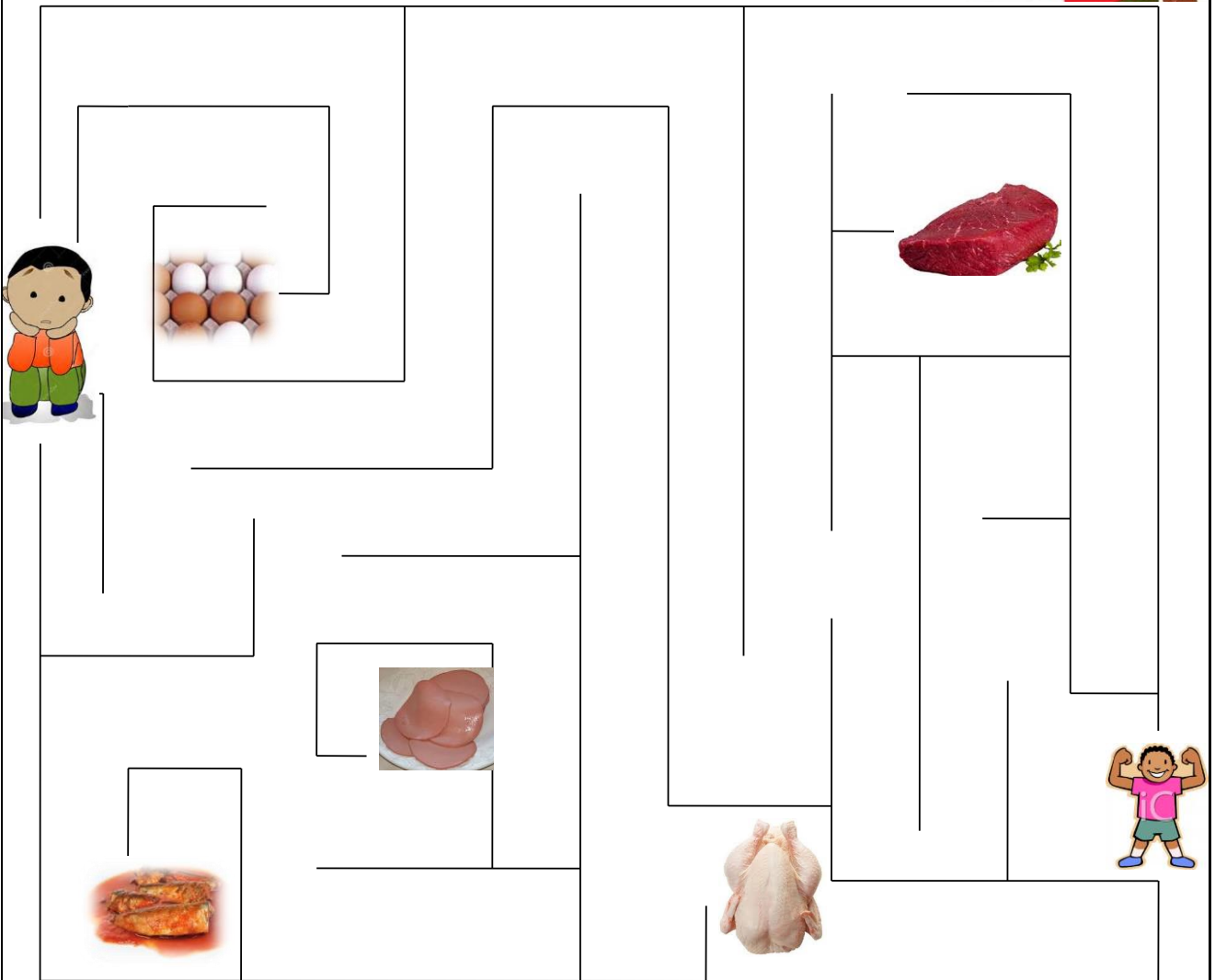


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2. Match the ingredients with the meals



Fish, chicken, lean meat or eggs could be eaten daily



Instructions

a) Find your way to the following foods:

Eggs

Fish

Lean meat

Chicken

b) Find your way out of the maze



Healthy drinks



D	G	Y	J	K	T	C	G	H	T
F	R	U	I	T	J	U	I	C	E
D	H	H	M	F	B	M	X	Z	A
S	M	K	A	Z	X	F	V	M	F
Q	W	W	A	T	E	R	M	I	V
D	E	O	S	P	P	I	Y	L	F
A	D	H	T	T	U	I	I	K	B
S	Y	O	G	H	U	R	T	C	V

Instructions

Find healthy drinks:

Milk

Fruit Juice

Water

Yoghurt

Tea

Maas



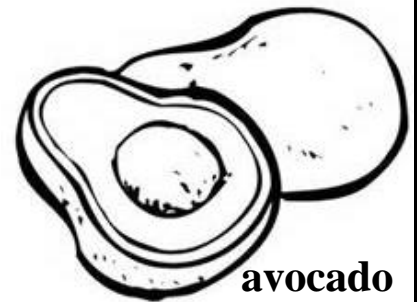
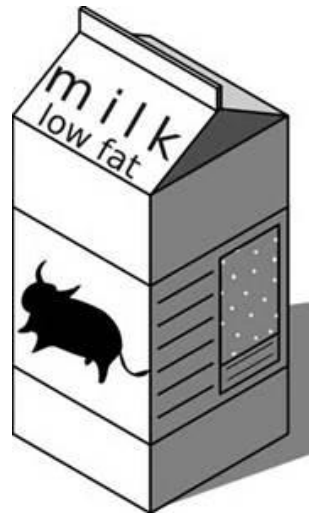
Use fat sparingly: choose vegetable oils rather than hard fats

Instructions

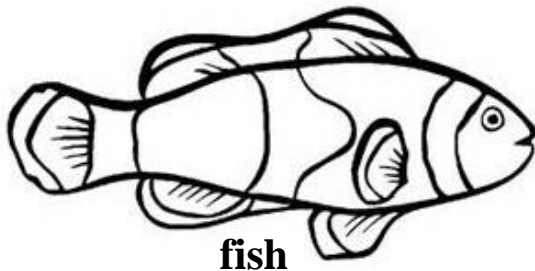
- I. Colour the foods that are low in fat
- II. Put a cross on the foods that are high in fat



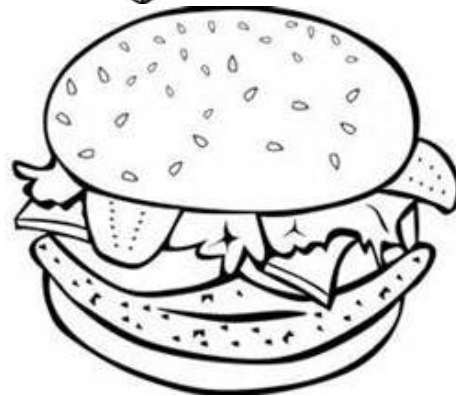
chips



avocado



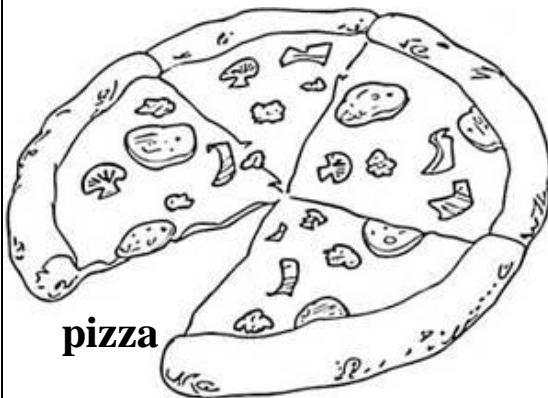
fish



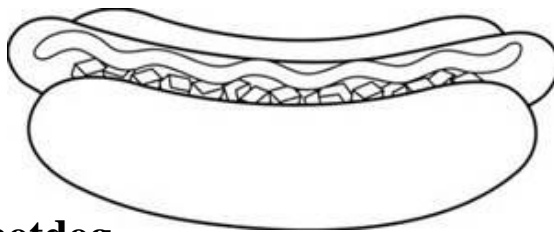
burger



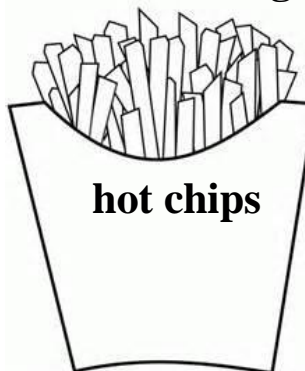
vegetable oil



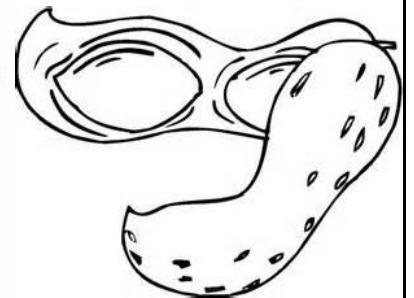
pizza



hotdog



hot chips



peanut

Use very little

Instructions

Which food is healthful?

- I. Circle the food you should eat to help you follow each rule.
- II. Put an x on the foods : a) high in sugar
b) high in salt

1. Eat foods low in sugar



2. Eat foods low in salt



unsalted



Appendix I

Grade 1 questionnaire

Naam/ Name..... Graad/Grade..... Ouderdom/Age.....

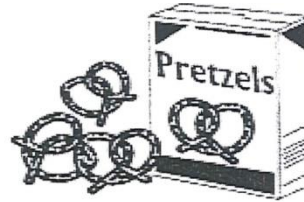
WATSAL DOEN / WHAT WILL YOU DO?

- 1 Wat sal jy kies vir 'n snack (peuselhappie tussen etes)? / What will you choose for a snack?



1

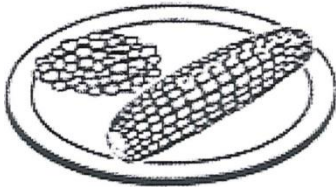
Aartappel skyfies (chips)



2

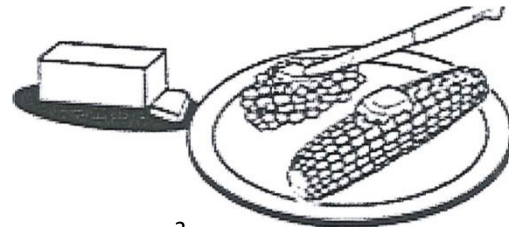
Pretzels

- 2 Wat sal jy doen? / What will you do?



1

'n Mielieet sonderbotter/ Eat corn with no butter



2

'n Mielieetmetbotter/ Eat corn with butter

- 3 Wattereen sal jy voor vra? / Which one will you ask for?



1

Water / Vrugteroomys/ Fruit icicle



2

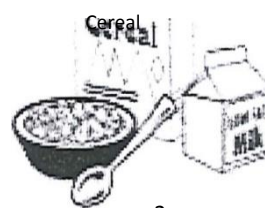
Roomys op 'n cone/ Icecream on a cone

- 4 Wat sal jy kies vir ontbyt? / What will you choose for breakfast?



1

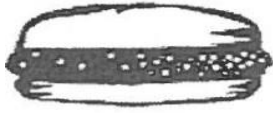
Eiers en spek (bacon)/ Eggs and bacon



2

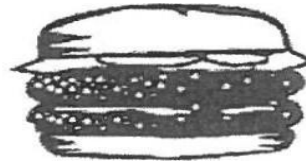
Ontbytpap, Graanvbkies, Mieliepap / Breakfast cereal, mealie pap

5 Wat sal jy by 'n restaurant besteli? /Which would you order at a fast food restaurant?



1

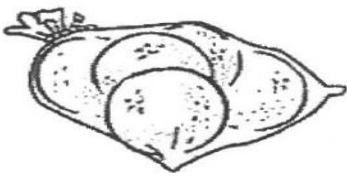
Gewone h/ Regular hamburger



2

Ekstra groot hamburger/ Extra big hamburger

6 Watter kos vra jy vir jou ma of pa om te koop? /Which food would you ask the adults in your house to buy?



1

1

'n Sakkie lemoene/ Bag of oranges



2

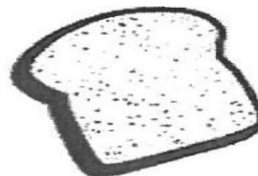
Pak Skyfies (chips soos Big Kom Bites)/ Bag of tortilla chips

7 Wat sal jy kies om te eet vir ontbyt? /Which would you choose to eat in the morning?



1

Vetkoek (oliering)/ Doughnut



2

Roosterbrood sonder botter /Toast with no butter

8 Wat sal jy kies om te drink? /Which would you choose to drink?



1

Suikervrye gaskoeldrank /Diet pop
(soos Sprite Zero, Coke light)



2

Gewone gaskoeldrank /Regular pop
(soos Coke, Fanta, Sprite)

Appendix J

Grade 2 and 3 questionnaire

HOE SEKER IS JY? / HOW SURE ARE YOU?

1. Ek kan baie speel tydens pouse / I can play a lot during the school break

1	2	3	4
Ek weet ek kan	Ek dink ek kan	Ek is nie seker of ek kan nie	Ek week ek kan nie
I know I can	I think I can	I am unsure I can	I know I can not

2. Ek kan hard speel tydens pouse / I can play hard during school break

1	2	3	4
Ek weet ek kan	Ek dink ek kan	Ek is nie seker of ek kan nie	Ek week ek kan nie
I know I can	I think I can	I am unsure I can	I know I can not

3. Ek speel elke dag baie / I play a lot every day

1	2	3	4
Ek weet ek kan	Ek dink ek kan	Ek is nie seker of ek kan nie	Ek week ek kan nie
I know I can	I think I can	I am unsure I can	I know I can not

4. Ek kan by die winkel eerder vir 'n vrugteroomys as 'n roomys op 'n cone vra/ I can ask at the shop for a fruit icicle rather than ice cream on a cone

1	2	3	4
Ek weet ek kan	Ek dink ek kan	Ek is nie seker of ek kan nie	Ek week ek kan nie
I know I can	I think I can	I am unsure I can	I know I can not

5. Ek kan elke dag 'n vrug eet (soos 'n piesang, appel, lemoen) / I can eat a fruit every day (banana, apple, orange)

1	2	3	4
Ek weet ek kan	Ek dink ek kan	Ek is nie seker of ek kan nie	Ek week ek kan nie
I know I can	I think I can	I am unsure I can	I know I can not

6. Ek kan elke dag eerder water drink as gaskoeldrank (Coca Cola) of Oros / I can rather drink water than fizzy drinks (Coca Cola) or Oros everyday

1	2	3	4
Ek weet ek kan	Ek dink ek kan	Ek is nie seker of ek kan nie	Ek week ek kan nie
I know I can	I think I can	I am unsure I can	I know I can not

7. By die huis kan ek eerder vir 'n klein kaaspizza vra as vir 'n groot vleis pizza/ At home I can ask for a small cheese pizza rather than a big meat pie

1	2	3	4
Ek weet ek kan	Ek dink ek kan	Ek is nie seker of ek kan nie	Ek weet ek kan nie
I know I can	I think I can	I am unsure I can	I know I can not

8. Ek kan vir 'n mielie sonder botter (margarie) vra / I can ask for mealie without butter (margarine)

1	2	3	4
Ek weet ek kan	Ek dink ek kan	Ek is nie seker of ek kan nie	Ek weet ek kan nie
I know I can	I think I can	I am unsure I can	I know I can not

9. Ek kan vir 'n suikervrye gaskoeldrank eerder as 'n gewone gaskoeldrank vra / I can ask for a sugarfree fizzy cold drink rather than a common fizzy drink

1	2	3	4
Ek weet ek kan	Ek dink ek kan	Ek is nie seker of ek kan nie	Ek weet ek kan nie
I know I can	I think I can	I am unsure I can	I know I can not

10. Ek kan by aandete 'n nuwe groente probeer / I can eat a new vegetable dish at dinner

1	2	3	4
Ek weet ek kan	Ek dink ek kan	Ek is nie seker of ek kan nie	Ek weet ek kan nie
I know I can	I think I can	I am unsure I can	I know I can not

11. By die snoepie kan ek eerder 'n vrug koop as 'n pakkie aartappelskyfies / I can rather buy a fruit than a packet of chips at the tuck shop

1	2	3	4
Ek weet ek kan	Ek dink ek kan	Ek is nie seker of ek kan nie	Ek weet ek kan nie
I know I can	I think I can	I am unsure I can	I know I can not

"KIES EEN VAN DIE VOLGENDE / CHOOSE ONE OF THE FOLLOWING:

1. Watter kos is die gesondste om elke dag te eet? / What food is the more healthy to eat every day?
 - a. kos met min of geen vet / food with little or no fat
 - b. gebraaide kos/ / fried foods
 - c. kos wat botter (margarine) by het / food with butter (margarine)

2. Watter een laat jou liggaam wys hy het gesonde oefening gedoen / Which one tells that your body had healthy exercise?
 - a. harder asemhaal / loud breathing
 - b. duiselig (lighoofdig) (dizzy) word / feeling dizzy
 - c. slaperig word / feeling sleepy

3. Watter kos het die minste vet / What food contains the least fat?
 - a. Pretzels
 - b. doughnuts, vetkoeke (olie-ring) / doughnuts
 - c. aartappel skyfies (chips) / chips

4. Watter soort melk het die minste vet / What milk contains the least fat?
 - a. Volroommelk/fu// cream milk
 - b. vetvrye (skim, 1%) melk / fat (skim) free milk (1%)
 - c. lae vet (2%) melk / low fat milk (2%)

5. Wat kan jy doen om die ekstra vet uit maalvleis uit te kry / What can you do to remove extra fat from mince meat?
 - a. braai die maalvleis tot baie gaar / fry the mince meat until it is well cooked
 - b. kook die maalvleis met geen olie (margarine) / cook the mince meat with no additional/ extra oil (margarine)
 - c. kook die maalvleis, gooi dan die water af, spoel die maalvleis dan met warm water af/ cook the meat; throw the water away and then rinse the meat under water

6. Watter ontbyt bevat die minste vet / What breakfast contains the least fat?
 - a. ontbytpap (graanvlokkies) met lae vet melk / cereal with low fat milk
 - b. gebraaide eiers en spek (bacon)/ fried eggs with bacon
 - c. plaatkoekies of pannekoek met boerewors / crumpets/pancake with boerewors

7. Watter een is die gesondste keuse vir 'n snack (peuselhappie tussen etes)/ Which one is the most healthy snack?
 - a. springmielies met botter/ popcorn with butter
 - b. aartappelskyfies (chips) / chips
 - c. vrugte ysie / fruit icicle
