Development and implementation of a nutrition education programme for primary school teachers in Bronkhorstspruit, Gauteng Province, South Africa

by

Mojisola Deborah Kupolati

Submitted in fulfilment of the requirements for the degree

PhD in Nutrition

in the

FACULTY OF NATURAL AND AGRICULTURAL SCIENCES
UNIVERSITY OF PRETORIA
PRETORIA

Supervisor: Prof. Una Maclntyre
Co-Supervisor: Ms Gerda Gericke

August 2016

DECLARATION

I, Mojisola Deborah Kupolati, hereby declare that the thesis for the degree, Doctor of Philosophy in Nutrition at the University of Pretoria, submitted by me has not been submitted for a degree at this or any other university or institution of higher learning. It is my own work in design and execution, and all reference materials contained therein have been duly acknowledged.

Mojisola Deborah Kupolati

Name

Signature

16 August 2016

Date

ACKNOWLEDGEMENTS

To God be all the glory, honour, adoration, thanks and praise for the grace He gave me to undertake and complete this study with joy.

I hereby gratefully acknowledge the following individuals and organisations who/which were instrumental to the successful completion of the study:

Prof Una E MacIntyre and Ms Gerda J Gericke my supervisors, for their consistent support, directive and expert guidance throughout the course of this study.

The Department of Basic Education for granting permission to undertake the study.

The principals and the teachers of Life Skills/Orientation and Natural Science and Technology in Grades 4 to 7 at the eleven schools in Bronkhorstspruit district for participating in the study.

The teachers of Life Skills and Natural Science and Technology and the Grades 5 and 6 learners in the treatment and the control schools for participating in the study.

The Institute for Food, Nutrition and Well-being (IFNuW) and the Department of Research and Innovation support, University of Pretoria; the Association of African Universities (AAU) and the Nestle Nutrition Institute Africa (NNIA) for funding the study.

Prof Piet Becker for the statistical analysis of all the quantitative data for the study.

Prof Andre Oelofse for valuable counsel at the beginning of the study.

Prof William Fraser and Mrs Carol Browne for expert advice in the development of the context specific nutrition education (NE) materials.

Prof Ronel Ferreira and Mrs Karien Botha for facilitating the approval for the study from the Gauteng Department of Basic Education, and arranging transportation for data collection for the study.

The education psychologist, the coordinator of the Life Skills subject (intermediate) and the coordinator of Natural Science and Technology subject (intermediate) of the Gauteng North District, Department of Basic Education for face and content validation of the NE materials.

The Creative Studios of the Faculty of Health Sciences, Department for Education Innovation, University of Pretoria for the design and production of the NE materials.

Mrs Juna Botha, the administrative officer, Department of Human Nutrition, for administrative support.

My colleagues, Dr Jane Muchiri, Mr Temitope Bello, Dr Bukola Olutola, Mrs Nathalie Saal and other fellow postgraduate students for moral support.

Ms. Keabetswe Kodi, Miss Nokuthula Vilakati, Miss Kevina Honajee and Mrs Edwinah Amondi for assisting in data collection and Mr David Ibrahim for assisting with word processing.

My husband, Prof Williams Kupolati, and children, Fiyinfoluwa and Halleluyah Kupolati, for their understanding and moral support throughout the study.

ABSTRACT

Introduction: Nutrition education (NE) is one of the most enduring, effective and economic interventions to fight malnutrition and food-related diseases through the impartation of nutrition knowledge and skills on healthy eating. The school remains a viable platform for NE with teachers playing significant roles.

Aim: To develop and implement a Nutrition Education Programme (NEP) for primary school teachers in order to improve teachers' skills to teach nutrition effectively.

Setting and population: The study setting was the Bronkhorstspruit district, east of Pretoria, involving eleven primary schools. The study population was teachers who taught nutrition to learners in Grades 4 to 7 and learners in Grades 5 and 6.

Methodology: The study was an intervention, comprising qualitative and quantitative research methodology in three phases. In the needs assessment (phase 1), qualitative and quantitative data on the nutrition knowledge, attitudes and dietary practices (KAP) of teachers and learners were obtained. The findings of phase 1, in conjunction with selected constructs of the Social cognitive theory (SCT) and the Meaningful learning model (MLM), the existing curriculum of the Department of Basic Education (DoBE) were used to develop a contextual NEP with supporting materials for teaching nutrition topics to Grade 5 and 6 learners (phase 2). In phase 3, the NEP was implemented in two of the eleven schools, allocated as the treatment and control schools. The NE materials were used by the teachers in the treatment school to teach nutrition to Grade 5 and 6 learners; while in the control school, the teachers taught nutrition in the usual manner. The implementation stretched over eight months and was assessed through a process evaluation with the teachers. The impact of the NEP on the teaching of nutrition and on the nutrition KAP of the teachers and the learners were assessed. The thematic framework approach was used to analyse the qualitative data. The quantitative data were analysed with descriptive and inferential statistics. An analysis of variance (ANOVA) was done with adjustment for pre-implementation scores to test the changes between schools in nutrition KAP from pre- to post-implementation. A random effects Generalised Least Squares (GLS) was used to compare overall change between the schools from pre- to post-implementation and to estimate within school differences in nutrition

KAP from pre- to post-implementation. The level of significance to test the hypotheses was set at 0.025 for a one-tailed test.

The NEP consisted of the developed NE materials comprising the teacher's manual, the picture book, posters, learner's work book; the implementation of the NEP to the teachers and the learners; and the evaluation of the impact of the NEP.

Results: The needs assessment (phase 1) revealed that the mean nutrition knowledge and mean nutrition attitudes scores for the teachers were good albeit with deficits in certain nutrition topics and in the method of teaching nutrition. There was an unavailability of up to date instructional materials, lack of in-service nutrition training for the teachers and limited time for teaching nutrition. The mean nutrition knowledge (58.8 ± 23.9%) and mean nutrition attitudes (58.4 ± 18.6%) for the learners were low and needed to improve.

The impact of the NEP (phase 3): Twenty teachers and 644 learners completed the post-implementation assessment. Results indicated a significantly higher mean score (85.5 ± 8.2% versus 73.4 ± 10.3%, P = 0.003) in the total nutrition knowledge of the treatment school teachers compared with the control school. There was a non-significant higher mean score (84.2 ± 16.4% versus 75.8 ± 17.3%, P = 0.531) in dietary attitudes of the treatment school teachers compared with the control school. The teachers in the treatment school showed no significant improvement in the mean scores on any of the categories of dietary practices compared with the control school. However, the personal dietary practices of the teachers in both schools revealed improvement in healthy eating practices, and their views regarding school wide food practices were in support of healthy eating. The teachers reported satisfaction with the use of the NE manual as well as their improved skills to teach nutrition and would like to continue to use the manual to teach nutrition. However, time constraint was a major challenge in the implementation fidelity of the NEP by the teachers.

Regarding the learners' assessment, there was a significant higher mean score in the total nutrition knowledge (53.2 ± 16.9% versus 53.1 ± 17.6%, P = 0.001) and a significant higher mean score (63.9 ± 19.7% versus 56.8 ± 19.6%, P = 0.002) in nutrition attitudes in the treatment school compared with the control school. The dietary practices of the learners in the treatment

school showed a non-significant lower mean score (60.0 ± 19.7% versus 62.2 ± 16.8%, P = 0.24) compared with the control school.

Conclusion: Implementing a theory based context specific NEP in line with the existing school curriculum holds the potential for programme sustainability as the teachers implemented the programme. In this way, the aim of the DoBE at enabling the learners to benefit their lives with their knowledge could be realised. The NEP enhanced the teachers' skills in teaching nutrition and improved the teachers' and the learners', nutrition knowledge and attitudes. The findings emphasise the value of a contextualised NEP consisting of theory based NE materials for primary schools as recommended in the literature.

Key words: Context specific nutrition education, nutrition teaching skills, primary school teachers, nutrition knowledge, nutrition attitudes, dietary practices, Social cognitive theory, Meaningful learning model.

PUBLICATIONS AND PRESENTATIONS ARISING FROM THIS STUDY

PUBLICATIONS

Kupolati, MD, MacIntyre, UE & Gericke, GJ 2014, 'School-based nutrition education: features and challenges for success', *Nutrition and Food Science*, vol. 44. no. 6, Doi: http://dx.doi.org/10.1108/NFS-01-2014-0001.

Kupolati, MD, Gericke, GJ & MacIntyre, UE 2015, 'Teachers' perceptions of school nutrition education's influence on eating behaviours of learners in the Bronkhorstspruit District', *South African Journal of Education,* vol. 35, no. 2, pp. 1-10.

Kupolati, MD, Gericke, GJ, MacIntyre, UE, Ferreira, R, Fraser, W & Du Toit, P 2016, 'Nutrition education practices of primary school teachers in a resource-constrained community in Gauteng, South Africa', *Ecology of Food and Nutrition,*
Doi: http://dx.doi.org/10.1080/03670244.2016.1161615.

PRESENTATIONS

Kupolati, MD, Gericke, GJ & MacIntyre, UE 2014, Teachers' perspectives of the impact of school nutrition education on learners' eating behaviours – A qualitative exploration, poster presentation at the 25th Congress of the Nutrition Society of South Africa and the 13th Congress of the Association for Dietetics in South Africa, *South African Journal of Clinical Nutrition*, vol. 27, no. 3, pp. 145-181.

Kupolati, MD, MacIntyre, UE & Gericke, GJ 2014, Nutrition knowledge, attitudes and practices of learners and teachers in primary schools in Bronkhorstspruit, South Africa, oral presentation, at the 25th Congress of the Nutrition Society of South Africa and the 13th Congress of the Association for Dietetics in South Africa, *South African Journal of Clinical Nutrition*, vol. 27, no. 3, pp. 145-181.

Kupolati, MD, MacIntyre, UE & Gericke, GJ 2014, Promoting healthy eating among Grade five and six learners: a theory-based nutrition lesson plan template, poster presentation at the 25th Congress of the Nutrition Society of South Africa and the 13th Congress of the Association for Dietetics in South Africa, *South African Journal of Clinical Nutrition*, vol. 27, no. 3, pp. 145-181.

Kupolati, MD, MacIntyre, U & Gericke, G 2014, A cross-sectional comparison of nutrition knowledge, attitudes and dietary practices between learners and teachers in primary schools in a resource limited community in Bronkhorstspruit, South Africa, oral presentation at the Biological Congress 2013, *South African Journal of Science and Technology*, vol. 33, no. 1, pp. 1280, Doi: http://dx.doi.org/10.4102/satnt.v33i1.1280.

Kupolati, MD, MacIntyre, UE & Gericke, GJ 2015, Nutrition education practices of primary school teachers in the Bronkhorstspruit district, Gauteng: a cross-sectional survey, poster presentation at Faculty Day, Faculty of Health Sciences, University of Pretoria, 18 – 19 August 2015, Pretoria, South Africa.

Kupolati, MD, Gericke, GJ & MacIntyre, UE 2015, Contextual nutrition education materials for Grades 5 and 6 teachers in the Bronkhorstspruit district, oral presentation at Faculty Day, Faculty of Health Sciences, University of Pretoria, 18 – 19 August 2015, Pretoria, South Africa.

TABLE OF CONTENTS

PART II: EMPIRICAL INVESTIGATION

LIST OF APPENDICES

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

AHROP	Agency for Healthcare Research and Quality
ANOVA	Analysis of variance
BC	Behavioural capability
BMI	Body mass index
BML	Blooms mastery learning
CAPS	Curriculum and Assessment Policy Statement
CDC	Centre for Disease Control
CFS	Child friendly schools
DoBE	Department of Basic Education
DoE	Department of Education
DoH	Department of Health
DR	Dietary recall
ELT	Experiential learning theory
ESs	Educational strategies
EXP	Expectation
F&V	Fruits and vegetables
FAO	Food and Agriculture Organization
FFQ	Food frequency questionnaire
FGDs	Focus group discussions
FNS	Food and Nutrition Service
FU	Follow up
GDP	Gross Domestic Product
GFH	Goals for Health

GLS	Generalised least squares
HBM	Health belief model
HELIC	Health and Effective Lifestyle in Children
HPM	Health promotion model
IFNuW	Institute for Food Nutrition and Well-Being
INK	Integrate new with prior knowledge
INP	Integrated Nutrition programme
IPHR	Input Paper Health Roadmap
IRT	Institutional Research Theme
KAP	Knowledge, attitudes and dietary practices
LO	Life Orientation
LS	Life Skills
MLM	Meaningful learning model
NCS	National Curriculum Statement
nd	Not dated
NE	Nutrition education
NEP	Nutrition education programme
NSNP	National School Nutrition programme
NST	Natural Science and Technology
OL	Observational learning
PA	Physical activity
PPI	Pre- and Post-intervention
RPK	Relevant prior knowledge
SAFBDGs	South African Food-Based Dietary Guidelines

SCT	Social cognitive theory
SEF	Social ecological framework
SEM	Social ecological model
SMH	Social marketing for health
SMP	Social marketing principles
SRL	Self-regulated learning
TPB	Theory of planned behaviour
UNESCO	United Nations Educational Scientific and Cultural Organization
UNICEF	United Nations International Children Emergency Fund

CHAPTER 1

INTRODUCTION AND OUTLINE

1.1 BACKGROUND TO THE RESEARCH

Nutrition education programmes (NEP) are often used as a strategy for nutrition interventions towards improving nutrition knowledge, attitudes and practices, developing nutrition and health programmes, promoting healthy eating, and improving health and nutritional status (Shariff et al. 2008; Sherman & Muehlhoff 2007). Nutrition education (NE) aims to impart knowledge on healthy eating and nutrition behaviours that foster health and well-being by using a combination of educational strategies and environmental factors (Contento 2011; Perez–Rodrigo & Aranceta 2003). NE intervention is effective in addressing malnutrition of varying degrees in children (McNulty 2013). Malnutrition is a sub-acute or chronic state of nutrition in which a combination of varying degree of over-nutrition or under-nutrition has led to a change in body composition and its diminished function (American Society for Parenteral and Enteral Nutrition 2009).

Malnutrition poses a serious challenge to the nutritional well-being of children in developing nations. The main nutritional problems are wasting, stunting, underweight, overweight and micronutrient deficiencies (World Health Organization (WHO) 2009). South Africa is faced with a double burden of malnutrition (co-existence of under-nutrition and overweight/obesity). The prevalences of stunting and overweight/obesity among 10 to 12 year old school children in the Western Cape were found to be 19% and 21% respectively and those of overweight and obesity in children aged ten to 14 years nationally to be 7.5% and 2.7% for males and 16.7% and 5.6% for females (Shisana et al. 2013; Abrahams et al. 2011). Studies have revealed restricted and poor food choices and intake (19% not taking breakfast at home) in some regions in South Africa resulting in children consuming less than 30% of their daily requirement of nutrients (Shisana et al. 2013; Napier & Oldewage-Theron 2005; Oldewage-Theron et al. 2005). Some of the reasons for this are a lack of nutrition education and unhealthy and poor eating practices which parents often pass down to their children (Shisana et al. 2013).

Malnutrition is also an impediment to mental and psychomotor development in children and to productivity, economic growth and poverty eradication (Steyn et al. 2006; United Nations

Millennium Project 2005). The Millennium Development Goals 1 and 4 were directly related to the eradication of hunger and malnutrition. The goals included eradicating extreme poverty and hunger and reducing child mortality rates (Hulme & Scott 2010).

The key problem with respect to the nutrition situation in South Africa is a big gap between knowledge and application (Input Paper for Health Roadmap (IPHR) 2008). Interventions have been directed towards nutrition issues in school children in developing nations, with the focus on direct interventions such as school feeding, micronutrient supplementation and treatment for helminth infestations, while efforts directed on intervention through NE has been marginal (Drake et al. 2002). There is, however, a growing body of research towards NE interventions to improve school children's dietary intake, nutrition knowledge, attitudes and practices and the methods of nutrition education delivery (Oldewage-Theron & Napier 2011; Oosthuizen, Oldewage-Theron & Napier 2011; Shariff et al. 2008; Walsh, Dannhauser & Joubert 2003).

This study was part of a larger study, "Schools as sites for social change: Facilitating adjusted behaviour in resource-constrained communities by empowering children". The study was under Theme D of the Institutional Research Theme (IRT) of the University of Pretoria, known as the Institute of Food, Nutrition and Well-being (IFNuW). The IFNuW seeks to address the emerging societal challenges of food insecurity, nutrition deficiencies and hunger in Africa. Theme D of IFNuW has the focus of facilitating behaviour change through communicating nutrition and health messages, increasing knowledge and facilitating change in attitudes. It also focuses on raising awareness and educating people on health promoting messages, enhancing social responsible food consumption and social change, and assessing the impact of health promotion programmes over time. Theme D is of the view that prevention, rather than management of disease conditions, is a more effective strategy in addressing malnutrition and diseases of the lifestyle. To this end therefore, appropriate and culturally accepted interventions are to be developed aiming at facilitating behaviour change.

This study sought to address the focus on facilitating behaviour change through communicating nutrition messages by developing and implementing a contextual nutrition education programme (NEP) for primary school teachers and learners.

1.2 PROBLEM STATEMENT

Lack of effective NE in schools is reflected by the low level of nutrition knowledge, attitudes and practices resulting in compromised nutritional status among pupils (Lakshman et al. 2010). NE is one of the most enduring, effective and economic interventions and one in which schools have the biggest role to play but has unfortunately been neglected (Food and Agriculture Organization (FAO) 2005). The compounded ill effect of malnutrition in children is inevitable, resulting in low cognitive and psychomotor and eventually low academic performances (Van Cauwenberghe et al. 2010). Teachers are an integral part of the school environment which has an important environmental influence on the dietary behaviour of learners. It is therefore important to ascertain teachers' nutrition knowledge, attitudes and practices. Little nutrition knowledge and low ratings in nutrition attitudes and practice assessments on the part of teachers may transmit unhealthy nutrition behaviours to learners (Senekal et al. 2015; Dalais et al. 2014; Rafiroiu & Evans 2005).

Food and nutrition are taught as an integral part of the Life Skills (LS) and Natural Science and Technology (NST) subjects in South African primary schools (United Nations Integrated Children's Emergency Fund (UNICEF) 2008). Appropriate NE materials for teachers are often lacking, as revealed in a pilot study to identify the nutrition education practices and needs in the Vaal region. "No NE resources or tools were available and most of the teachers recommended the use of these (The ones developed by the referenced authors) as appropriate educational tools for primary school children in all Grades where English is the medium of instruction" (Oldewage-Theron & Napier 2011, p. 285). The critical problems identified from the literature are:

- The change agents (teachers) may not be effectively equipped to the extent of imparting desirable nutrition behaviour change (Oldewage-Theron & Napier 2011). Therefore, there was a need for an intervention to improve the nutrition knowledge and dietary intake among primary school educators (Senekal et al. 2015; Dalais et al. 2014).
- NE has not been incorporated into the teaching programmes as a subject in public primary schools. Topics in food are taught in other subjects (UNICEF 2008; Department of Basic Education (DoBE) 2011a; DoBE 2011b) which may be inadequate to impart NE (Nguyen et al. 2013).
- There appears to be a lack of NE materials for teachers and learners (Oldewage-Theron & Napier 2011).

- The role of teachers as an important environmental influence on learners' nutrition behaviour is yet to be fully explored (Senekal et al. 2015; Rafiroiu & Evans 2005).
- Findings from the HealthKick programme, a school based multicomponent intervention in Western Cape which aimed at promoting healthy eating, revealed important issues around NE intervention in schools, some of which were:
    - Unhealthy eating was a major aspect of concern among learners from limited resource settings (De Villiers et al. 2012, Steyn et al. 2015).
    - A need for an appropriate educational strategy that fits into the school curriculum (Hill et al. 2015).
    - A need for an effective approach to communicate nutrition messages to learners from low economic backgrounds (Steyn et al. 2015).
    - Capacity development to equip teachers as implementers of school based interventions was a challenge (Draper et al. 2010).
    - Greater support from the DoBE and buy-in from the schools were vital to the success of school based NE interventions (De Villiers et al. 2015).

1.2.1 Research problem

The identified problem which the research sought to address was that the inappropriate approach to school NE, which is expressed in unsuitable educational strategies, ill-equipped teachers in nutrition and inadequate instructional materials, weakens the influence of NE.

NE is taught in public schools with the focus on knowledge for school performance, rather than with a motivation towards nurturing nutrition behaviours that are consistent with health and well-being. Thus the potential influence of the school environment in shaping desirable nutrition attitudes and practices among learners was not realised (Lakshman et al. 2010; Panunzio et al. 2007; Rafiroiu & Evans 2005). There is therefore a need to establish whether a context specific, enhanced curriculum approach NEP for teachers could achieve effective teaching of nutrition and promote healthy eating among learners. The enhanced curriculum approach is a theory-based nutrition education plan based on the nutrition topics in the existing nutrition curriculum of the DoBE (Dudley, Cotton & Peralta 2015).

1.3 AIM OF THE STUDY

The aim of the study was to develop, implement and evaluate a context specific NEP for primary school teachers in the Bronkhorstspruit area in order to improve skills to teach nutrition towards enhancing the nutrition knowledge, attitudes and dietary practices of the teachers and the learners.

1.4 JUSTIFICATION FOR THE STUDY

There is a growing body of knowledge which supports school-based NE as an effective intervention to improve and maintain the nutritional status and health of learners (Hildebrand, Jacob & Garraid-Foster 2012; Oosthuizen, Oldewage-Theron & Napier 2011; Blom-Hoffman et al. 2004). It has also been established that effective interventions should be based not only on a preliminary assessment of nutritional status, knowledge, attitudes and practices, but also on other environmental factors that relate to a child's food behaviours and food environment. These include the school environment, household food security, family food values and beliefs, government policies, to mention a few (Shariff et al. 2008; Sherman & Muehlhoff 2007; Rafiroiu & Evans 2005). Though many previous studies have shown that the school environment is a good platform to promote and support the development of healthy dietary behaviours (Hildebrand, Jacob & Garraid-Foster 2012; Oosthuizen, Oldewage-Theron & Napier 2011; Blom-Hoffman et al. 2004), few have investigated teachers' direct role on learners' dietary behaviours (Rosario et al. 2012; Panunzio et al. 2007; Rafiroiu & Evans 2005; Olivares et al. 2004).

In South Africa, few studies have directly included teachers' involvement in school-based NE. These studies addressed areas such as the reduction of diabetes risk, promoting healthy eating habits in children, their parents and teachers, impact of NEP, implementing the food-based dietary guidelines, and nutrition and physical activity knowledge (De Villiers 2015; Hill et al. 2015; Steyn et al. 2015; Dalais et al. 2014; Nguyen et al. 2013; Oldewage-Theron & Egal 2012; Draper et al. 2010). Few NE studies in South Africa have looked into targeting an intervention at teachers in order to influence the dietary behaviours of learners. School children between the ages of ten and 12 years present a window of opportunity to influence the dietary behaviours of the next generation of adolescents and adults (Lakshman et al. 2010). Eating habits that children adopt often continue into adulthood (Van Cauwenberghe et al. 2010).

Effective NE through the school system is a viable strategy to reduce malnutrition, to which the World Bank (2006) attributes a loss of as much as 2-3% of a country's Gross Domestic Product (GDP). Assessing the cost benefit of NE for participants, the benefit of not less than USD3.67 (Block-Jay et al. 2006) and up to USD10 (Rajopal et al. 2003) for every dollar cost have been documented. In Steyn et al.'s (2009) review of school-based nutrition education interventions globally, it was revealed that a school-based nutrition curriculum implemented by trained teachers generally improved behavioural outcomes. As teachers have regular contact with learners, they have great influence on learners' nutrition behaviour as change agents (Rafiroiu & Evans 2005).

1.5 ORGANISATION OF THE THESIS

Chapter 1

This chapter presents the background information on school-based NE with a particular reference to the position and role of teachers in school-based nutrition interventions. Against this background, the research problem and aim of the study were stated; this was followed by the justification for the study. The references for this chapter are presented together with the references of chapter 2 at the end of chapter 2.

Chapter 2

This chapter presents the review of the literature in respect of the main thrusts of the research. The following aspects were included in the review: Importance of a school-based NE, curriculum development in NE, the concept and principles of school-based NE, learning theories, the teacher's role in school-based NE, environmental influences on school based NE, and designing theory-based NE. The references of chapter 1 and chapter 2 appear at the end of this chapter.

Chapter 3

In this chapter, an overview of the study and the three phases through which the study was conducted are presented. The detailed description of the study design is presented and includes the study population and sampling procedure, inclusion and exclusion criteria, data collection procedures, data analyses, conceptual definition of terms and ethical considerations. A reference list for this chapter is presented at the end of the chapter.

Chapter 4

This chapter reports phase 1 of this study which was the needs assessment conducted by using both qualitative and quantitative research methods. The results, discussion and conclusions of the needs assessment are presented. The references for the chapter appear at the end.

Chapter 5

This chapter presents phase 2 of the study which was the development of a context specific NEP by using the results of phase 1 and information from the literature. A reference list for this chapter is presented at the end of the chapter.

Chapter 6

This chapter presents the aim, objectives and methodology for phase 3 which was the implementation and evaluation phase of the NEP. The references for this chapter appear at the end of chapter 8.

Chapter 7

In this chapter, the results of phase 3 (the implementation and evaluation of the NEP) are presented. The references for this chapter appear at the end of chapter 8.

Chapter 8

This chapter presents the discussion, conclusions and recommendations of phase 3. The references of chapter 6, 7 and 8 are presented at the end of this chapter.

Chapter 9

In this chapter, the executive summary, conclusions and recommendations for the entire study are presented. The reference list for this chapter is presented at the end of the chapter.

The Monash – Harvard referencing 2012, accessed from the University of Pretoria Library website, was used in this study.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

NE in the context of the school environment has received considerable research attention, and as an intervention strategy has witnessed a gradual change from knowledge orientation to behavioural orientation (Contento, Randel & Basch 2002). However, research results have shown that adequate nutrition knowledge and attitudes do not necessarily translate to practice. NE intervention that has a positive impact on behaviour and not just on knowledge and attitudes is most beneficial and is considered effective (FAO 2005; Drake et al. 2002). Such an intervention depends on social and interpersonal interaction with the participants in order to provide the opportunity to practise the new behaviours. The question as to whether NE should be mainly concerned with those populations at risk or already suffering from malnutrition, or whether efforts should be more on preventing malnutrition and sustaining good nutritional health, has often been raised. While explanations support both views, they favour the allocation of resources to school-based NEPs which tend to create a more nutritionally literate future generation (FAO, 2005).

The aim of the literature review is to present a synopsis (Shuttleworth 2009) of school-based NE in order to expand upon the reasons behind selecting the focus of this study (Fink 2009). It also aims to present established knowledge and ideas including their strengths and weaknesses (Steyn et al. 2009) on school-based NE intervention. Therefore, this literature review is organised around teacher oriented school-based NE interventions.

2.2 IMPORTANCE OF SCHOOL-BASED NUTRITION EDUCATION

In general, NE helps to develop wholesome attitudes towards food, to cultivate good food habits, and to enable families and individuals to obtain nutritionally adequate diets through improved methods of food production, preparation and preservation (Perez-Rodigo & Aranceta 2003). The emphasis in NE should be on the use and application of knowledge and not on acquisition only. Effective school-based NE results in the nutritional well-being of not only the children who are

instructed in school, but also of the adults and the members in the community (Preventive Institute, 2012). Malnutrition caused by deficiencies of micronutrients, protein and energy, and also excess energy intake resulting in overweight/obesity can be prevented and controlled through effective NE. Physical and mental development of individuals through the choice of nutritious food are promoted and people are encouraged to use their money on more nutritious food. School NE can lead to improving the family diets through nutrition messages brought home by the learners (Vereecken, Van-Danme & Maes 2005; Contento, Randel & Basch 2002). In addition, NE enables the school child and his family to acquire simple but accurate knowledge about food and health, to reject false beliefs about food, to accept food habits compatible with normal growth, to understand and acquire the skills of obtaining an adequate diet from locally available foods and to acquire knowledge and practice of food production and preservation. The importance of NE for school age children produces fundamental changes in food habits at an early age, and it will go on to increase their ability to practice healthy eating in later years. Moreover, children present the most serious malnutrition problems and interestingly they are also the most receptive to the acquisition of good food habits. Interventions which aim at empowering children for healthy eating are invaluable. Interventions should be directed at promoting changes in the food habits of parents and guardians in order to achieve holistic impact and to prevent out-of-school influences which can undermine the results obtained at the school (Savage, Fisher & Birch 2007; Drake et al. 2002).

Various aspects of NE interventions involving teachers have been investigated with variable outcomes (Dudley, Cotton & Peralta 2015; Contento 2011; Perez-Rodrigo & Aranceta 2003). They included, but were not limited to the following:

Teachers' direct involvement

- Teachers' nutrition knowledge and attitudes assessment: Teachers' nutrition knowledge levels were fair and attitudes were positive (Rafiroiu & Evans 2005).
- School food practices of teachers: Nutrition knowledge, attitudes and behaviour of teachers and prospective teachers could be barriers to promoting healthy food habits among learners (Senekal et al. 2015; Rossiter et al. 2007).
- Impact of trained teachers: Intervention by trained teachers increased fruit and vegetable consumption among learners. An intervention by trained teachers was showed to be

superior to the intervention by nutritionists in a study aimed at increasing consumption of fruit and vegetable, legumes, and reducing overweight and obesity (Rosario et al. 2012; Panunzio et al. 2007).

- Nutrition knowledge of Life Orientation (LO) educators: Nutrition knowledge of life orientation educators was reported not to be optimal in a study. However, a significant improvement in nutrition knowledge of the educators was shown after a NE intervention (Oldewage-Theron & Egal 2012).

Fruit and vegetable intake and physical activity

- Psychosocial assessment of the intake of fruit and vegetable: Intervention led to improvement in learners' fruits and vegetables intake at school with preferences for certain fruits (He et al. 2009).
- Encouragement of healthy attitudes toward physical activity and healthy nutrition behaviours: Intervention impacted positively on children's health by increasing physical activity and healthy nutrition behaviours (Breslin & Brennan 2012).
- Attitudes, beliefs and behaviours towards fruit and vegetable intake: A significant change in teachers' influence on learners' attitudes to fruits and vegetables was recorded in a hybrid approach of NE intervention. The hybrid model was adjudged to accurately reflect the implementation of school-based NE interventions over the theory driven or the observational techniques (Prelip et al. 2011).

Non-communicable diseases

- Reduction of diabetes risk factors in children through NE and physical activity: The role of educators in the success of intervention was identified to be of great importance, but capacity development among teachers was a challenge (Draper et al. 2010).
- Effect of NE on overweight/obesity and food intake: Significant improvements in dietary intake were observed among learners but with little or no significant changes in body mass index (BMI) (Lien et al. 2010; Fernandes et al. 2009).
- NE and heart healthy nutrition: NE intervention was shown to improve cardiovascular health and to reduce future risk of diseases of the lifestyle among learners (Slawta & DeNeui 2010).

Nutrition knowledge and academic performance

- Improvement in nutrition knowledge, attitudes and behaviours: General improvement in learners' nutrition knowledge was reported in a NE intervention with reduced intake of fried foods and improved ability to identify healthy foods from labels as the focus (Katz et al. 2011; Francis, Nichols & Dalrymple 2010; Shi-Chang et al. 2004).
- NE and learners' academic performance: NE intervention resulted in improved academic performance in a study that measured achievement of academic standards in Mathematics and English (Shilts et al. 2009).

It is evident from the above-mentioned studies (and many sited elsewhere in this review) that school based NE has received much research attention especially in the developed nations. However, the important role of teachers in influencing nutrition behaviours of learners has not been thoroughly investigated. The fact that teachers' influence may impact negatively (Rosario et al. 2012; Rafiroiu & Evans 2005) and positively (Rossiter et al. 2007; Panunzio et al. 2007) on the nutrition behaviours of learners has been established.

2.3 NUTRITION EDUCATION CURRICULUM DEVELOPMENT

Specific guidelines characterise the basic fundamentals of curriculum development for NE, and define the ultimate goals to be achieved. NE curricula are often developed against the background of identified needs. A NE curriculum (FAO 2006) was developed against the background that many developing countries do not offer NE in schools and where they do, focuses are on increasing learners' knowledge of good nutrition with less emphasis on motivation and establishment of good eating practices. The desire to improve school children's attendance and attention in class and to develop a lifelong healthy eating patterns among school age children, motivated curriculum development for NE in some sectors (Appleby 2009; Centers for Disease and Control (CDC) 1996; Contento, Keilly & Corcoran1992).

The California State Department of Education designed a NE curriculum based on the development of teaching modules on nutrition knowledge and food use (California State Department of Education 1981). Likewise, the FAO designed a NE curriculum for primary schools based on a tripartite approach, involving families, community and the school

environment (FAO 2006). Others were based on theory of behaviours and learning such as the Social cognitive theory (Morris, Briggs & Zidenberg-Cherr 2002), and the Kolb learning model (Fornari 2006). Curriculum contents were often developed in line with desired goals and sometimes accompanied by other components such as gardening and physical activity (Morris & Zidenberg-Cherr 2002). The development of Food-Based Dietary Guidelines for South Africa by Voster, Love & Browne (2001) is not essentially a NE curriculum for children. However, it features the South African Food-Based Dietary Guidelines (SAFBDGs) that formed a major part of the nutrition topic for Grade 5 in the DoBE curriculum (DoBE 2011a). Curriculum facilitators were mostly teachers, head-teachers and nutrition experts. In some cases, inputs from professionals were obtained from other disciplines as is the case with Oldewage-Theron and Napier (2011), and Contento and Morin (1988), where graphic designers were involved. A summary of some guidelines for curriculum development for NE implementation in South Africa and other parts of the world is presented in table 2.1.

Table 2.1: A summary of nutrition education curriculum development and facilitation approaches

Author, year and title	Target	Guidelines for curricula development	Contents	Facilitators	Background
South Africa					
Voster, Love & Browne 2001, Development of Food-Based Dietary Guidelines for South Africa – the process	Age five years and above	Based on the existing consumption of locally available foods and aimed to address the identified nutrition-related public health problems	Ten items: Enjoy a variety of foods; be active; make starchy foods the basis of most meals; eat plenty of vegetables and fruit; eat dry beans, lentils, and soya often; meat, fish, chicken, milk, and eggs can be eaten daily; eat fats sparingly; drink lots of clean water	Nutritionists, dietitians and nutrition volunteers	The need to develop a positive, practical, affordable, sustainable and culturally sensible guide to help South Africans over the age of 5 years to choose an adequate but prudent diet.
The Valley Trust 2004, School nutrition education programme	Learners in Grade R to Grade 6	Guidelines in line with the Revised National Curriculum Statement of 2001	Basic nutrition information. Teaching modules consisted of learning areas, learning outcomes and assessment standards	Primary school teachers	A means of meeting NE needs in primary schools and to maximise the link between health and education
Oldewage-Theron & Napier 2011, Nutrition education tools for primary school children in the Vaal region	Primary school learners	FAO's guidelines which provided a logical development process on scientific principles of the SAFBDGs	Board and card games and food puzzle. Teacher resource book for classroom instructions and activities	Registered nutritionists, dietitians	Tools for nutrition education needed to be developed to enhance children's learning as part of the implementation of NEP for primary schools in the Vaal region
De villiers et al. 2015, Implementation of the Health-Kick intervention in primary schools in low-income settings in Western Cape	Educators, parents and learners	Action Planning Process (APP) was used to identify specific priorities regarding nutrition and physical activity	Educator's manual comprising booklets for APP action areas, the SAFBDGs and posters. Curriculum support manual and physical activity equipment	Educators	Unhealthy eating and physical inactivity among learners in South Africa presented an emerging public health challenge

Abbreviations: FAO – Food and Agriculture Organization, NEP – Nutrition education programme, SAFBDGs – South African Food-Based dietary Guidelines.

Continued/…….

Table 2.1: A summary of nutrition education curriculum development and facilitation approaches continued

Author, year and title	Target	Guidelines for curricula development	Contents	Facilitators	Background
Others					
Contento, Keilly & Corcoran 1992, Changing the course of nutrition education curriculum	Elementary schools	Curriculum was developed to be behaviourally oriented and activity based	Not indicated	Class teachers	A formative education conducted on elementary students revealed the need for an improvement in food behaviours
CDC 1996, Guidelines for school health programs to promote lifelong healthy eating.	School age children and adolescents	Based on the guidelines: to eat a variety of foods; balance food eaten with activity; choose diets with plenty of grains; fruits and vegetables; choose diets low in fats; choose diets with moderate sugar and moderate salt	Health education, counselling, physical education, nutrition services	Class teachers with nutrition training	Young persons need NE to help them develop lifelong eating patterns consistent with the dietary guidelines for Americans
Morris, Briggs & Zidenberg-Cherr 2002, Development and evaluation of a garden-enhanced nutrition education curriculum for elementary school children	Fourth Grade learners	Based on the theoretical framework of the Social cognitive theory comprising of 3 inter-related factors: the individual, the environment and behaviour, taking the advantage of the impact of the environment on the children's ability to learn new behaviour	Nutrition lessons: plant parts, nutrient classes, food guide pyramid, serving sizes, the food label, physical activity, goal setting, and healthy snack making. Gardening activities: indoor seed planting, outdoor seed planting, weed identification, water and fertilizer, and crop harvesting	Local master gardeners, nutrition experts and the researcher who developed all nutrition lessons	Relating nutrition to agriculture was not properly established in nutrition education

Abbreviation: CDC – Centers for disease control.

Continued/…….

Table 2.1: A summary of nutrition education curriculum development and facilitation approaches continued

Author, year and title	Target	Guidelines for curricula development	Contents	Facilitators	Background
FAO 2006, Nutrition education in Primary schools: A planning guide for curriculum development	Primary schools learners	Based on tripartite approach involving families, communities, school environment and the classroom. Developed to impart knowledge, attitudes and habits, practical and life skills	Nutrition topics: Need for food, nutrients and their functions, composing mixed and balanced diets, food need of different ages, meeting dietary needs of school children, malnutrition and its causes, recognising signs of malnutrition and more. Topics were followed with activities sessions	Nutritionists, teachers, head-teachers and council members	Many schools did not offer NE and where it is offered, it often focused on increasing learners' knowledge of good nutrition, with less emphasis on motivation and establishment of good eating practices
Appleby 2009, Guidelines to support healthy eating environments in New Zealand. Early childhood educator services	Students and teachers	Guidelines were designed based on the food and beverage classification system. This system helped early childhood education services and schools make decisions about the healthy foods and beverages they provided	Relationship between food factors and well-being. Skills to manage change, overcoming barriers, influences on food choices and responsibility to bring about change	Teachers, all food personnel and all administrative staff in the school	As a feedback on the Early Childhood Education Service, teachers reported improvement in children's attendance, attention, behaviours and levels of concentration where healthy eating has become accepted and practised

Abbreviations: FAO – Food and Agriculture Organization, NE – Nutrition education.

2.3.1 Nutrition content in the National Curriculum Statement - Curriculum and Assessment Policy Statement 2011 for Grades 4 – 6 in South Africa

The National Curriculum Statement (NCS) was built on the values of the South African constitution, which among others aim to improve the quality of life of all citizens and free the potential of each person. It provides clarification of what is to be taught and learnt on a term by term basis (DoBE 2011a). This is in consonant with the UNICEF Child Friendly School policy (CFS). UNICEF CFS is a means to advocate for and promote quality education for every child, and help children achieve safe, healthy and protective environments which meet their specific needs (UNICEF 2012). The UNICEF's framework for CFS has the following components, among others:

- The school is a significant personal and social environment in the lives of learners, and the CFS ensures that every child is physically safe, emotionally secured and psychologically enabled.
- Teachers are an important factor in creating an effective and inclusive programme, and therefore, teachers' capacity, morale and commitment must be enhanced.
- Children are helped to learn what they would need to learn to face challenges and enhance their lives, health and well-being.

The DoBE NCS is divided into in two parts: Curriculum and Assessment Policy Statement (CAPS) Life skills and CAPS Natural Sciences and Technology. Subjects for the intermediate school (Grades 4 to 6) include Life Skills, Social Sciences, Home Language, Mathematics, First Additional Language, and Natural Sciences and Technology.

The Life Skills curriculum is made up of three study areas, which are:

i. Personal and social well-being. This study area is divided into:
    a. Development of the self.
    b. Health and environmental responsibility.
    c. Social responsibility.
ii. Physical education.
iii. Creative arts.

Nutrition topics, and other topics not related to nutrition, are taught in the Health and Environmental Responsibility study area.

The Natural Science and Technology curriculum is categorised into a Natural Science strand and a Technology strand. Natural Science strand has the following study areas:

i. Planet and earth beyond
ii. Energy and change
iii. Matter and materials
iv. Life and living

Technology strand has the following study areas:

i. Structures
ii. Processing
iii. System control

Nutrition topics are treated under the study areas of Life and Living and Processing in Grade 6 (DoBE 2011a; DoBE 2011b). The nutrition topics and the contents with the allotted number of hours they are taught in Grades 4 to 6 are summarised in table 2.2.

Table 2.2: Summary of nutrition topics and contents in the National Curriculum Statement (NCS) (Grades 4 to 6)

Grades	Nutrition topics	Subject area	School terms in which topics are taught	Hours allocated/year
Grade 4	**Dietary habits of children** • Impact on dental and oral hygiene • Reading about dietary habits of children	Life Skills	Term 4	3
Grade 5	**Healthy eating for children** • South African Food-Based Dietary Guidelines • Dietary needs of children • Factors influencing food intake of children • Reading about healthy eating for children	Life Skills	Term 3	3
Grade 6	**Nutrients in food** Food groups • Grouping of food into: - Foods for energy – carbohydrates - Foods for growth and repair – proteins - Foods for storing energy (in the form of body fats), fats and oils - Foods for building bones and teeth, and maintaining a healthy immune system - vitamins and minerals • Most natural foods contain a mixture of more than one nutrient group • Most processed (manufactured) foods have added salt, sugar, preservatives, flavourings and colourings	Natural Science and Technology	Term 1	5¼

Sources: DoBE 2011a; DoBE 2011b.

Continued/…….

Table 2.2: Summary of nutrition topics and contents in the National Curriculum Statement (NCS) (Grades 4 to 6) continued

Grades	Nutrition topics	Subject area	School terms in which topics are taught	Hours allocated/year
Grade 6	**Nutrients in food continued** **Suggested activities** • Sorting foods into the four different nutrient groups - Carbohydrates in foods such as bread, sugar, mealie meal, potato, rice, pasta - Proteins in foods such as eggs, beans, meat, fish, cheese - Fats and oils in foods such as margarine, cooking oil, butter - Vitamins and minerals in foods such as fresh fruits and vegetables, milk (source of calcium) - Reading labels on food packaging to look for the nutrients and/or the additives in the food			
Grade 6	**Nutrition** • Balanced diets - Diet refers to the selection of foods we eat everyday - Balanced diet contains sufficient quantities of food from all four nutrient groups, as well as water and fibre • Some diseases can be related to diet **Suggested activities** - Evaluating a given diet to determine if it contains food from all nutrient groups - Finding out about a disease that could be diet related, such as tooth decay, obesity and deficiency diseases	Natural Science and Technology	Term 1	5¼

Sources: DoBE 2011a; DoBE 2011b

Continued/…….

Table 2.2: Summary of nutrition topics and contents in the National Curriculum Statement (NCS) (Grades 4 to 6) continued

Grades	Nutrition topics	Subject area	School terms in which topics are taught	Hours allocated/year
Grade 6	**Food processing** • Need for processing food - To make it edible (preparing, cooking) - To make it last longer (preserving) - To improve its nutrient value (fermenting) • During processing many foods may lose some of their nutrients • Methods for processing food There are many different methods (ways) to process food **Suggested activities** - Researching how to process food (raw material) by combining, cooking, freezing, pickling, fermenting, drying and salting to make a product - Indigenous ways of processing of food in different communities - Choosing a food and processing it in some way	Natural Science and Technology	Term 1	8¾
Grade 6	**Food hygiene** • Safe and harmful ingredients • Food preparation • Food storage • Food-borne diseases **Suggested activities** - Reading about food hygiene interpreting, explaining and relating what has been studied	Life Skills	Term 4	4½

Sources: DoBE 2011a; DoBE 2011b

2.4 PRINCIPLES AND CONCEPTS OF SCHOOL-BASED NUTRITION EDUCATION

Three basic principles have been distinguished in the application of NE in primary schools: Acquisition and application of nutrition knowledge to daily living; development of positive attitudes and values to food; and the formation of good habits relating to skills in food production, selection, preparation and preservation (PI 2012). These principles are used to modify learners' food behaviours. Important motivation strategies that have been identified by children in relation to good foods can be applied. Some of these are the desire to grow in stature, to be energetic and lively, to feel well, to look attractive, to perform creditably on the playing field, to do well in studies and to be socially acceptable (Perez-Rodrigo et al. 2003; Ammerman, Lindguist & Lohn 2002).

Strategies relevant to behavioural focus and behavioural change are rooted in theories. The behavioural change approach is generally based on the assumptions that individuals have a great deal of influence over their personal decisions and actions, and these changes can be capitalised upon to bring about desirable change in nutrition and health outcomes (Contento 2011). The use of theories on behaviours and learning such as the Social cognitive theory (SCT), Social marketing theory, Theory of planned behaviour (TPB), and Health belief model (HBM) has characterised the implementation of successful school-based NE interventions (Kupolati, MacIntyre & Gericke 2014; Draper et al. 2010; Steyn et al. 2009). However, the most frequently used theory is the SCT (Dudley, Cotton & Peralta 2015). Unhealthy behaviours are considered behavioural risk factors. Health promotion and NE often consist of intervention strategies to alter behavioural risk factors (Contento 2011). Enhancement of knowledge and the ability to make informed choices are vital in NE.

2.4.1 Learning theories

Learning is a change in a person as a result of an experience or the interaction of a person with his or her environment (Holli et al. 2009). It is an "ordering change in behaviour or in the capacity to behave in a given fashion, which results from practice or other forms of experience" (Schunk 2012, p. 3). In summary, learning involves the processes of acquiring and modifying knowledge, skills, strategies, attitudes and behaviours. Learning is a product of a process which theories seek to explain.

A theory is described as a conceptual model or a mental map which is used to represent how mediators influence behaviour change (Contento 2011). The importance of theory to NE entails that: (i) it provides a mental map of why and how behaviour occurs which helps nutrition educators to identify mediators of behaviour change that should be addressed in a NE intervention; (ii) it specifies the information that needs to be gathered; (iii) it guides the design of the intervention components and educational strategies in order to reach the audience more effectively; and (iv) it provides guidance on how to evaluate the impact of the intervention (Contento 2011; Holli et al. 2009). NE makes room for the acquisition of nutrition knowledge for a desirable change in behaviour.

The foundation for effective NE is based on theory, as the proper application of theory enhances the planning, implementation and evaluation of education interventions. The effective use of theory helps people to make changes in their eating practices and to have control over environmental influences (Holli et al. 2009).

The commonly used theories in school-based NE include the SCT, TPB, the HBM, the Social ecological model (SEM), the Meaningful learning model (MLM) and the Experiential learning theory (ELT). These theories and their application in school-based NE are explained in sections 2.4.1.1 to 2.4.1.6

2.4.1.1 Social cognitive theory

The SCT is a learning theory which posits that a change in behaviour occurs by watching others and the reinforcement or punishment associated with these actions (Bandura 2001). The theory explains how people acquire and maintain behavioural patterns, while providing a basis for intervention strategies. The SCT is widely used to design, implement and evaluate programmes, and is known to help learners increase knowledge, build skills and set behavioural goals (Glanz, Rimer & Lewis 2002). Basic concepts of the SCT according to Glanz, Rimer and Lewis (2002) are:

i. Environment: These are factors external to the person and are capable of providing opportunity and support.
ii. Situation: This is the way in which the person perceives the environment. The ideal is to correct misperceptions of the environment and to promote healthy practices.

iii. Behavioural capability: This is the knowledge and skills to perform a given behaviour. The action is to help learners to develop skills.

iv. Expectation: This is to anticipate outcomes of behaviour. This is done by modelling positive outcomes of healthy eating behaviours.

v. Self-control: Personal regulation of goal-directed behaviour. This is facilitated by providing opportunities for self-monitoring, goal setting, problem solving and self-reward.

vi. Observational learning: Acquisition of behaviour that occurs by watching the actions and outcomes of others' behaviour. This is facilitated by including a credible role model of the targeted behaviour.

vii. Reinforcements: These are the responses to a person's behaviour that increase or decrease the likelihood of reoccurrence. This is done through provision of self-initiated rewards and incentives.

viii. Self-efficacy: The person's confidence in his ability to perform a particular behaviour. This is done by approaching behavioural change in small steps to ensure success.

ix. Reciprocal determinism: The dynamic interaction between the person, the behaviour and the environment in which the behaviour is performed. This is done by considering multiple avenues to behavioural change, including environmental, skill and personal change.

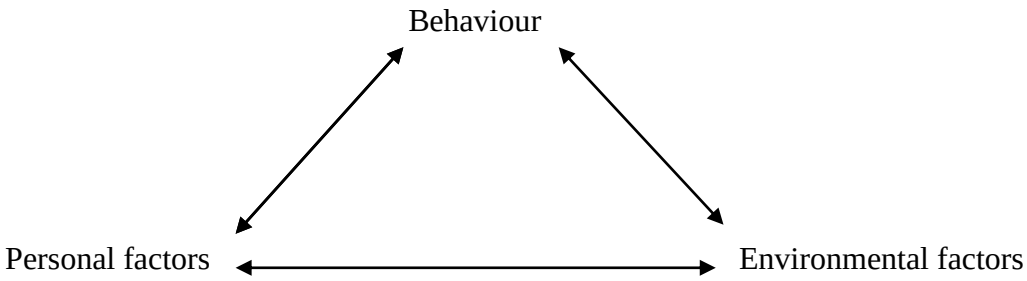


Figure 2.1: Conceptual model of social cognitive theory (Bandura 2001)

According to Schunk (2012), the triad model (figure 2.1) does not mean that the directions of the influence are always the same. Directions may change at any given time, for example, when environmental influences are weak, personal factors predominate, and environmental influences may dictate personal factors and hence the behaviours. He further explained how learners' behaviour and the classroom environment influence one another in many ways. As the teacher presents lessons to the class, learners try to assimilate what the teacher is teaching

(environment influences cognition, a personal factor). Learners who have questions indicate to ask (cognition influences behaviour). The teacher answers the question (behaviour influences environment). Merrell (2008) further confirmed the fact that the social cognitive view point supports a conception of the causes of human behaviour to be due to reciprocal determinism, also known as triadic reciprocality. Behaviour, environmental influences and various personal factors (such as cognition and temperament) all work together in an interactive way and have the effect of acting as determinants of each other.

2.4.1.2 Theory of planned behaviour

The TPB posits that peoples' intention to perform a given behaviour is determined by their attitudes (values placed on the outcomes of the behaviour) in performing the behaviour and their conviction of what relevant others believe should be done (McKenzie, Neiger & Smeltzer 2005). Another determinant of intention to perform a given behaviour in the TPB is the perceived behavioural control (PBC). The PBC explains the extent to which people believe they can accomplish a given behaviour, if they are intending to do so (Ajzen 2012). Hence, the more favourable the attitude to the outcome of performing the behaviour and the greater the perceived belief of control, the more the likelihood is that the individual intends to perform the behaviour (McKenzie, Neiger & Smeltzer 2005).

The TPB has been used in school-based NE intervention programmes with positive outcomes such as improvement in learners' attitudes towards fruits and vegetables, and knowledge of the relationship of diet related heart diseases with fruit and vegetable intake (Prelip et al. 2011; Anderson et al. 2005).

2.4.1.3 Health belief model

The HBM postulates that peoples' behaviour can be predicted by their perceptions of the following variables: (i) their susceptibility to a particular negative healthy outcome, (ii) the personal benefits in taking the action, the stronger the perception of the negative outcome the more motivated they will be to take action to avoid the negative outcome, (iii) the action will produce strong positive outcomes and prevent negative outcomes. The less positive the outcome, the less likelihood that the behaviour will be performed, and (iv) the barriers to taking the action are surmountable. If the barriers are considered too strong, people are less likely to perform the behaviour (Carpenter 2010). The HBM is essentially based on the four variables of susceptibility, severity, benefits, and barriers, though other variables such as self-efficacy and motivation to pursue health behaviour may be incorporated.

A study by Abi, Lahham and Afifi (2011) engaged the application of HBM in a NE intervention to promote drinking of water instead of soft drinks, and reported increase in the nutrition knowledge of the learners with increase in the self-efficacy to choose water instead of soft drinks.

2.4.1.4 Social ecological model

The Social ecological model (SEM) posits that individual behaviour is formed by causal factors at multiple levels which include the inter-personal, intra-personal, institutional, community, and policy levels. At the inter-personal level, social influences such as from family, friends and social networks largely influence peoples' behaviour, while the intra-personal level, individual's belief and attitudes are the variables of influence (Kumar et al. 2012). The institutional level includes organisations, such as schools and hospitals, and these organisations are also influenced by their own internal and external social factors. The community level refers to interactions between relevant groups and organizations, while policy level refers to the regulatory policies, laws and procedures from the governing bodies. The health behaviours of the people in a given setting are influenced by the interactions within and between the variables at the five levels (Langille, & Rodgers 2010).

The SEM was applied in an intervention to improve children's ability to distinguish between healthy and less healthy foods. It was reported that the children improved in their ability to identify healthy choices of foods by reading the labels (Katz et al. 2011).

2.4.1.5 Meaningful learning model

The Meaningful learning model (MLM) evolved from Ausubel's cognitive psychology and posits that learning occurs by the assimilation of new concepts into the perceptions and knowledge that the learner already has (Ausubel, Novak & Hanesian 1978). The MLM is based on the principle that learning takes place primarily by building on existing knowledge which invariably leads to new understandings about the subject. If new learning must be built on relevant knowledge that the learner already has, it is necessary to identify the learner's prior knowledge about the subject (Novak 2011). Meaningful learning is the product of a deliberate effort to relate new information to the background ideas and knowledge of the learner about the subject. The output is determined by the richness of the new knowledge to be acquired and the organisation of the concept. Novak and Cañas (2006) explained that for meaningful learning to occur the following must be in place:

i. Relevant prior knowledge: The learner must have relevant prior knowledge with which to relate the new information to be learned.
ii. Meaningful materials: The knowledge must be presented with concepts such as patterns, objects and records of events that learners can literarily relate to.
iii. The learner must be ready to learn meaningfully: The learner must make a deliberate effort to integrate new knowledge into existing knowledge.

Development of a school's curriculum based on the concept of meaningful learning can make room for learners to achieve learning in a more effective way. Since the new knowledge is built on existing knowledge of learners, the general idea for the subject is systematically broken down into more specific areas. Hence the curriculum is constructed to present major ideas in the initial stages and gradually open up into specific details on the subject matter. In this way, learners are able to comprehend the concept and assimilate the information that is presented throughout the entire learning period (Novak & Cañas, 2006). Organising the concepts and principles of instructional materials in a co-ordinated way is effective in promoting meaningful learning (Yildiz & Karabiyik 2012).

2.4.1.6 Experiential learning theory

The ELT is a four stage cyclical theory of learning which combines experience, perspective, cognition and behaviour. It posits that learning is a process whereby knowledge is created through the transformation of experience (Kolb 1984, p. 38). The theory is presented in a cyclical model consisting of four stages: (i) concrete experience (CE), where the learner actively experiences an activity; (ii) reflective observation (RO), where the learner consciously reflects back on the experience of the first stage; (iii) abstract conceptualism (AC), where the learner attempts to conceptualise a theory of what is observed; and (iv) active experimentation (AE), where the learner tries to test a model or theory or make a plan to test the theory in a new situation.

Four learning styles correspond to the stages in the ELT cycle and highlight the conditions under which learners learn better. The learning styles are: (i) assimilators, who learn better when presented with sound logical theories to consider; (ii) convergers, who learn better when provided with practical applications of concepts and theories; (iii) accommodators, who learn better when provided with hands-on experiences; and (iv) divergers, who learn better when they are allowed to observe and collect a wide range of information. The Kolb model offers

both a way to understand individual's learning styles and a cycle of experiential learning that applies to all (Thompson 2008; Kolb 1984).

A study which aimed to increase the knowledge, preference and intake of fruits and vegetables of second grade learners used the ELT. Significant increases in the learners' ability to identify fruits and vegetables, vegetable choice and in vegetable consumption were reported (Parmer et al. 2009).

2.4.2 Learning styles of children

Learning essentially occurs in children in two ways. The unplanned learning whereby a child unconsciously learns to do what he/she was not able to do before. The other way is the planned learning whereby a child learns by what he/she is taught in a formal setting such as the classroom (Pritchard 2013). Children are able to follow a structured pattern of learning to acquire knowledge or skills necessary to perform specified behaviours. The basics of learning in children comprise the acquisition of knowledge, development of understanding and acquisition of skills (Schunk 2012). Understanding the ways children assimilate and learn new things is essential in providing education that is aimed at enriching their lives.

Piaget described how children learn in four distinct stages, namely sensorimotor, preoperational, concrete operation and formal operation (Schunk 2012). The sensorimotor stage describes the period from birth to two years old, which typifies a period when the infant builds on understanding of self and reality through interactions with the environment. He is able to differentiate between self and other objects. The preoperational stage explains how the two to four year olds learn. The child at this stage needs concrete physical situations. Learning takes place through objects which are classified in simple ways especially by important features. Concrete operations describe the seven to 11 year old. At this stage there is accumulation of physical experiences. There is increase in accommodation and the child begins to think abstractly and conceptualise his physical experiences. Formal operations explain the eleven to 15 year old when reasoning reaches its final form. The child at this stage is capable of logical and hypothetical reasoning without the use of a concrete object to make sensible decisions.

Children can be guided to learn meaningfully through problem based learning. This style is a method of active learning centred on solving real life problems and making new discoveries (Kirschner, Sweller & Clark 2006; Hmello-Silver, 2004). It is often used in higher education

and also in primary school education from grade 1 through grade 12 for curriculum design methodologies. Some of the defining characteristics of problem based learning as outlined by Hmello-Silver and Barrows (2006) are that: (i) learning is driven by challenges and open-ended problems with no one right answer; (ii) problems and cases are context specific; (iii) that the learners can work as self-directed, active investigators and problem solvers in small collaborative groups; (iv) a key problem can be identified and a solution is agreed upon and implemented; (v) the teacher can adopt the role of facilitator, guiding the learning process and encouraging an environment of inquiry. Problem based learning attempts to get learners to apply knowledge to new situations instead of providing facts and testing learners' ability in memorising facts. Learners identify problems and are encouraged to discover meaningful solutions. Problem based learning can develop critical thinking skills, improve problem solving skills, and discover new things by helping learners to transfer knowledge to new situations (Babadogan & Unal 2011; Kirschner, Sweller & Clark 2006).

As it relates to NE, school children tend to learn more effectively with learning strategies that incorporate experiential learning such as practical sessions, vegetable gardening, hands-on demonstration and also problem identification and solution through games and work book tasks (Duncan et al. 2011; Oosthuizen, Oldewage-Theron & Napier 2011; Morgan et al. 2010; Gorely et al. 2009; Parmer et al. 2009; McAleese & Rankin 2007).

2.4.3 Educational strategies

Educational strategies refer to the teaching methods employed in delivering nutrition messages to the target audience (Dudley, Cotton & Peralta 2015; Perez-Rodrigo & Aranceta 2003). Establishing appropriate teaching strategies is vital to achieve successful healthy eating behaviour outcomes among learners in school-based NE interventions (Dudley, Cotton & Peralta 2015; FAO 2006). The following teaching strategies have been used with some measure of success in school-based NE interventions:

i. Enhanced curriculum approach: This involves the use of the existing curriculum with the inclusion of facilitators of the desired outcomes (Duncan et al. 2011; Parmer 2009). The use of the enhanced curriculum approach was found to be most effective in a review of the teaching approaches and strategies that promoted healthy eating in primary school children (Dudley, Cotton & Peralta 2015). However, the approach yielded better results when combined with secondary approaches such as experiential learning or parental involvement.

ii. Experiential learning approach: This is the method of NE delivery which engages learners in hands-on activities like gardening, cooking, class demonstration, goal setting and problem solving (Morgan et al. 2010).

iii. Cross-curricula approach: This involves delivering nutrition messages across two or more subjects such as integrating a nutrition topic into reading passages in English language and teaching the concepts in Life Skills subjects. A NE intervention promoted the concepts of fruits and vegetables through the school-wide, classroom and lunchroom platforms, and through the family component (Hoffman et al. 2010).

iv. Parental participation: This is a method of NE delivery involving the contributions of the parents/guardians of learners either directly through consultations or indirectly through take home assignments (Draper et al. 2010; Day et al. 2008).

v. Literary abstraction approach: This entails the use of reading exercises such as stories or real life experiences on nutrition issues which feature characters that exemplify healthy eating (Edwards & Hermann 2011).

vi. Web-based approach: This method uses internet resources to engage learners in nutrition exercises with self-assessment and feedback devices, followed by nutrition couselling (Mangunkusumo et al. 2007).

vii. Games-based approach: This involves the use of games such as board games, puzzles and card games to help learners learn about healthy eating (Oosthuizen, Oldewage-Theron & Napier 2011; Day et al. 2008).

viii. Contingent reinforcement approach: This method uses a reward system to encourage healthy practices (Horne et al. 2004). A nutrition intervention programme examined the effect of rewards on children's enjoyment of vegetables. The use of tangible rewards such as stickers and a social reward in the form of praises produced an increase in acceptance for vegetables which the children initially disliked (Cooke et al. 2011).

2.5 ROLE OF THE TEACHER IN SCHOOL-BASED NUTRITION EDUCATION

The role of teachers in the implementation of NE in schools is very important. Teachers are seen as role models by learners (Rafiroiu & Evans 2005). Their influence to bring about the desirable behavioural changes in relation to food and nutrition can go a long way to dictate the success of NE intervention in schools. However, to succeed NE must be incorporated into the school curriculum with the active involvement of the teachers (Perez-Rodrigo & Aranceta

2003). The NE resources should be adequate to prepare teachers to teach, guide and positively influence learners' eating behaviours (Sherman & Muehlhoff 2007). The curriculum must be explicit and teachers must receive adequate training in the use of the curriculum. Nutrition training for teachers that has a behavioural change component can lead to effective NE implementation for behaviour change into healthy eating among learners (Hildebrand, Jacob & Garraid-Foster 2012; Perez-Rodrigo & Aranceta 2003). Adequate contact time, the provision of suitable materials and teacher training programmes are crucial to the success of school-based NE. Even with these in place, Shariff et al. (2008) pointed out the need for continuous monitoring of teaching, and discussions with teachers to ensure that teachers are consistent in implementing the curriculum.

The influence of teachers on dietary behaviours of learners can either be helpful or harmful (Senekal et al. 2015). Learners can be influenced by teachers through positive role modelling, such as by eating foods that are healthy choices in front of learners and avoiding unhealthy classroom food practices (Rossiter et al. 2007; Rafiroiu & Evans 2005). The fact that teachers' classroom food behaviour may not necessarily encourage healthy dietary behaviour among learners was revealed by a study conducted by Kubik et al. (2002). In that study, teachers mostly used unhealthy choices of food as incentives and rewards for learners. The use of foods such as candy for rewards to learners in the classroom was a common practice (Rossiter et al. 2007) that could hinder the promotion of healthy dietary behaviours among learners. It is desirable for teachers to model and emphasise healthy classroom food practices along with nutrition curriculum teaching.

Evidence from previous studies has confirmed improvement in dietary behaviours of learners when classroom teachers implemented NE intervention to learners (Rosario et al. 2012; Steyn et al. 2009; Rossiter et al. 2007; Panunzio et al. 2007). Studies conducted by Panunzio et al. (2007) revealed that teacher intervention (dietary intervention implemented by trained teachers) was superior to nutritionist intervention (dietary education implemented by nutritionists to learners). Teachers are authority figures and role models to learners and hence can model healthy dietary behaviours (Rossiter et al. 2007). Moreover, teachers have the opportunity to integrate nutrition matters into other subjects thereby using a multi-facet approach to emphasise nutrition messages (Panunzio et al. 2007).

2.5.1 Expected roles of teachers in school-based nutrition education

In order to promote effective NE in schools, certain expectations of teachers' roles in school-based NE have been expressed. It was garnered from the Culinary Institute of America (2012), UNICEF (2009) and FAO (2006) that teachers are expected to:

i. Teach nutrition with the aim of improving learners' health and well-being, thereby preparing them to effectively contribute to a nation's social and economic development in the long term.
ii. Teach nutrition in a way to impart nutrition knowledge which will culminate into improvement in nutrition behaviour.
iii. Teach nutrition through teaching strategies which integrate experiential and participatory approaches.
iv. Teach nutrition with commitment and personal interest in health, diet and healthy lifestyle.
v. Know that the nutritional well-being of learners has a direct relationship to education achievement, and that good nutrition is important for healthy growth and development in children.
vi. Model desirable nutrition behaviours for learners through healthy eating at school.
vii. Use nutrition issues to explain some topics in other subjects so as to increase nutrition awareness through multiple sources.
viii. Be sensitive to the warning signs of malnutrition among learners. These include lack of concentration, poor memory, difficulty in understanding, restlessness and irritability.
ix. Involve learners in school-wide learning opportunities in nutrition so as to increase their capability for nutrition application in a personal situation.
x. Incorporate situations that describe food and eating habits of the learners when they teach. These include locally available foods, local methods of food preparation, economy and local beliefs.
xi. Develop and implement nutrition education based on local needs and practices. It should be tailored towards enhancing the existing curriculum by using an improved approach.

2.6 SCHOOL-BASED NUTRITION EDUCATION IN SOUTH AFRICA

In South Africa the activities and initiatives of NE reside under the umbrella of the Integrated Nutrition Programme (INP) which has developed from the recommendations of the appointed Nutrition Committee in 1994 (Department of Health (DOH) 2008a). The committee was given the responsibility to develop a nutrition strategy for South Africa. The INP had as part of its aims to promote NE in order to ensure optimum nutrition for all, advocate for NE interventions for the youth and adolescents, and advocate the inclusion of NE in all schools' curricula (DOH 2003). The INP proposed nutrition promotion and education as one of its immediate goals with the vision to reduce malnutrition (DOH 2008a). It also recommended the use of the South African Food-Based Dietary Guidelines (SAFBDGs) in the implementation of NEPs (DOH 2008b). The SAFBDG were developed to provide a positive, affordable and sustainable approach to food choices by South Africans, seven years of age and above (Voster, Love & Browne 2001). The guidelines are based on the National Food Consumption Survey (NFCS) of 1999 and aim at addressing malnutrition and providing NE for the South African population (Maunder & Meaker 2007). The SAFBDGs were revised in 2012. The revised SAFBGDs (Vorster, Badham & Venter 2013; DOH 2012) are used as basis for NE in South Africa. The messages are short, clear and simple and are as follows:

Enjoy a variety of foods.
Be active.
Drink lots of clean, safe water.
Make starch food part of most meals.
Eat plenty of vegetables and fruit every day.
Eat dry beans, split peas, lentils, and soya regularly.
Fish, chicken, lean meat, milk or eggs could be eaten daily
Have milk, maas or yoghurt every day.
Use fat sparingly; choose vegetable oils rather than hard fats.
Use salt and food high in salt sparingly.
Use sugar and food and drinks high in sugar sparingly.

The Primary School Nutrition Programme (PSNP) was introduced in 1994 to complement the efforts of the INP and was later renamed the National School Nutrition Programme (NSNP) following the recommendations of a review (Public Service Commission (PSC) 2008). The NSNP aimed at enhancing the learning capacity, promoting school attendance and alleviating

short term hunger of needy primary school learners through the provision of healthy meals. Though school feeding was the main thrust of the project, it had the component of supporting NE through curricular activities in LO subject. The programme was reported to have improved punctuality, regular school attendance, concentration and the general wellbeing of learners where it had been implemented (DoBE 2015). In the UNICEF report of NE in South Africa, the objective to strengthen NE was achieved in all provinces through curricular activities in Life Orientation. The report was obtained through interviews, school visits and survey findings. However subject materials used at the various schools were not assessed (UNICEF 2008). The NSNP was extended to secondary school learners in quintile one in 2009, and in quintile two and three in 2010 and 2011 respectively (Department of Education (DoE) 2009).

The quintile system is the ranking and funding of public primary and secondary schools according to the poverty index of the community into five categories. (Mestry & Ndhlovu 2014). Quintiles 1, 2 and 3 are the poorest quintiles, referred to as the no-fee schools, and receive more per-learner allocation than the less poor quintiles 4 and 5, referred to as the fee-paying schools (DoBE 2015; DoBE 2012).

School-based NE in South Africa would gradually experience a boost by reason of policy initiatives to improve the quality of life of school children and to help South Africans above the age of five to have healthy eating plans, using a variety of foods (DOH 2012; DOH 2008a). Moreover, more research activities are being undertaken in school-based NE in South Africa (Hill et al. 2015; Nguyen et al. 2013; Oldewage-Theron & Egal 2012; Oosthuizen, Oldewage-Theron & Napier 2011; Oldewage-Theron & Napier 2011; Draper et al. 2010; Steyn et al. 2009).

2.7 SCHOOL-BASED NUTRITION EDUCATION INTERVENTIONS

Research evidence supports the fact that school-based NE intervention has the capacity to enhance the nutrition knowledge, attitudes and practices, and to improve the nutritional status of school children in the long run (Kabahenda et al. 2011; Falter et al. 2011; Slawta & DeNeui 2010). Some studies on school-based NE interventions in South Africa and other countries are presented in table 2.3. The intervention focus was diverse, addressing various issues such as tools and methods of intervention delivery (Roseman, Riddel & Haynes 2011; Oldewage-Theron & Napier 2011), and encouraging consumption of health promoting foods (Breslin &

Brennan 2012; Katz et al. 2011; Lien et al. 2010). Other areas of intervention focus included combining physical activity with dietary behaviours to improve health (De Villiers et al. 2015; Eisenmann et al. 2011; Slawta & DeNeui 2010; Draper et al. 2010), and issues directly related to nutrition attitudes and behaviour change as a result of knowledge impartation through the intervention (Slawta & DeNeui 2010).

Implementers of school based NE have the potential to determine the success of the intervention and the sustainability of the outcome (Swindle, Baker & Auld 2007). Interventions were implemented either through care-givers (Kabahenda et al. 2011), trained para-professionals (Hildebrand, Jacob & Garraid-Foster 2012), or health teachers and class teachers who were trained in the use of a nutrition curriculum (Prelip et al. 2012; Breslin & Brennan 2012; Francis, Nichols & Dalrymple 2010). NE implemented through the class teachers, conducted over a period of six weeks had positive impacts on nutrition knowledge, attitudes and practices of primary school children (Shariff et al. 2008). These authors further explained that although teachers were trained to deliver the nutrition curriculum, variation in their teaching styles could influence learning by the children. This therefore calls for continuous monitoring to ensure effective delivery.

The research design most often used was that of controlled randomised intervention and the evaluation of effectiveness was by pre- and post-test surveys and a follow up after a specified period of time (Hildebrand, Jacob & Garraid-Foster 2012; Oosthuizen, Oldewage-Theron & Napier 2011 Singhal et al. 2010; Forneris et al. 2010). Most of the interventions that included the use of theories recorded successes in their main objectives. The SCT was the most frequently used theory (Rosario et al. 2012; Breslin & Brennan 2012; Jones et al. 2011).

Table 2.3: Summary of some school-based NE interventions in South Africa and globally from 2010 to 2015

Author, publication year & country	Participants	Study design	Components	Duration	Issues addressed	Theory based	Implementers	Evaluation	Outcomes
South Africa									
Draper et al. 2010	517 teachers, 887 4th graders	Interven-tion mapping approach	NE + PA+ Family involvement + diabetes awareness	24 months	Healthy eating and PA to reduce diabetes risk factors in children	SEM and SCT	Trained educators, HealthKick champion and educational psychologists	Anthropom-etry, nutrition KAP and PA questionn-aires at PPI	Educators played key role in SBI, but capacity development was a challenge
Oosthuizen, Oldewage-Theron & Napier 2011	173 learners	Control-led interven-tion trial involving random selection of 2 schools	NE only which included cards, board game and food puzzle	9 weeks of 45 minute sessions	To improve the dietary patterns and food choices of children	Not reported	Researcher	Nutrition KAP questionnaire, 24-hr DR at PPI and 9mths FU	Dietary intake patterns of the children did not improve
Oldewage-Theron & Egal 2012	24 educators	Interven-tion study	NE training for teachers	Three days (Eight hours /day)	Impact of a NE training on the nutrition knowledge of LO educators	Not reported	Researchers	Nutrition knowledge questionnaire	Significant improvement in nutrition knowledge of the teachers which was previously not optimal

Abbreviations: NE – Nutrition education, PA – Physical activity, SCT – Social cognitive theory, 24-hr DR – 24-hour dietary recall, PPI – Pre- and Post-intervention, SEM – Social ecological model, KAP – Knowledge attitudes and practices, FU – Follow-up, SBI – School-based intervention, FGDs – Focus group discussions, LO – Life Orientation.

Continued/…….

Table 2.3: Summary of some school-based NE interventions in South Africa and globally from 2010 to 2015 continued

Author, publication year & country	Participants	Study design	Components	Duration	Issues addressed	Theory based	Implementers	Evaluation	Outcomes
South Africa									
De Villiers et al. 2015	Learners, parents, teachers and school staff in 16 schools	Interven-tion mapping approach	NE + PA + staff health + diabetes awareness	3 years	To promote healthy lifestyles among learners, their families and school staff	Action planning process	Trained educators	Record of intervention activities and FGDs	Low level of completion of intervention activities
Hill et al. 2015	Grades 4 – 6 teachers and principals in 8 schools	Interven-tion Mapping approach	NE + PA + staff health; chronic diseases and diabetes awareness	3 years	To promote healthy eating habits and PA in children, their parents and teachers	Not reported	LO teachers	FGD and quantitative data using evaluation sheet	Feasibility of incorporating healthy lifestyle teaching into school curriculum
Steyn et al. 2015	998 Grades 4 through 6 learners in 16 primary schools	Rando-mised controlled trial	NE + PA + availability of healthier food choices in the school + school garden	3 years	To promote healthy eating habits by improving school nutrition environment	SEM	Trained educators	Dietary intake through 24-h recall in 2009, FU in 2010 and 2011	Significant improvement in nutrition knowledge and self-efficacy, but no improve-ement in the quality of diet of the children

Abbreviations: NE – Nutrition education, PA – Physical activity, 24-hr– 24-hour recall, SEM – Social ecological model, FU – Follow-up, FGD – Focus group discussion, LO – Life Orientation.

Continued/…….

Table 2.3: Summary of some school-based NE interventions in South Africa and globally from 2010 to 2015 continued

Author, publication year & country	Participants	Study design	Components	Duration	Issues addressed	Theory based	Implementers	Evaluation	Outcomes
USA and Canada									
Slawta & DeNeui 2010 (USA)	65 4th Grade learners	Control-led comp-arison study	NE + PA + School environment + Parental involvement	10 weeks	To emphasise PA and heart healthy nutrition	Precede–proceed model	Trained teachers and PA teachers	Anthropom-etry, body composition and nutrition knowledge test at PPI	Significant improvement in nutrition knowledge and habits
Forneris et al. 2010 (Canada)	2120 6th Grade learners from 23 schools	School-based rando-mised trial	NE only	12 weeks and 2 year follow up	To assess the impact of GFH on healthy eating outcomes	None	Trained peer leaders and health education instructor	Nutrition questionnaire and FFQ at PPI and 2 years FU	Improvement in knowledge and self- efficacy but not sustainable
Eisenmann et al. 2011 (USA)	403, 3rd – 5th Grade learners	Multi-compo-nents	School, community, social marketing and SSW	2 years	To increase PA and healthy eating among learners (Reported baseline findings)	SEM, SMP and SCT	Project staff, trained school staff and coaches,	Nutrition KAP and PA questionn-aires at PPI	Baseline reported low PA and unhealthy eating habits
Falter et al. 2011 (USA)	96 pharmacy learners and 468 elementary school learners	Not indicated	NE only 30 minute nutrition lessons sessions, once a week	4 weeks	To implement NE to learners through train the trainer strategy	None	Pharmacy students trained by nutritionists	Experience survey instruments and nutrition questionn-aires at PPI	A non-significant improvement in nutrition knowledge of both learners and trainers

Abbreviations: NE – Nutrition education, PA – Physical activity, SCT – Social cognitive theory, PPI – Pre- and Post-intervention, SEM – Social ecological model, SMP – Social marketing principles, KAP – Knowledge attitudes and practices, FU – Follow-up, SSW – School staff wellness, FFQ – Food frequency questionnare, GFH – Goals for Health.

Continued/…….

Table 2.3: Summary of some school-based NE interventions in South Africa and globally from 2010 to 2015 continued

Author, publication year & country	Participants	Study design	Components	Duration	Issues addressed	Theory based	Implementers	Evaluation	Outcomes
Jones et al. 2011 (USA)	104 4th Grade learners	Quasi-experi-mental trial	NE only	2 years	To improve school food environm-ent and child nutrition	SCT	Learners of Tennessee University trained peer leader from 5th Grade	Anthropometry and 24-hr DR at PPI	Positive changes in diets in response to the interventions offered at the schools
Katz et al. 2011 (USA)	1180 2nd, 3rd and 4th Grade learners in 3 schools	Rando-mised controlled trial	NE + parental involvement	4 months	To improve children's' ability to distinguish between healthy and less healthy foods	SEM	Physical education instructors	FFQ and nutrition knowledge questionnaires	Improvement in ability to identify healthy choices of foods from labels
Siega-Riz et al. 2011 (USA)	3908 students from 42 middle schools	Cluster rando-mised trial	NE only	2½ years	To improve self-reported dietary intakes	None	Not specified	Food frequency questionnaires at PPI	Improvement in fruit and water intake but no change in dietary habits

Abbreviations: NE – Nutrition education, SCT – Social cognitive theory, 24-hr DR – 24-hour dietary recall, PPI – Pre- and Post-intervention, SEM – Social ecological model, FFQ – Food frequency questionnaire.

Continued/…….

Table 2.3: Summary of some school-based NE interventions in South Africa and globally from 2010 to 2015 continued

Author, publication year & country	Participants	Study design	Components	Duration	Issues addressed	Theory based	Implementers	Evaluation	Outcomes
Prelip et al. 2011 (USA)	1528, 3rd 4th and 5th Graders	Rando-mised controlled trial	NE + PA + nutrition activities	10 months	Attitudes, beliefs and behaviours towards F&V intakes	SCT and TPB	Teachers	Attitudes beliefs & behaviour questionn-aires at PPI	Teachers positively influenced learners' attitudes towards F&V
Prelip et al. 2012 (USA)	399 3rd 4th and 5th Graders, 56 teachers and 53 mothers	quasi-experi-mental pre-/post-test design	NE + Nutrition activities + parental involvement	10 months	Impact of a multicomp-onent NEP on learners' F&V intake	SCT and TPB	Class teachers and research team members	F&V KAP questionn-aires at PPI	No significant increase in learners' F&V intake was observed
Hildebrand, Jacob & Garraid-Foster 2012 (USA)	426 3rd Graders and 386 4th Graders in 9 schools	Quasi experi-mental design	NE + PA	6 weeks of 45 minute lessons	To influence nutrition behaviour change	SCT	Trained para-professionals	Nutrition behaviour questionnaire at PPI	Improvement in health-promoting nutrition behaviours
Wall et al. 2012 (USA)	1047 4th Grade learners	A non-equiva-lent control group design	NE only	1 year	To improve vegetable consumption among learners	None	Local partner educators	Food preference and attitudes questionn-aires at PPI	Intervention improved learners' preferences for vegetables

Abbreviations: NE – Nutrition education, PA – Physical activity, PPI – Pre- and Post-intervention, SCT – Social cognitive theory, KAP – Knowledge attitudes and practices, TPB – Theory of planned behaviour, F & V – Fruits and vegetables, NEP – Nutrition education programme.

Continued/…….

Table 2.3: Summary of some school-based NE interventions in South Africa and globally from 2010 to 2015 continued

Author, publication year & country	Participants	Study design	Components	Duration	Issues addressed	Theory based	Implementers	Evaluation	Outcomes
Europe									
Lakshman et al. 2010 (UK)	2519, 5th and 6th Grade learners	Cluster rando-mised controlled trial	Card game + classroom NE	9 weeks	To improve nutrition knowledge and healthy eating among learners	SMH	Not specified	Nutrition knowledge questionn-aires at PPI	A modest increase in nutrition knowledge
Lien et al. 2010 (Norway)	114 learners	Cluster rando-mised controlled trial	NE + PA + Campaigns	20 months	To increase PA, intake of F&V and reduce intake of sweetened beverages	SCT and SEF	Trained teachers and researchers	Anthropom-etry and questionn-aires at PPI	No significant difference in BMI between intervention and control
Breslin & Brennan 2012 (Northern Ireland)	416, 8 – 9 year old children from 24 schools	Rando-mised controlled trial	NE + PA	12 weeks	To increase PA, encourage healthy attitudes and nutrition behaviours	SCT	Class teacher and the Sports learner teaching assistant	Anthropom-etry, accelerometer and nutrition questionn-aires at PPI	Positive impact on children's health and nutrition behaviours
Rosario et al. 2012 (Portugal)	464 children, 15 teachers	Rando-mised trial	NE + sessions on PA	6 months-72 hrs.	F & V consumption, anthropome-try and PA	HPM and SCT	Researchers and researchers' trained teachers	24-hr DR, anthropometr y and PA questionnaire s at PPI	Intervention by TT increase F&V consumption among learners

Abbreviations: NE – Nutrition education, PA – Physical activity, F & V – Fruits and vegetables, SCT – Social cognitive theory, SMH – Social marketing for health, SEF – Social ecological framework, PPI – Pre- and Post-intervention, TT – Trained teacher, BMI – Body mass index, 24-hr DR – 24-hour dietary recall .

Continued/…….

Table 2.3: Summary of some school-based NE interventions in South Africa and globally from 2010 to 2015 continued

Author, publication year & country	Participants	Study design	Components	Duration	Issues addressed	Theory based	Implementers	Evaluation	Outcomes
Others									
Francis, Nichols & Dalrymple 2010 (Trinidad and Tobago)	579 6th Grade learners from 10 schools	Rando-mised control-led trial	NE + PA	9 months	To improve nutrition knowledge attitudes and behaviours	BML	Trained teachers	Anthropometry, questionnaires at PPI and after 3 months	Improvement in nutrition knowledge and reduced intake of fried foods
Huang, Wu & Chen 2010 (China)	5th Grade learners	One group pre-test-pro-test design	NE + PA + obesity concept	4 months	To assess the effectiveness of an in-school weight control programme	None	Not specified	Anthropometry, fitness test and questionnaires at PPI	Significant decline in BMI and WHtR ($P < 0.001$)
Morgan et al. 2010 (Australia)	127 learners in Grade 5	Quasi-experi-mental	NE + garden	10 weeks	To assess impact of garden enhanced NE on children's F&V intake	None	Not specified	24-hr F&V recall at PPI and 4 months FU	Increased preference for and willingness to taste some F&V

Abbreviations: NE – Nutrition education, PA – Physical activity, PPI – Pre- and Post-intervention, 24-hr F & V – 24-hour fruits and vegetables, WHtR – waist-to-height ratio, BML – Blooms mastery learning model, F&V – Fruits and vegetables, TT – Trained teachers, BMI – Body mass index.

Continued/…….

Table 2.3: Summary of some school-based NE interventions in South Africa and globally from 2010 to 2015 continued

Author, publication year & country	Participants	Study design	Components	Duration	Issues addressed	Theory based	Implementers	Evaluation	Outcomes
Singhal et al. 2010 (India)	201 Grade 11 learners	Rando-mised control-led trial	NE + lifestyle education + PA + counselling + School policy	9 months	Behaviour modification, anthropomet-ry and metabolic risk	None	Trained nutritionists	Anthropometry, questionnaires at PPI and after 6months	Improvement in dietary behaviours, BMI and biochemical profiles
Abi, Lahham & Afifi 2011 (Lebanon)	110, 3rd Graders in 4 schools	Not indicat-ed	NE only	2 weeks	To promote drinking of water instead of soft drinks	HBM	Researcher	Nutrition KAP questionnaire at PPI	Increase in knowledge and self-efficacy to choose water

Abbreviations: NE – Nutrition education, PA – Physical activity, HBM – Health belief model, PPI – Pre- and Post-intervention, BMI – Body mass index, KAP – Knowledge, attitudes and practices.

2.8 ENVIRONMENTAL INFLUENCES ON SCHOOL-BASED NUTRITION EDUCATION

Nutrition intervention through school-based NE can seldom be successful without consideration of the inter-relationship with environmental factors. Environmental influences such as the school environment, the family, the community, the media, the food industry and the government have been identified to markedly influence the dietary behaviours of children (Vereecken, Van-Danme & Maes 2005). Influence from household or family appeared to be the greatest in dictating dietary intake of children. Young children do not choose what they eat, but eat what parents decide and prepare for them (Shariff et al. 2008; Savage, Fisher & Birch 2007). The family environment is crucial to the success of any NE intervention in schools as food behaviour change largely depends among others, on household food security and parents' nutrition knowledge, attitudes and practices (Sherman & Muehlhoff 2007). The parents' efforts to make healthy and varied foods more available at home for their children and to model healthy food behaviours are highly desirable. In a study that investigated teachers' perceptions of the impact of NE on eating behaviours of learners, it was revealed how parents boasted about not eating vegetables but meat in their homes. This situation led to learners from such homes refusing certain vegetables when served in the school meals. It was also discovered how peer influences affected the impact of NE in school (Kupolati, Gericke & MacIntyre 2015).

The realisation of intervention goals is enhanced when there is environmental support for the targeted behaviour (Contento 2011). School environmental support such as from teachers, administrators, food service personnel, counsellors and others in school-based NEPs enhances effectiveness. Environmental influences may induce both conscious and unconscious situations which can greatly affect behaviours. While conscious situations affect behaviours through perceptions, unconscious processes affect behaviours through unplanned actions created by the environment (Kremers et al. 2006). Basically two approaches are identified as routes to create environmental support for behaviours that interventions seek to address, and are referred to as the direct and the indirect roles. The direct role involves raising awareness and support about the targeted behaviours. The indirect role consists of making alliance with potential influencers (like the food services providers, policy makers and food vendors) of the target behaviours. These endeavours help to create an enabling environment for the desired behaviours to occur. It is important to give attention to the environmental factors of potential

influence in favour of the target behaviours in order for NE intervention to be effective (Contento 2011).

2.8.1 Nutrition education in resources limited settings

The resources limited settings are characterised by restricted availability of household amenities such as inadequate supply of clean and safe water, lack of household toilets and lack of storage facilities such as a refrigerator (Labadarios, Steyn & Nel 2011; Galobardes et al. 2006). The people living in resources limited settings often have a low level of education and income resulting in inadequate financial resources for basic needs such as food and clothing (Shisana et al. 2013). NE education in the context of limited resources presents opportunities for the use of local foods and food practices (UNICEF 2012). Many locally available foods have good food value, but because they have low social status, their uses are often neglected in meal planning in the local communities. Also, available foods are disproportionately distributed among family members with children and women having the less nutritious and the least share of foods (FAO 2006). NE is effective in ameliorating these problems. To effectively implement a NEP in a resource limited setting, it is helpful to develop a tailored NE curriculum based on identified needs in solving nutrition problems (Contento 2011; FAO 2006). Formative or needs assessment involving the target audience for NE in limited resources communities often helps to facilitate participation and cooperation from the audience (Contento 2011; Draper et al. 2010).

NE in limited resources communities and schools within these settings may experience a number of challenges such as unavailability of resources for illustration, cultural values and household food insecurity (David, Kimiywe & Waudo 2012; David et al. 2008). Modernisation and availability of unhealthy choices of food at low cost also negatively influence the food choices of individuals in limited resources and peri-urban communities. A high level of ignorance is displayed in food choices such as the eating of meat with very little or no vegetables and spending limited financial resources on more costly tinned foods instead of fresh produce (Kupolati, Gericke & MacIntyre 2015; FAO 2006).

NE in resource limited settings may be challenging, however, successful outcomes often result when appropriately planned NEP is engaged (Khan et al. 2013; Oosthuizen, Oldewage-Theron & Napier 2011; Parker et al. 2011; Draper 2010; Sherman & Muehlhoff 2007). Challenges and barriers encountered in such interventions serve as recommendations for further research and practice in NE interventions (Dudley, Cotton & Peralta 2015).

2.9 DESIGNING THEORY-BASED NUTRITION EDUCATION

To bring about a successful intervention that will justify and optimise efforts and resources involved, it is necessary to put a working blueprint in place. Table 2.4 summarises a modification of the step by step design for behaviour focused and evidence based NE that interrelates theory, research and practice by Contento (2011). The design consists of five steps in three phases.

Table 2.4: Theory-based nutrition education plan

Inputs: Analysing needs	**Designing the output**			**Designing implementation, outcomes/ impact evaluation**
Step 1 Analyse and identify priority needs i. Evaluate current curriculum content ii. Explore prevailing nutrition teaching approach iii. Identify behaviours of concern iv. Select core practices to be addressed	**Step 2** Set educational objectives for addressing the needs identified	**Step 3** Select theory and the components of the NE i. Select the theory or create appropriate model ii. Clarify curriculum contents iii. Determine NEP components	**Step 4** Design theory-based educational strategies and activities to be employed in the practical applications of the strategies	**Step 5** Design evaluation: i. Evaluation of programme impact on behaviours ii. Process evaluation

Developed from Contento 2011 and FAO 2006

2.9.1 Analysing needs

A needs assessment is a means of determining the needs of individuals or groups of people so as to design an intervention that can respond to those needs (Bauer, Liou & Sokolik 2012). This has the potential of bringing about behavioural change. Analysing needs helps implementers to identify areas where nutrition services must increase or improve. A needs assessment is also useful to monitor and evaluate programme effectiveness so as to make decisions (Iowa Department of Public Health (IDPH) 2012). It is noteworthy that proposed audiences are often more willing to participate in NEPs if their opinions and views were considered (IDPH 2012).

Assessment tools can be a combination of data collection through questionnaires, interviews, focus group discussions or critical reviews of literature (Alabama Department of Public Health (ADPH) 2011; IPMA 2010). Elaborate needs assessment is necessary when planning NE especially for educators in order to identify educational needs, challenges they encounter in teaching nutrition and the best approach for achieving desired results (Interstate Postgraduate Medical Association (IPMA) 2010).

The following were suggested as useful information in assessing needs for school-based NE: the children's diet, existing school health programmes, family and community involvement, the school food environment, content of classroom nutrition curricula and the prevailing teaching approach (FAO 2006). Adequate assessment of needs and issues allows for a better understanding of the audience, eliminates guesswork and makes room for the development of educational goals to address issues of concern (Contento 2011).

2.9.2 Designing the output

This phase describes the three steps, namely selecting the theory, stating educational objectives and designing a theory based educational strategy (Contento 2011; FAO 2006).

2.9.2.1 Selecting the theory

Effective design of NE intervention consists of the use of theories, which incorporate the components of the programme to appropriately develop educational strategies (Hoelscher 2002; Contento 2011). In the debate on the usefulness and barriers of theory application in nutrition and physical activity behaviour-change intervention, Brug, Oenema and Ferreira (2005) contributed that theories that promote action, and not motivation only, are considered useful. Application of theories should lead to improvement of intervention effectiveness. However, a relationship exists between the intention or motivation and the real action, i.e. behaviour change. French and Worsley (2004) explained the need for theories to bridge the gap between intentions or motivations for change and behaviour change. It is necessary to engage strategies that can facilitate the translation of determinants of behaviour change into real behaviour change in interventions. Approaches to bridge the gap between intention and behaviour change were identified and explained (Brug, Oenema & Ferreira 2005). The first approach is to use theories to help individuals identify what motivates them to perform certain behaviours. The principle of this approach is based on cognitive self-regulation activities (Swinburn et al. 2004). The second approach has to do with modifying

environmental influences. Brug, Oenema and Ferreira (2005) explained that increasing environmental opportunities for healthy nutrition can go a long way to translate intention into behaviour change. It was again pointed out that many theories in use often dwell on environmental influences that need to change, and not how the changes can occur (Lawrence & Worsley 2007).

In order to tackle the effective application of theories in nutrition and physical activities, three directions were distinguished: theory driven, problem driven and quality management (Brug, Oenema & Ferreira 2005). While theory driven research seeks to test applicability of a theory, problem-based research is employed to find a solution(s) to identified problems. Quality management addresses the sustainability of the change that may occur (Lawrence & Worsley 2007). Theories are generalisations in respect of the main cause of the issues being studied. Therefore, the use of theory is important in problem-based research where insights obtained from one or more theories are applied to solve research problems (Lawrence & Worsley 2007).

2.9.2.2 Stating educational objectives

Educational objectives to address the identified needs should be clearly stated. Prelip et al. (2011) explained three different approaches often employed in many school-based interventions. The deductive approach which is theory driven, the inductive approach which employs observational techniques to motivate theory development, and the third approach is the combination of the first two. While the first is considered the strongest and best, the study situation may not perfectly fit into the situation where the theories were developed. Contento (2011) established the need to identify and list personal mediators and express them in terms of theory constructs. Nevertheless, it is advisable to select and use only the constructs that can be realistically addressed within the time and resources available. It is often beneficial to limit theory constructs to a number that can optimise advantages on the targeted issue, based on the extent to which the mediators can be influenced by the educational intervention. Evidence from literature suggests that limiting the number of issues to address in an intervention makes room for ease of programme management, and hence increases the chances of success (Contento 2011; Prelip et al.2011).

The educational goals and objectives for the programme should be set out for each of the needs identified, as these will guide the educational activities for the programme. While

educational goals are set to achieve issues, behaviours or actions targeted by the intervention, educational objectives are set to address determinants of the issues, behaviours or actions. Educational objectives should be tailored to the intended audience in three domains, namely the head (cognitive), the heart (affective) and the hand (psychomotor). This is considered holistic and can tremendously improve effectiveness of school-based NE interventions (Contento 2011; FAO 2006).

2.9.2.3 Theory-based educational strategies and activities

Theory based educational strategies (ESs) with learning experiences should be structured to address identified needs (Contento 2011). Theory based ESs are means of putting the constructs of theories into operation to explain mediators of behaviour change and the educational activities employed. Educational activities typify the various ways in which strategies are practically implemented. Here, the stage is set for numerous ideas to translate objectives into activities. ESs are employed to increase communication effectiveness, skill building and eventually behaviour change (Perez-Rodrigo & Aranceta 2003).

The strategies are usually arranged as instructions of how to go through the process and are called by different names as the curriculum, educational plan, the lesson plan or intervention guide. The sequential arrangement of ESs is often dictated by the overall goal, the needs of the audience and also the theory constructs. When designing the ES, it is advisable to go through the process systematically. Each session is approached with activities that gain the attention of the audience, to activities that encourage motivation, and to activities that bring about decision making to take action (Contento 2011). The teaching of NE in schools needs to be culturally relevant, participatory in approach and engage learning strategies that enhance food behavioural changes or help learners translate knowledge into behaviour (FAO 2006).

To first develop the lesson plan in a table format helps to ensure all issues have been covered and that none of the potential mediators of behaviour change and educational objectives have been left out (Yildiz & Karabiyik 2012; Babadogan & Unal 2011). It is important also to particularly develop the learners' ability to take actions when designing theory driven ESs. In this way, use is made of theory-based strategies which address the potential mediators that can facilitate ability to take action. This is achieved by encouraging the learners to set goals,

plan ahead, develop routines and make personal commitment for the action or behaviour being targeted (Schunk 2012; Contento 2011).

ESs must be fashioned to be relevant and suited to the intended audience. Effective ESs for people with limited resources were found to be those involving fun and interactive, hands-on lessons with limited lectures. Furthermore, the use of approaches that create small but practical changes, provide incentives that encourage participation and foster a welcoming, non-threatening learning atmosphere, is helpful (Benavente, Jayaratne & Jones 2009). A combination of multiple ESs has been used where one strategy seems inadequate to realise the intervention outcomes (Dudley, Cotton & Peralta 2015; Parker et al. 2011).

2.9.3 Designing outcomes evaluation

Evaluation was defined as "an applied enquiry process for collecting and synthesising evidence that culminates in conclusions about the state of affairs, value, merit, worth, significance and quality of a programme" (Mertens 2014, p. 48). The Iowa Department of Public Health (IDPH) (2012) itemised the purposes of monitoring and evaluating nutrition interventions as follows: (i) helps to determine the continuity, adjustment, expansion of a programme or service; (ii) cost effectiveness can be determined and proper accountability put in place; (iii) progress about whether action plans and objectives are met, can be measured; and (iv) the possibility of justifying current and future programmes can be made available.

Evaluation further provides information on the appropriateness of ESs and learning activities used for the audience in realising the goal of the intervention (Contento 2011). Evaluation should be an on-going process during an intervention; at mid-point (monitoring) and at end-point (evaluation). Different approaches are used to monitor and evaluate NE interventions. It is fundamental to work through baseline data; in many cases these may be the pre-test data or data from reviews (IDPH 2012).

2.9.3.1 Process evaluation

Process evaluation in NE intervention is a means to measure the progress of programme activities to know whether the programme was implemented as planned (Young et al. 2008). Tracking of events or activities is the mainstay of process evaluation. Process evaluation reveals the degree of fidelity in intervention delivery, successes, obstacles and challenges and how to overcome them (Food and Nutrition Service/United States Department of Agriculture

(FNS/USDA) 2005). Taking account of failures can help to reveal error in the design and identify inconsistencies in programme implementation (Contento 2011). Additionally, process evaluation provides information about what works and does not work, and reveals relationships between programme elements and programme outcomes in an intervention (Saunders, Evans & Joshi 2005). A group of researchers concluded that process evaluation provided data for the effectiveness trial, and that this explained why intervention worked to improve the targeted behaviour (Robert et al. 2006).

2.9.3.2 Outcome evaluation

Outcome evaluation is the measure of changes in the target behaviour that occurred in the audience from before and to after the intervention, without necessarily indicating whether or not the changes were due to the activities of the intervention (FNS/USDA 2005). Outcome evaluation may often not reveal positive results if formative and process evaluation was not done (California Women, Infants and Children (WIC) Programme 2012). Outcome evaluation in NE basically measures whether the overall goals of the programme have been achieved or not. These are usually medium-term to long-term outcomes. Often the measurements of the improvement in the mediators of the behaviours are what readily show in many interventions. These constitute short-term outcomes and the impact of the intervention. However, a strong relationship between the variables of mediators and the behaviour can indicate that the impact may translate to action under suitable conditions (Contento 2011).

2.9.3.3 Impact evaluation

Impact evaluation is the measure of change in the target behaviour of the audience that can be attributed to activities of the intervention. It provides answers to whether there could be changes and how much change occurred due to the intervention. However, in order to be able to come up with impact outcome of an intervention, it is necessary for the intervention to be implemented in a sound research design that leaves no room for bias. When the issue of cause and effect are of importance to intervention, the impact evaluation is most appropriate (FNS/USDA 2005). The following basic principles (FNS/USDA 2005) were proposed as guide to planning for a sound impact evaluation:

i. The NE intervention design should be such that can be evaluated. Answers to the following questions provide guidance to planning impact evaluation: what are the

specific objectives of the intervention?; what is the extent of impact expected?; why and how the objectives are to be achieved?, and what are the possibilities of implementing the intervention as intended?

ii. Impact measures that properly align with the intervention type must be used. The use of existing standards or tools ensures credible assessment. Reliability and validity of the instruments must be established before use, and also the compatibility of the instruments with the intervention.

iii. Fair consideration must be given to participants in the choice of standards. Therefore, participants' informed consent must be obtained, confidentiality ensured, the burden on the individual participant limited and essential services not denied to participants.

iv. Impact data should be collected soon enough before implementation goes too far to prevent activities and information meant for the intervention groups only reaching the control groups.

v. Both positive and negative results should be accurately reported. The details that make results of the intervention generalisable must be present.

2.9.3.4 Formative evaluation

Formative evaluation includes assessments during programme development, a pilot study or actual implementation used in providing feedback to an on-going programme in order to improve programme effectiveness (Looney 2011; Bennett 2011). Formative components may sometimes be included as programme activities for observing a trend or performance to inform the revision of the programme (Bennett 2010). A periodic formative assessment in an on-going programme can help participants to reflect on their experiences, be open to amendment and develop new skills. Formative evaluation can be a useful tool in assessing performance towards developing innovative practices in intervention programmes (Looney 2011; Bennett 2010).

2.9.3.5 Summative evaluation

Summative evaluation consists of assessments that are used in summarising the findings of the programme at completion (Contento 2011). Assessments are based on programme goals and objectives and the findings typically provide information for judging the programme effectiveness, for adopting a programme and suggestions for improvement (Bennett 2011; Looney 2011). Summative evaluation basically assesses the effects of programmes and is

often expressed as the impact or outcome evaluation (Contento 2011; McKenzie, Neiger & Smeltzer 2005).

2.10 SUMMARY

School-based NE, as documented in the literature, has been widely used to address health promoting initiatives and nutrition issues not only to learners but also to teachers and school staff. The school setting offers a platform to nurture NE albeit the environmental challenges and facilitators. The role of teachers in school-based NE is a very important one as they can both facilitate and hinder successes. Teachers are seen as role models by learners beside the fact that they have the responsibility to teach nutrition messages to learners.

The success of school-based NE is dependent on effective planning which encompasses identifying the needs and selecting the theoretical basis with the ESs and activities involved in the programme implementation. Curriculum approaches, which are generally determined by the programme goals, often accompany school-based NE. The effectiveness of school-based NE endeavours is revealed by the evaluation procedures employed.

Many NE intervention studies are lacking in the effective assessment of the impact of interventions, especially among populations of lower socio-economic status (Swindle, Baker & Auld 2007). This calls for effective evaluation of nutrition interventions to know the extent to which behavioural change can be or has been sustained so as to make recommendations that could be applied to the larger setting.

The role of teachers holds prospects in this regard as teachers have the opportunity to continue on an established approach year in year out (Prelip et al. 2011). The role of teachers is therefore central in NE and changing food choices and nutrition behaviour (Panunzio et al. 2007) in school-based nutrition intervention. This factor needs to be fully explored in order to bring about sustainable and healthy dietary changes in learners.

REFERENCES

Abi, HG, Lahham, SN & Afifi, RA 2011, 'Jarrib Baleha – a pilot nutrition intervention to increase water intake and decrease soft drink consumption among school children in Beirut', *Journal of Medical Liban*, vol. 59, no. 2, pp. 55-64.

Abrahams, Z, De Villiers, A, Steyn, NP, Fourie, J, Dalais, L, Hill, J, Draper, CE & Lambert, EV 2011, 'What's in the lunchbox? Dietary behaviour of learners from disadvantaged schools in the Western Cape, South Africa' *Public Health Nutrition*, vol. 14, no. 10, pp.1752-1758.

Ajzen, I 2012, 'The theory of planned behaviour', in PAM Van Lange, AW Kruglansk & ET Higgins (eds.), '*Handbook of theories of social psychology'*, vol. 1. Sage Publications, London.

Alabama Department of Public Health (ADPH) 2011, *Community assessment*, viewed 4 February 2013, http://adph.org/ob.

American Society for Parenteral and Enteral Nutrition (ASPEN) 2009, *Definition of terms*, viewed 25 August 2012, http://www.nutritioncare.org/library.aspx.

Ammerman, AS, Lindguist, CH & Lohn, KN 2002, 'The efficacy of behavioural interventions to modify dietary fat and fruit and vegetable intake: a review of the evidence', *Preventive Medicine*, vol. 35, pp. 25-41.

Anderson, AS, Porteous, LE, Foster, E, Higgins, C, Stead, M & Hetherington, M 2005, 'The impact of a school-based nutrition education intervention on dietary intake and cognitive and attitudinal variables relating to fruits and vegetables', *Public Health Nutr*ition, vol. 8, no. 6. pp. 650-656.

Appleby, P 2009, 'Food and nutrition for healthy, confident kids: guidelines to support healthy eating environments in New Zealand', *National Nutrition Resource*, viewed 25 September 2012, http://healthylifestyles.tki.org.nz.

Ausubel, DP, Novak, JD & Hanesian, H 1978, *Educational psychology: A cognitive view*. 2nd edn. Holt, Rinehart and Winston, New York NY.

Babadogan, C & Unal, F 2011, 'Examples of instructional design for social studies according to meaningful learning and information processing theories. *Procedia - Social and*

Behavioural Sciences, vol. 15, pp. 2155-2158, viewed 11 January 2014, http://.doi:10.1016/j.sbspro.2011.04.070.

Bandura, A 2001, 'Social cognitive theory: An agentic perspective. *Annual Review of Psychology*, vol. 52, pp. 1-26.

Bauer, K, Liou, D, & Sokolik C 2012, *Nutrition counselling and education skill development*. 3rd edn. Cengage Learning, Boston MA.

Benavente, LM, Jayaratne, KSU, & Jones, L 2009, Challenges, alternatives, and educational strategies in reaching limited income audiences', *Journal of Extension*, vol. 47, no. 6, viewed 7 February 2013, www.joe.org.

Bennett, RE 2010, 'Cognitively Based Assessment of, for, and as Learning (CBAL): A Preliminary Theory of Action for Summative and Formative Assessment, Measurement', *Interdisciplinary Research and Perspectives*, vol. 8, no. 2, pp. 70-91.

Bennett, RE 2011, 'Formative assessment: a critical review, assessment in Education', *Principles, Policy & Practice*, vol. 18, no. 1, pp. 5-25.

Block-Jay, A, Goldman, G & Pradhan, V 2006, 'Cost benefit analysis conducted for nutrition education in California', *California Agriculture*, vol. 60, no. 4, pp. 185-192.

Blom-Hoffman, J, Kelleher C, Power, TJ & Leff, SS 2004, 'Promoting healthy food consumption among young children: evaluation of a multi-component nutrition education program', *Journal of School Psychology*, vol. 42, pp. 45-60.

Breslin, G & Brennam D, 2012. 'A healthy lifestyle intervention delivered by aspiring physical education teachers to children of social disadvantage: Study protocol and preliminary findings', *Child Care in Practice*, vol. 18, no. 3, pp. 207-225.

Brug, J, Oenema, A & Ferreira, I 2005, 'Theory, evidence and intervention mapping to improve behaviour nutrition and physical activity interventions', *International Journal of Behavior Nutrition and Physical Activity*, viewed 12 January 2013, http://wwwijbnpa.org/content/2/1/2.

California Department of Education 1981, *Nutrition education today: A curriculum design for nutritional knowledge and food use in California's public secondary schools,* viewed 15 October 2012, www.cde.ca.gov.

California WIC Programme 2012, *How to evaluate a WIC nutrition education programme*, viewed 5 February 2013 http://www.cdph.ca.gov.

Carpenter, CJ 2010, 'A Meta-Analysis of the Effectiveness of Health Belief Model Variables in Predicting Behaviour', *Health Communication*, vol. 25, no. 8, pp. 661-669.

Centres for Disease and Control (CDC) 1996, *Guidelines for school health programmes to promote lifelong healthy eating, MMWR*, vol. 45 (RR-9), pp. 1-33, viewed 7 February 2013. http://www.cdc.gov/mmwr/preview.

Contento, IR & Morin. K 1988, *Manual for developing a nutrition education curriculum*, (United Nations Educational Scientific and Cultural Organization) UNESCO division of science technical and environmental education, Paris, viewed 22 June 2012 http://unesdoc.unesco.org/images/0008/000805/080584eb.

Contento, IR 2011, *Nutrition education: Linking research, theory and practice*. Jones and Bartlett Publishers, Sudbury MA.

Contento, IR, Keilly, MK & Corcoran, RD 1992, 'A formative evaluation of the American cancer society: "Changing the course" nutrition education curriculum', *Journal of School Health*, vol. 62. no. 9, pp. 411-416.

Contento, IR, Randel, JS & Basch, CE 2002, 'Review and analysis of evaluation measures used in nutrition education intervention research', *Journal of Nutrition Education and Behavior*, vol. 34, pp. 2-25.

Cooke, LJ, Chambers, LC, Añez, EV, Croker, HA, Boniface, D, Yeomans, MR & Wardle, J 2011, 'Eating for pleasure or profit the effect of incentives on children's enjoyment of vegetables', *Psychological Science*, vol. 22, no. 2, pp. 190-196.

Culinary Institute of America 2012, *A national initiative to improve the health of K – 12 students through food education, culinary strategy and flavour insight*, viewed 26 November 2012, http://www.ciaprochef.com/healthykids.

Dalais, L, Abrahams, Z, Steyn, NP, De Villiers A, Fourie JM, Hill, J, Lambert, EV & Draper, CE 2014, 'The association between nutrition and physical activity knowledge and weight status of primary school educators', *South African Journal of Education*, vol. 34, no. 3, pp. 817-824.

David, DM, Kimiywe, JO, Waudo, JN & Orodho, JA 2008, 'Promotion of nutrition education interventions in rural and urban primary schools in Machakos district, Kenya', *Journal of Applied Biosciences*, vol, 6, pp. 130-139, viewed 25 December 2013, http://m.elewa.org/JABS/2008/6/1.pdf.

David, MD, Kimiywe, J & Waudo, J 2012, Nutritional Knowledge, Attitude and Practices and Nutritional Status of School-Going Children in Machakos District, Kenya: *International Conference on Nutrition and Food Sciences*, IPCBEE 39, IACSIT Press, Singapore.

Day, ME, Strange, KS, McKay, HA, Naylor, P 2008, 'Action schools! BC–healthy eating: effects of a whole-school model to modifying eating behaviours of elementary school children', *Canadian Journal of Public Health*, vol. 99, no. 4, pp. 328-331.

De Villiers, A, Steyn, NP, Draper, CE, Fourie, JM, Barkhuizen, G, Lombard, CJ, Dalais, L, Abrahams, Z & Lambert, EV 2012, '"HealthKick": Formative assessment of the health environment in low-resource primary schools in the Western Cape Province of South Africa. *BMC Public Health*, vol. 12, no. 1, pp.1, viewed 14 July 2016, http://www.biomedcentral.com/1471-2458/12/794.

De Villiers, A, Steyn, NP, Draper, CE, Hill, J, Dalais, L, Fourie,J, Lombard, C, Barkhuizen, G & Lambert, EV 2015, 'Implementation of the HealthKick intervention in primary schools in low-income settings in the Western Cape Province, South Africa: a process evaluation', *BMC Public Health*, vol. 15, p. 818, viewed 23 November 2015, http://doi:10.1186/s12889-015-2157-8.

Department of Basic Education (DoBE) 2011a, *National Curriculum Statement (NCS). Curriculum and Assessment Policy Statement (CAPS) Grades 4 - 6: Natural Sciences and Technology*, viewed 15 November 2012, http://www.edu.gov.za.

Department of Basic Education (DoBE) 2011b, *National Curriculum Statement (NCS). Curriculum and Assessment Policy Statement (CAPS) Grades 4 - 6: Life Skills*, viewed 15 November 2012, http://www.edu.gov.za.

Department of Basic Education (DoBE) 2015, *National School Nutrition Programme*, viewed 12 July 2015, http://www.education.gov.za/Programmes/NationalSchoolNutrition.

Department of Basic Education 2012, *Action plan to 2014 - towards the realisation of schooling 2025*, viewed 15 January 2016, http://www.education.gov.za/LinkClick.aspx.

Department of Education (DoE) 2009, *National School Nutrition Programme: a guide for secondary schools*. Education Department, South Africa viewed 2 December 2015, http://www.education.gov.za.

Department of Health South Africa (DoH) 2003, *Guidelines for nutrition intervention of health facilities to manage and prevent child malnutrition*. Department of Health, Pretoria, pp. 11-20.

Department of Health South Africa (DoH) 2008a, *Integrated Nutrition Programme. A foundation for life,* Issue. 5, viewed 3 December 2015, https://www.westerncape.gov.za/sites/inp_foundation_for_life_1to12.pdf.

Department of Health South Africa (DoH) 2008b, '*National Food Consumption Survey – Fortification Baseline (NFCS-FB-1) South Africa, 2005: Executive summary*', *South African Journal of Clinical Nutrition*, vol. 21, no. 3, Suppl. 2, pp. 255-266.

Department of Health South Africa (DoH) 2012, *Guidelines for healthy eating: information for nutrition educators*. Department of Health, Nutrition Directorate, Pretoria.

Drake, L, Maier, C, Jukes, M, Patrikios, A. & Bundy, D 2002, 'School age children their health and nutrition', *United Nations standing committee on nutrition, working group on nutrition of school-age children, SCN News*, vol. 25, pp. 4-30.

Draper, CE, De Villiers, A, Lambert, EV, Fourie, J, Hill, J, Dalais, L, Abrahams, Z & Steyn, NP 2010, 'HealthKick: a nutrition and physical activity intervention for primary schools in low-income settings', *BMC Public Health*, vol. 10, pp. 398, viewed 13 July 2013, http://doi.10.1186/1471-2458-10-398.

Dudley, DA, Cotton, WG & Peralta, LR 2015, 'Teaching approaches and strategies that promote healthy eating in primary school children: a systematic review and meta-analysis', *International Journal of Behavioral Nutrition and Physical Activity*, vol. 12, p. 28, viewed 23 June 2015, http://dx.doi.10.1186/s12966-015-0182-8.

Duncan, S, McPhee, JC, Schluter, PJ, Zinn, C, Smith, R, Schofield, G 2011, 'Efficacy of a compulsory homework programme for increasing physical activity and healthy eating in children: the healthy homework pilot study', *International Journal of Behavioral Nutrition and Physical Activity*, vol. 8, p. 127, viewed 12 December 2015, http://www.ijbnpa.org/content/8/1/127.

Edwards, CS & Hermann, JR 2011, 'Piloting a cooperative extension service nutrition education program on first-grade children's willingness to try foods containing legumes', *Journal of Extension*, vol. 49, no. 1, pp. 1-4.

Eisenmann, JC, Alaimo, K, Pfeiffer, K, Paek, H, Carlson, JJ, Hayes, H, Thompson, T, Kelleher, D, Oh, HJ, Orth, J, Randall, Sue, Mayfield, K & Holmes, D 2011, 'Project FIT: Rationale, design and baseline characteristics of a school- and community-based intervention to address physical activity and healthy eating among low-income elementary school children', *BMC Public Health*, vol. 11, pp. 607-617, viewed 20 July 2014, http://doi.10.1186/1471-2458-11-607.

Falter, RA, Pignotti-Dumas, K, Popish, SJ, Petrelli, HM, Best, MA & Wilkinson, JJ 2011, 'A service learning program in providing nutrition education to children', *American Journal of Pharmacology and Education*, vol. 75, no. 5, pp. 85-92.

Fernandes, PS, Bernardo Cde, O, Campos, RM & Vasconcelos, FA 2009, 'Evaluating the effect of nutritional education on the prevalence of overweight/obesity and on foods eaten at primary schools', *Journal of Paediatrics (Rio J)*, vol. 85, no. 4, pp. 315-321.

Fink, A 2009, *Conducting research literature reviews: from the internet to paper*. 3rd edn. Sage Publications, Los Angeles CA.

Food and Nutrition Service/United States Department of Agriculture (FNS/USDA) 2005, *Nutrition education: Principles of sound impact evaluation*, viewed 7 February 2013, http://www.fns.usda.gov.

Food and Agriculture Organization (FAO) 2005, '*Corporate document repository. Nutrition education for the public: A framework for nutrition education programmes*, viewed 15 May 2012, www.faocdr.org.

Food and Agriculture Organization (FAO) 2006, *Nutrition education in primary schools: A planning guide for curriculum development*, viewed 21 June 2012, ftp://ftp.fao.org/docrep/fao/009/.

Fornari, A 2006, 'Developing an ethics curriculum using learner centred pedagogy', *The Internet Journal of Allied Health Sciences and Practice*, viewed 30 June 2012, http://ijahsp.nova.edu.

Forneris, T. Fries, E, Meyer, A, Buzzard, M, Uguy, S, Ramakrishnan, R, Lewis, C & Danish, S 2010, 'Results of a rural school-based peer-led intervention for youth: goals for health', *Journal of School Health,* vol. 80, no. 2, pp. 57-65.

Francis, M, Nichols, SS & Dalrymple, N 2010, 'The effects of a school-based intervention programme on dietary intakes and physical activity among primary-school children in Trinidad and Tobago', *Public Health Nutrition,* vol. 13, no. 5, pp. 738-747.

French, SA & Worsley, T 2004, 'What is the role of theory in health behaviour change intervention?', *International Journal of Behavioral Nutrition and Physical Activity*, vol. 1, no. 1, pp. 9, viewed 11 January 2013, http://www.ncbi.nlm.nih.gov.

Glanz, K, Rimer, BK & Lewis, FM 2002, *Health behaviour and health education: Theory, research and practice.* Willey and Sons, San Francisco CA.

Galobardes, B, Shaw, M, Lawlor, DA, Lynch, JW & Smith, GD 2006, 'Indicators of socioeconomic position (part 1), *Journal of Epidemiology and Community Health'*, vol. 60, pp. 7-12, viewed 18 January 2016, http://doi:10.1136/jech.2004.023531.

Gorely, T, Nevill, ME, Morris, JG, Stensel ,DJ, Nevill, A 2009, 'Effect of a school-based intervention to promote healthy lifestyles in 7–11 year old children', *International Journal of Behavioral Nutrition and Physical Activity*, vol. 6, pp. 5, viewed 18 January 2016, http://doi:10.1186/1479-5868-6-5.

He, M, Beynon, C, Sangster, B M, St Onge, R, Stewart, S, Khoshaba, L, Horbul, BA & Chircoski, B 2009, 'Impact evaluation of the Northern Fruit and Vegetable Pilot Programme - a cluster-randomised controlled trial', *Public Health Nutrition*, vol. 12, no. 11, pp. 2199-2208.

Hildebrand, DA, Jacob, T & Garraid-Foster, D 2012, 'Food and fun for everyone: a community nutrition education program for 3rd and 4th Grade students suitable for school wellness programmes', *Journal of Nutrition Education and Behavior*, vol. 44, no. 1, pp. 93-95.

Hill, J, Draper, CE, De Villiers, A, Fourie, JM, Mohamed, S, Parker W & Steyn, N 2015, 'Promoting healthy lifestyle behaviour through the Life-Orientation curriculum: Teachers' perceptions of the HealthKick intervention', *South African Journal of Education*, vol. 35, no. 1, pp. 981-989.

Hmelo-Silver, CE & Barrows, HS 2006, 'Goals and strategies of a problem-based learning facilitator', *Inter-Disciplinary Journal of Problem-Based Learning*, vol. 1, pp. 21-39.

Hmelo-Silver, CE 2004, 'Problem-based learning. What and how do students learn?', *Educational Psychology Review*, vol. 16, pp. 235-266.

Hoelscher, DM, Evans, A, Parce, GS & Kelder, SH 2002, 'Designing effective nutrition interventions for adolescents', *Journal of the American Dietetic Association*, vol. 102, Suppl. 52-63.

Hoffman, JA, Franko, DL, Thompson, DR, Power, TJ & Stallings, VA 2010, 'Longitudinal behavioural effects of a school-based fruit and vegetable promotion program', *Journal of Paediatric Psychology*, vol. 35, no. 1, pp. 61-71.

Holli, BB, Maillet, JO, Beto, JA & Calabrese, RJ 2009, *Communication and education skills for dietetics professionals.* 5th edn. Lippincott, Williams & Wilkins, Baltimore.

Horne, PJ, Tapper, K, Lowe, CF, Hardman, CA, Jackson, MC, Woolner, J 2004, 'Increasing children's fruit and vegetable consumption: a peer-modelling and rewards-based intervention', *European Journal of Clinical Nutrition*, vol. 58, no. 12, pp. 1649-1660.

Huang, HM, Wu, MC & Chen, KH 2010, 'Effectiveness of a school weight control program', *Journal of Nursing*, vol. 57, no. 3, pp. 51-59.

Hulme, D. & Scott, J 2010, 'The political economy of the MDGs: retrospect and prospect for the world's biggest promise', *Brooks World Poverty Institute (BWPI) working paper 110*, viewed 24 August 2012, www.manchester.ac.ul/bwpi.

Input Paper for Health Roadmap (IPHR) 2008, *Combating malnutrition in South Africa*, viewed 13 June 2012, http://www.dbsa.org/en/about.

Iowa Department of Public Health (IDPH) 2012, *WIC Nutrition education needs assessment technical assistance tool*. Bureau of Nutrition and Health Promotion, viewed 4 February 2013, www.movingtothefuture.org.

Interstate Postgraduate Medical Association (IPMA) 2010, *Educational opportunities in nutrition: An integrated needs assessment*, viewed 6 February 2013, http://www.ipmameded.org.

Jones, S, Spence, M, Hardin, S, Clemente, N & Schoch, A 2011, 'Youth Can! results of a pilot trial to improve the school food environment', *Journal of Nutrition Education and Behavior*, vol. 43, no. 4, pp. 284-287.

Kabahenda, M, Mullis, RM, Erhardf, JG, Nurlhrup-Clewes, C & Nichols, SY 2011, 'Nutrition education to improve dietary intake and micronutrient nutriture among children in less-resourced areas: a randomised controlled intervention in Kabarole district, Western Uganda', *South African Journal of Clinical Nutrition*, vol. 24, no. 2, pp. 83-88.

Katz, DL, Katz, CS, Treu, JA, Reynolds, J, Njike, V, Walker, J, Smith, E & Michael, J 2011, 'Teaching healthful food choices to elementary school students and their parents: the nutrition detectives TM program', *Journal of School Health*, vol. 81, no. 1, pp. 21-28.

Khan, AZ, Rafique, G, Qureshi, H & Badruddin, SH 2013, 'A nutrition education intervention to combat under nutrition: experience from a developing country, *ISRN Nutrition*, vol. 210287, no. 7, viewed 23 December 2015, http://doi:10.5402/2013/210287.

Kirschner, PA, Swellar, J & Clark, RE 2006, 'Why minimal guidance during instruction does not work: An analysis of the failure of constructivism, discovery, problem-based, experiential, and enquiry-based teaching', *Educational Psychologist*, vol. 41, pp. 75-86.

Kolb, DA 1984, *Experiential learning: Experience as the source of learning and development*, Prentice-Hall, Englewood Cliffs.

Kremers, SPJ, deBruijn, G, Visscher, TLS, VanMechelen, W, deVries, NK & Brug, J 2006, 'Environmental influences on energy balance related behaviours: A dual process view', *International Journal of Behavioral Nutrition and Physical Activity*, vol. 3, p. 9, viewed February 2014, http://doi.10.1186/1479-5868-3-9.

Kubik, MY, Lytle, LA, Hannan, PJ, Story, M & Perry, CL 2002, 'Food related beliefs eating behaviour and classroom food practices of middle school teachers', *Journal of School Health*, vol. 72, no. 80, pp. 339-345.

Kumar, S, Quinn, SC, Kim, KH, Musa, D, Hilyard, KM & Freimuth, VS 2012, 'The Social Ecological Model as a Framework for Determinants of 2009 H1N1 Influenza Vaccine Uptake in the United States', *Health Education and Behavior*, vol. 39, no. 2, pp. 229-243.

Kupolati, MD, Gericke, GJ & MacIntyre, UE 2015, 'Teachers' perceptions of school nutrition education's influence on eating behaviours of learners in the Bronkhorstspruit District', *South African Journal of Education*, vol. 35, no. 2, pp. 1-10.

Kupolati, MD, MacIntyre, UE & Gericke, GJ 2014, 'School-based nutrition education: features and challenges for success', *Nutrition & Food Science*, vol. 44, no. 6, pp. 520-535.

Labadarios, D, Steyn, PN & Nel, J 2011, 'How diverse is the diet of adult South Africans?', *Nutrition Journal*, vol. 10, no. 33, viewed 26 January 2016, http://www.nutritionj.com/content/10/1/33.

Lakshman, RR, Sharp, SJ, Ong, KK & Forouhi, NG 2010, 'A novel school-based intervention to improve nutrition knowledge in children: cluster randomised controlled trial', *BMC Public Health*, vol. 10, pp. 123-132.

Langille, JD & Rodgers, WM 2010, 'Exploring the Influence of a Social Ecological Model on School-Based Physical Activity', *Health Education and Behaviour*, viewed 11 January 2016, http://doi.1090198110367877.

Lawrence, M & Worsley, T 2007, *Public health nutrition: from principles to practice*. Allen and Unwin, Sydney.

Lien, N, Bjelland, M, Bergh, IH, Grydeland, M, Anderssen, SA, Ommundsen, Y, Andersen, LF, Henriksen, HB, Randby, JS & Klepp, KI 2010, 'Design of a 20-month comprehensive, multicomponent school-based randomised trial to promote healthy weight development among 11-13 year olds: The health in adolescents study', *Scandinavian Journal of Public Health*, vol. 38, Suppl. 5, pp. 38-51.

Looney, JW 2011, 'Integrating formative and summative assessment: progress toward a seamless system', *OECD Education Working Papers*, No. 58, OECD Publishing, viewed 20 December 2015, Available at http://dx.doi.org/10.1787/5kghx3kbl734-en.

Mangunkusumo, RT, Brug, J, De Koning, HJ, Van Der Lei, J, Raat, H 2007, 'School-based internet-tailored fruit and vegetable education combined with brief counselling increases children's awareness of intake levels', *Public Health Nutrition*, vol. 10, no. 3, pp. 273-279.

Maunder, EMW & Meaker, JL 2007, 'The current and potential contribution of home- grown vegetables to diets in South Africa', *Water South Africa*, vol. 33, no. 3, pp. 401-406.

McAleese, J & Rankin, L 2006, 'Garden-based nutrition education affects fruit and vegetable consumption in sixth-grade adolescents', *Journal of the American Dietetic Association,* vol. 107, pp. 662-665.

McKenzie, JF, Neiger, BL & Smeltzer, JL 2005, *Planning, implementing and evaluating health promotion programs. A primer*. 4th edn. Pearson Education, San Francisco CA.

McNulty, J 2013, Challenges and issues in nutrition education. Rome: Nutrition Education and Consumer Awareness Group. Food and Agriculture Organization of the United Nations, viewed 12 March 2015, www.fao.org/ag/humannutrition/nutritioneducation/en.

Mertens, DM 2014, *Research and evaluation in education and psychology: Integrating diversity with quantitative, qualitative and mixed methods*. 4th edn. Sage Publishers, Washington DC.

Merrell, KW 2008, *Behavioural, social and emotional assessment of children and adolescents.* 3rd edn. Lawrence Erlbaum Associates. Taylor and Francis Group, New York NY.

Mestry, R & Ndhlovu, R 2014, 'The implications of the national norms and standards for school funding policy on equity in South African public schools, *South African Journal of Education*, vol. 34, no. 3, pp. 1-11.

Morgan, PJ, Warren, JM, Lubans, DR, Saunders, KL, Quick, GI, Collins, CE 2010, 'The impact of nutrition education with and without a school garden on knowledge, vegetable intake and preferences and quality of school life among primary-school learners', *Public Health Nutrition*, vol. 13, no. 11, pp. 1931-1940.

Morris, J & Zidenberg-cherr, S 2002, 'Garden enhanced nutrition curriculum improves 4th grade school children's knowledge of nutrition preferences for some vegetables', *American Dietetic Association. Journal of the American Dietetic Association,* vol. 102, no. 1, pp. 91-93.

Morris, JL, Briggs, M, & Zidenberg-Cherr, S 2002, 'Development and evaluation of a garden enhanced nutrition education curriculum for elementary schools children', *Journal of Child Nutrition & Management*, viewed 21 June 2012, http://docs.schoolnutrition.org/newsroom/jcnm/02.

Napier, CE & Oldewage-Theron, WH 2005, 'Knowledge of food-based dietary guidelines and nutritional status of primary school children in an informal settlement', *Symposia: Proceedings of the 18th International Congress of Nutrition*, 19-23 September 2005, pp. 1-2.

Nguyen, KA, De Villiers, A, Fourie, JM, Bourne, LT & Hendricks MK 2013, 'The feasibility of implementing food-based dietary guidelines in the South African primary-school curriculum', *Public Health Nutrition*, vol. 18, no. 1, pp. 167-175.

Novak, JD 2011, 'A theory of education: meaningful learning underlies the constructive integration of thinking, feeling, and acting leading to empowerment for commitment and responsibility', *Meaningful Learning Review*, vol. 1, no. 2, pp. 1-14.

Novak, JD and Cañas AJ 2006, 'The theory underlying concept maps and how to construct them, technical report IHMC CmapTools 2006-01', *Florida Institute for Human and Machine Cognition',* viewed 21 January 2014, http://cmap.ihmc.us/Publications/ResearchPapers/.

Oldewage-Theron, W & Egal, A 2012, 'Impact of nutrition education on nutrition knowledge of public school educators in South Africa: A pilot study', *Health SA Gesondheid*, vol. 17, no. 1, viewed 2 December 2012, http://dx.doi.org/10.4102/hsag.v17i1.602.

Oldewage-Theron, WH & Napier, CE 2011, 'Nutrition education tools for primary schools children in the Vaal region', *Development Southern Africa*, vol. 28, no. 2, pp. 283-292.

Oldewage-Theron, WH, Napier, CE, Dicks, E & Rutengwe, R 2005, 'Situation analysis of an informal settlement in the Vaal Triangle', *Development Southern Africa*, vol. 22, no. 1, pp. 13-26.

Olivares, S, Moron, C, Kain, J, Zacarias, I, Andrade, M, Lera, L, Diaz, N & Vio, F 2004, 'A methodological proposal to include nutrition education in primary schools in Chile', *Archaeology of Latinoam Nutrition*, vol. 54, no. 2, Suppl. 1, pp. 33-9.

Oosthuizen, D. Oldewage-Theron, WH & Napier, C 2011, 'The impact of a nutrition education programme on the dietary intake patterns of primary school children', *South African Journal of Clinical Nutrition*, vol. 24, no. 920, pp. 75-81.

Panunzio, MF, Antoniciello, A, Allessandra, P & Dalton, S 2007, 'Nutrition education intervention by teachers may promote fruit and vegetable consumption in Italian students', *Nutrition Research*, vol. 27, no. 9, pp. 524-528.

Parker, S, Powell, L, Herman, J, Phelps, J & Brown, B 2011, 'Preferred educational delivery strategies among limited income older adults enrolled in community nutrition education programmes', *Journal of Extension*, vol. 49, no. 1, viewed 9 February 2013, www.joe.org.

Parmer, SM, Salisbury-Glennon, J, Shannon, D, Struempler, B 2009, 'School gardens: an experiential learning approach for a nutrition education program to increase fruit and vegetable knowledge, preference, and consumption among second-grade learners', *Journal of Nutrition Education and Behavior*, vol. 41, no. 3, pp. 212-217.

Perez-Rodigo, C & Aranceta J 2003, 'School based nutrition education: lessons learned and new perspectives', *Public Health Nutrition*, vol. 4, no. 1A, pp. 131-139.

Prelip, M, Kinsler, J, Chan, LT, Erausquin, JT & Slusser, W 2012, 'Evaluation of a school-based multicomponent nutrition education program to improve young children's fruit and vegetable consumption', *Journal of Nutrition Education and Behavior*, vol. 44, no. 4, pp. 310-318.

Prelip, M, Slusser, W, Thai, CL, Kinsler, J & Erausquin, JT 2011, 'Effects of a school-based nutrition program diffused throughout a large urban community on attitudes, beliefs, and behaviors related to fruit and vegetable consumption', *Journal of School Health*, vol. 81, no, 9, pp. 520-529.

Preventive Institute (PI) 2012, *Nutrition education in schools*. Prevention Institute's nutrition policy profile series, viewed 26 May 2012, www.preventioninstitute.org.

Pritchard, A. 2013, *Ways of Learning: Learning theories and learning styles in the classroom*. 3rd edn, Routledge, New York NY.

Public Service Commission (PSC) 2008, *Report on the evaluation of the national school* nutrition programme (NSNP). Commission House, South Africa.

Rafiroiu, AC & Evans, A 2005, 'Nutrition knowledge, attitudes and practices among nutrition educators in the South', *American Journal of Health Studies*, vol. 20, pp. 29-38.

Rajopal, R, Cox, RH, Lamber, M & Lewis, EC 2003, 'Cost benefit analysis indicates the positive economic benefits of the expanded food and nutrition education programme related to chronic disease prevention', *Journal of Nutrition Education and Behavior*, vol. 34, pp. 26-37.

Robert, RC, Gittelsohn, J, Creed-Kanashiro, HM, Penny, ME, Caufield, LE, Narro, RM & Black, RE 2006, 'Process evaluation determines the pathway of success for a health centred, nutrition education intervention for infants in Truijillo, Peru', *Journal of Nutrition*, vol. 136, no. 3, pp. 634-641.

Rosario, R, Araujo, A, Oliveira, R, Padrao, P, Lpoes, O, Teixeira, V, Moreira, A, Barros, R, Pereira, B & Moreira, P 2012, 'The impact of an intervention taught by trained teachers on childhood fruit and vegetable intake: A randomised trial', *Journal of Obesity, Article ID: 342138*, viewed 28 August 2013, http://www.ncbi.nlm.nih.gov/pubmed/22523664.

Roseman, MG, Riddel, MC & Haynes, JN 2011, 'A content analysis of kindergarten – 12th Grade school-based nutrition interventions: taking advantage of past learning', *Journal of Nutrition Education and Behavior*, vol. 43, no. 1, pp 2-18.

Rossiter, M, Glanville, T, Taylor, J & Blum, I 2007, 'School food practices of prospective teachers', *Journal of School Health*, vol. 77, no. 10, pp. 694-700.

Saunders, R.P, Evans, MH & Joshi, P 2005, 'Developing a process evaluation plan for assessing health promotion program implementation: A how to guide', *Health Promotion Practice*, vol. 6, no. 2, pp. 134-147.

Savage, JS, Fisher, JO & Birch, LL 2007, 'Parental influence on eating behaviour: conception to adolescence', *Journal of Law, Medicine & Ethics*, vol. 35, pp. 22-34.

Senekal, M, Seme, Z, De Villiers, A & Steyn, NP 2015, 'Health status of primary school educators in low socio-economic areas in South Africa', *BMC Public Health*, vol. 15, no. 1, pp.1, http://doi.10.1186/s12889-015-1531-x.

Schunk, DH 2012, *Learning theories: An educational perspective*. 6th edn, Prentice Hall, Boston MA.

Shariff, ZM, Bukhari, SS, Othman, N, Hashim, N, Ismail, M, Jamil, Z, Kazim, SM, Paim, L, Samah, BA & Hussein, ZAM 2008, 'Nutrition education intervention improves nutrition

knowledge, attitude and practices of primary school children: a pilot study', *International Electronic Journal of Health Education*, vol. 11, no. 1, pp. 119-132.

Sherman, J & Muehlhoff, E 2007, 'Developing a nutrition and health education program for primary schools in Zambia', *Journal of Nutrition Education and Behavior*, vol. 39, no. 6, pp. 335-342.

Shi-Chang, X, Xin-Wei, Z, Shui-Yang, X, Shu-Ming, T, Sen-Hai, Y, Aldinger, C & Glasauer, P 2004, 'Creating health-promoting schools in China with a focus on nutrition', *Health Promotion International*, vol. 19, no. 4, pp. 409-418.

Shilts, MK, Lamp, C, Horowitz, M & Townsend, MS 2009, 'Pilot study: Eat-Fit impacts sixth Graders' academic performance on achievement of Mathematics and English education standards', *Journal of Nutrition Education and Behavior*, vol. 41, no. 2, pp. 127-131.

Shisana, O, Labadarios, D, Rehle, T, Simbayi, L, Zuma, K, Dhansay, A, Reddy, P, Parker, W, et al 2013, *South African National Health and Nutrition Examination Survey (SANHANES-1)*. HSRC Press, Cape Town.

Shuttleworth, M. 2009, What is a literature review?, viewed 22 August 2012, http://www.experiment-resources.com?what-is-a-literature-review.html.

Siega-Riz, AM, El Ghormli, L, Mobley, C, Gillis, B, Stadler, D, Hartstein, J, Volpe, SL, Virus, A & Bridgman, J 2011, 'The effects of the HEALTHY study intervention on middle school student dietary intakes', *International Journal of Behavior Nutrition and Physical Activity*, vol. 4, no. 8, p. 7, viewed 10 December 2012, http://www.ijbnpa.org/content/8/1/7.

Singhal, N, Misra, A, Shah, P & Gulati, S 2010, 'Effects of controlled school-based multi-component model of nutrition and lifestyle interventions on behaviour modification, anthropometry and metabolic risk profile of urban Asian Indian adolescents in North India', *European Journal of Clinical Nutrition*, vol. 64, no. 4, pp. 364-373.

Slawta, JN & DeNeui, D 2010, 'Be a Fit Kid: nutrition and physical activity for the fourth Grade', *Health Promotion Practice*, vol. 11, no. 4, pp. 522-529.

Steyn, NP, De Villiers, A, Gwebushe, N, Draper, CE, Hill, J, de Waal, M, Dalais, L, Abrahams, Z, Lombard, C & Lambert, EV 2015, 'Did HealthKick, a randomised controlled trial primary school nutrition intervention improve dietary quality of children in low-income

settings in South Africa?', *BMC Public Health*, vol. 15, no. 1, pp.1, http://doi.10.1186/s12889-015-2282-4.

Steyn, NP, Bradshaw, D, Nornam, R, Joubert, J, Schneider, M Steyn, K 2006, 'Dietary changes and the health transition in South Africa: Implication for health policy', *South African Medical Research Council. Cape Town*, viewed 25 October 2012. http://www.sahealthinfo.org/lifestyle.

Steyn, NP, Lambert, EV, Parker, W, Mchiza, Z & De Villiers, A 2009, 'A review of school nutrition interventions globally as an evidence base for the development of the HealthKick programme in the Western Cape, South Africa', *South African Journal of Clinical Nutrition*, vol. 22, no. 3, pp. 145-152.

Swinburn, BA, Caterson, I, Seidell, JC & James, WP 2004, 'Diet, nutrition and the prevention of excess weight gain and obesity', *Public Health Nutrition*, vol. 7, pp. 123-146.

Swindle, S, Baker, SS & Auld, GW 2007, 'Operation frontline assessment of longer-term curriculum effectiveness, evaluation strategies and follow up methods', *Journal of Nutrition Education and Behavior*, vol. 39, no. 4, pp. 205-213.

The Valley Trust 2004, *School nutrition education programme*. The Valley Trust Whole Nutrition Programme, Botha Hill, South Africa.

Thompson, M 2008, 'Concept and principles of experiential learning activities', *Martin Thompson MTA International*, viewed 17 July 2012, http://www.businessballs.com.

United Nations Integrated Children Emergency Fund (UNICEF) 2008, *Evaluation of the school nutrition programme: National report*, Department of Education, South Africa.

United Nations Integrated Children Emergency Fund (UNICEF) 2009, *Tracking progress of child and maternal nutrition – a survival and development priority*. UNICEF, NewYork, USA, viewed 26 May 2012, www.unicef.org/publications.

United Nations Integrated Children Emergency Fund (UNICEF) 2012, *Focusing resources on effective school health*. UNICEF, viewed 23 December 2015, http://www.unicef.org/lifeskills/index_7262.html.

United Nations Millenium Project 2005, *Investing in development: A practical plan to achieving the millennium development goals*. United Nations Development Project, New York.

Van Cauwenberghe, E, Maes, L, Spittaels, H, Van Lenthe, FJ, Brug, J, Oppert, J & De Bourdeaudhuij, I 2010, 'Effectiveness of school-based interventions in Europe to promote healthy nutrition in children and adolescents: systematic review of published and grey literature', *British Journal of Nutrition*, vol. 103, no. 6, pp. 781-797.

Vereecken, CA, Van-Danme, W, Maes, L 2005, 'Measuring attitudes, self-efficacy and social and environmental influences on fruit and vegetables consumption of 11 and 12 year old children: Reliability and validation', *Journal of the American Dietetic Association*, vol. 105, pp. 257-261.

Vorster H, Badham J & Venter C 2013, 'An introduction to the revised food-based dietary guidelines for South Africa', *South African Journal of Clinical Nutrition*, vol. 26, no. 3, suppl. 5-12.

Voster, HH, Love, P & Browne, C 2001, 'Development of food-based dietary guidelines for South Africa - the process', *South African Journal of Clinical Nutrition*, vol. 14, no. 3, pp. S1-S80.

Wall, DE, Least, C, Gromis, J & Lohse, B 2012, 'Nutrition education intervention improves vegetable-related attitude, self-efficacy, preference, and knowledge of fourth-Grade students', *Journal of School Health*, vol. 82, no. 1, pp. 37-43.

Walsh, CM, Dannhauser, A & Joubert, G 2003, 'Impact of a nutrition education programme on nutrition knowledge and dietary practices of lower socioeconomic communities in the Free State and Northern Cape', *South African Journal of Clinical Nutrition*, vol. 16, no. 3, pp. 88-94.

World Bank 2006, *Repositioning Nutrition as central to development: A strategy for large scale action.* World Bank, Washington DC.

World Health Organization (WHO) 2009, *Tracking progress of child and maternal nutrition*. World Health Organization, Geneva.

Yildiz, Z & Karabiyik, B 2012, Implementation of a sub-topic plan which is prepared according to the meaningful learning theory and evaluation of the results: *The International 4th World Conferences on Education Sciences (WCES),* Barcelona, Spain, vol. 46, pp. 4021-4025, viewed 11 January 2014, www.sciencedirect.com.

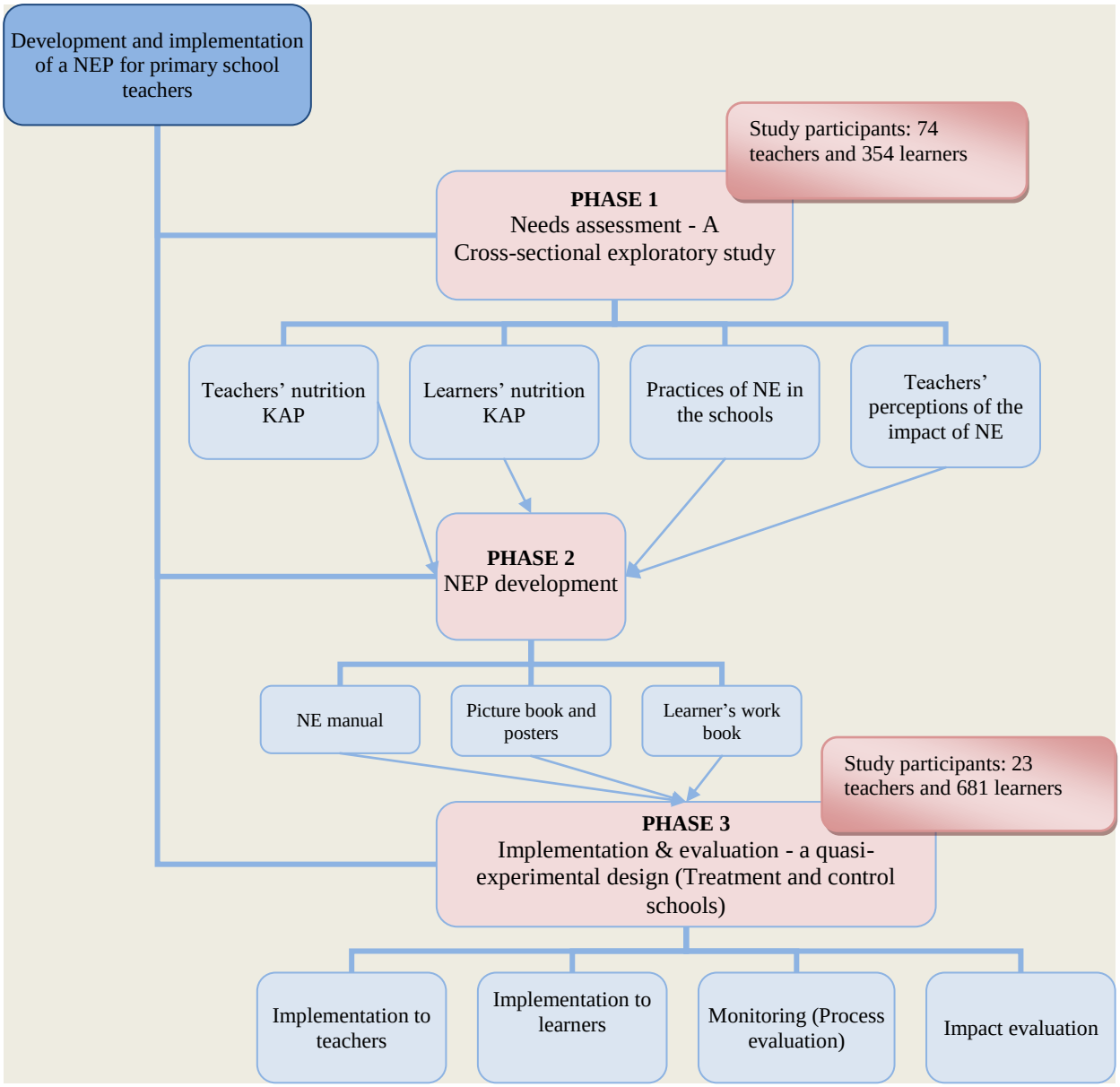
Young, DR, Steckler, A, Cohen, S, Pratt, C, Felton, G, Moe, SG, Pickrel, J, Johnson, CC, Grieser, M, Lytle, LA, Lee, JS & Raburn, B 2008, 'Process evaluation results from a school- and community-linked intervention: the Trial of Activity for Adolescent Girls (TAAG)', *Health Education Research*, vol. 23, no. 8, pp. 976-986.

CHAPTER 3

METHODOLOGY

3.1 INTRODUCTION

This study sought to develop a contextual NEP for teachers in order to improve their skills in teaching nutrition. Effective teaching of nutrition could lead to healthy eating through improved nutrition knowledge, attitudes and dietary practices. In order to actualise this goal, quantitative and qualitative research methods were used to collect data in a three phase study plan. The overview of the phases is discussed in this chapter, and includes the study setting and population, as well as the conceptual definition of terms used in the whole study. However, the detailed method used in the different phases is described with the phases in chapters 4, 5 and 6. Phase 3 was conducted at two schools (the treatment and the control schools) different from the two schools where both the teachers and the learners participated in phase 1. The diagrammatic overview of the study is presented in figure 3.1



The treatment and control schools were not part of the schools used in the needs assessment

Abbreviations: NEP – Nutrition education programme, NE – Nutrition education, KAP – Nutrition knowledge, attitudes and dietary practices

Figure 3.1: Overview of the study design

3.2 RESEARCH PERSPECTIVE

3.2.1 Research approach

The study was conducted in three phases:

i. The needs assessment (Phase 1)
ii. The development of a context specific NEP (Phase 2)
iii. The implementation and evaluation of the developed context specific NEP (Phase 3)

The three phases were used to address three research questions which were:

Phase 1

Question 1: What are the needs for NEP that would enable teachers to teach nutrition most effectively?

Phase 2

Question 2: What are the features (Educational strategies (ESs) and theoretical basis) for a context specific NEP for the teachers and how can these features be applied in the development of the NEP?

Phase 3

Question 3: What is the impact of the context specific NEP on the teachers' skill in teaching nutrition, and on the nutrition knowledge, attitudes, and dietary practices (KAP) of the teachers and the learners?

The study engaged both quantitative and qualitative research methodologies in a way to complement each other and reveal information which would otherwise be neglected by using either of the methods alone (Harwell 2011; Broom & Willis 2007). Therefore, the rationale for integrating both quantitative and qualitative research methodologies in the study was to ensure completeness of information about the subject matter (Bryman 2006). The methods were used in a sequential order with no consideration of one having priority over the other (Bryman 2006).

3.2.2 Research phases

The phases were conducted one after the other, because the outcome of phase 1 dictated the content of phase 2, and phase 3 was dependent on the outcome of phase 2. The results of each

phase are discussed separately in the chapters describing the different phases, and all the phases were reported together as a whole in the executive summary in chapter 9.

3.2.2.1 Phase 1: Needs assessment (May to September 2013)

Phase 1 was the needs assessment phase which aimed at exploring the teachers' and the learners' nutrition KAP, and the situation of NE in the schools in the Bronkhorstspruit district to inform the development of a context specific NE intervention for teachers. Quantitative research methodology, using questionnaire administration, and qualitative research methodology, using a phenomenological approach in group interviews were employed in data collection. A phenomenological approach focuses on people's subjective experiences and interpretations of their circumstances (Houston & Mullan-Jensen 2012).

Participants in phase 1 included the teachers who taught nutrition to Grades 4 to 7 and learners in Grades 5 and 6. Convenience sampling was used to select the teachers in eleven schools and the learners in the two schools, while purposive sampling was used to select the teachers who participated in the FGDs in the three schools. Only the teachers and learners who consented and assented to participate by signing the informed consent were included in the study.

Quantitative data were analysed for descriptive statistics using the Stata® Statistical Software® Release 10, 2007. Qualitative data were analysed by using the thematic framework approach of qualitative research (Dixon-Woods 2011; Ritchie & Spencer 2002). This phase is discussed in detail in chapter 4.

3.2.2.2 Phase 2: Development of the nutrition education programme (January to December 2014)

The aim of phase 2 was to develop a context specific NEP for teachers who were teaching nutrition to Grades 5 and 6 learners in primary schools in the Bronkhorstspruit district. The specific objective was to identify and develop the features (ESs, theoretical models and activities) of the NEP most appropriate for teachers in teaching nutrition.

The integrated constructs of the SCT and the MLM were used to explain the nutrition topics in the existing curriculum while also accommodating the needs identified in phase 1. The phase also included arrangement for the implementation which included the training of the teachers, consultation with stakeholders (Officers of the DoBE), pilot testing the instruments

and determining the facilitators for the process evaluation interview. Phase 2 is discussed in detail in chapter 5.

3.2.2.3 Phase 3: Implementation and evaluation of the nutrition education programme (January to September 2015)

The aim of phase 3 was to implement the developed context specific NE manual to teachers who were teaching nutrition to Grade 5 and 6 learners and to evaluate the impact of the NEP on the teachers' skills in teaching nutrition, and on the nutrition KAP status of the teachers and the learners.

Phase 3 employed the use of a quasi-experimental design and involved both qualitative and quantitative research methodology. The nutrition KAP of the teachers and the learners were assessed at pre- and post-implementation by means of validated nutrition KAP questionnaires (Shariff et al. 2008; Rossiter et al. 2007; Parmenter & Wardle 1999).

Process evaluation was conducted to assess whether the NE was delivered as intended (Young et al. 2008). Data obtained were used to assess the programme in terms of completeness, fidelity, dose delivered, dose received and the reach (Moore et al. 2012). Continuous discussion on a one on one basis to ensure teachers' motivation (Shariff et al. 2008) took place during the course of the implementation. This was done by the researcher through visits to deliver food and materials needed for class demonstration and practical sessions. Visits were done once in two weeks during the period of implementation.

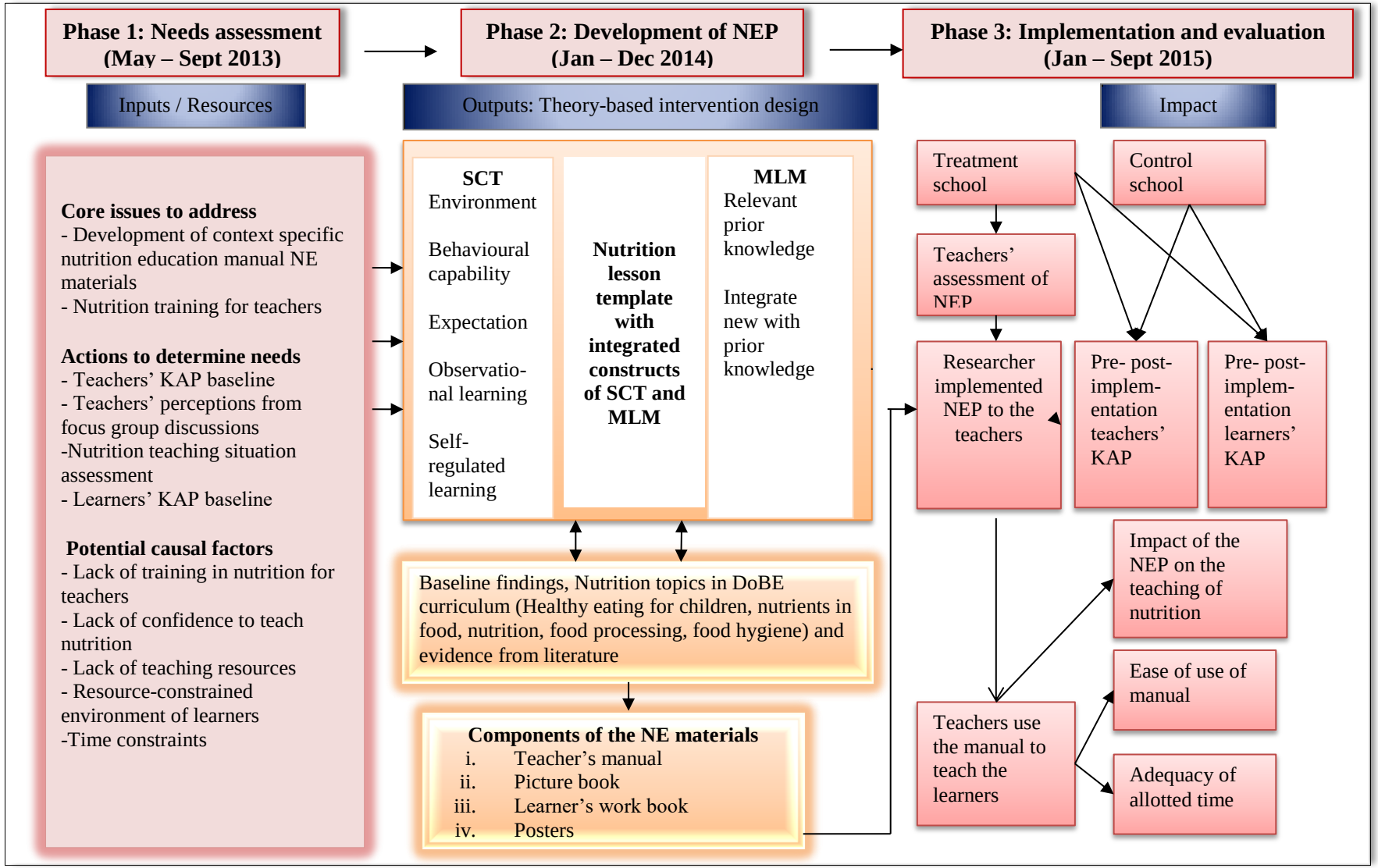
Process evaluation data consisted of both qualitative and quantitative data. Quantitative data were obtained in respect of the implementation of the NEP to the teachers. Qualitative data were obtained on the teachers' implementation of the NEP to the learners and the teachers' perceptions of the impact of the NEP in a focus group discussion. Only the teachers who used the manual to teach learners were involved in the focus group discussion. The details of the methodology of phase 3 are reported in chapter 6.

Quasi-experimental design

A quasi-experimental design often described as a non-randomised, pre-post intervention study, is a design used to test the causal hypothesis of an intervention that does not involve a random assignment in selecting the research participants into treatment and control groups (White & Sabarwal 2014). This design is often employed when it is not logistically or

ethically feasible to conduct a randomised controlled trial (Harris et al. 2006). The implementation and evaluation of the NEP (phase 3) employed a quasi-experimental design whereby the two schools were selected into treatment and control through simple random sampling by tossing a coin. The small number of schools involved and the nature of the intervention, i.e. based on the existing curriculum, according to the school schedule and implemented by teachers, made it unfeasible to use a randomised controlled trial.

The conceptual framework for the study as a whole is presented in figure 3.2 and the conceptual definition of terms used in the entire study is discussed in section 3.3.



Abbreviations: NE – Nutrition education, NEP – Nutrition education programme, KAP – Knowledge, attitudes and dietary practices, NE – Nutrition education, DoBE – Department of Basic Education, SCT – Social cognitive theory, MLM – Meaningful learning model.

Figure 3.2: Conceptual framework for developing and implementing nutrition education programme for teachers

3.3 CONCEPTUAL DEFINITION OF TERMS

- Completeness: The extent to which all the content of the contextual NE programme was implemented as it was originally planned (Androutsos et al. 2014).
- Context specific: Compliant with the resource constrained background of the learners in respect of the available foods in the schools' environment and in the Bronkhorstspruit district.
- Control school: The school that was used as a standard of comparison to the treatment school from which the NEP activities were absent but has the characteristics similar to the treatment school in all respects (Insel, Turner & Ross 2006).
- Dietary practices: A person's choice of food also referred to as the habitual decision an individual makes when choosing what foods to eat. In the present study, it describes the regular food consumption of the teachers and the learners which typified a pattern and was dictated by availability, convenience, cost and cultural factors (California Department of Public Health (CDPH) 2012).
- Dose delivered: The amount of the content of the NE manual that was taught by the teachers as assessed by the number of lessons that were taught (Androutsos et al. 2014).
- Dose received: The amount of the content of the NE manual that the learners were exposed to as assessed by the number of work book activities that the learners engaged in (Yamada et al. 2010).
- Enhanced curriculum approach: The theory-based nutrition education plan built on the existing nutrition curriculum of the DoBE (NCS/CAP of 2011) (Dudley, Cotton & Peralta 2015).
- Fidelity: The extent to which the implementation of the contextual NEP was in compliance with the order in which the lessons were to be delivered (Yamada et al. 2010).
- Formative evaluation: The process evaluation assessments that were used to adjust the NEP when the implementation was on-going (Looney 2011).
- Impact evaluation: The assessment of the immediate effect of the NEP using a combination of quantitative and qualitative measures. Measurements included the intervention's acceptability at post-implementation and comparison between the

treatment and control schools regarding changes in the nutrition KAP of the teachers and the learners between schools and within school (Lawrence & Worsely 2007).

- Implementation: The processes involved in the execution of the mapped out NEP to improve the teachers' skills in teaching nutrition and the nutrition KAP of the teachers and the learners.
- Instructional materials: Aids such as the picture book, the posters and the learner's work book used by teachers to help in teaching nutrition lessons effectively by expressing intended concepts of learning adequately and enhancing learning in a systematic manner (Lewis 2012; Chanda, Phiri & Nkosha 2000).
- Needs assessment: The process of identifying the dietary practices of the teachers and the learners, and the NE practices in the schools to inform the development of an appropriate NEP for the teachers (IDPH 2012).
- Nutrition attitudes: The stance, views and perception of the teachers and the learners in respect to food, food values and nutrition related matters (Contento 2011).
- Nutrition education manual: The step by step instructions and outline on the approach to deliver nutrition lessons using selected constructs of the SCT and the MLM to explain nutrition concepts (FAO 2006).
- Nutrition education programme (NEP): This is the development and implementation of a context specific NE for teachers, featuring a NE manual and materials using the enhanced curriculum approach and the selected constructs from the SCT and the MLM as explained by Contento (2011).
- Nutrition intervention: A purposefully planned NEP intended to improve nutrition knowledge, and facilitate a voluntary adoption of nutrition related practices and attitudes, which are consistent with health and well-being (Academy of Nutrition and Dietetics 2012).
- Nutrition knowledge: The level of general knowledge of the teachers and the learners in respect of food and nutrition related matters (Spronk et al. 2014).
- Process evaluation: The strategy that studied the ways in which the NE was delivered by the teachers and the quality of the procedures, description of what goes on and possible suggestion on ways in which programme design and implementation may be improved (Lawrence & Worsely 2007).
- Reach: The number of the learners who participated in the NEP (Yamada et al. 2010).

- Summative evaluation: Assessments during and at the end of the NEP that were used to describe the impact of the NEP (Bennett 2010).
- Treatment school: The school that was studied to evaluate the effect of the NEP on which the activities of the intervention were executed (Insel, Turner & Ross 2006).

3.4 STUDY SETTING AND POPULATION

The study (phase 1 to 3) took place in eleven primary schools in the Bronkhorstspruit district. The eleven schools were in the quintile 2 in the national poverty classification system. This classification qualifies the schools to benefit from the NSNP where learners receive nutritious meals at the school every day (DoE 2009). Bronkhorstspruit is reported as a farming area 50km east of Pretoria, in the Northern Gauteng Province, lying on the border between the Gauteng and Mpumalanga Provinces. It had 13 government primary schools with not less than 13,788 learners at the time of the study. The 13 Government schools on the recommendation of the DoBE, were approached by means of a letter introducing the study and inviting them to participate in the study. Two of the 13 schools declined participation.

The Bronkhorstspruit local authority consists of Bronkhorstspruit, Ekangala, Rethabiseng and Zithobeni, all of which are sub-division areas under the Tshwane metropolitan municipality. The sub-division areas have a diverse employment profile which reflects various sectors and occupations (City of Tshwane 2015). The population of these areas is 94,361 (by 2011 census) and the languages spoken are Afrikaans, isiNdebele, isiZulu and Northern Sotho (Statistics South Africa 2012). The map of Bronkhorstspruit and surroundings (figure 3.3) shows the study setting: Bronkhorstspruit, Ekangala, Rethabiseng and Zithobeni.

The study population consisted of teachers who taught nutrition to learners in Grades 4 to 7 and learners in Grades 5 and 6. The number of teachers and learners who participated in phase 1 of the study was 74 and 354 respectively, while 23 teachers and 681 learners participated in phase 3 of the study.

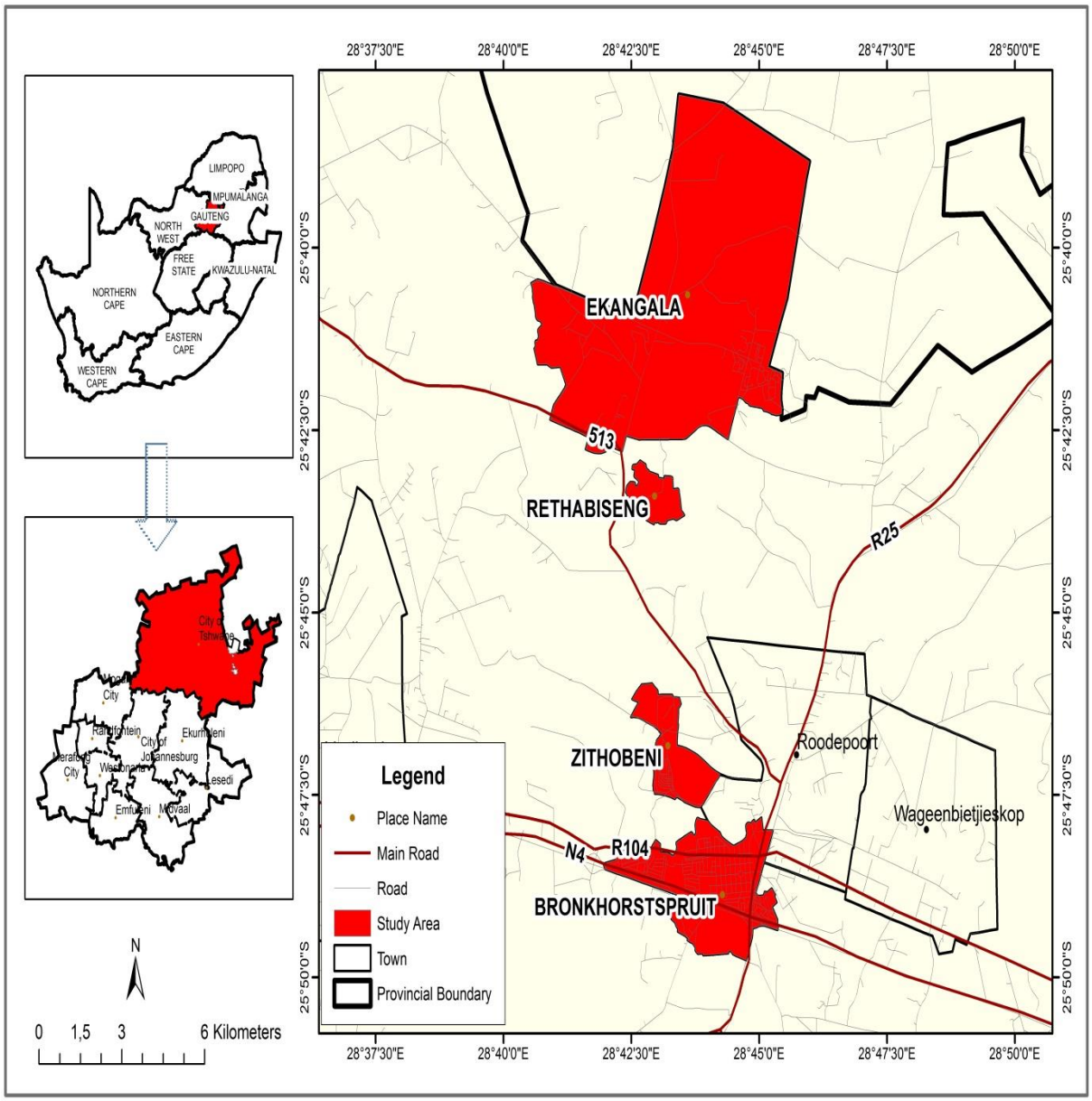


Figure 3.3: Map of Bronkhorstspruit and surroundings showing the study setting (Google Maps 2016)

3.5 ETHICAL APPROVAL AND CONSIDERATIONS

Ethical approval for the study was obtained from the Research Ethics Committee of the Faculty of Natural and Agricultural Sciences, University of Pretoria (Number: EC130424-037) (Appendix 1). The larger study obtained approval for intervention in the primary schools from the Gauteng DoBE with the approval number: D2013/233 (Appendix 2). Additional approval was obtained from the Gauteng DoBE for this study to take place in the 13 government primary schools in the Bronkhorstspruit district with subsequent renewals in 2014 and 2015 (Numbers: D2014/199; D2014/308A and D2015/374A) (Appendix 3). Written consent was obtained from all the teachers who participated in the study in phase 1 (Appendix 4) and in phase 3 (Appendix 5). Written parental consent was obtained in respect of all learners who participated (Appendix 6). The parents were informed through a letter introducing the study and informed consent. The letters were sent to the parents through the learners and signed informed consent forms were submitted to the class teachers. Assent to participate was obtained from the learners themselves (Appendix 7).

Ethics has the essential element to respect rights and preserve confidentiality of all participants in a research study (Kaufman 2007). Therefore, participation was voluntary and confidentiality was assured to all participants in both phases 1 and 3. Study numbers were assigned to all the participants in both phases 1 and 3 in the treatment and control schools (only accessible to the researcher). Participants were assured of no potential harm or risk, and were free to discontinue participation at any point with no prejudice. Information was made clear, understandable and with no deception.

Benefits of intervention were meant to be fairly distributed, i.e. the control school would receive copies of the NE materials at the end of the intervention. A copy each of the developed contextual NE materials was made available to the Gauteng North district of the DoBE. During the administration of the questionnaires to learners in the needs assessment study, questions were interpreted in isiNdebele, the preferred language of the learners.

3.6 DELIMITATIONS OF THE STUDY

i. The study was conducted in schools located in resource constrained communities.
ii. Implementation of the NEP to the learners in the school followed the allotted periods for teaching nutrition topics in the curriculum.
iii. Post-implementation assessment was done when one of the topics in the NE manual was yet to be taught.

3.7 ASSUMPTIONS

It was assumed that:

i. there would be no contamination between the treatment and control schools. However, the learners were allowed to take the work books home to complete homework and share nutrition messages with family and friends. Likewise, teachers had the custody of the NE manuals when they were using the manual to teach the learners;
ii. the study participants would give honest responses to questions in the interviews.

REFERENCES

Academy of Nutrition and Dietetics 2012, *Definition of terms.* Academy of Nutrition and Dietetics Evidence Analysis Library, Quality Management Committee: Reference manual, 3rd edn, viewed 25 August, 2012, http://www.adaevidencelibrary.com/category.cfm.

Androutsos, O, Apostolidou, E, Iotova, V, Socha, P, Birnbaum, J, Moreno, L, De Bourdeaudhuij, I, Koletzko, B & Manios, Y 2014, 'Process evaluation design and tools used in a kindergarten-based, family-involved intervention to prevent obesity in early childhood: The ToyBox-study', *Obesity Reviews*, vol. 15, Suppl. 3, pp. 74-80.

Bennett, RE 2010, 'Cognitively based assessment of, for, and as learning (CBAL): A preliminary theory of action for summative and formative assessment, measurement', *Interdisciplinary Research and Perspectives*, vol. 8, no. 2, pp. 70-91.

Broom, A & Willis, E 2007, 'Competing paradigms and health research', in M. Saks & J. Allsop (eds.), '*Researching health, qualitative, quantitative and mixed methods',* Sage Publications, London.

Bryman, A 2006, 'Integrating quantitative and qualitative research: how is it done?', *Qualitative Research*, vol. 6, p. 97, viewed 23 June 2015, http://.doi:10.1177/1468794106058877.

California Department of Public Health (CDPH) 2012, *Glossary of terms*, viewed 11 September 2012, www.cdph.ca.gov/programs/cpns/Documents/Network-NLP.

Chanda, DH, Phiri, SNA & Nkosha, DC 2000, *Teaching and learning materials analysis and development in basic education,* UNESCO Basic Education Division, Paris.

City of Tshwane 2015, *City of Tshwane wards maps*, viewed 3 July 2015, http://www.tshwane.gov.za/Sites/About_Tshwane/MapsAndGIS/Pages.

Contento, IR 2011, *Nutrition education. Linking research, theory and practice*. Jones and Bartlett Publishers, Sudbury MA.

Department of Education (DoE) 2009, *National School Nutrition Programme: a guide for secondary schools.* Education Department, South Africa, viewed 2 December 2015, http://www.education.gov.za.

Dixon-Woods, M 2011, 'Using framework based synthesis for conducting reviews of quantitative studies', *BMC Medicine*, vol. 9, p. 39, viewed 30 July 2013, www.biomedcentral.com/1741-7015/9/39.

Dudley, DA, Cotton, WG & Peralta LR 2015, 'Teaching approaches and strategies that promote healthy eating in primary school children: a systematic review and meta-analysis', *International Journal of Behavioral Nutrition and Physical Activity*, vol. 12, p. 28, viewed 23 June 2015, http://dx.doi.10.1186/s12966-015-0182-8.

Food and Agriculture Organization (FAO). 2006. *Nutrition education in primary schools- a planning guide for curriculum development*, viewed 21 June 2012, ftp://ftp.fao.org/docrep/fao/009.

Harris, AD, McGregor, JC, Perencevich, EN, Furuno, JP, Zhu, J, Peterson, DE, Finkelstein, J 2006, 'The use and interpretation of quasi-experimental studies in medical informatics', *Journal of the American Medical Informatics Association*, vol. 13 no. 1, pp. 16-23.

Harwell, M 2011, *Research design in qualitative/quantitative/mixed methods: The Sage handbook for research in education*. 2nd edn. Sage Publishers, Los Angeles CA.

Houston, S & Mullan-Jensen, C 2012, 'Towards depth and width in Qualitative Social Work: Aligning interpretative phenomenological analysis with the theory of social domains', *Qualitative Social Work*, vol. 11 no. 3, pp. 266-281.

Insel, P, Turner, RE & Ross, D 2006, *Discovering Nutrition*. 2nd edn, Jones and Bartlett Publishers, Sudbury MA.

Iowa Department of Public Health (IDPH) 2012, *WIC Nutrition education needs assessment technical assistance tool*, Bureau of Nutrition and Health Promotion, viewed 4 February 2013, www.movingtothefuture.org.

Kaufman, M 2007, *Nutrition in promoting the public health: strategies, principles and practices*. Jones and Bartlett Publishers, Sudbury MA.

Lawrence, M. & Worsely, T 2007, 'Public health nutrition from principles to practice', *Australian Health Review*, viewed 20 August 2012, http://www.highbeam.com.

Lewis, B 2012, 'Teaching/learning materials: Elementary education', viewed 7 September 2012, http://k6educators.about.com/od/educationglossary/g/gtlm.htm.

Looney, JW 2011, 'Integrating formative and summative assessment: Progress toward a seamless system', *OECD Education Working Papers, No. 58*, viewed 20 December 2015, http://dx.doi.org/10.1787/5kghx3kbl734-en.

Google Maps 2016, Map of Bronkhorstspruit and surroundings, viewed 6 April 2016, https://www.google.co.za/maps/place/Zithobeni,+Bronkhorstspruit/.

Moore, G, Audrey, S, Barker, M, Bond, L, Bonell, C, Hardeman, W, Moore, L, O'Cathain, A, Tinati, T, Wight, D & Baird J 2012, 'Process evaluation of complex interventions', *UK Medical Research Council (MRC) Guidance*, viewed 30 April 2015, http://www.ioe.ac.uk/MRC_PHSRN_Process_evaluation_guidance.

Parmenter, K. & Wardle, J 1999, 'Development of a general nutrition questionnaire for adults', *European Journal of Clinical Nutrition*, vol. 53, pp. 298-308.

Ritchie, J & Spencer, L 2002, 'Qualitative data analysis for applied policy research', *The Qualitative Researcher's Companion*, pp. 305-329, viewed 20 November 2013, http://dx.doi.org/10.4135/9781412986274.n12.

Rossiter, M, Glanville, T, Taylor, J & Blum, I 2007, 'School food practices of prospective teachers', *Journal of School Health*, vol. 77, no. 10, pp. 694-700.

Shariff, ZM, Bukhari, SS, Othman, N, Hashim, N, Ismail, M, Jamil, Z, Kazim, SM, Paim, L, Samah, BA & Hussein, ZAM 2008, 'Nutrition education intervention improves nutrition knowledge, attitude and practices of primary school children: a pilot study', *International Electronic Journal of Health Education*, vol. 11, no. 1, pp. 119-132.

Spronk, I, Kullen, C, Burdon, C & O'Connor, H 2014, 'Relationship between nutrition knowledge and dietary intake', *British Journal of Nutrition*, vol. 111 no. 10, pp. 1713-1726.

Statistics South Africa 2012, *Tshwane Census 2011*, viewed 3 July 2015, http://.www.tshwane.gov.za.

White, H & Sabarwal, S 2014, *Quasi-experimental Design and Methods*, Methodological Briefs: Impact Evaluation 8, UNICEF office of research, Florence.

Yamada, J, Stevens, B, Sidani, S, Watt-Watson, J & de Silva, N 2010, 'Content validity of a process evaluation checklist to measure intervention implementation fidelity of the EPIC Intervention', *Worldviews on Evidence-Based Nursing*, vol. 7, no. 3, pp. 158-164.

Young, DR, Steckler, A, Cohen, S, Pratt, C, Felton, G, Moe, SG, Pickrel, J, Johnson, CC, Grieser, M, Lytle, LA, Lee, JS & Raburn B 2008, 'Process evaluation results from a school- and community-linked intervention: the Trial of Activity for Adolescent Girls (TAAG). *Health Education Research*, vol. 23, no. 8, pp. 976-986.

CHAPTER 4

PHASE 1: NEEDS ASSESSMENT

4.1 INTRODUCTION

An investigation into the needs of the population intended for a nutrition intervention is vital to the designing of a NEP that would effectively respond to the identified needs. The investigation is referred to as the needs assessment and it identified and implemented the activities necessary for assessing the needs as stated in the conceptual framework (chapter 3, figure 3.2). This chapter discusses the details of the needs assessment in regards to:

i. Aim and objectives
ii. Methods
iii. Results
iv. Discussion
v. Strengths and limitations
vi. Conclusions
vii. Recommendations
viii. References

4.2 AIM AND OBJECTIVES

The aim of phase 1 of this study was to explore the teachers' and the learners' nutrition knowledge, attitudes and dietary practices (KAP) as well as the situation of NE in the schools to inform the development of a context specific NE intervention for teachers.

The objectives were to:

i. assess the nutrition KAP of the teachers willing to participate in the study from the primary schools in the Bronkhorstspruit district,
ii. assess the practice of NE in the primary schools in Bronkhorstspruit,
iii. explore teachers' perceptions of the impact of school NE on learners' dietary practices,
iv. assess the nutrition KAP of the learners in two selected schools of the Bronkhorstspruit district.

4.3 METHODS

4.3.1 Study design

Both qualitative and quantitative research methods were used. The use of a combination of qualitative and quantitative research methods allows for more insight than what is possible with either a qualitative or quantitative investigation alone, while also providing complementary strength to the findings (Harwell 2011).

4.3.2 Setting

Eleven primary schools in the Bronkhorstspruit district, Gauteng Province, South Africa as discussed in chapter 3 section 3.4, participated in the study.

4.3.3 Population and sampling

The populations were teachers who taught nutrition to Grade 4 to 7 learners and learners in Grades 5 and 6. Teachers who taught nutrition to Grades 4 to 7 learners were chosen because they would be in a better position to provide information on the teaching of nutrition than those who did not. The participants were involved as follows:

i. teachers in eleven schools in respect of assessment of the nutrition KAP and the practice of NE in schools,
ii. teachers in three schools in respect of obtaining the teachers' perceptions of the, impact of school NE on learners' eating behaviours,
iii. learners in two schools in respect of assessment of learners' nutrition KAP.

The selection of three schools (in ii above) from a total of 13 schools in the Bronkhorstspruit district was on the recommendation of the educational authorities and the three schools were involved in the larger project. The selection of the two schools in respect of the learners' assessment was due to budgetary constraints.

4.3.3.1 Inclusion criteria

Teachers:

- who consented to participate in the study.

Learners:

- who had parental consent and themselves gave assent to participate in the study,
- who were present on the day of data collection.

4.3.3.2 Sampling

Convenience sampling was employed in selecting the teachers, therefore the eligible teachers who consented to participate in the study were enrolled as participants. The learners consisted of convenient samples of all learners in Grades 5 and 6 who met the inclusion criteria (Suen, Huang & Lee 2014).

4.3.4 Ethical approval

Ethical approval for the study was obtained from the Ethics Committee of the Natural and Agricultural Sciences of the University of Pretoria and the DoBE as discussed in chapter 3, section 3.5.

4.4 DATA COLLECTION INSTRUMENTS

Standardised questionnaires were modified to ensure cultural relevance of the questionnaires used in phase 1. They included the teachers' KAP nutrition questionnaire, learners' KAP nutrition questionnaire and the NE practices questionnaire (Sharrif et al. 2008; Rossiter et al, 2007; Parmenter & Wardle 1999; Celebuski & Farris 2000).

4.4.1 Nutrition knowledge, attitudes and dietary practices questionnaire for teachers

The teachers' nutrition KAP questionnaire was developed from three standardised questionnaires (Sharrif et al. 2008; Rossiter et al. 2007; Parmenter & Wardle 1999). Sections relevant to the purpose of the study in standardised questionnaires were selected and adjusted to develop the questionnaire for teachers' nutrition KAP assessment as follows:

i. Several visits to the three schools (involved with the larger study) provided information about the Bronkhorstspruit district schools' food environment such as the availability of vending machines and the type of foods available in the schools and sold around the schools. The information was used to adjust selected sections of the questionnaires to make it relevant to the school's food environment of the proposed study setting.
ii. Information was obtained from participatory action interviews (conducted as part of the larger study – Schools as sites for social change, with the DoBE's approval number: D 2013/223) with the teachers of Grades 4 – 7 learners in the three schools. The information on what teachers already knew regarding the foods available to

learners in the school and in the community was used to effect changes in the standardised questionnaires.

iii. Information was obtained from literature (Culinary Institute of America 2012; UNICEF 2009; FAO 2006) in respect of nutrition knowledge that teachers were expected to have when they teach learners at this level. This information was used to select and modify sections in the standardised questionnaires.

iv. Critical observation of the school curriculum (DoBE 2011a; DoBE 2011b) and the resources used to teach nutrition topics (Biennan et al. 2012; Amato, Calitz & Campbell 2012; Jacobs 2004; Beckett & Zietsman nd) further provided information on nutrition knowledge that teachers had and were expected to teach to learners. This information was used to modify the standardised questionnaires to develop the teachers' KAP questionnaire used in this study (Appendix 8). Details of the changes made on the standardised questionnaires are explained in table 4.1

4.4.2 Nutrition education practice questionnaire

The nutrition education practices questionnaire was adapted from the survey instrument of the National Centre for Education Statistics - Nutrition education in public elementary schools, United States of America (Celebuski & Farris 2000). The information provided to address high priority nutrition education needs among elementary schools in the United States of America was adjusted to be in agreement with the situation of the primary schools in the Bronkhorstspruit district as follows:

i. The education levels for primary school teachers were adjusted to be consistent with the teachers' qualifications in South Africa.

ii. The educational structure and terms were adjusted to reflect the situation and structures in South African primary schools. This included adjustments such as R – Grade 7 instead of K – Grade 5, and the term Grade R instead of kindergarten.

iii. The questions were adjusted to reflect the situation in South African primary schools and what teachers could relate to. This included the subject/study area nomenclature and policy issues. The resulting NE practices questionnaire used in this study is included in appendix 9.

4.4.3 Focus group interview guide

An interview guide of ten questions, based on the objectives of the focus group discussions (FGDs) was developed by the researcher. The interview guide (Appendix 10) was subjected

to face and content validity by the researcher's colleagues. Examples of the questions were "What are your priorities when you teach nutrition to learners?" and "What can you say about time and resources allocated to nutrition education in your school".

4.4.4 Nutrition knowledge, attitudes and dietary practices questionnaire for learners

The learners' nutrition KAP questionnaire was adapted from the questionnaires used in the Health and Effective Lifestyle in Children's (HELIC) study (Shariff et al. 2008) which was obtained on request from the author of the published article. The HELIC questionnaire was modified and adapted to the situation of the intended subjects as follows:

i. The curriculum for primary schools in South Africa was perused to identify the subjects and study areas where nutrition was taught (DoBE 2011a; DoBE 2011b).

ii. The various nutrition topics and contents as outlined in the National Curriculum Statement (NCS) - the Curriculum Assessment Policy Statements (CAPS) were checked to identify the areas that the developed questionnaire should cover (DoBE, 2011a; DoBE 2011b).

iii. Triplicate 24 hour dietary recalls were conducted in one of the three schools with selected learners in Grade 6 in another study (The nutritional status of Grade 6 learners in a resource-constrained area of Bronkhorstspruit with the Faculty of Health Sciences protocol approval number S55/2012, (N = 105)). The information obtained was used to make adjustment in the food types and names used in the adapted HELIC questionnaire.

iv. Visits were made to the three schools' tuck-shops, NSNP in the school, and food vendors around the school where learners purchased foods to identify foods available to learners in the schools. The information obtained was used to make adjustment to foods named in the HELIC questionnaire but were not available either in the schools' tuck-shops, from the vendors, served in the school meal or mentioned in the 24 hour dietary recalls of the learners.

v. Information from participatory action interviews (the larger study – Schools as sites for social change, with the DoBE's approval number: D 2013/223) with the teachers of Grades 4 – 7 learners in the three schools provided additional information. This was used to make adjustments to the HELIC questionnaire regarding the foods available in the community and how the foods were prepared. The details of the changes made on the standardised questionnaire are explained in table 4.1.

Table 4.1: Detailed changes made to the standardised questionnaires

Developed questionnaire	**Standardised questionnaire**	**Author**	**Source**	**Changes made / Sections used**
Teachers' nutrition KAP questionnaire	Nutrition knowledge questionnaire used in the study titled: *Development of a general nutrition knowledge questionnaires for adults*	Parmenter & Wardle 1999	Published article	1. Reduction in the number of questions on fat, e.g. which fat do experts say is most important for people to cut down on? 2. The section titled: **Expert recommendation** was adjusted to **nutrition expert recommendations for children** 3. Replacement of some food items with foods commonly eaten in the study setting, e.g. spinach instead of broccoli
Teachers' nutrition KAP questionnaire	Nutrition KAP questionnaire used in the study titled: *School food practices of prospective teachers.*	Rossiter et al. 2007	Questionnaire obtained on request from author. Questionnaire originally developed by Kubik et al. (2002)	1. Section B on **personal eating habits** was included in the adapted questionnaire after adjustment to include and describe food commonly eaten in the Bronkhorstspruit district 2. Section C on **eating habits at school** was adjusted to include tuck-shops and food vendors around the school. Questions relating to vending machine were removed 3. **Classroom food practices** in section D were adjusted to the situation of the schools in the Bronkhorstspruit district. The questions were reduced from 14 to eleven 4. **School-wide food practices** questions in section E were adjusted to the situation of the schools in the Bronkhorstspruit district. Questions were reduced from 41 to 14

Continued/…….

Table 4.1: Detailed changes made to the standardised questionnaires continued

Developed questionnaire	**Standardised questionnaire**	**Author**	**Source**	**Changes made / Sections used**
Teachers' s nutrition KAP assessment	HELIC KAP questionnaire described in the study titled: *Nutrition education intervention improves nutrition knowledge, attitudes and practices of primary school children: A pilot study.*	Shariff et al. 2008	Questionnaire obtained on request from the author	Section on attitude items were modified and adapted to adult situation and questions were made up to 14 questions. This made up the section D: **Nutrition attitudes** of the adapted questionnaire
NE practices questionnaire	Nutrition education needs survey instrument used in the National Center for Education Statistics - Nutrition education in public elementary school classrooms, K – 5	Celebuski & Farris 2000	Published report	1. Question on policy issues in question 3 was excluded 2. The question on the number of hours teachers would have used at the end of the school year was modified to read number of hours teachers taught nutrition in the previous school year 3. Question 5 was modified to reflect subjects in South African primary school, i.e. Life skills, Social science, Mathematics, English language, Natural Sciences and Technology 4. Questions 9, 10, 13 and 14 which have to do with barriers to school meal programme, parental involvement, Team Nutrition and suggestion to encourage cooperation between teachers and school meal programme were excluded in the adapted NE practices questionnaire

Continued/…….

Table 4.1: Detailed changes made to the standardised questionnaires continued

Developed questionnaire	**Standardised questionnaire**	**Author**	**Source**	**Changes made / Sections used**
Learners' nutrition KAP questionnaire	HELIC KAP questionnaire for learners reported in the study titled: *Nutrition education intervention improves nutrition knowledge, attitudes and practices of primary school children: A pilot study*	Shariff et al. 2008	Questionnaire obtained on request from the author	1. Exclusion of questions on food pyramid 2. Replacement of food items with food normally eaten in South Africa 3. Changes in the names of some food items, e.g. 'Simba' (various brands of maize snacks are called 'Simba' by the learners) instead of extrusive snacks, chips instead of French fries, tomato sauce instead of soy sauce 4. Changes in terms to what learners in South Africa are familiar with, e.g. break instead of recess, cold drinks instead of carbonated drinks 5. Exclusion of one practices question which connoted repetition

4.4.5 Pretesting of instruments

The questionnaires, i.e. nutrition KAP questionnaire for teachers, nutrition KAP questionnaire for learners and the NE practices questionnaire were pretested in one of the primary schools in the Bronkhorstspruit district among a convenience sample of nine teachers and 20 learners (ten Grade 5 and ten Grade 6). The teachers were included in the study sample but the learners were not. The purpose was to assess the clarity of words and the understandability of the questions.

Administration of the questionnaires for teachers was self-administered. The questionnaires were handed over to the teachers and completed questionnaires were collected at the school closing time as agreed.

Administration of questionnaires for the learners was done in the classroom where each learner received a copy each of the questionnaires and a pencil. The questions were read aloud one after the other by the researcher and the class teacher translated in the learner's language (Isi-Ndebele) for better understanding. Learners were asked to tick their answers on the questionnaires. The next question was not attempted until all learners had indicated that they had ticked their answers. The exercise was completed in 25 minutes.

4.4.6 Adjustment of the questionnaires

After the pretesting, the questionnaires were adjusted appropriately.

4.4.6.1 Nutrition knowledge, attitudes and dietary practices questionnaire for teachers

The questions were reported to be clear and understandable. However, the following adjustments were made (Appendix 8):

i. For the purpose of proper classification, under nutrition knowledge, question 7.3 (Red meat) was removed from the options of foods high or low in salt. Likewise question 9.2 (Nuts) was removed from the options of foods high or low in fibre/roughage.
ii. Question 16 under nutrition knowledge section (iv) was removed as it portrayed the same meaning as question 22, i.e. 'a person can prevent heart disease by eating more fruits and vegetables'.
iii. Question 51 under nutrition practices section (v) 'Which is the healthiest eating behaviour', option 4 was edited to read 'when you eat snacks preferring fruits'.

The final questionnaire (Appendix 8) comprised 46 *knowledge* questions which addressed three categories: current dietary recommendations for children, sources of nutrients and diet disease relationship. There were 60 *practice*s items which addressed four broad areas: personal dietary habits, eating habits at school, classroom food practices and school wide food practices. There were 14 *attitudes* items which addressed questions such as eating small meals at regular intervals and eating foods as circumstances dictate.

4.4.6.2 Nutrition education practices questionnaires

Questions were reported to be clear and understandable with the exception of question 15. The question read "In the previous academic year please indicate the Grade where you taught nutrition and the total number of hours". Teachers reported that the number of hours that nutrition was taught could not be categorically stated as nutrition was taught as topics among others in a learning area under LO or NST. In consultation with the teachers the question was adjusted as follows.

Indicate, by ticking the appropriate box, the proportion of classes you taught which included nutrition in the previous academic year:

a. 10 – 20 per cent 1□
b. 21 – 40 per cent 2□
c. 41 – 60 per cent 3□
d. 60 – 80 per cent 4□
e. 81 – 100 per cent 5□

The NE practice questionnaire (Appendix 9) consisted of closed ended questions eliciting information such as the proportion of classes in which nutrition was taught, training to teach nutrition and methods used to teach nutrition. The questionnaire also contained Likert type questions, addressing the matters such as the extent of integrating nutrition into other subjects and the rating of the quality of the instructional materials used in teaching nutrition.

4.4.6.3 Nutrition knowledge, attitudes and dietary practices questionnaire for learners

Questions were reported to be clear and understandable. However, the following adjustments were made (Appendix 8):

i. Answer boxes for questions 24 and 25, which were omitted by typing errors, were corrected.

ii. Options of 'almost every day' in questions 31 to 35 under practices questions were changed to 'every day'.

The questionnaire (Appendix 11) consisted of 23 *knowledge* questions that addressed five categories: food nutrients and function, food and energy, nutrient deficiency, food choices and sources of nutrients. The eight *practices* items addressed questions such as foods that learners usually eat for lunch and foods learners usually choose as snacks. The *attitudes* items were ten in total and featured questions such as the importance of breakfast and the choice of delicious foods irrespective of its nutritional value.

4.5 DATA COLLECTION

4.5.1 Preliminary meetings

Preliminary meetings were held with the principals and the teachers of the participating schools where the researcher presented both written and verbal explanations of the research activities. The DoBE's approval (Appendix 3) for the study to be carried out in the schools was presented to the principals. Permission to progress with the research activities in the schools was obtained from the principals. The dates for the data collection were fixed by the principals in conjunction with the Heads of Department for LS who acted as the school co-ordinators in respect of the research activities in the schools.

Data were collected between May and September 2013. The teachers' nutrition KAP and the practices of NE in the schools and the learners' nutrition KAP were assessed using questionnaires. The teachers' questionnaires were self-administered while that of the learners was administered with assistance. The teachers' perceptions of the impact of NE on learners' eating behaviours were also obtained through FGDs.

4.5.2 Assessment of teachers' nutrition knowledge, attitudes and dietary practices

The self-administered questionnaire (Appendix 8) was used to assess the teachers' nutrition KAP. The researcher delivered the questionnaires with the letter introducing the study and the informed consent form to the teachers. The teachers were requested to complete the questionnaires in their own time, ready for collection in one week. However, follow up was done through repeated visits and reminder letters until all the completed questionnaires were collected.

4.5.3 Investigation of the practices of nutrition education in the schools

The practices of NE by the teachers were investigated using the NE practices questionnaires (Appendix 9). The questionnaires were self-administered and the handling (delivery and collection of completed questionnaires) was done in the same way as with the nutrition KAP questionnaires.

4.5.4 Focus group discussions

An interview guide (Appendix 10) was used to obtain information regarding the practice of NE in the three schools. The FGDs were conducted by the researcher with the assistance of two research assistants. Enquiries included teachers' understanding of NE in primary schools, priorities in teaching nutrition and whether the teaching of nutrition in the classroom can translate into healthy eating among the selected learners.

Before commencing the FGDs, the researcher explained the purpose of the study and the conduct of the interview to the participants. The research team (the researcher, a research assistant and a team member) were introduced and their roles in the interview were explained. Participants were asked to introduce themselves along with the subjects they were teaching. The interview took place in the staff common room immediately after school hours to prevent encroachment into teachers' teaching time. The sitting arrangement in all the FGDs was a round table type allowing maximum view for each and every participant (Harris et al. 2009).

Three FGDs that lasted between 58 and 75 minutes were held involving seven to ten teachers. Three FGDs were considered adequate as no new information emerged in the third FGD (Morgan 2013). The researcher facilitated the interview and the research assistant took notes and did the tape recording of the discussions. All the FGDs were done in English. Questions asked were accompanied by probes to make room for in-depth explanation of ideas and comments (Harris et al. 2009).

4.5.5 Assessment of learners' nutrition knowledge, attitudes and dietary practices

The learners' questionnaires (Appendix 11) were administered with assistance by research assistants in their classes during the school hours. Before the commencement of questionnaire administration, the researcher introduced the study and explained what was expected of the learners. The class teachers requested the learners who had submitted the signed consent forms from their parents to signify by standing. (The researcher further confirmed the parental consent by merging the learners' assent with the corresponding parental consent.) Those

learners who had parental consent were asked to give their assent by signing the assent form after which each learner received a copy of the questionnaire. The questions were dictated to the learners and they were instructed to tick their answers on the questionnaire. The dictation of the questions was accompanied by translation into isiNdebele, the preferred language of the learners. The Grade 6 learners readily comprehended the questions in the English Language; therefore, the administration of the questionnaire to them was not translated into the local language.

4.6 DATA MANAGEMENT AND ANALYSIS

4.6.1 Quantitative data

Double entry of quantitative data was done on Microsoft Excel® spread sheets by the researcher and a research assistant. Data were cleaned and analysed for descriptive statistics, using the using the Stata® Statistical Software® Release 10, 2007. Continuous variables such as age, years of teaching experience, nutrition knowledge and attitudes were normally distributed (table 4.2). Large values of 'W' (>0.8) by the Shapiro Wilk test are indicative of normal data (Royston 1995). Therefore, parametric statistics were used to describe the results as means and standard deviations (SD). Cronbach's alpha reliability test was performed on the questionnaires to measure the internal consistency.

A nutrition knowledge question that was correctly answered was assigned the score of one and zero if not correctly answered. Likewise, a score of one was assigned to attitude statements with a response that was consistent with healthy eating, while a response that was contrary to healthy eating was assigned the score of zero. The mean nutrition knowledge and attitudes scores were classified as good if it was equal or greater than 70%, average if it was between 60% and 69%, and low if it was less than or to equal 59%.

The practices questions were categorical variables, the results were described in number and frequencies with respect to the categories. A linear regression analysis was used to determine if there were relationships between independent variables (gender and highest education qualification) and dependent variables (methods to prepare to teach nutrition, desire to receive in-service nutrition training and the use of teacher materials and textbooks).

4.6.2 Qualitative data

Data from the FGDs were transcribed verbatim by the researcher. The hand written notes taken by the research assistant during the interviews were used to check the accuracy of the transcribed data.

Data were analysed using the thematic framework approach of qualitative research (Dixon-Woods 2011; Ritchie & Spencer 2002). The framework method of qualitative data analysis involves the construction of thematic categories into which identified themes can be coded and entered (Dixon-woods 2011; Lacey & Luff 2007). It has the unique capacity to accommodate previously determined themes and integrating new themes as they emerge from the data. The use of charting in the framework method allows for transparency in coding, which makes entries accessible and understandable to others (Gale et al. 2013; Lacey & Luff 2007). The following thematic framework approach steps (figure 4.1) were adopted in the analysis of the data:

i. Step 1: familiarisation

The researcher read the transcribed scripts many times to get acquainted with the data. In the process of reading the scripts, the key issues and recurrent views were noted and listed (Gale et al. 2013; Ritchie & Spencer 2002).

ii. Step 2: identifying a thematic framework

The key issues and recurrent views identified in the first step were organised into a framework with themes called the thematic framework. The themes were developed from the objectives of the discussion, the questions that guided the discussion, and the issues that emerged from the discussions (Gale et al. 2013; Dixon-Woods 2011).

iii. Step 3: coding or indexing

The data were sorted under the themes identified in step 2. A systematic numbering style was employed to compile a list of indexed data. Intuitive judgement and in-depth meaning were employed to interpret the information in sorting the data into themes appropriately. This system of indexing made it possible for sources from which indexed data originated to be traced (Lacey & Luff 2007).

iv. Step 4: charting

This involved lifting out indexed data and arranging them according to the themes which were organised as headings and subheadings in charts. Charts were drawn for each key issue and

entries for participants were based on the theme. Participants' contributions were studied and summarised before they were entered on the chart. Each entry was carefully referenced with participants' identification and transcript page numbers (Gale et al. 2013; Ritchie & Spencer, 2002).

v. Step 5: mapping and identification

The main issues that emerged were segmented into categories to explain the data. The issues were related to the aim and objectives of the discussion. The data indexed on the charts were analytically reviewed, participants' views, and perceptions were compared and contrasted and these provided course of direction for the data.

Over-all, the basic concepts for issues were mapped out and defined, and the participants' quotes were used to explain the relationship between the data and the results. (Lacey & Luff 2007; Ritchie & Spencer 2002).

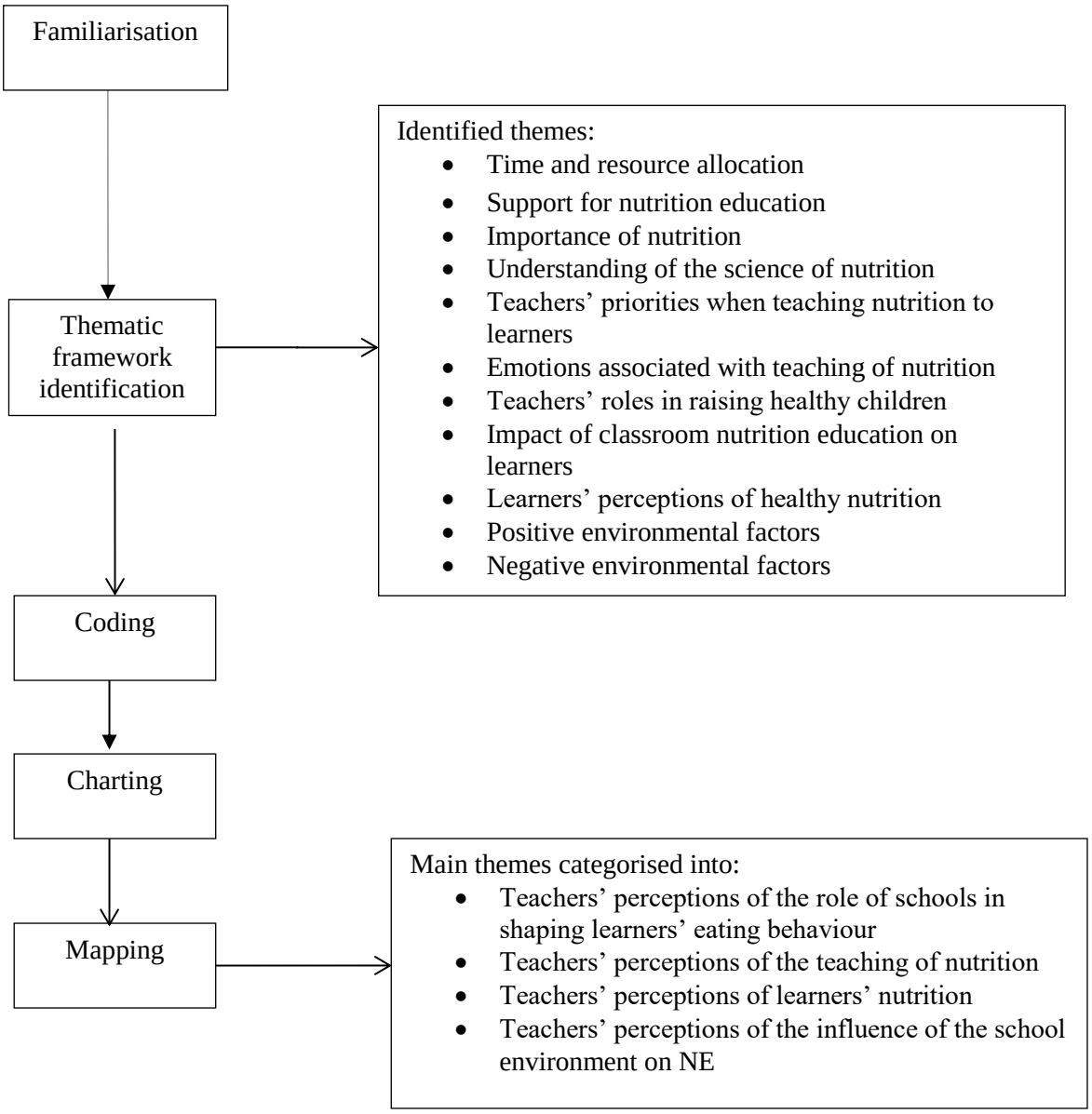


Figure 4.1: Qualitative data analysis process [Adapted from Dixon-Woods (2011) and Ritchie & Spencer (2002)].

4.7 QUALITY CONTROL

4.7.1 Validity, reliability and control of bias

- A previously developed and validated questionnaire was used in collecting quantitative data from the learners, and that of the teachers was developed from standardised questionnaires.
- The questionnaires were subjected to face and content validity by NE experts at the University of Pretoria and teachers in one of the schools in the Bronkhorstspruit district.

- The questionnaires and data collection process had been pretested among a convenient sample of nine teachers and 20 learners in a setting similar to the phase 1 study participants after which adjustments were made as explained in section 4.4.6.
- The Cronbach's alpha reliability test was used to measure the internal consistency of the questionnaires. The Cronbach's alpha reliability regarding the teachers' questionnaires for the total of the 46 nutrition knowledge items was 0.798; for the 60 practice items was 0.92; and for the 14 attitudes items was 0.81. The Cronbach's alpha reliability regarding the learners' questionnaires for the total of the 23 nutrition knowledge items was 0.784; for the eight practice items was 0.498; and for the ten attitudes items was 0.531.

4.7.2 Trustworthiness of the qualitative data

Trustworthiness is the degree of confidence attributable to a set of data which can be measured in terms of reliability, transferability, confirmability and fidelity (Cohen, Manion & Morrison 2011). The trustworthiness of this data was confirmed through the following ways:

- Data saturation: The number of FGDs was determined by theoretical saturation when no new information emerged (Morgan 2013).
- Adequate referential material was achieved by audio tape recording and field notes.
- The qualitative data were complemented with information obtained from quantitative data (Harwell 2011).

4.8 RESULTS

The results of the needs assessment (phase 1) are presented in four categories in line with the objectives of the phase. These results include the demographic characteristics of the participants, the nutrition KAP of the teachers, the practice of NE in the schools by the teachers, the teachers' perceptions of the impact of NE on learners' eating behaviours and the nutrition KAP of the learners. The results of the normality test for the variables of measurements are presented in table 4.2

Table 4.2: Normality distributions (Shapiro Wilk test) for variables of measurements

Variables	Shapiro Wilk value (W)	P-value
Teachers (N = 74)		
Categories of nutrition knowledge		
Age	0.922	0.320
Years of teaching experience	0.984	0.062
Current dietary recommendations for children	0.883	<0.0001*
Sources of nutrients	0.870	<0.0001*
Diet disease relationships	0.985	0.522
Nutrition attitudes	0.985	0.635
Learners (N = 354)		
Categories of nutrition knowledge		
Age	0.981	0.412
Food nutrient and function	0.992	0.054
Food and energy	0.991	0.051
Nutrient deficiencies	0.997	0.675
Food choices	0.968	<0.0001*
Sources of nutrients	0.993	0.109
Nutrition attitudes	0.993	0.128

*P-values less than 0.05 show that the data are not normally distributed, however Shapiro Wilk "W" values greater than 0.8 are indicative of normally distributed data (Royston 1995).

4.8.1 Demographic characteristics of participants

A total of 74 teachers (74% of population, i.e. a total of 100 eligible teachers in the eleven schools) and 354 learners (66% of population, i.e. a total of 536 eligible learners in the two schools) participated in phase 1. The demographic characteristics are shown in tables 4.3 and 4.4. The mean age of the teachers (n = 74) was 47 ± 6.1 years and they had taught for a mean period of 19 ± 8.2 years. Most (66%) of the teachers were female and were in full time employment (91%). A Teaching Diploma was the highest education attained by 46% of the teachers, while 39% had a University first degree.

The mean age of the learners (n = 354) was 11.3 ± 1.1 years. There were more female (53%) than male (46%) learners. It was clear that the learners had sometimes in the past heard about

healthy eating (table 4.3), as was indicated by 100% of the learners who answered to the question. Information was obtained through varied sources such as the school (41%) and the clinic or the hospital (27%) where 30% and 27% of learners had been told of healthy eating by teachers and medical doctors or nurses respectively.

Table 4.3: Demographic characteristics of teachers in phase 1 (N = 74)

Variables	
Age in years (n=74)	**Mean ± SD** 47 ± 6.05
Years of teaching experience (n=74)	19 ± 8.21
Gender (n=73) Male Female	**Frequency (%)** 25 (34.3) 48 (65.8)
Race (n=72) White Black Coloured	 4 (5.5) 67 (93.0) 1 (1.3)
Employment status (n=73) Employed full time Employed part time Others not specified	 67 (91.3) 4 (5.5) 2 (2.7)
Highest education (n=72) Teaching Diploma University first degree Master Degree Others not specified	 33 (45.8) 28 (38.9) 1 (1.3) 10 (13.9)

Table 4.4: Demographic characteristics of learners in phase 1 (N = 354)

Variables	
Age in years (n = 354)	**Mean ± SD** 11.3 ± 1.1
Gender Male Female	**Frequency (%)** 165 (46.6) 189 (53.4)
Sources of nutrition information (n = 340) Had sometimes been told about having a healthy diet	 340 (100.0)
Who told you about having a healthy diet (n = 340) Family Members Friend Doctor / Nurse Teacher Others not specified	 57 (16.8) 17 (5.0) 92 (27.0) 102 (30.0) 72 (21.1)
Where information about healthy diet was obtained (n = 354) Media (TV, magazines, newspapers) School Hospital / Clinic Others not specified	 23 (6.4) 144 (40.7) 96 (27.1) 91 (25.7)

4.8.2 Nutrition knowledge, attitudes and dietary practices of the teachers

4.8.2.1 Nutrition knowledge and attitudes of the teachers

The teachers were assessed on three categories of nutrition knowledge: current dietary recommendations for children, sources of nutrients and diet disease relationships (table 4.5). The teachers demonstrated good nutrition knowledge (mean score = 74.4 ± 12.6%). The mean score of more than 70% was considered good as explained in section 4.6.1. However, the results showed that many teachers could not correctly answer a few questions. The teachers also had a good stance regarding dietary attitudes with a mean score of 84.0 ± 13.5%.

Table 4.5: Mean % (±SD) scores of nutrition knowledge and attitudes of teachers (N = 74)

Variables	**Mean (%) Score ± SD**
Nutrition knowledge Categories	
Current dietary recommendations for children	78.2 ± 13.2
Sources of nutrients	73.3 ± 9.7
Diet disease relationships	71.8 ± 15.0
Total nutrition knowledge score	**74.4 ± 12.6**
Nutrition attitudes	**84.0 ± 13.5**

The questions where only a few teachers (i.e. less than 50% of the teachers) answered correctly are presented in table 4.6 showing the distribution of the correct and incorrect options to each question. The teachers' view of the number of servings of fruit and vegetables that experts advise children to eat a day was one serving (19%), two servings (40%), three servings (28%), and only 7% correctly chose five servings. (This question followed the American recommendation of five fruits and vegetables a day but was revised to align with the recommendations of the SAFBDGs in the questionnaires used in the pre- and post-implementation assessments.) Most (58%) of the teachers incorrectly believed that there were more protein and calcium in a glass of whole milk than in a glass of fat free milk. Only two teachers (3%) knew that fat has the highest amount of energy per 100g serving size. The majority (65%) of the teachers believed that sugar has the highest amount of energy, while 20% chose starchy foods as having the highest amount of energy per 100g serving size. Regarding the content of harder fat, most (47%) of the teachers were of the view that harder fat contains more polyunsaturated fats, while 43% correctly answered that harder fat contains

more saturated fat. The teachers interpreted a healthy diet to mean a diet without fat (42%) and 42% correctly interpreted it as a diet rich in different foods. Regarding eating habits that were considered healthy, only 28% of the teachers considered that fruits should be preferred when eating snacks while the majority (42%) considered preferring cooked vegetables to uncooked vegetables as healthy eating.

Table 4.6: Distribution of correct and incorrect options in nutrition knowledge questions where only few teachers (< 50%) answered correctly (N = 74)

Questions	**n (%)**
Question 2. How many servings of fruit and vegetables a day do experts advise children to eat (n = 68)	
Options	
Incorrect - 1 serving	13 (19.1)
Incorrect - 2 servings	27 (39.7)
Incorrect - 3 servings	19 (27.9)
Incorrect - 4 servings	4 (5.9)
Correct option - 5 servings	5 (7.3)
No answer	6
Question 11. There is more protein in a glass of whole milk than in a glass of fat-free milk (n = 74)	
Incorrect - Agree	43 (58.1)
Correct – Disagree	31 (41.9)
No answer	0
Question 13. There is more calcium in a glass of whole milk than a glass of fat-free milk (n = 74)	
Incorrect - Agree	43 (58.1)
Correct - Disagree	31 (41.9)
No answer	0
Question 14. Which one of the following has the highest amount of energy per 100g serving size? (n = 71)	
Incorrect option 1 - Sugar	46 (64.8)
Incorrect option 2 - Starchy foods	14 (19.7)
Incorrect option 3 - Fibre/roughage	9 (12.7)
Correct answer - Fat	2 (2.8)
No answer	3
Question 15. Harder fats contain more (n = 68)	
Incorrect option 1 - Monounsaturated	7 (10.3)
Incorrect option 2 - Polyunsaturated	32 (47.1)
Correct answer - Saturates	29 (42.6)
No answer	6
Question 53. Which is a healthy diet? (n = 72)	
Incorrect option 2 - A diet whose foods are rich in protein	11 (15.3)
Incorrect option 3 - A diet without fats	30 (41.7)
Incorrect option 4 - Eating fish very often	1 (1.4)
Correct answer - A diet rich in different foods	30 (41.7)
No answer	2

Percentage was based on total number of responses, and "no answer" was out of the total sample

Continued/…….

Table 4.6: Distribution of correct and incorrect options in nutrition knowledge questions where only few teachers (< 50%) answered correctly (N = 74) continued

Questions	n (%)
Question 54. Which is the healthiest eating habit? (n = 74)	
Incorrect option 1 - Drinking 2 glasses of milk/eating 2 cups of yogurt every day	22 (29.7)
Incorrect option 2 - Preferring cooked vegetables to uncooked vegetables	31 (41.9)
Incorrect option 3 - Always eating cheese instead of meat	0 (0.0)
Correct answer - When you eat snacks, preferring fruit	21 (28.4)
No answer	0

Percentage was based on total number of responses

4.8.2.2 Dietary practices of teachers

Personal dietary practices of the teachers

The personal dietary practices of the teachers (table 4.7) indicated healthy eating to some extent. The frequency (three or more times a week) of eating foods that were not healthy choices such as beef cuts or ground beef (not lean), sausages; muffins, cakes, biscuits and potato chips was low. For example, only 17% of the teachers ate fried chicken three or more times a week. However, 32% of the teachers consumed drinks such as Oros or Coca-cola products three or more times a week. The teachers' intake of healthy choices of foods such as baked or boiled potatoes was one to two times a week and above (64%) and stewed vegetables one to two times a week and above (55.6%).

Table 4.7: Personal dietary practices of the teachers (N = 74)

Questions How often do you eat:	Frequency of consumption						
	Never n (%)	**1 time a month n (%)**	**2-3 times a month n (%)**	**1-2 times a week n (%)**	**3-4 times a week n (%)**	**5+ times a week n (%)**	**No answer n**
beef cuts, ground beef, sausages (Polony)	5 (6.8)	11 (15.1)	28 (38.4)	18 (24.7)	7 (9.6)	4 (5.5)	1
fried chicken	5 (6.9)	22 (30.7)	22 (30.7)	11 (15.3)	8 (11.1)	4 (5.7)	2
salad dressing (not low fat)	4 (5.7)	21 (30.0)	21 (30.0)	17 (24.3)	6 (8.6)	1 (5.9)	4
butter or brick margarine	9 (12.3)	14 (19.1)	19 (26.0)	14 (19.2)	11 (15.0)	6 (8.2)	1
whole eggs (either boiled or fried)	3 (4.2)	12 (16.7)	23 (31.9)	23 (31.9)	7 (9.7)	4 (5.6)	2
muffins, cakes, biscuits, corn chips, potato chips, crackers, cookies	0 (0.0)	25 (34.3)	14 (19.2)	21 (28.8)	9 (12.3)	4(5.5)	1
cheese, cheese spread (not low fat)	6 (8.1)	19 (25.7)	22 (29.7)	13 (17.6)	7 (9.5)	7 (9.5)	0
whole milk	9 (12.5)	4 (5.6)	15 (20.8)	16 (22.2)	16 (22.2)	12 (16.8)	2
ice cream	13 (17.8)	37 (50.7)	13 (17.8)	6 (8.2)	1 (1.4)	3 (4.11)	1
drinks e.g. Oros, Coca-Cola products and flavoured drinks	12 (17.4)	11 (15.9)	12 (17.4)	12 (17.4)	14 (20.3)	8 (11.6)	5
baked fish, chicken	2 (3.0)	10 (14.9)	24 (35.8)	13 (19.4)	12 (17.9)	6 (9.0)	7
fruit juice (e.g. ligui fruit, not cold drinks)	2 (2.7)	12 (16.2)	11 (14.9)	20 (27.0)	20 (27.0)	9 (12.2)	0
any fresh fruit	1 (1.4)	-	12 (16.2)	15 (20.3)	22 (29.7)	24 (32.4)	0
green salad	3 (4.3)	7 (10.0)	22 (31.4)	23 (32.9)	11 (15.7)	4 (5.7)	4
Potatoes, e.g. baked or boiled	3 (4.2)	11 (15.5)	17 (23.9)	29 (40.8)	7 (9.9)	4 (5.6)	3
vegetable soup or stewed vegetables	2 (2.8)	12 (16.7)	18 (25.0)	26 (36.1)	10 (13.9)	4 (5.6)	2
other vegetables e.g. string beans, peas, corn, cabbage, lettuce	-	5 (6.94)	17 (23.6)	22 (30.7)	20 (27.8)	8 (11.1)	2

Percentage was based on total number of responses

Teachers' dietary practices at school

Teachers mostly brought lunch from home. When they purchased food items at school, (table 4.8) 30% frequently (four or more times a week and one to three times per week) purchased healthy choices of foods such as bread, fruits or vegetables. The teachers (37%) occasionally (one to three times a month) purchased candy, chips, cookies or fat cakes. Only 15% purchased these unhealthy choices of foods one to three times and more than four times a week, while 43% of the teachers never purchased those foods. However, the teachers' responses to the questions on dietary practices at school showed some irregularities. For example, six teachers answered to purchasing of food or beverage items from school tuck

shop, shops or food vendors four or more times per week, yet eight teachers indicated to have purchased bread, fruits or vegetables four or more times per week.

Table 4.8: Purchases of food or beverage items from school tuck shop, shops or food vendors by the teachers (N = 74)

Food practices statements How often do you buy:	Frequency of consumption						
	Never n (%)	**4 or more times per week n (%)**	**1-3 times per week n (%)**	**2-3 times per month n (%)**	**1 time per month or less n (%)**	**Items are not available n (%)**	**No answer n**
food or beverage items from school tuck shop, shops or food vendors?	17 (23.0)	6 (8.11)	8 (10.8)	15 (20.3)	28 (37.8)	-	0
candy, chips, cookies or fat cakes?	31 (42.5)	1 (1.4)	10 (13.7)	15 (20.6)	12 (16.4)	4 (5.5)	1
bread, fruits or vegetables?	22 (30.1)	8 (10.96)	14 (19.2)	15 (20.6)	7 (9.6)	7 (9.6)	1
cold drinks or fruit drinks, like Oros, Wild Island?	30 (41.1)	5 (6.9)	7 (9.6)	9 (12.33)	12 (16.4)	10 (13.7)	1
100% fruit juice, bottled water, low fat milk drinks?	25 (34.3)	6 (8.2)	11 (15.1)	9 (12.3)	9 (12.3)	13 (17.8)	1

Percent was based on total number of responses

Classroom food practices of the teachers

The teachers' classroom food practices were consistent with healthy eating (table 4.9). However, the teachers' views on the use of sweets as reward, incentive or special treat for learners were mixed. While 38% of the teachers would likely use sweets as reward for learners, 56% were not likely to do so. The teachers (59%) were also not likely to eat with learners during lunch or break times.

Table 4.9: Classroom food practices of the teachers (N = 74)

Food practice statements Would you:	Responses				
	Likely n (%)	Somewhat Likely n (%)	Not likely n (%)	Uncertain n (%)	No answer n
use sweets as reward, incentive or special treat for learners?	10 (13.7)	18 (24.7)	41 (56.2)	5 (5.5)	0
use fat cakes, doughnuts or cookies as reward, incentive or special treat for learners?	3 (4.1)	5 (6.8)	58 (78.8)	8 (10.8)	0
use fruits or vegetables as reward, as reward, incentive or special treat for learners?	25 (33.8)	14 (18.9)	28 (37.8)	7 (9.5)	0
use drinks, as rewards, incentive or as a special treat for students?	5 (6.8)	7 (9.5)	53 (71.6)	9 (12.6)	0
use bottled water, 100% fruit juice or low fat milk drinks as reward, incentive or as a special treat for learners?	17 (23.3)	7 (9.6)	40 (54.8)	9 (12.3)	1
allow students to drink soft drinks during class time?	3 (4.1)	1 (1.4)	60 (81.1)	10 (13.5)	0
allow students to eat food items (including candy) during class time	1 (1.4)	2 (2.7)	67 (90.5)	4 (5.4)	0
withhold a food or beverage item from a learner as punishment?	7 (9.5)	5 (6.8)	57 (77.0)	5 (6.8)	0
praise learners when you see those eating healthier foods, such as fruit juice or low fat snack items?	39 (53.4)	19 (26.0)	12 (16.4)	3 (4.1)	1
eat lunch or break snacks with the students?	10 (14.1)	13 (18.3)	42 (59.2)	6 (8.5)	3
include information on nutrition and healthy eating as part of your lesson plans?	47 (70.0)	13 (18.6)	8 (11.4)	-	4

Percent was based on total number of responses

School-wide food practices of the teachers

Regarding the school-wide food practices, the teachers' views were consistent with the values of healthy eating (table 4.10). For example, the teachers agreed that the eating behaviours of teachers could influence the eating behaviours of learners (66%), and that they could influence the school food policy (91%). Most of the teachers (93%) agreed that it is important to have a healthy school food environment so that there is consistency with the messages taught in the classroom. In addition, 90% of the teachers were of the view that the nutritional health of learners should be a school priority, while 87% agreed that NE should equip learners

with the skill to make healthy food choices. The teachers (80%) disagreed to the statement that selling foods, such as candy and cookies, as part of school fund-raising is okay because it helps provide revenue for school programmes. The teachers also disagreed to the statement that high fat and high sugar foods are used as incentive in the classroom because learners prefer these kinds of foods (76%), and that learners should be able to buy soft drinks and candy at school (68%).

Table 4.10: School-wide food practices of the teachers (N =74)

Food practice statements	Responses					
	Strongly disagree n (%)	Disagree n (%)	Uncertain n (%)	Agree n (%)	Strongly agree n (%)	No answer n
The foods that learners eat during the school day affect their readiness to learn	4 (5.5)	12 (16.4)	3 (4.1)	32 (43.8)	22 (30.1)	1
School prepared lunches are healthy	2 (2.7)	3 (4.1)	9 (12.3)	35 (48.0)	24 (32.9)	1
School lunch should include more fruits and vegetables	3 (4.1)	3 (4.1)	-	28 (37.8)	40 (54.1)	0
Selling high fat, high sugar foods, such as candy and cookies, as part of school fund-raising is okay because it helps provide revenue for school programmes	30 (40.5)	29 (39.2)	12 (16.2)	3 (4.1)	-	0
It is important for schools to have a written school nutrition policy which addresses food related issues, such as food in the classroom or food selections in tuck shops	3 (4.11)	3 (4.11)	3 (4.11)	23 (31.5)	41 (56.2)	1
High fat and high sugar foods are used as reward and incentive in the classroom because learners prefer these kinds of foods	30 (40.5)	26 (35.1)	6 (8.1)	7 (9.5)	5 (6.8)	0
Students in my school seem to eat healthy diets	6 (8.11)	25 (33.8)	27 (36.5)	14 (18.9)	2 (2.7)	
It is important to have a healthy school food environment so that there is consistency with messages taught in the classroom	2 (2.7)	1 (1.4)	2 (2.7)	30 (40.5)	39 (52.7)	0
The eating behaviours of teachers influence the eating behaviours of learners	4 (5.5)	11 (15.1)	10 (13.7)	21 (28.8)	27 (37.0)	1

Percent was based on total number of responses

Continued/…….

Table 4.10: School-wide food practices of the teachers (N =74) continued

Food practice statements	Responses					
	Strongly disagree n (%)	Disagree n (%)	Uncertain n (%)	Agree n (%)	Strongly agree n (%)	No answer n
As a teacher, I can influence school food policy	1 (1.4)	3 (4.2)	2 (2.8)	37 (52.1)	28 (39.4)	3
Schools should give adequate attention to learners' nutrition	2 (2.7)	13 (17.8)	16 (21.9)	32 (43.8)	19 (13.7)	1
The nutritional health of learners should be a school priority	2 (2.7)	4 (5.5)	1 (1.4)	30 (41.1)	36 (49.3)	1
Nutrition education should give learners the skills to make healthy food choices	1 (1.4)	3 (4.1)	6 (8.1)	30 (40.5)	34 (46.0)	0
Learners should be able to buy soft drinks and candy at school	21 (28.4)	29 (39.2)	11(14.9)	12 (16.2)	1 (1.4)	0
The food habits of children affect their health as adults	2 (2.7)	5 (6.8)	8 (10.8)	24 (32.4)	35 (47.3)	0
It is important for schools to teach learners the basic skills of food preparation, so they can put nutrition knowledge into practice	-	2 (2.7)	1 (1.4)	28 (38.4)	42 (57.5)	1

Percent was based on total number of responses

4.8.3 Nutrition education practices of the teachers

The NE practices of the teachers were investigated through the NE questionnaire described earlier. The teachers either taught LS/LO as the only subject, NST as the only subject, and LS/LO or NST with other subjects. The results showed the proportion of classes used in teaching nutrition, the training that teachers had to teach nutrition, the methods used in teaching nutrition and the instructional materials used in teaching nutrition. Questions were not answered by all the teachers; therefore, percentages were based on the number of responses to individual questions.

The proportion of classes where nutrition was taught (table 4.11) revealed that most of the teachers (60%) taught nutrition in about 10-20% of their teaching time. Almost a third of the teachers had no training to teach nutrition and 86% of the teachers would like to receive nutrition training. The formal method used to teach nutrition was mostly as part of the curriculum as indicated by 67% of the teachers.

Table 4.11: Proportion of classes in which nutrition was taught, training received for teaching nutrition and methods used (N = 66)

Characteristics	n (%)
Proportion of classes where nutrition was taught (n=58)	
10–20 %	35 (60.3)
21–40 %	11 (19.0)
41–60 %	12 (20.7)
Training for teaching nutrition	
In-service training (n=48)	22 (45.8)
Undergraduate or graduate training (n=48)	15 (31.3)
Research and personal study (n=47)	27 (57.5)
No training (n=56)	17 (30.4)
Desire to receive in-service training on various nutrition topics (n=66)	57 (86.4)
Formal methods used to teach nutrition	
By integrating nutrition lessons into various subjects (n=61)	11 (18.0)
Nutrition as part of the curriculum (n=47)	31 (66.9)

Percentage did not sum up to 100 because teachers might have undergone more than one option.
Percentage was based on total number of responses

The teachers' opinions of the instructional materials (table 4.12) were that the materials were up to date (64%) and age appropriate (67%). However, they reported that there were not enough instructional materials for all learners.

Table 4.12: Teachers' rating of the quality of instructional materials (N = 66)

Quality index	Response n (%)			
	Great extent	Moderate extent	Limited extent	Not at all
Materials are up to date (n=64)	11 (17.2)	30 (46.9)	20 (31.3)	3 (4.6)
Materials are age appropriate (n=64)	15 (23.4)	28 (43.7)	16 (25.0)	5 (7.8)
Learners find materials appealing (n=63)	17 (27.0)	17 (27.0)	24 (38.1)	5 (7.9)
Enough materials for all learners (n=64)	12 (18.8)	16 (25.0)	22 (34.9)	14 (21.9)

Percentage was based on total number of responses

The teachers indicated that all the various instructional materials as identified in the literature, would aid their teaching of nutrition to a great extent (table 4.13). The instructional materials included a curriculum-based manual, textbooks, worksheets, learners' assessment materials, computer software and visual aids.

Table 4.13: Extent to which various instructional materials would aid the teaching nutrition (N = 66)

Type of material	Extent to which materials would be useful n (%)			
	Great extent	Moderate extent	Limited extent	Not at all
Teacher materials (e.g. curriculum based manual) (n=65)	41 (63.1)	16 (24.6)	5 (7.7)	3 (4.6)
Textbooks (n=65)	44 (67.7)	16 (24.6)	3 (4.6)	2 (3.1)
Supplementary learners' materials (e.g. worksheets) (n=66)	36 (54.6)	17 (25.8)	10 (15.2)	3 (4.6)
Learners' assessment materials (n=64)	33 (51.6)	21 (32.8)	7 (10.9)	3 (4.6)
Computer software (n=63)	33 (52.4)	10 (15.9)	9 (14.3)	11 (17.5)
Audio and visual aids (e.g. films, video-tapes, posters) (n=64)	32 (50.0)	14 (21.9)	7 (10.9)	11 (17.2)

Percentage was based on total number of responses

4.8.4 Teachers' perceptions of the impact of nutrition education on learners' dietary behaviours

The teachers' perceptions of the impact of NE on learners' eating behaviours were obtained by generating discussions around the role of the school in shaping learners' eating behaviours, the teaching of nutrition, teachers' perceptions of learners' nutrition and school environmental influences on NE. The results of the three FGDs were reported together. Selected quotes from participants were used to explain and support the results (tables 1.14 to 1.17). The quotes were designated with the teacher's participating number and the FGD from where the quotes emanated, e.g. FG1, P2 designates focus group 1, participant 2.

4.8.4.1 Role of the school in shaping learners' dietary behaviours

Three main themes (time- and resource-allocation, support for NE and importance of NE in schools) evolved from the teachers' perception of the role of the school in shaping learners' eating behaviours. Direct quotes (table 4.14) from the teachers corroborate the results. The teachers were of the view that time- and resource-allocation were inadequate if NE in schools were to help learners adopt healthy eating (FG3, P3; FG3, P6). Different opinions were expressed concerning support for NE in schools. It was noted by some teachers that support

was in place; others indicated that though there was support, but the support was inadequate. Some teachers reported that support was not in place at all beside the teaching curriculum and the recommended textbooks. The support included in-service nutrition training, establishment of a school vegetable garden, and the supply of vegetables from the school garden to supplement the NSNP (FG2, P3).

Concerning the importance of NE in schools, teachers perceived that NE in schools could have long term benefits in addition to the immediate benefits of equipping learners about healthy eating. Moreover, learners would be able to pass healthy eating messages to their families and the community (FG2, P1).

Table 4.14: Quotes of the teachers regarding their perceptions of the role of school

Sub-themes	Teachers' quotes
Time and resource allocation	*"Time allocation is very small. For example, if I must teach food processing I should do demonstration for learners to be able to learn and understand. The time is not adequate"* – FG2, P3. "*We don't also have enough resources. The only resource we have is the textbooks*" – FG3, P6.
Support for nutrition education	"*We don't have enough support. There is no general information coming to learners on the assembly that learners must not buy unhealthy foods like sweets, simba, and the rest.*" – FG1, P4 "*My school is supporting through the school garden. Sometime from the school garden, vegetables are supplied to support the NSNP.*" – FG2, P3
Importance of nutrition	"*I think it is necessary because it will help learners plus the parents plus the community. What the learners learn they can pass it on to others.*" – FG2, P1

4.8.4.2 Teachers' perceptions of the teaching of nutrition

The teachers' perception of the teaching of nutrition was described in four sub-themes as supported by the quotes (table 4.15). Teachers' understanding of the science of nutrition; the priorities when teaching nutrition; emotions associated with the teaching of nutrition; and teachers' roles in nurturing healthy children. The teachers' understanding of the science of

nutrition was expressed in terms of the nutrition information they would pass on to learners. The information included teaching learners to know the right types of foods, how to make healthy food choices and avoid unhealthy choices of foods, about food preparation, balanced diets and the role nutrients in the body (FG1, P3; FG2, P4).

The priorities of teachers when teaching nutrition to learners were those of imparting lifelong healthy eating to learners and providing knowledge to help them to pass the subject at school (FG2, P7). Nevertheless, the teachers expressed the concern that the resource-constrained environment of the learners might limit the application of their nutrition knowledge. Feelings of guilt and inadequacy emerged when teachers discussed their emotions of teaching nutrition. Guilt feelings were expressed in two ways. The fact that they themselves sometimes did not practise what they taught (FG1, P4). Also, they had to provide information which learners might not be able to practise because of their resource-constrained background (FG1, P7). Feelings of inadequacy were expressed due to the teachers' limited understanding of some nutrition topics and limited resources for illustrations and demonstration. The teachers explained that they used the textbooks to teach even though they might not feel comfortable about their understanding of the text books (FG3, P3). A few teachers however explained that they felt comfortable teaching nutrition as it gave them opportunity to pass on knowledge about healthy eating. Regarding teachers' roles in nurturing healthy children, the teachers agreed that teachers could model healthy eating to learners. The things teachers could do to model healthy eating for learners included eating lunch containing healthy choices of foods in front of the learners, and displaying healthy choices of food on the teacher's desk (FG1, P6).

Table 4.15: Quotes of the teachers regarding their perceptions of the teaching of nutrition

Sub-themes	Teachers' quotes
Understanding of the science of nutrition	"*How to teach learners what to eat and how to cook, which foods to eat regularly, and which foods not to eat*" – FG1, P3 "*To make learners know what is suitable for their body*" – FG3, P1. *"…know that healthy foods are necessary for the development of their brains and for healthy minds and so they will be able to learn better"* – FG2, P4
Teachers' priorities when teaching nutrition to learners	"*My priorities are for them to imbibe lifelong healthy eating and at the same time for them to pass. Now many of them may not be able to afford it but the knowledge can be useful for them in the future*" – FG2, P7.
Emotions associated with teaching of nutrition	"*….because I think it is hard to practise, so I wonder if they will practise all of them, as I myself do not practise some of these things*" – FG1, P4. "*I feel guilty because of the children's socioeconomic background as a result of which they cannot afford the healthy foods we advocate for them to eat*" – FG1, P7. "*… like myself, I am not so much clear about nutrition, so to teach them I must prepare first. I need to just go deeper in the text book*" – FG3, P3.
Teachers' roles in raising healthy children	"*Teacher can come with a bottle of water and banana and left them on the table, the 2nd day he/she comes with an apple and a bottle of water and left them on the table. Learners will be seeing these actions and receive the messages that our teacher is always taking fruits and water.*" – FG1, P6.

4.8.4.3 Teachers' perceptions of learners' dietary behaviour

The impact of classroom NE on learners and teachers' perceptions of learners' understanding of healthy nutrition emerged when teachers discussed their perceptions of learners' dietary behaviour. The results were supported by direct quotes from the teachers (table 4.16). Teachers were of the view that classroom NE did not seem to impact much on learners'

dietary behaviour (FG3, P3). It was explained that unhealthy choices of foods such as extruded corn snack (generally called "Simba" by learners), candies and ice cream were frequently observed among learners, and many of them consumed these foods for lunch. The teachers noted that learners often became frightened when they were informed of the consequences of unhealthy eating. They usually made efforts towards healthy food choices but these efforts were short lived. Teachers viewed learners' understanding of healthy nutrition in two ways. Learners were perceived to lack proper nutrition knowledge regarding foods that were beneficial to health. This deficit was shown in learners' refusal of some foods, mainly vegetables, served in the NSNP, linking the eating of such foods with poverty (FG1, P7).

Parents were seen to have supported these attitudes, as parents would proudly say they ate meat and not vegetables in their homes. Teachers therefore perceived that learners were willing to learn and adopt healthy eating, barring all limiting circumstances. Parental influence and insufficient school NE were among the factors that were recognised affecting learners' eating behaviours.

Table 4.16: Quotes of the teachers regarding their perceptions of learners' dietary behaviour

Sub-themes	Teachers' quotes
Impact of classroom nutrition education on learners	"*If nutrition is taught as a subject, then it is understandable, but if it is the little bits that are taught in topics, it is limited in capacity to help learners to imbibe healthy eating*" – FG3, P3. "*The issue is not that they are totally not aware of healthy eating, but because they are so used to the things they like to eat which are also very cheap*." – FG1, P4.
Teachers' perceptions of learners' understanding of healthy nutrition	*"…who when cabbage is served in NSNP will reject it with pride, instead such learners would buy unhealthy foods for lunch showing that they don't belong to the group of the poor"* – FG1, P7.

4.8.4.4 Teachers' perceptions of school environmental influences on nutrition education

Regarding the teachers' perceptions of the school environment, the impact of positive and negative environmental influences on learners' eating behaviours emerged as shown in the quotes from the teachers (table 4.17). Factors considered were limited to those of the school environment. The following positive environmental factors were identified as having capacity for improving learners' eating behaviours: improving the teaching of nutrition in the

classroom; providing NE for food vendors; making only healthy foods available in the school tuck shops and continuing to serve healthy foods in the NSNP (FG2, P6). The development of a vegetable garden was perceived as an important positive factor (FG2, P3). Children usually become more interested in what they participated in than in what they were taught. Teachers gave an example of how learners participated with enthusiasm in planting a vegetable garden and were happy to eat the food prepared with vegetables from the garden.

Teachers identified two negative environmental influences on school NE as unhealthy choices of food from vendors (FG2, P1) and peer influences. Unhealthy choices of foods available in schools presented serious challenges to learners' food choices. The foods were cheap, easily available and tempting to learners, making it difficult for learners to practise what they learnt in class. Teachers sadly expressed that efforts made to stop the activities of vendors or make them sell healthy choices of food were to no avail. Peer influences were observed as another strong negative environmental influence on learners' eating behaviours. Children wanted to do what they saw their friends doing. When some learners refused foods from the NSNP, they usually bought unhealthy foods. This behaviour seemed to influence learners who would not like to be seen as poor.

Table 4.17: Quotes of the teachers regarding their perceptions of school environmental influences on nutrition education

Sub-themes	Teachers' quotes
Positive environmental factors	"*The NSNP provided by the government is a good way to influence learners to imbibe healthy eating habits*" – FG2, P6. "*Learners should be given chance to work on the school garden so that they can practise at home, plant their own vegetables and eat from them*" – FG2, P3.
Negative environmental factors	"*We have tried many times to tell food vendors what to sell and what not to sell. They were of the view that those things we wanted them to sell were not profitable*" – FG2, P1.

4.8.5 Nutrition knowledge, attitudes and dietary practices of learners

4.8.5.1 Nutrition knowledge and attitudes of learners

The learners' nutrition KAP was assessed using the nutrition KAP questionnaire. The knowledge questions were in five categories, namely food nutrients and functions; food and energy; nutrient deficiencies; food choices and sources of nutrients. The questions where the majority of the learners answered correctly were few. This situation led to the low mean score

in nutrition knowledge (58.8 ± 23.9%) and attitudes (58.4 ± 18.6%) of the learners. The mean scores for nutrition knowledge and attitudes were classified as low if they were less than or to equal 59% as explained in section 4.6.1.

The learners' mean scores in the different categories of nutrition knowledge (table 4.18) ranged between the lowest mean score of 35.5 ± 19.4% in sources of nutrients and highest mean percentage score of 73.3 ± 21.5% in food choices.

Table 4.18: Mean % (± SD) scores in the different categories of nutrition knowledge and attitudes of the learners (N = 354)

Variables	**Mean (%) (SD)**		
	School 1 n = 174	**School 2 n = 180**	**Total N = 354**
Nutrition knowledge Categories			
Food nutrient and function	65.1 ± 25.3	61.7 ± 27.0	63.3 ± 26.2
Food and energy	65.4 ± 27.7	67.5 ± 28.5	66.4 ± 28.1
Nutrient deficiencies	57.6 ± 26.9	61.9 ± 26.9	59.8 ± 26.9
Food choices	70.9 ± 21.8	75.7 ± 21.0	73.3 ± 21.5
Sources of nutrients	34.9 ± 19.4	36.2 ± 19.4	35.5 ± 19.4
Total nutrition knowledge score	**57.2 ± 23.9**	**60.3 ± 23.9**	**58.8 ± 23.9**
Nutrition attitudes	57.6 ± 19.3	59.2 ± 17.9	58.4 ± 18.6

Table 4.19 presents the proportion of learners answering the nutrition knowledge questions correctly. The questions that most learners answered correctly included the importance of food for growth (82%); to keep a healthy body weight, we need to have a healthy eating plan and exercise (82%); a hungry learner cannot perform well in his studies (84%); breakfast must consist of healthy choices of foods (87%) and the need to have three meals (breakfast, lunch, and supper) a day (84%). The majority (83%) of the learners knew that eating of a lot of chocolates, sweets, and ice cream is not good for health. A few learners correctly answered questions relating to food sources of calcium (39%), and highly processed foods always contain more nutrients than minimally processed foods (25%). Only 11% of the learners correctly answered the question on the cooking methods that would retain more nutrients in vegetables, and only 24% knew the reasons for processing foods.

Table 4.19: Nutrition knowledge questions: learners (%) answering correctly (N = 354)

Statements (response options; correct options underlined)	Frequency (%)		
	School 1 n = 174	School 2 n = 180	Total N =354
Food nutrients and functions			
Salty food is not good for health (True, false, don't know)	95 (54.6)	93 (51.7)	188 (53.1)
Food is important for growth (True, false, don't know)	145 (83.3)	146 (81.1)	291 (82.2)
To be a brilliant learner, we need to eat nutritious food (True, false, don't know)	134 (77.0)	115 (65.3)	249 (70.5)
The most important meal that helps us to be active all day long is (Breakfast, lunch dinner, don't know)	79 (45.4)	90 (50.0)	169 (47.7)
Food and energy			
We need a lot of energy to (Sleep, play football, use the computer, don't know)	107 (61.5)	132 (73.3)	239 (65.5)
Energy to learn and play comes from (Food, air, water, don't know)	93 (53.5)	84 (46.7)	177 (50.0)
To keep a healthy body weight, we need to have healthy eating plan and exercise (True, false, don't know)	141 (81.5)	148 (82.2)	289 (81.9)
Nutrient deficiency			
A hungry learner cannot perform well in his studies (True, false, don't know)	142 (82.2)	154 85.6)	297 (83.9)
We will get sick more easily, if our body lacks nutrients (True, false, don't know)	116 (66.7)	120 (66.7)	236 (66.7)
If we have 'lack of blood' (pale), it would be hard for us to focus in class (True, false, don't know)	81 (46.6)	103 (57.2)	184 (51.9)
Which of these is true (Lack of nutrients can: cause stunted growth, cause fatness, make us tall, don't know)	61 (35.1)	69 (38.3)	130 (36.7)
Food choices			
Breakfast must consist of healthy choices of foods (True, false, don't know)	150 (86.2)	157 (87.2)	307 (86.7)
Eating a lot of chocolates, sweets, and ice cream is good for your health (True, false, don't know)	133 (77.9)	156 (87.2)	289 (82.6)
Fruits are healthy snacks (True, false, don't know)	104 (60.1)	98 (54.4)	202 (57.2)
Food that is high in fat can cause diseases (True, false, don't know)	110 (63.9)	138 (77.1)	248 (70.7)
We need to have 3 meals a day - breakfast, lunch, and supper ((True, false, don't know))	143 (82.2)	153 (85.5)	296 (83.9)
Frequent eating of fast foods could risk our health - fast foods e.g. KFC, McDonalds and pizza (True, false, don't know)	101 (58.4)	115 (63.9)	216 (61.2)
Sources of nutrients			
Food that is low in fat is (Watermelon, chocolate, ice-cream, don't know)	86 (49.4)	86 (47.8)	172 (48.6)
Calcium is mostly found in (Fruit beverages, cold drinks, milk, I don't know)	63 (36.2)	75 (41.7)	138 (38.9)
Highly processed foods always contain more nutrients than minimally processed foods (True, false, don't know)	40 (22.9)	46 (25.7)	86 (24.6)

Continued/…….

Table 4.19: Nutrition knowledge questions: learners (%) answering correctly (N = 354) continued

Statements (response options; correct options underlined)	Frequency (%)		
	School 1 n = 174	School 2 n = 180	Total N =354
Which of the following cooking methods will retain more nutrients in vegetables? (Frying, boiling in water, steaming and roasting)	17 (9.8)	21 (11.7)	38 (10.7)
The following are the reasons for processing foods except (To prevent spoilage, to make them edible, to produce more convenient foods, to produce foods that prevent tooth decay)	44 (25.3)	39 (21.7)	83 (23.5)
Rice with fish / meat / egg and vegetables is a balanced diet (True, false, don't know)	114 (65.9)	123 (68.3)	237 (67.1)

Table 4.20 shows the proportion of learners whose responses to attitude statements were consistent with healthy eating. Many of the learners had positive attitudes to the statement relating to the importance of breakfast (84%), eating breakfast to focus in class (79%), and eating vegetables (88%). Only about half (51%) of the learners were of the view that it is necessary to eat a variety of foods. Learners had negative attitudes in respect of statements such as "I need to eat a lot in order to grow fast" and "I only need to consume a healthy diet when I am sick". Only 33% and 21% of the learners respectively believed that they did not have to eat a lot in order to grow fast and that they did not only need to take a healthy diet when they were sick.

Table 4.20: Nutrition attitudes statements: Learners (%) whose responses were consistent with healthy eating (N = 354)

Statements	Frequency (%)		
	School 1 n = 174	School 2 n = 180	Total N = 354
Breakfast is very important for me	140 (81.4)	156 (86.7)	296 (84.1)
I need to eat a lot in order to grow fast	52 (30.1)	66 (36.7)	118 (33.4)
I need to have breakfast so I can focus in class	134 (77.5)	144 (80.0)	278 (78.7)
I need to eat a variety of foods	81 (47.1)	98 (54.7)	179 (51.0)
I only need to consume a healthy diet when I am sick	34 (19.8)	39 (21.8)	73 (20.8)
I like eating vegetables	150 (86.2)	161 (89.4)	311 (87.9)
To keep a healthy body, I must learn about food	129 (74.6)	137 (76.5)	266 (75.6)
I will choose delicious food, regardless of its nutritional value	78 (44.8)	66 (36.7)	144 (40.7)
I am still young, and I can eat whatever I want. I will look after my diet when I am older	88 (50.6)	81 (45.0)	167 (47.7)
I like to try new food	116 (67.8)	117 (65.4)	233 (66.6)

4.8.5.2 Dietary practices of the learners

Dietary practices among the learners depicted both healthy and unhealthy eating practices (table 4.21). The foods that most learners (63%) ate during break were soft maize meal porridge or stiff maize meal porridge, known as “pap” followed by sweets or chocolates eaten by 20% of the learners. For lunch, 42% of the learners always ate a sandwich known as “kwota” which consisted of a quarter of a bread loaf with either potato chips, sausage and/or cheese and tomato sauce or rice with fish and vegetables (33%) and stiff maize meal porridge (23%). A healthy choice of snacks was observed in 44% of the learners who always chose fruits as snacks, while 52% of the learners always chose foods that were unhealthy choices for snacks. These foods included corn snacks and potato crisps, ice-cream, chocolates and sweets and buns, cakes and fat-cakes (sugar sweetened and fermented dough deep-fried in oil). The learners’ response to the eating of fast foods (foods from McDonalds and KFC) revealed a

situation whereby more than half of the learners had frequent intake (every day to several times a week), while 43% never ate the foods or did so occasionally. About half (52%) of the learners ate a balanced diet every day and the majority (72%) ate breakfast every day. The drink that learners always had with their breakfast was coffee or tea as reported by 66% of the learners. Most (67%) of the learners reported a frequent (every day to several times a week) intake of sweets, chocolates, and ice-cream.

Table 4.21: Dietary practices of learners (N = 354)

Questions with options	**Frequency (%)**		
	School 1 n = 174	**School 2 n = 180**	**Total N = 354**
1. The foods that learners always eat during break			
Porridge or "pap"	104 (59.8)	118 (65.6)	222 (62.7)
Sweets or chocolates	47 (27.0)	24 (13.3)	71 (20.1)
Ice- cream/carbonated Drinks	12 (6.9)	23 (12.8)	35 (9.9)
Others not specified	10 (5.7)	14 (7.8)	24 (6.8)
Missing	1	1	2
2. The foods that learners always eat for lunch			
Rice, fish, and chicken and vegetables	62 (35.6)	54 (30.0)	116 (32.9)
"Pap" and vegetables	43 (24.7)	37 (20.6)	80 (22.7)
"Kwota" (Bread + chips + polony + tomato sauce)	64 (36.8)	82 (45.5)	146 (41.5)
Others not specified	4 (2.3)	6 (3.4)	10 (2.8)
Missing	1	1	2
3. The foods that learners always choose as snacks			
Fruits	67 (38.5)	89 (49.4)	156 (44.2)
Corn snacks (Simba) potato chips (Lays)	53 (30.5)	54 (30.0)	107 (30.3)
Ice -cream, chocolates, sweets	17 (9.8)	14 (7.8)	31 (8.8)
Cakes, fat-cakes, buns	30 (17.2)	16 (8.9)	46 (13.0)
Others not specified	6 (3.4)	7 (3.9)	13 (3.7)
Missing	1	1	2
4. The eating of fast foods (McDonalds, Pizza, KFC, etc.)			
Almost every day	41(23.6)	37 (20.6)	78 (21.8)
Several times a week	67(38.5)	58 (32.2)	125 (35.4)
Occasionally	43(24.7)	71 (39.4)	114 (32.3)
Never	23(13.2)	13 (7.2)	36 (10.2)
Missing	0	1	1

Continued/…….

Table 4.21: Dietary practices of learners (N = 354) continued

Questions with options	Frequency (%)		
	School 1 n = 174	School 2 n = 180	Total N = 354
5. The eating of balanced diet (pap/rice/bread with meat/fish/egg with vegetables/fruits and milk/dairy products)			
Almost every day	74 (42.5)	110 (61.8)	184 (51.9)
Several times a week	60 (34.5)	36 (20.0)	96 (27.1)
Occasionally	27 (15.5)	29 (16.1)	56 (15.8)
Never	13 (7.5)	5 (2.8)	18 (5.1)
Missing	0	0	0
6. The eating of breakfast			
Almost every day	127 (72.9)	129 (71.7)	256 (72.3)
Several times a week	30 (17.2)	25 (13.9)	55 (15.4)
Occasionally	13 (7.4)	15 (8.3)	28 (7.9)
Never	4 (2.3)	11 (6.1)	15 (4.2)
Missing	0	0	0
7. With breakfast, I always drink			
Cordial drinks / carbonated drinks	8 (4.6)	9 (5.0)	17 (4.8)
Fresh milk / long life milk / powder milk / Milo	40 (23.0)	33 (18.3)	73 (20.9)
Coffee / tea	116 (66.7)	118 (65.6)	234 (66.3)
Others	10 (5.7)	19 (10.6)	29 (8.2)
Missing	0	1	1
8. The eating of sweets / chocolates / ice cream			
Almost every day	62 (35.6)	37 (20.6)	99 (27.9)
Several times a week	64 (36.8)	75 (41.7)	139 (39.3)
Occasionally	39 (22.4)	51 (28.3)	90 (25.4)
Never	9 (5.2)	17 (9.4)	26 (7.3)
Missing	0	0	0

4.9 DISCUSSION

This phase aimed to assess the needs for NE among the teachers and the learners. The baseline nutrition KAP statuses of the participants were revealed, along with findings around the practices of NE and its impact on the learners' eating behaviours. The results provided insight for the development of a context specific NEP for teachers. The results are discussed in line with the stated objectives of the study: the teachers' nutrition KAP, the NE practices of

the teachers, the teachers' perception of the impact of NE on learners' eating behaviours and the learners' nutrition KAP.

4.9.1 Nutrition knowledge, attitudes and dietary practices of the teachers

The teachers had good general nutrition knowledge but had deficits in some areas. It has been documented that measurement of nutrition knowledge can be complex, as responders may demonstrate high levels of knowledge in some nutrition topics but have little knowledge in others (Worsely 2002). This pattern was anticipated among teachers who were expected to be knowledgeable in a wide scope of learning. The areas of nutrition knowledge deficit revealed the aspects that intervention efforts should target. Questions that a high percentage of the teachers could not answer correctly were related to the energy content of foods, sources of nutrients and composition of fats. The result of this present study is in line with the findings of a study in the United States of America (USA) where only a few teachers (3%) correctly answered questions relating to the amount of energy in macronutrients, recommended servings for vegetables and fruits, and the recommended intake of fat (Sharma et al. 2013). It is common for people to erroneously associate obesity and overweight with the intake of starchy foods as was the view of the primary school educators in a South African study (Dalais et al. 2014). This perception might have informed the options of the majority of the teachers in this needs assessment study who indicated that sugar and starchy foods have the highest amount of energy per gram. Fat free milk is normally thin in consistency which might make people to relate it to a reduction in the essential nutrients such as protein and calcium as was the case with the teachers in this study. The teachers involved with the study by Sharma et al. (2013) were head start teachers who were responsible for providing NE to young children from low income communities in the USA. These results imply that deficit in the nutrition knowledge of teachers is irrespective of the location, either USA or South Africa.

A South African study found a mean score for nutrition knowledge of 63% ± 30.2 for teachers (Oldewage-Theron & Egal, 2012), which was considerably lower than in this needs assessment study. The instruments used in the studies were not the same and perhaps the one used in this needs assessment study might have dwelt more on those topics that the teachers were knowledgeable about than those that they were not. Spronk et al. (2014) in their review discussed how the instruments used to assess nutrition knowledge vary widely, while some addressed general nutrition knowledge; others addressed specific areas such as fat, fibre, and the dietary guidelines. The deficit of knowledge in some nutrition topics among the teachers

surveyed was substantiated with the findings that teachers in South Africa had themselves expressed inadequacy in some topics in nutrition to which they requested nutrition training (Nguyen et al. 2013). Moreover, the need for appropriate nutrition training for teachers to effectively teach nutrition has been documented in the literature (Kupolati, MacIntyre & Gericke 2014; Oldewage-Theron & Egal 2012; Shariff et al. 2008;). It was recommended that the development of NE material for teachers be aligned with the existing school curriculum (Hill et al. 2015; Faber et al. 2013; Oldewage-Theron & Napier 2011). These recommendations, along with the findings of this study, clearly revealed the need for a context specific NEP for these teachers.

The teachers' nutrition attitudes and practices typified healthy eating to some extent with a few aspects that needed improvement. Teachers could model healthy eating for learners (Schee & Gard 2014; Senekal et al. 2015) aside from providing NE in the classroom. A deficit in the nutrition knowledge of the teachers in the identified areas could have negative implications for the nutrition messages that they pass on to the learners. For example, the teachers in this study understood a healthy diet to mean a diet whose foods are rich in protein, or are without fats, or eating fish very often instead of a diet rich in different foods. Also, about a third of the teachers had the habit of having cold drinks more than three times a week. Some inconsistencies were observed in the teachers' responses to the questions on the dietary practices at school. A lack of commitment in completing the questionnaires and misunderstanding of the questions might explain this situation. Moreover, the teachers might have answered the practices questions in a generally acceptable way, as self-report dietary practices have been shown to be susceptible to inaccuracy (Gardner, de Bruijn, & Lally 2011). These shortcomings are potential sources of bias to the validity of the data.

4.9.2 Nutrition education practices of the teachers

It was revealed that teachers only taught nutrition in a about 10 – 20% of their classes. The small proportion of time used to teach nutrition was confirmed in a study where teachers spent less than one hour per week in teaching nutrition (Oldewage-Theron & Egal 2012). This amount of time in which the teachers taught nutrition is far from what can be used to achieve behaviour change with these learners. It was recommended that 50 hours are necessary to achieve behaviour change in children (Briggs, Fleschhacker & Mueller 2010).

Teachers play an important role in school NE as they are required to teach and guide learners (FAO 2005). However, for teachers to effectively perform this role, they need to receive

training on nutrition topics, and how to deliver nutrition messages by accommodating the learners' circumstances (McNulty 2013). Only about half of the teachers had received training to teach nutrition. It has been reported that capacity and skills to teach nutrition are often lacking among teachers who teach nutrition (Nguyen et al. 2013; FAO 2005). This needs assessment study revealed the need for nutrition training for the teachers as has been confirmed in other South African studies (Dalais et al. 2014; Van Deventer 2009).

The teachers in this needs assessment study indicated they would like to receive training to teach nutrition effectively as was confirmed in a study where teachers admitted inadequacy in teaching nutrition and expressed their need for nutrition training (Nguyen et al. 2013). About one third of the teachers in this needs assessment study had not had any opportunities for in-service nutrition training. In-service training is a useful resource to sharpen personnel's skills. Therefore, constant exposures of teachers to in-service nutrition training can equip teachers to teach nutrition effectively (Hill et al. 2015; Dalais et al. 2014; Faber et al. 2013).

The teachers mostly taught nutrition as part of the curriculum, and only a few teachers taught nutrition by integrating it into other subjects. This finding is contrary to the U.S Department of Education survey on the teaching of nutrition where one-third of the teachers taught nutrition as a separate subject, while the same proportion also taught nutrition by integrating it into other subjects such as Health/physical education, Reading/language arts and Science (Celebuski & Farris 2000). Teaching nutrition by integrating it into other subjects, and as a separate subject, helps to consolidate the learning and concepts of nutrition through various avenues (FAO 2005). Aside from teaching nutrition as a separate subject, nutrition issues can be used to illustrate fraction or percentage exercises in mathematics. Likewise, benefits of healthy eating or appropriate methods of food preparation can be used as a comprehension exercise in English Language.

About 62% of the teachers indicated a lack of instructional materials to teach nutrition as was confirmed in other South African studies where lack of quality instructional materials hindered the effectiveness of NE (Oldewage-Theron & Egal 2012; Nguyen et al. 2013). A study in the USA reported that teachers had limited resources and curriculum materials to support NE (Lambert & Carr 2006). The teachers in this needs assessment study specified that instructional materials were up to date and age appropriate but not enough for all learners. The use of instructional materials such as posters, charts, work books and hands-on materials can enhance the delivery of nutrition lessons to learners. Nutrition messages on posters that

are positioned on the classroom walls could serve as constant reminders of nutrition issues to learners. A work book exercises and activities which the learners engage in, do not only assess their understanding on the topics but can help the learners to internalise their learning.

The teachers involved with the study by Lambert and Carr (2006) indicated that instructional materials such as teacher's manuals, worksheets, computer software, films, video-tapes and posters would greatly enhance their teaching of nutrition. In their intervention study Oldewage-Theron and Egal (2012) discovered that teachers preferred colouring books, videos, posters and wall charts and NE card games. These authors recommended a NE manual covering all the nutrition topics in the DoBE curriculum to be used together with NE tools. These findings have important implication in planning a NEP for teachers.

The NSNP was seen as a supportive resource to NE by almost half of the teachers. This finding was reported in another study (Faber et al. 2013) where teachers reported that the meals from the NSNP formed part of discussion during nutrition lessons in the classroom. The various resources such as quality in-service training, NSNP meals, reference materials at school, and support for use of instructional materials were reported as having potential to greatly improve NE. This position is consistent with the recommendations that school NE should be supported by the school environment, build capacity for NE through staff training and maintain a school feeding programme (CSFSA 2003; World Bank 2006).

4.9.3 Teachers' perceptions of the impact of nutrition education on learners' eating behaviours

It was revealed that NE received limited support from the school probably because of inadequate resources. The support received was perceived to be insufficient for NE to positively influence the eating behaviours of learners. This perception is consistent with the findings of Perez-Rodrigo and Aranceta (2003) in their review of school-based NE where time- and resource-allocations were repeatedly reported to be insufficient. Some studies have reported limited time and resources for NE in South African schools (Nguyen et al. 2013; Oldewage-Theron & Egal 2012).

Teachers in this study viewed their role in NE in schools as that of providing nutrition information. The explanations on their role lacked the components that could facilitate the translation of nutrition knowledge into practice. Components such as teaching nutrition in context of the learners' circumstances and using examples that are familiar to learners in

explaining nutrition concepts were missing. Contento (2011) clarified NE as the use of educational strategies and environmental factors to facilitate voluntary adoption of healthy dietary practices. The teachers expressed the desire to impart lifelong healthy eating as one of their priorities in teaching nutrition. However, the realisation of this goal is doubtful in the light of many unfavourable environmental factors, and the teachers' limited understanding of nutrition concepts. Although the quantitative aspect of this study revealed that the teachers' nutrition knowledge was good, there was limited knowledge in certain aspects such as sources and energy content of nutrients and diet and disease relationship. This finding is consistent with a South African study, where teachers admitted to limited knowledge about nutrition and healthy dietary habits and requested for nutrition training (Nguyen et al. 2013). Even with many years of experience in teaching nutrition, teachers in all the FGDs still expressed their need for training in teaching nutrition. Teachers' role in raising healthy individuals was seen by the teachers as very important. This finding agrees with that of Schee and Gard (2014) who advocated teachers to model healthy eating to learners and to look after their own health. Teachers' good health status can improve their effectiveness as role models.

Learners were perceived by the teachers in this study to be aware of healthy eating, but they lacked the ability to effect changes. The resource-constrained background of the learners was identified as a limiting factor in a South African study (Oosthuizen, Oldewage-Theron & Napier 2011). However, the resources locally available could be properly channelled with the use of appropriate environmental support and learning strategies (Contento 2011). Nguyen et al. (2013) argued that learners need to be taught that one does not have to be wealthy to have a balanced diet. Teachers had mixed views regarding the eating behaviours of the learners. Learners were seen as not ignorant about healthy eating but they lacked nutrition knowledge in certain areas. This finding is in agreement with that of Nguyen et al. (2013) that poor nutrition knowledge was an important factor in learners making unhealthy choices of foods. The learners' rejection of certain vegetables and foods served in the NSNP probably revealed their ignorance.

The teachers in all the FGDs perceived that classroom NE was an important school environmental factor to encourage healthy eating among learners. This result revealed that even with the curriculum in place there was the need to ensure nutrition messages were effectively communicated to learners. In addition, provision of NE to food vendors, healthy choices of food in tuck shops, and the NSNP were identified as potential positive influences on learners' eating behaviours. This finding is consistent with the recommendation that school

tuck shops and school events should feature healthy choices of food (Nguyen et al. 2013). Implementation of a vegetable garden was also perceived as a way of encouraging learners to practise healthy eating. This finding was in agreement with the findings of David et al. (2008), where learners who were involved in school garden activities followed up on gardening practices at home.

Unhealthy choices of food available from vendors and tuck shops were viewed by the teachers as a major influence on learners' eating behaviour. Bauer, Yang and Austin (2004) reported that easy access to foods that were unhealthy choices hindered learners from taking advantage of a programme planned to help them eat a balanced diet. Learners were also viewed as being influenced by their peers to reject foods served from the NSNP because they would not like to be seen as poor. Such learners often purchased unhealthy choices of snacks from food vendors. A South African study revealed that about 60% of learners always purchased unhealthy choices of snack foods sold at tuck shops or vendors at school (Abrahams et al. 2011).

The teachers' perception of the potential of NE in schools was that it could impart the healthy dietary behaviours with lifelong consequences to learners. Their views revealed how the school, the teachers, learners and school environment facilitated or hindered the successes that school NE could achieve. These findings furnished important information for developing an effective NEP for teachers.

4.9.4 Learners' nutrition knowledge, attitudes and dietary practices

The learners had a mean percentage score of 58.8 ± 23.9 for nutrition knowledge and 58.4 ± 18.6 for nutrition attitudes with a high percentage of the learners not able to correctly answer many questions relating to sources of nutrients and nutrient deficiencies. Studies in South Africa have confirmed a deficit in the nutrition knowledge of learners and especially in the areas such as nutrient deficiency, diet variety and food portions (Oldewage-Theron & Egal 2012; Oosthuizen, Oldewage-Theron & Napier 2011). A survey of school children aged 10 – 14 years across the nine provinces of South Africa showed that the majority of the children had a low level of general nutrition knowledge (Shisana et al. 2013). The learners' low mean nutrition knowledge and attitudes scores were revealed in certain nutrition topics. For example, many of the learners did not know that milk is a rich source of calcium and that highly processed foods do not always contain more nutrients than minimally processed foods. The majority of the learners would choose delicious food, regardless of its nutritional value

and believed that healthy eating was only needed during illness. The learners' dietary practices were also reflected in the frequent intake of unhealthy choices of foods such as corn snacks (Simba), potato chips, sweets, chocolates, ice cream and fast foods by a high percentage of the learners.

It was clear from these results that the learners' nutrition knowledge, attitudes and dietary practices needed to improve for realising the benefits of NE among the learners. Optimal nutrition knowledge was reported to be essential for good nutrition attitudes and practices leading to healthy eating (Shariff et al. 2008; Perez-Rodrigo & Aranceta 2003). Evidence from the body of literature has associated healthy eating with good growth outcomes, mental development, school performance and long term manpower development (Northstone et al. 2011; Nansel, Huang & Rovner 2010; Shilts et al. 2009). Teachers have an important role in improving learners' nutrition knowledge for a desirable change in attitudes and dietary practices (Rafiroiu & Evans 2005). Therefore, the teachers' positive attitudes and healthy dietary attitudes in this needs assessment study was an indication that they could facilitate an effective NEP in the schools. The findings of this study established the need to empower the learners for healthy eating through improvement in their nutrition knowledge, attitudes and dietary practices.

4.10 STRENGTHS AND LIMITATIONS OF PHASE 1

The use of both quantitative and qualitative research methods is an important strength of this study as some of the findings of the quantitative surveys were confirmed in the qualitative interviews (Agency for Healthcare Research and Quality (AHRQ) 2013). The finding about the frequent eating of unhealthy choices of foods in the learners' KAP survey was confirmed in the qualitative interview with the teachers on their perceptions of the impact of NE on learners' eating behaviour. Similarly, some issues such as the teachers' training needs, limited time and resources allocation which, were revealed in the quantitative survey of the practice of NE in schools, were confirmed in the qualitative interviews with the teachers.

The sample sizes used with the teachers' survey and FGDs were small, learners from only two schools were involved, and the fact that the study was conducted in only one district, created the findings that cannot be generalised to the other districts in South Africa. However, the purpose was not to generalise to other districts in South Africa, but specifically to assess NE needs in the Bronkhorstspruit district. In addition, the commitment of the teachers to

answering the questions was low as was indicated in the large number of missing data which could have led to loss of information.

The teachers were employees under an authority; this might have led to expressing their views with caution, particularly on matters relating to policy. The teachers who participated in the study were mostly experienced teachers, while a different profile of participants (such as inexperienced teachers or an equal mix of experienced and inexperienced teachers) might have generated different results.

The administration of questionnaires to the learners was done by dictating the questions to a large group of learners in a class, whereas a smaller group of learners could have enhanced a better control of the class and independent responses to the questions. One of the practices question "I need to eat a lot" might have been misunderstood by learners. The low alpha value of 0.498 for practice items and 0.531 for attitudes items in the learners' questionnaire was indicative of a misunderstanding of some of the questions. Not including the meals served from the NSNP in the options of what learners ate for lunch might have influenced the results. The self-administered questionnaires for the teachers were received after a period of time, making external consultation for knowledge questions a possibility. Also the questions on the dietary practices at school were answered by the teachers with some inaccuracies. In the teachers' questionnaires 100% fruit juice was grouped with healthy drinks which might have contributed to the teachers' healthy eating practices. Meanwhile, recently in South Africa, fruit juice has been grouped with sugar sweetened beverages because of its very high sucrose content. These shortcomings might have constituted possible sources of bias to the data.

4.11 CONCLUSION ON PHASE 1

The goal of this phase was to explore the needs for a context specific NEP for teachers so as to empower them in providing effective NE to learners.

The mean scores for the nutrition knowledge and attitudes of teachers were good with the need for improvement on certain nutrition topics, while those of the learners were low and needed general improvement. These results revealed the need for an improved approach to the delivery of NE by the teachers for the realisation of the benefits of school NE to the learners' health.

To fully realise the benefits of school NE, it is vital to secure adequate time for teaching nutrition in the classroom, to provide nutrition training for teachers who teach nutrition, and to provide quality reference and instructional materials in line with the schools' curriculum.

The study shed light on the interaction of the schools' support, the teachers' roles, the learners' nutrition KAP and the environmental factors in addressing the issues that influence the impact of NE on learners' eating behaviours. The teachers' recognition of their role and readiness to give support is important in raising a future generation of healthy individuals through school NE.

4.12 RECOMMENDATION FOR PLANNING THE NUTRITION EDUCATION PROGRAMME

In the planning of the NEP for the teachers, the identified problems, summarised under the following, should be addressed:

i. nutrition knowledge deficit in certain nutrition topics among the teachers,
ii. the inappropriate approach to NE delivery by the teachers,
iii. the learners' resource-constrained environment and deficit in nutrition KAP.

The implementation of these recommendations is addressed in chapter 5.

REFERENCES

Abrahams, Z, De Villiers, A, Steyn, NP, Fourie, J, Dalais, L, Hill, J, Draper, CE & Lambert, EV 2011, 'What's in the lunchbox? Dietary behaviour of learners from disadvantaged schools in the Western Cape, South Africa' *Public Health Nutrition*, vol. 14, no. 10, pp.1752-1758.

Agency for Healthcare Research and Quality (AHRQ) 2013, *Mixed methods: integrating quantitative and qualitative data collection and analysis while studying patient-centered medical home models*, viewed 22 June 2015, https://pcmh.ahrq.gov/sites/default/files/attachments/MixedMethods_032513.

Amato, H, Calitz, J & Campbell, SH 2012, *Platinum life skills: Grade 6 Learners Book (CAPS)*. Maskew Miller Longman, Cape Town.

Bauer, K, Yang, YW & Austin SB 2004, 'How can we stay healthy when you are throwing all this in front of us?: Findings from focus groups and interviews in middle school on environmental influences on nutrition and physical activity', *Health Education and Behavior*, vol. 31, no. 1, pp. 34-46.

Beckett, M, Zietsman, E nd, *Natural Sciences and Technology Grade 6-B (CAPS)*. Sasol Inzalo Foundation, viewed 22 April 2013, http://www.thunderboltkids.co.za/downloads/Gr_5_B_Eng_TG.

Biennan, P, Dada, F, Gough, B, Holgate, S, Lorimer, P, Minkley, C 2012, *Day by day life skills Grade 5. Learners Book (CAPS)*. Maskew Miller Longman, Cape Town.

Briggs, M, Fleschhacker, S & Mueller, CG 2010, 'Position of the American Dietetic Association, School Nutrition Association, and Society for Nutrition Education: Comprehensive School Nutrition Services', *Journal of Nutrition Education and Behavior*, vol. 42, no. 6, pp. 360-371.

California School Food Service Association (CSFSA) 2003, *Position statement: nutrition education*, viewed 15 February 2014, http://www.calsna.org/documents/PositionPapers/NutritionEducation.

Celebuski, C and Farris E 2000, *Nutrition education in public elementary school classrooms, K – 5, FRSS*, National Center for Education Statistics, US Department of Education, viewed 8 July 2012, https://catalyst.library.jhu.edu/catalog/citation.

Cohen, L, Manion, L & Morrison, K 2011, *Research Methods in Education*. Routledge, New York NY.

Contento, IR 2011, *Nutrition education: Linking research, theory and practice*. 4th edn, Jones and Bartlett Publishers, Sudbury MA.

Culinary Institute of America 2012, *A national initiative to improve the health of K – 12 students through food education, culinary strategy and flavour insight*, viewed 26 November 2012, http://www.ciaprochef.com/healthykids.

Dalais, L, Abrahams, Z, Steyn, NP, De Villiers, A, Fourie, JM, Hill, J, Lambert, EV & Draper, CE 2014, 'The association between nutrition and physical activity knowledge and weight status of primary school educators', *South African Journal of Education*, vol. 34, no. 3, pp. 817-824.

David, D, Kimiywe, JO, Waudo, JN & Orodho, JA 2008, 'Promotion of nutrition education interventions in rural and urban primary schools in Machakos district, Kenya', *Journal of Applied Biosciences*, vol. 6, pp. 130-139, viewed 25 December 2013, www.biosciences.elewa.org.

Department of Basic Education (DoBE) 2011a, *National Curriculum Statement (NCS). Curriculum and Assessment Policy Statement (CAPS) Grades 4 - 6: Natural Sciences and Technology*, viewed 15 November 2012, http://www.edu.gov.za.

Department of Basic Education (DoBE) 2011b, *National Curriculum Statement (NCS). Curriculum and Assessment Policy Statement (CAPS) Grades 4 - 6: Life Skills*, viewed 15 November 2012, http://www.edu.gov.za.

Dixon-Woods, M 2011, 'Using framework based synthesis for conducting reviews of quantitative studies', *BMC Medicine*, vol. 9, p. 39, viewed 30 July 2013, www.biomedcentral.com/1741-7015/9/39.

Faber, M, Laurie, S, Maduna, M, Magudulela, T and Muehlhoff, E 2013, 'Is the school food environment conducive to healthy eating in poorly resourced South African schools?', *Public Health Nutrition*, vol. 17, no. 6, pp. 1214-1223.

Food and Agriculture Organization (FAO) 2005, *Nutrition Education in Primary Schools*, Vol. 1: The Reader. Rome: FAO, viewed 18 March 2015, http://www.fao.org/3/a-a0333e.pdf.

Food and Agriculture Organization (FAO) 2006, *Nutrition education in primary schools: A planning guide for curriculum development*, viewed 21 June 2012, ftp://ftp.fao.org/docrep/fao/009/.

Gale, NK, Heath, G, Cameron, E, Rashid, S and Redwood, S 2013, 'Using the framework method for the analysis of qualitative data in multi-disciplinary health research', *BMC Medical Research Methodology*, vol. 13, p. 117, viewed 28 June 2015, http://www.biomedcentral.com/1471-2288/13/117.

Gardner, B, de Bruijn, G & Lally, P 2011, 'A systematic review and meta-analysis of applications of the Self-Report Habit Index to nutrition and physical activity behaviours', *Annals of Behavioral Medicine*, vol. 42, pp. 174-187, viewed 1 February, 2015, http://doi.10.1007/s12160-011-9282-0.

Harris, JE, Gleason, PM, Sheean, PM, Boushey, C, Beto, JA & Bruemmer, B 2009, 'An introduction to qualitative research for food and nutrition professionals', *Journal of the American Dietetic Association*, vol. 109, no. 1, pp. 80-90.

Harwell, M 2011, *Research design in qualitative/quantitative/mixed methods: The Sage handbook for research in education.* 2nd edn, Sage Publishers, Los Angeles CA.

Hill, J, Draper, CE, De Villiers, A, Fourie, JM, Mohamed, S, Parker, W & Steyn, N 2015, 'Promoting healthy lifestyle behaviour through the Life-Orientation curriculum: Teachers' perceptions of the HealthKick intervention', *South African Journal of Education*, vol. 35, no. 1, pp. 981-989.

Jacobs, D 2004, *Millennium Life Orientation Grade 4: Learners Book and facilitators guide, (RNCS)*. Action Publishers, Cape Town.

Kubik, MY, Lytle, LA, Hannan, PJ, Story, M & Perry, CL 2002, 'Food-related beliefs, eating behaviour, and classroom food practices of middle school teachers', *Journal of School Health*, no. 72, pp. 339-345, viewed 20 November 2015, http://doi:10.1111/j.1746-1561.2002.tb07921.x.

Kupolati, MD, MacIntyre, UE & Gericke, GJ 2014, 'School-based nutrition education: features and challenges for success', *Nutrition & Food Science*, vol. 44, no. 6, pp. 520-535.

Lacey, A. & Luff, D 2007, *Qualitative Research Analysis*. The NIHR Research Design Service, East Midlands / Yorkshire & Humber.

Lambert, LG & Carr, DH 2006, 'Perceptions of elementary school nutrition education practices by school foodservice directors, teachers, and principals', *Journal of Child Nutrition and Management,* viewed 21 March 2015, http://docs.schoolnutrition.org/newsroom/jcnm/06spring/lambert/index.

McNulty, J 2013, 'Challenges and issues in nutrition education, Rome: Nutrition Education and Consumer Awareness Group', *Food and Agriculture Organization of the United Nations,* viewed 12 March 2015, http://www.fao.org/ag/humannutrition/nutritioneducation/en.

Morgan, DL 2013, 'Focus groups as qualitative research', in *Planning and research design for focus groups'*, SAGE Publications, viewed 28 June 2015, http://dx.doi.10.4135/9781412984287.

Nansel, TR, Huang, TT & Rovner, AJ 2010, 'Association of school performance indicators with implementation of the Healthy Kids, Smart Kids programme: case study', *Public Health Nutrition,* vol. 13, no. 1, pp.116-122.

Nguyen, KA, De Villiers, A, Fourie, JM, Bourne, LT & Hendricks MK 2013, 'The feasibility of implementing food-based dietary guidelines in the South African primary-school curriculum', *Public Health Nutrition,* vol. 18, no. 1, pp. 167-175.

Northstone, K, Joinson, C, Emmett, P, Ness A & Paus, T 2011, 'Are dietary patterns in childhood associated with IQ at 8 years of age?: A population-based cohort study' *Journal of Epidemiology & Community Health,* viewed 14 June 2014, http://doi:10.1136/jech.2010.111955.

Oldewage-Theron WH, Napier, CE 2011, 'Nutrition education tools for primary school children in the Vaal region', *Development Southern Africa,* vol. 28, no. 2, pp. 283-292.

Oldewage-Theron, W & Egal, A 2012, 'Impact of nutrition education on nutrition knowledge of public school educators in South Africa: A pilot study', *Health SA Gesondheid,* vol. 17, no. 1, viewed 2 December 2012 http://dx.doi.org/10.4102/hsag.v17i1.602.

Oosthuizen, D, Oldewage-Theron, WH & Napier, C 2011, 'The impact of a nutrition education programme on the dietary intake patterns of primary school children', *South African Journal of Clinical Nutrition*, vol. 24, no. 2, pp. 75-81.

Parmenter, K & Wardle, J 1999, 'Development of a general nutrition questionnaire for adults', *European Journal of Clinical Nutrition*, vol. 53, pp. 298-308.

Perez-Rodigo, C & Aranceta, J 2003, 'Nutrition education in schools: experiences and challenges', *European Journal of Clinical Nutrition*, vol. 57, Suppl 1, pp. S82-S85.

Rafiroiu, AC & Evans, A 2005, 'Nutrition knowledge, attitudes and practices among nutrition educators in the South', *American Journal of Health Studies*, vol. 20, no. 1, pp. 29-38.

Royston, P 1995, 'A Remark on Algorithm AS 181: The W-test for Normality', *Journal of the Royal Statistical Society*, Series C (Applied Statistics), vol. 44, pp. 547-551.

Ritchie, J & Spencer, L 2002, 'Qualitative data analysis for applied policy research', *The Qualitative Researcher's Companion*, pp. 305-329, viewed 20 November 2013, http://dx.doi.org/10.4135/9781412986274.n12.

Rossiter, M, Glanville, T, Taylor, J. & Blum, I 2007, 'School food practices of prospective teachers', *Journal of School Health*, vol. 77, no. 10, pp. 694-700.

Schee, VS & Gard, M 2014, 'Healthy, happy and ready to teach, or why kids can't learn from fat teachers: the discursive politics of school reform and teacher health', *Critical Public Health*, vol. 24, p. 2, viewed 10 December 2014, http://dx.doi.org/10.1080/09581596.2013.828152.

Senekal, M, Seme, Z, De Villiers, A & Steyn, NP 2015, 'Health status of primary school educators in low socio-economic areas in South Africa', *BMC Public Health*, vol. 15, no. 1, pp.1, http://doi.10.1186/s12889-015-1531-x.

Shariff, ZM, Bukhari, SS, Othman, N, Hashim, N, Ismail, M, Jamil, Z, Kazim, SM, Paim, L, Samah, BA & Hussein, ZAM 2008, 'Nutrition education intervention improves nutrition knowledge, attitude and practices of primary school children: a pilot study', *International Electronic Journal of Health Education*, vol. 11, no. 1, pp. 119-132.

Sharma, S, Dortch, KS, Byrd-Williams, C, Truxillio, JB, Rahman, GA, Bonsu, P & Hoelscher, D 2013, 'Nutrition-related knowledge, attitudes, and dietary behaviours among

Head Start teachers in Texas: a cross-sectional study', *Journal of the Academy of Nutrition and Dietetics*, vol. 113, no. 4, pp. 558-562.

Shilts, MK, Lamp, C, Horowitz, M & Townsend, MS 2009, 'Pilot study: EatFit impacts sixth graders' academic performance on achievement of Mathematics and English education standards', *Journal of Nutrition Education and Behavior*, vol. 41, no. 2, pp. 127-131.

Shisana, O, Labadarios, D, Rehle, T, Simbayi, L, Zuma, K, Dhansay, A, Reddy, P, Parker, W, et al. 2013, *South African National Health and Nutrition Examination Survey (SANHANES-1)*, HSRC Press, Cape Town.

Spronk, I, Kullen, C, Burdon, C & O'Connor, H 2014, 'Relationship between nutrition knowledge and dietary intake', *British Journal of Nutrition*, vol. 111, no. 10, pp. 1713-1726.

Suen, LW, Huang, H, Lee, H 2014, 'A comparison of convenience sampling and purposive sampling', *Journal of Nursing*, vol. 61, no. 3, pp. 105-111.

United Nations Integrated Children Emergency Fund (UNICEF) 2009, *Tracking progress of child and maternal nutrition – a survival and development priority*. UNICEF, NewYork, USA, viewed 26 May 2012, www.unicef.org/publications.

Van Deventer K 2009, 'Perspectives of teachers on the implementation of Life Orientation in Grades R–11 from selected Western Cape schools', *South African Journal of Education*, vol. 29, no. 1, pp. 127-145.

World Bank 2006, *Repositioning Nutrition as central to development: A strategy for large scale action*, World Bank, viewed 25 July 2012, http://go.worldbank.org/M63XQNCQ20.

Worsely, T 2002, 'Nutrition knowledge and food consumption: can nutrition knowledge change food behaviour?', *Asia Pacific Journal of Clinical Nutrition*, vol. 11, pp. S579-S585.

CHAPTER 5

PHASE 2: PLANNING THE NUTRITION EDUCATION PROGRAMME

5.1 INTRODUCTION

A context specific NEP was recommended in phase 1 to equip teachers for teaching nutrition effectively. For a NEP to be effective and achievable, it was suggested to be in line with the existing school curriculum and to comprise a teacher's manual and instructional materials (Faber et al. 2013; Oldewage-Theron & Egal 2012). A NEP that aims at changing behaviours is often based on the theories of learning and behaviour (Dudley, Cotton & Peralta 2015; Perez-Rodrigo & Aranceta 2003).

This phase followed phase 1. Phase 1 (chapter 4) identified the needs for an effective NEP for teachers. These identified needs were addressed in the development of a context specific NEP for the teachers. This chapter describes the process for developing the NEP.

5.2 AIM

The aim of this phase was to develop a context specific NEP for teachers who teach nutrition to Grades 5 and 6 learners in primary schools in the Bronkhorstspruit district.

5.3 METHOD

An effective NEP should engage the intended audience in the three domains, the head (cognitive), the heart (affective) and the hand (psychomotor) (Contento 2011; FAO 2006). The results of the needs assessment obtained in phase 1 were used in the development of the NEP for the teachers by using the modification of NE theory based design that was developed by Contento (2011) as represented in table 5.1. The steps were discussed as part of the process for the NEP development and are listed as follows:

- Analysing the needs and identifying the problem areas
- Identifying programme goals and objectives
- Selecting the theories of choice
- Selecting the programme components and identifying educational goals
- Selecting the theory-based strategies and activities
- Designing the process and impact evaluation

- Planning for NE implementation

Table 5.1: Theory-based nutrition education programme

Analysing needs Phase 1	Developing the nutrition education programme Phase 2			Implementation and evaluation
Step 1: Identified priority needs i. Assessed the nutrition KAP of the teachers and the learners ii. Assessed the practice of NE in the primary schools in Bronkhorstspruit iii. Explored the teachers' perceptions of the impact of school NE on learners' dietary practices	**Step 2: Educational objectives** i. To improve teachers' skills in teaching nutrition ii. To use selected constructs of the SCT and the MLM in explaining nutrition concepts	**Step 3: Theories and the components of the NEP** i. Selected constructs of the SCT and the MLM ii. Existing curriculum of the DoBE iii. Identified NE needs iv. Contextual NE materials comprising the teacher's manual, picture book, learner's work book and posters	**Step 4: Theory-based ESs and activities** i. Enhanced curriculum approach ii. Revision of previous lessons iii. Active participatory teaching iv. Problem-based small group discussions v. Goals setting vi. Lesson activities in learner's work book	⟵ **Step 5: Implementation** i. Training of teachers ii. Teachers use the NE manual to teach nutrition **Evaluation** i. Monitoring of NEP ii. Impact of NEP on the teaching of nutrition iii. Impact of NEP on the teachers' and the learners nutrition KAP

Abbreviations: NEP – Nutrition education programme, KAP – Knowledge, attitudes and dietary practices, NE – Nutrition education, DoBE – Department of Basic Education, SCT – Social cognitive theory, MLM – Meaningful learning model, ESs – Educational strategies.

5.4 THE PROCESS

5.4.1 Analysing the needs and identifying issues

5.4.1.1 Analysing the needs

The needs assessment carried out in phase 1 of the study identified the following needs:

- Deficit in teachers' nutrition knowledge in the areas related to nutrient and energy content of food and diet and health relationship.
- Unavailability of up to date instructional materials such as a teacher's manual, posters, work books and hands-on materials.
- Lack of in-service nutrition training for the teachers and their desire for training to teach nutrition topics.
- Limited time for teaching nutrition.
- Learners' inadequate nutrition knowledge.

- The learners' resource-constrained environment.
- Frequent intake of unhealthy choices of foods among the learners.

5.4.1.2 Identifying the problem areas

The problems that contributed to the revealed needs were considered in respect of the primary audience of the NE intervention (Contento 2011) which in this case was the teachers. Evidence from the literature (Nguyen et al. 2013; Oldewage-Theron & Egal 2012) and the needs assessment revealed inappropriate methods of delivery of NE to learners. Good successes (desired targeted behaviour) always result when school NE is accompanied with appropriate teaching strategies (Dudley, Cotton & Peralta 2015). Teaching strategies describe the style and the material component of the NE as earlier stated in the literature review (chapter 2 section 2.4.3), and can determine the impact of the NE on learner's dietary behaviour.

The major concerns identified which this NEP would address were:

Primary:

- Teaching strategy of enhanced curriculum approach.

Secondary:

- Enhanced teachers' nutrition knowledge.
- Improved learners' nutrition knowledge.

The teaching strategy of the enhanced curriculum approach refers to a NEP that is based on the existing curriculum but enriched with the desired behavioural change components (Dudley, Cotton & Peralta 2015). This approach was chosen because it is in line with recommendations and findings from previous studies that integrating school-based NE into an existing curriculum yields better outcomes (Dudley, Cotton & Peralta 2015; Faber et al. 2013; Oldewage-Theron & Egal 2012). The outcomes were in terms of winning teachers' support to implement the NEP, to model healthy eating and the behaviour change into healthy eating among learners.

5.4.2 Identifying programme goal and objectives

Based on the primary outcome and the identified problems to be addressed, the goal and objectives of the NEP were defined.

5.4.2.1 Goal

The goal of the NEP was to improve the teachers' delivery of classroom NE to learners in order to improve the learners' knowledge, attitudes and dietary practices regarding nutrition.

5.4.2.2 Objectives

The specific objectives were to:

i. define the educational strategy,
ii. explain the concepts of theories in context of the nutrition topics,
iii. integrate the selected concepts of theories into the nutrition topics,
iv. verify the developed NE manual with the teachers and stakeholders.

5.4.3 Selecting the theories of choice

Adequate nutrition knowledge is necessary for an individual to adopt and maintain healthy dietary behaviours (David et al. 2008). As stated earlier, a successful NEP that targets behaviour change is often accompanied by theories of learning or behaviour. Based on the information from the literature, and in consideration of the goals of this study, the SCT and the MLM were selected for use in developing and implementing the NEP. Successful school-based intervention studies and curriculum development have their basis in the SCT, taking advantage of the impact of the school environment on the learners' ability to learn new behaviours (Hildebrand, Jacob & Garraid-Foster 2012; Shariff et al. 2008; Morris, Briggs & Zidenberg-Cherr 2002). The MLM engages active involvement of learners during the delivery of classroom nutrition messages by ascertaining learners prior knowledge, concretising learning and facilitating the use of new learning in real life situations (Novak & Cañas, 2006). Selected concepts from the combination of the two theories were used in developing the NE materials. The NE materials refer to the contextual NE manual for teachers, the picture book, the learner's work book and the posters.

5.4.3.1 Selected constructs of the Social cognitive theory

The SCT posits that a change in behaviour occurs by watching others and the reinforcement or punishment associated with their actions (Bandura 2001). The SCT constructs selected for use were the environment, behavioural capability, expectation, observational learning and self-regulated learning.

i. Environment

The environment refers to the factors that are external to the learners, but which are capable of influencing learners' behaviour regarding healthy eating (Contento 2011). Things in the environment serve as means to realise the local context of the learners (Contento 2011; FAO 2006). The environmental factors capable of influencing learners' eating behaviour were in two categories:

Factors with the potential of promoting healthy eating:

- nutrient dense foods available in the community,
- serving of school meals through the NSNP,
- healthy choices of food in the tuck shop,
- classroom nutrition messages.

Factors with the potential of hindering healthy eating:

- foods low in nutrients but high in fat or sugar or salt that were sold by food vendors and in the tuck shop,
- lack of variety of foods in the homes of learners,
- peer influences among learners,
- learners' limited nutrition knowledge,
- the limited amount of money available to spend on food in learners' homes due to their low economic background.

ii. Behavioural capability

Behavioural capability is about acquiring knowledge on an issue and developing skills to perform the behaviours that can help to deal with the issue (Linnell, Briggs & Zidenberg-Cherr 2013). If an individual is expected to perform a given behaviour, he/she must have adequate knowledge about what the behaviour is and how to acquire it (Schunk 2012).

iii. Expectation

Expectation is to anticipate outcomes of performing a specific behaviour, which in this study is by modelling positive outcomes of healthy behaviours. The realisation of a desired achievement both in the short and long term can serve as motivation for learners to adopt healthy eating. Here we took advantage of the link between healthy eating and brain function which can lead to good performance in their studies (Kleinman et al. 2002). Other expectations capable of motivating learners towards healthy eating behaviour include the

desire for good growth stature, for strong bones fit for sport activities, for strong and healthy teeth and to be free from diseases.

iv. Observational learning

Observational learning refers to acquiring behaviour by watching the actions and outcomes of others who performed the behaviour (Contento 2011). This was facilitated by including individuals who could act as role models of healthy eating for learners. The potential models from whom learners could learn were teachers and peers.

v. Self-regulated learning

Self-regulated learning is about providing opportunity for self-monitoring through goal setting which will lead to problem solving. The idea here was that learners could be helped to make progress in their behaviour change to healthy eating by committing to a line of action (Schunk 2012). Learners would make a decision on what they learnt and set their goals in the goal setting section provided in the work book.

5.4.3.2 Selected constructs of the Meaningful learning model

The Meaningful learning Model (MLM) is based on the principle that learning takes place primarily by building on existing knowledge which invariably brings about new understandings around the subject (Novak 2011). The constructs of MLM used were relevant prior knowledge and integrate new with prior knowledge.

i. Relevant prior knowledge

The relevant prior knowledge concept is based on the fact that for any meaningful learning to occur, the background knowledge that learners have regarding the topic must be established. This was achieved by checking learners' understanding around the subject and by revising previous lessons with learners (Yildiz & Karabiyik 2012), before introducing a new topic.

ii. Integrate new with prior knowledge

The integrate new with prior knowledge concept advocates building on learners' existing nutrition knowledge (Babadogan & Unal 2011). Learners would add the new knowledge to what they already know and apply them in real life experiences.

The concepts were used to create a template (table 5.2) for the context specific NE materials. The template described how the concepts were used to explain nutrition messages. The two theories the (SCT and the MLM) were applied to the achievement of acquisition of

knowledge and the empowerment for behaviour change. While the MLM employs active involvement of learners during the delivery of classroom nutrition messages, the SCT, which emphasises a strong behavioural component, enables learners to learn new dietary behaviours through the manipulations of environmental influences (Glanz, Rimer & Lewis 2002). The SCT also has the capacity to help learners increase knowledge, which can bring about a desired combined effect between the two theories.

Table 5.2: Template for the application of constructs of theory

Meaning of constructs of theories	Application of constructs	Expected learner outcomes
Environment (SCT) External factors which may influence learners' eating behaviours	**Environment (SCT)** - Use available foods in the community as examples - Identify healthy eating practices in the community - Provide effective ways to use available foods - Encourage eating from school feeding scheme - Promote vegetable gardening	**Environment (SCT)** - Identify healthy eating practices in the community - Use available foods in the community - Establish home vegetable garden - Raise poultry for egg production - Choose foods that are healthy choices
Behavioural capability (SCT) Learners receive nutrition messages and acquire healthy eating behaviours	**Behavioural capability (SCT)** - Deliver nutrition messages using an active participatory approach - Demonstrate healthy eating principles and practices - Identify barriers and solutions	**Behavioural capability (SCT)** -Acquire skills for choosing foods that are good choices -Acquire skills to perform healthy eating behaviours
Expectation (SCT) Learners anticipate outcomes of healthy eating	**Expectation (SCT)** - Learners identify and draw aspired dreams - Link dreams with healthy eating - Incorporate role models	**Expectation (SCT)** -Healthy eating is motivated by the anticipation of achieving their dreams
Observational learning (SCT) Learners acquire behaviour by watching the actions of role models (teachers, peers and parents) who perform the behaviours	**Observational learning (SCT)** -Teachers demonstrate healthy food choices and practices - Teachers model healthy eating - Learners engage in role play - Learners and teachers share experiences of healthy eating	**Observational learning (SCT)** -Learn to practise healthy eating behaviours by watching teachers, peers and parents
Self-regulated learning (SCT) Create opportunity for self-monitoring of learners through goal setting e.g. use of goal setting card	**Self-regulated learning (SCT)** -Learners identify and set own goals -Teachers and learners monitor progress on set goals -Learners share goals with friends and families	**Self-regulated learning (SCT)** -Identify and address barriers to achieving goals -Strengthen facilitators to achieving goals
Relevant prior knowledge (MLM) Establish learners' prior knowledge for meaningful learning to occur	**Relevant prior knowledge (MLM)** - Revise previous lessons - Learners share successes and challenges from their own experiences	**Relevant prior knowledge (MLM)** -Reinforce previous nutrition knowledge and healthy eating behaviours
Integrate new with prior knowledge (MLM) Teachers and learners build on existing knowledge of healthy eating behaviours	**Integrate new with prior knowledge (MLM)** -Integrate new with prior knowledge through active participation	**Integrate new with prior knowledge (MLM)** -Use combination of prior and new knowledge to overcome barriers to healthy eating

Abbreviations: SCT – Social cognitive theory, MLM – Meaningful learning model, BC – Behavioural capability, EXP – Expectation, OL – Observational learning, SRL – Self-regulated learning, RPK – Relevant prior knowledge, INK – Integrate new with prior knowledge.

5.4.4 Selecting the programme components and identifying educational goals

5.4.4.1 Programme components

The programme was planned to include the following:

- Context specific NE materials which comprised the teacher's manual, the learner's work book, the picture book and the posters. The NE materials were meant to be implemented to the learners following the allotted hours and time in the DoBE's curriculum (table 5.3).
- Training session for teachers and re-orientation sessions prior to implementation in each term.
- Monitoring of the implementation with the teachers at the completion of each nutrition topic through a one-on-one interview.
- Provision of food items and materials for teachers' use in class demonstration and practical sessions.
- Evaluating the impact of the NEP.

Table 5.3: Schedule and topics of the context specific nutrition education manual

Nutrition topics	Subject area	Grade where it was taught	Terms that topics were treated	Hours allocated /year	Weeks that lessons cover
Healthy eating for children	Life Skills	Grade 5	Term 3	3	2
Nutrients in food	Natural Science and Technology	Grade 6	Term 1	5¼	1½ Weeks
Nutrition	Natural Science and Technology	Grade 6	Term 1	5¼	1½ Weeks
Food processing	Natural Science and Technology	Grade 6	Term 1	8¾	2½ Weeks
Food Hygiene	Life Skills	Grade 6	Term 4	4½	3

Sources: DoBE 2011a and DoBE 2011b

Description of the NE materials

As stated earlier (section 5.3), the NE materials were developed by the primary investigator and comprised the teacher's manual, the picture book, the learner's work book, work sheets and the posters (figures 5.1 and 5.2).

i. The teacher's manual

The teacher's manual was titled, *Contextual nutrition education manual for teachers (Grade 5 and 6)*. The manual featured nutrition topics for Grades 5 and 6 as outlined in the DoBE's curriculum (Curriculum assessment policy statement (CAP)) (DoBE 2011a; DoBE 2011b). The manual was made up of 25 chapters. The first two chapters presented the introduction and the content of the manual. Five nutrition topics were covered in the manual and the topics were sub-divided into headings known as sub-topics (table 5.4). A chapter discussed a sub-topic and a sub-topic comprised two lessons of 30 minutes each, the allotted teaching time as specified in the DoBE's curriculum.

Each sub-topic/chapter was in two parts. The first part was the sub-topic plan and outline which provided teachers with guidelines on how to present nutrition messages to the learners. Teachers were to use the guidelines as a supporting resource to their teaching skills in presenting nutrition messages accommodating the circumstances of the learners. Teachers could use their teaching skills to teach nutrition to learners in ways that could benefit their lives as revealed by Panunzio et al. (2007). The sub-topic plan and outline featured the following:

- objectives,
- what would be needed for each lesson?
- learners' prior knowledge,
- active participatory teaching and learning,
- problem-based small group discussion,
- self-regulatory learning which consisted of:
    - the learner's goal setting card. Learners were to make decisions concerning the nutrition messages they received. Learners could further be helped to be committed to their decisions by the teacher following up in class discussions. The goal setting card is contained in a section of the learner's work book (section iii below).
    - work sheets for learners. This was to be used to engage learners in problem identification and problem solving exercises and also as a means to assess learners' knowledge about the topic. The work sheets are part of the learner's work book (section iii below).

The second part was the sub-topic notes which provided detailed information about the sub-topics. The notes were to serve as a resource to be consulted for background information in preparation for teaching the lessons.

ii. The picture book

The picture book was a collection of pictures to serve as a supplementary resource for teachers in using the teacher's manual. The pictures were presented according to the chapters as they featured the sub-topics of the manual. Teachers could use the pictures to show examples and emphasise nutrition messages to learners and to make nutrition messages tangible for themselves. The picture book also served the purpose of correcting misconceptions by making the messages of the manual more vivid and clearer, thereby enhancing a better understanding of teachers and learners. The pictures were relevant to the South African context and showed foods known to learners.

iii. The learner's work book

The learner's work book was the collation of the learners' tasks and activities section of the teacher's manual. This section was referred to in the manual as self-regulated learning, and comprises goal setting cards and work sheets. The goal setting cards and the work sheets were arranged according to the chapters of the sub-topics of the teacher's manual. Learners were to use a goal setting card to establish what they have learnt, write down their goals and how they intended to accomplish them. Teachers were to encourage learners to set their goals and monitor learners' progress on how they were keeping up with their set goals.

iv. The posters

The posters are pictorial illustrations of nutrition concepts. They were meant to be hung on the classroom walls thereby serving as constant reminders of nutrition messages to learners.

The comments received from the teachers during the one day workshop were used to revise the NE materials (see section 5.4.7.1).

Figure 5.1: Nutrition education materials: teacher's manual, picture book and learner's work books

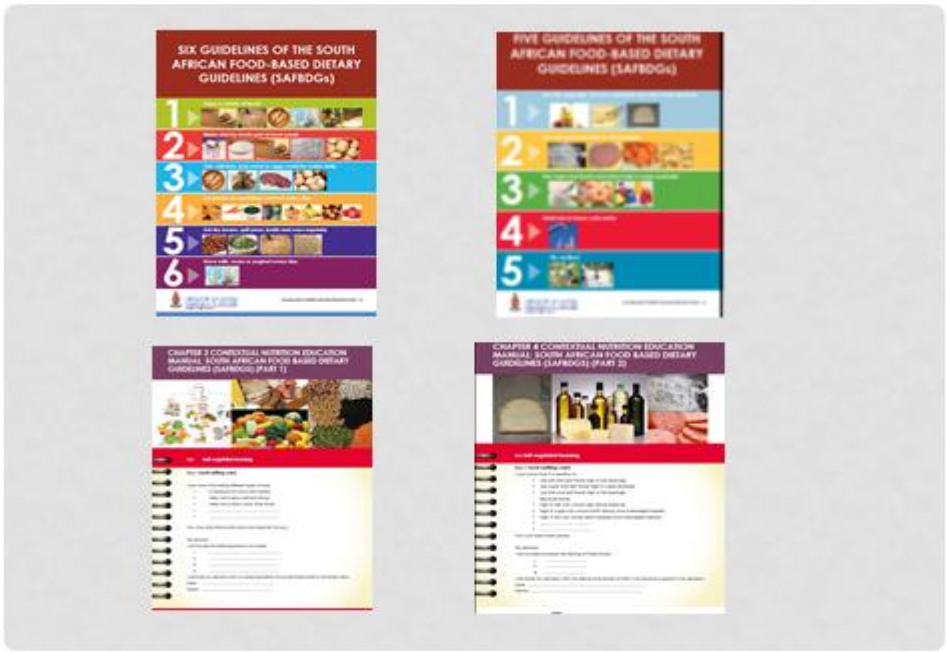


Figure 5. 2: Nutrition education materials: posters and learner's work sheets

Table 5.4: Topics and the sub-topics of the teacher's manual

Topics	Sub-topics
Healthy eating for children	South African Food Based Dietary Guidelines (SAFBDGs) (Part 1) South African Food Based Dietary Guidelines (SAFBDGs) (Part 2) Classes of nutrients and the South African food guide
Nutrients in food	Nutrient: Carbohydrates Nutrient: Proteins Nutrient: Fats Nutrients: Vitamins and minerals Reading of labels
Nutrition	The South African food groups Balanced diet and meal planning Unhealthy diets Problems caused by unhealthy diets
Food processing	Introduction to food processing Food processing methods Food cooking methods Indigenous dishes Hands-on preparation of vegetable relish Hands-on preparation of 'phuthu' with 'masonja' Hands-on preparation of butternut porridge
Food hygiene	Hygiene in food handling and preparation Food storage Safe and harmful ingredients Food borne diseases

5.4.4.2 Identifying educational goals

The main educational goals for the NEP were to:

- Use selected constructs of the SCT and the MLM in presenting nutrition messages to learners.
- Enhance teaching skills for increasing learners' knowledge of:
  - good food choices in the context of the environment in order to develop skills for healthy eating,
  - food nutrients and their desire to choose nutritious foods,
  - food groups and to develop skills to plan healthy mixed meals from different food groups within the context of the environment,
  - food processing and preparation and to develop skills for healthy choices of processed foods and cooking methods,
  - hygiene practices in healthy eating and to develop skills for hygienic food handling and preparation.

5.4.5 Selecting the theory-based strategies and educational activities

Theory-based strategies refer to the method of teaching that influences learners' learning and behaviour (Dudley, Cotton & Peralta 2015), while the educational activities describe the practical applications of the strategies (Contento 2011). The enhanced curriculum strategy employed in this study also accommodated secondary approaches by combining it with an experiential learning approach and family involvement. The purpose of this combined approach was to facilitate the desired healthy behaviour change among learners through multiple avenues (Dudley, Cotton & Peralta 2015). The approaches were built into the lesson plans and outlines. The experiential learning approach featured the activities such as class demonstrations with food items, correct hand washing procedures, and learners' goal setting endeavours. The parental involvement was through the learners sharing the work sheet exercises and their set goals with friends and families to both receive their support and share healthy eating messages. ESs must be fashioned to be relevant and suited to the intended audience. Benavente, Jayaratne and Jones (2009) explained that in planning NEP for people with limited resources, the ESs should be interactive and with hands-on lessons. A combination of multiple ESs was shown to realise intervention outcomes where one strategy was inadequate (Dudley, Cotton & Peralta 2015; Parker et al. 2011). Table 5.5 describes the theory based strategies used in the manual and the educational activities employed.

Table 5.5: Summary of the strategies and the educational activities involved

Strategies	Concept of theory used	Practical application (educational activities)
Teacher's preparation for lessons	SCT - observational learning	• Displayed foods that were good choices on teacher's desk for learners to see
Revision of previous lessons and confirmation of what learners already knew	MLM - relevant prior knowledge	• Revised previous lesson using question-answer methods engaging learners in class discussions • Refreshed learners' knowledge on nutrition messages from past lessons that were relevant to the new sub-topic while building on them
Teachers employed active participatory teaching and learning	SCT - Environment SCT - Behavioural capability	• Incorporated foods commonly eaten in the community, sold in and around the school and often eaten by learners in the presentation of nutrition messages • Identified healthy and unhealthy eating practices as the lessons were presented • Facilitated learners' acquisition of knowledge on the topic using question-answer method

Abbreviations: SCT – Social cognitive theory, MLM – Meaningful learning model.

Continued/…….

Table 5.5: Summary of the strategies and the educational activities involved continued

Strategies	Concept of theory used	Practical application (educational activities)
	MLM - Integrate new with prior knowledge	• Engaged learners in class discussions as the teacher wrote their answers on the board. • Gave demonstrations of how to perform an expected behaviour • Engaged practical classes Encouraged learners to integrate new knowledge with their existing knowledge and use them in real life
Learners engaged in problem-based small group discussion	SCT - Behavioural capability	• Developed learners' skills by engaging them in problem identification and solution through classwork and home work
Learners' set goals	SCT - Self-regulated learning	• Encouraged learners to complete the commitment / goal setting card • Monitored learners' progress on how they were keeping up with their set goals • Provided opportunity for discussing challenges learners had regarding set goals and how challenges might be overcome • Encouraged learners to share their decisions with friends and families for support, and also to pass healthy eating messages to them
Learners performed lesson activities in work sheets	MLM - Integrate new with prior knowledge SCT - Behavioural capability and Expectation	• Included assignments that required learners to add their prior knowledge to the new learning in order to solve problems • Asked learners to write and draw what they would like to achieve in the short term or become in the future • Engaged learners in activities identifying foods and eating practices that could help fulfil their aspirations • Incorporated the link between learners' expectations and healthy eating • Used the learners' desire for good growth stature, strong bones, and desire to be free of diseases

Abbreviations: SCT – Social cognitive theory, MLM – Meaningful learning model.

5.4.6 Designing the process and impact evaluation

Process and impact evaluation were planned for evaluating the NEP. Process evaluation appraises whether the intervention programme was implemented and received as planned (Young et al. 2008). The indicators and measures for the process evaluation are presented in table 5.6.

Table 5.6: Indicators and measures for process evaluation

Indicator	Means of measure
Teachers' experience with the training on the use of the NE manual	Workshop evaluation form
Teachers experience on the use of the manual to teach the learners	Internally-developed questionnaire (one-on-one interview with the teachers at the completion of each topic)
Teachers' perceptions of the impact of the implementation of the nutrition education manual on their teaching of nutrition	Interview guide (Focus group discussion)

The impact assessment was a quasi-experimental design and aimed at evaluating the impact of the NEP on the teachers' use of the manual in teaching nutrition, on the teachers' nutrition KAP and on the learners' nutrition KAP. The nutrition KAP questionnaires used in the needs assessment study was used to assess the teachers' and the learners' nutrition KAP status at pre- and post-implementation. A qualitative interview through a FGD was used to explore the teachers' perceptions of the impact of the NE manual on their teaching of nutrition. The instruments and the impact measures are presented in chapter 6.

5.4.7 Planning for nutrition education implementation

Planning for the implementation involved the preparation for the training of the teachers on the use of the manual, consultation with officers of the DoBE, development of the process and impact evaluation instruments, piloting the instruments and identifying the facilitators for the process evaluation interviews.

5.4.7.1 Preparation for the training of the teachers: workshop with specific outcomes

The training of the teachers on the use of the manual was meant to be the first part of implementation of the NEP. It was planned to take place in a one day workshop at the Department of Human Nutrition, University of Pretoria. The teachers (treatment school only) and the officers of the DoBE in charge of the Life Skills (LS) and Natural Science and

Technology (NST) curriculum were invited by means of a letter explaining the purpose of the workshop. Workshop materials were prepared for each participant. These included the draft NE manual in photocopied and spiral bounded format, draft copy of the picture book, informed consent form, order of the day's activities, name tags, workshop evaluation form and certificate of attendance. The order in which the workshop was to proceed included the selection of the facilitators for each session, allocation of time for every activity and development of the activities in power point slides. The detailed explanation on the conduct of the workshop is provided in chapter 6, section 6.4.1.1.

Comments were received from participants during the workshop and were used to make adjustments on the NE manual as follows:

i. The nutrition topics were organised to be taught in 30 minutes which is the duration for a lesson period in primary schools in the Bronkhorstspruit district.
ii. The inclusion of information on the important things that needed to be covered in a 30 minutes lesson period under each sub-topic. This information was included in the NE manual as highlighted boxes.
iii. The use of page referencing to facilitate ease of use of the manual. For example, page reference was made to the sub-topics and the lesson notes where they were referred to in the manual.
iv. The inclusion of glossary of terms which was used to explain difficult words and terms used in the manual.
v. The development of the learner's work book which emanated from the following:
    - consideration for securing the learners' goal setting cards from loss and handling,
    - consideration for giving learners the opportunity to develop reading skills through the use of the goal setting activities, the group discussions and the work sheet activities,
    - consideration for making the learner's work book very attractive by including relevant pictures and graphics, and
    - consideration for enhancing the learners' participation in the class discussions.

5.4.7.2 Consultation with officers of the Department of Basic Education

The officers of the DoBE in charge of the LS and NST curriculum were consulted. Their views and advice were sought; information regarding policy and regulation on curriculum matters was obtained.

5.4.7.3 Development of the process and impact evaluation instruments

Two Likert type questionnaires were used for the process evaluation. One was for the evaluation of the teachers' workshop (Appendix 12) and the other was to evaluate the implementation of the NEP to the learners (Appendix 13). A question guide (Appendix 14) was developed for the qualitative interview with the teachers at the end of the intervention. The researcher developed the questionnaires based on the study objectives and guided by information from the literature (Wilson et al. 2009; Saunders, Evans & Joshi 2005). The questionnaire for evaluating the impact of the NE intervention on the teachers and the learners included the nutrition KAP questionnaires. The nutrition KAP questionnaires used in the needs assessment were revised to address the needs that were identified and to reflect the content of the NE manual. The learners' questionnaire was used for grade 5 and 6. The revised nutrition KAP questionnaire for teachers (Appendix 15) and for learners (Appendix 16) and the question guide were subjected to face and content validity by the study leaders and the researcher's colleagues in nutrition. The description of the questionnaires and the question guide and the pre-testing of the questionnaires are provided in chapter 6.

5.4.7.4 Pretesting of the questionnaires

The nutrition KAP questionnaires for teachers and learners were pretested among six teachers and 48 learners respectively in a school in the Bronkhorstspruit district which had similar characteristics with the treatment and the control schools. The questionnaires were tested for understandability.

5.4.7.5 Determining the facilitators for the process evaluation interview

An independent team who had not participated in the intervention planning was recommended to facilitate the process evaluation in order to maximise validity and credibility (Saunders, Evans & Joshi 2005). Therefore, the researcher did not perform the process evaluation, involving the interview with the teachers after their implementation of the NEP to the learners. Colleagues of the researcher in the nutrition profession, who were not part of the study planning, were selected to facilitate the process evaluation.

5.5 SUMMARY

Phase 2 aimed at planning a context specific NEP for teachers. The objectives were to identify and integrate appropriate educational strategies and selected concepts of theories in planning the NEP. The results of the needs assessment in phase 1, with support and evidence from the literature, were used to enlighten the nutrition topics of the DoBE curriculum. The programme components and educational goals in respect of the teachers were identified. The theory based strategies, namely the curriculum enhanced approach incorporating experiential learning and family involvement, as well as the educational activities incorporated were explained. The procedure for evaluating the NEP was determined. The actions involved in preparation for the NEP was undertaken which included training of teachers, consultation with DoBE officers, process and impact evaluation, pre-testing of the questionnaires, and identification of facilitators for the process evaluation.

REFERENCES

Babadogan, C & Unal, F 2011, 'Examples of instructional design for social studies according to meaningful learning and information processing theories', *Procedia - Social and Behavioral Sciences*, vol. 15, pp. 2155-2158, viewed 11 January 2014, http://.doi:10.1016/j.sbspro.2011.04.070.

Bandura, A 2001, 'Social cognitive theory: An agentic perspective', *Annual Review of Psychology*, vol. 52, pp. 1-26.

Benavente, LM, Jayaratne, KSU, & Jones, L 2009, Challenges, alternatives, and educational strategies in reaching limited income audiences', *Journal of Extension*, vol. 47, no. 6, viewed 7 February 2013, www.joe.org.

Contento, IR 2011, *Nutrition education: Linking research, theory and practice*, Jones and Bartlett Publishers, Sudbury MA.

David, D, Kimiye, JO, Waudo, JN & Orodho, JA 2008, 'Promotion of nutrition education interventions in rural and urban primary schools in Machakos district, Kenya', *Journal of Applied Biosciences*, vol. 6, pp. 130-139, viewed 25 December 2013, www.biosciences.elewa.org.

Department of Basic Education (DoBE) 2011a, *National Curriculum Statement (NCS). Curriculum and Assessment Policy Statement (CAPS) Grades 4 - 6: Life Skills*, viewed 12 August 2012, http://www.edu.gov.za.

Department of Basic Education (DoBE) 2011b, *National Curriculum Statement (NCS). Curriculum and Assessment Policy Statement (CAPS) Grades 4 - 6: Natural Sciences and Technology*, viewed 12 August 2012, http://www.edu.gov.za.

Dudley, DA, Cotton, WG & Peralta, LR 2015, 'Teaching approaches and strategies that promote healthy eating in primary school children: a systematic review and meta-analysis', *International Journal of Behavioral Nutrition and Physical Activity*, vol. 12, p. 28, viewed 23 June 2015, http://dx.doi.10.1186/s12966-015-0182-8.

Faber, M, Laurie, S, Maduna, M, Magudulela, T & Muehlhoff, E 2013, 'Is the school food environment conducive to healthy eating in poorly resourced South African schools?', *Public Health Nutrition*, vol. 17, no. 6, pp. 1214–1223.

Food and Agriculture Organization (FAO) 2006, *Nutrition education in primary schools- a planning guide for curriculum development,* viewed 21 June 2012, ftp://ftp.fao.org/docrep/fao/009/.

Glanz, K, Rimer, BK & Lewis, FM 2002, *Health behavior and health education: Theory research and practice*. Willey and Sons, San Francisco CA.

Hildebrand, DA, Jacob, T & Garraid-Foster, D 2012, 'Food and fun for everyone: a community nutrition education program for 3rd and 4th Grade students suitable for school wellness programmes', *Journal of Nutrition Education and Behavior*. vol. 44, no. 1, pp. 93-95.

Kleinman, R, Hall, S, Green, H, Korzec-Ramirez, D, Patton, K, Pagano, M & Murphy J 2002, 'Diet, breakfast, and academic performance in children', *Annals of Nutrition and Metabolism,* vol. 46, Suppl 1, pp. 24-30.

Linnell, J, Briggs, M & Zidenberg-Cherr, S 2013, Calcium Counts Curriculum improves fifth-Graders' knowledge about calcium-rich food', *Journal of Nutrition Education and Behavior,* vol. 45, no. 2, pp. 191-193.

Morris, JL, Briggs, M, & Zidenberg-Cherr, S 2002, 'Development and evaluation of a garden enhanced nutrition education curriculum for elementary schools children', *Journal of Child Nutrition & Management,* viewed 21 June 2012, http://docs.schoolnutrition.org/newsroom/jcnm/02.

Nguyen, KA, De Villiers, A, Fourie, JM, Bourne, LT & Hendricks MK 2013, 'The feasibility of implementing food-based dietary guidelines in the South African primary-school curriculum', *Public Health Nutrition,* vol. 18, no. 1, pp. 167-175.

Novak, JD 2011, 'A theory of education: meaningful learning underlies the constructive integration of thinking, feeling, and acting leading to empowerment for commitment and responsibility', *Meaningful Learning Review,* vol. 1, no. 2, pp. 1-14.

Novak, J D & Cañas, AJ 2006, 'The theory underlying concept maps and how to construct them, technical report IHMC CmapTools 2006-0', *Florida Institute for Human and Machine Cognition*, viewed 21 January 2014, http://cmap.ihmc.us/Publications/ResearchPapers/.

Oldewage-Theron, W & Egal, A 2012, 'Impact of nutrition education on nutrition knowledge of public school educators in South Africa: A pilot study', *Health SA Gesondheid*, vol. 17, p. 1, viewed 2 December 2012, http://dx.doi.org/10.4102/hsag.v17i1.602.

Panunzio MF, Antoniciello, A, Allessandra, P & Dalton, S 2007, 'Nutrition education intervention by teachers may promote fruit and vegetable consumption in Italian students', *Nutrition Research*, vol. 27, no. 9, pp. 524-528.

Parker, S, Powell, L, Herman, J, Phelps, J & Brown, B 2011, 'Preferred educational delivery strategies among limited income older adults enrolled in community nutrition education programmes', *Journal of Extension*, vol. 49, no. 1, viewed 9 February 2013, www.joe.org.

Perez-Rodigo, C & Aranceta, J 2003, 'School based nutrition education: lessons learned and new perspectives', *Public Health Nutrition*, vol. 4, no. 1A, pp. 131-139.

Saunders, RP, Evans, MH & Joshi, P 2005, 'Developing a process-evaluation plan for assessing health promotion program implementation: a How-To Guide', *Health Promotion Practice*, vol. 6, no. 2, pp. 134-147.

Schunk, DH 2012, *Learning theories: An educational perspective*, 6th edn, Prentice Hall, Boston MA.

Shariff, ZM, Bukhari, SS, Othman, N, Hashim, N, Ismail, M, Jamil, Z, Kazim, SM, Paim, L, Samah, BA & Hussein, ZAM 2008, 'Nutrition education intervention improves nutrition knowledge, attitudes and practices of primary school children: a pilot study', *International Electronic Journal of Health Education*, vol. 11, no. 1, pp. 119-132.

Wilson, DK, Griffin, S. Saunders, RP, Kitzman-Ulrich, H, Meyers, DC & Mansard L 2009, 'Using process evaluation for program improvement in dose, fidelity and reach: the ACT trial experience', *International Journal of Behavioral Nutrition and Physical Activity*, vol. 6, p. 79, viewed 28 June 2015, http://www.ijbnpa.org/content/6/1/79.

Yildiz, Z & Karabiyik, B 2012, Implementation of a sub-topic plan which is prepared according to the meaningful learning theory and evaluation of the results: *The International 4th World Conferences on Education Sciences (WCES)*, Barcelona, Spain, vol. 46, pp. 4021-4025, viewed 11 January 2014, www.sciencedirect.com.

Young, DR, Steckler, A, Cohen, S, Pratt, C, Felton, G, Moe, SG, Pickrel, J, Johnson, CC, Grieser, M, Lytle, LA, Lee, JS & Raburn, B 2008, 'Process evaluation results from a school- and community-linked intervention: the Trial of Activity for Adolescent Girls (TAAG)', *Health Education Research*, vol. 23, no. 8, pp. 976-986.

PHASE 3: IMPLEMENTATION AND EVALUATION OF THE NUTRITION EDUCATION PROGRAMME

CHAPTER 6

AIM, OBJECTIVES AND METHODS OF PHASE 3

6.1 INTRODUCTION

Phase 3 was the last phase of the study where the implementation and evaluation of the developed contextual NEP took place. Phases 1 and 2 were fundamental to this phase. In phase 1, the needs assessment identified the requirements for planning an effective NEP for primary school teachers in Bronkhorstspruit. In phase 2 the contextual NE materials were developed from the findings of phase 1 in combination with selected constructs of the SCT and the MLM, and also in line with the existing curriculum.

Phase 3 comprised quantitative research for the nutrition KAP assessment and qualitative research for the process evaluation. The phase is presented in three chapters: chapter 6 describes the aim, objectives and methods; chapter 7 describes the results, and chapter 8 presents the discussion, conclusions and recommendations. The references for chapters 6 to 8 are presented at the end of chapter 8.

Chapter 6 is described in respect of the following:

- Aim, objectives and hypotheses.
- Methods: study setting, study design, study participants.
- Implementation of the NEP.
- Measurements, data management and statistical analyses.
- Validity and reliability of the measurements.

6.2 AIM, OBJECTIVES AND HYPOTHESES

6.2.1 Aim

The aim of phase 3 was to implement the context specific NEP that was developed for teachers who taught nutrition to Grade 5 and 6 learners, and to evaluate the impact of the NEP on the teachers' skills in teaching nutrition, and on the nutrition KAP of the teachers and the learners.

6.2.2 Objectives

6.2.2.1 To implement the developed NEP to the teachers who taught nutrition to Grade 5 and 6 learners in the treatment school.

6.2.2.2 To implement the developed NEP to Grade 5 and 6 learners in the treatment school through the teachers who were trained on the use of the manual.

6.2.2.3 To explore the teachers' perceptions of the impact of the implementation of the NE manual on their teaching of nutrition to the learners.

6.2.2.4 To determine differences between the treatment and control schools regarding the nutrition KAP of the teachers from pre- to post-implementation.

6.2.2.5 To determine within schools' differences in the teachers' KAP from pre- to post-implementation.

6.2.2.6 To determine differences between the treatment and control schools regarding the nutrition KAP of the learners from pre- to post-implementation.

6.2.2.7 To determine within schools' differences in the learners' KAP from pre- to post-implementation.

6.2.3 Research hypotheses

The level of significance (P = 0.025) for a one tailed test was set to test the following hypotheses.

6.2.3.1 The teachers in the treatment school, compared with the teachers in the control school, would significantly improve in the nutrition KAP.

6.2.3.2 The teachers in the treatment school would have significantly better within school improvements in the nutrition KAP compared with the teachers in the control school.

6.2.3.3 The learners in the treatment school, compared with the learners in the control school, would significantly improve in the nutrition KAP.

6.2.3.4 The learners in the treatment school would have significantly better within school improvements in the nutrition KAP compared with the learners in the control school.

6.3 METHODS

The study protocol was submitted to the Ethics Committee of the Faculty of Natural and Agricultural Sciences of the University of Pretoria and approval (Number: EC130424-037) for the study was received as reported in chapter 3 section 3.4. Permission for the study to be carried out in the schools was granted by the DoBE with the approval number D2015/374A.

6.3.1 Study design

The study was a quasi-experimental study design which implemented a NEP for teachers in two schools selected into treatment and control schools. The treatment school received the training on the use of the developed NE manual and the supporting materials, and the learners each received a copy of the work book. The control school received none of the developed NE materials but carried on with the teaching of nutrition according to the DoBE curriculum. The impact of the intervention was evaluated at the end of the teaching of nutrition topics to learners in September 2015.

6.3.2 Study setting

The study was carried out in two primary schools in the Bronkhorstspruit district, east of Pretoria in Gauteng Province, South Africa as discussed in chapter 3 Section 3.3. The two schools were 5.5km apart.

6.3.3 Population

The population consisted of teachers who taught nutrition to Grades 5 and 6 learners and the learners in Grades 5 and 6 in the Bronkhorstspruit district.

6.3.4 Sample design

The Bronkhorstspruit educational district has 13 government primary schools, all of which were recommended for the study by the educational authority (the DoBE). The multi-step sampling design as described by Joubert and Katzenellenbogen (2014) was used in the sample design. In the first step, the 13 schools were divided into two clusters, i.e. small size schools (n = 5) and large size schools (n = 7) based on the number of learners enrolled in the schools. A school was classified as large if the number of enrolled learners was ≥ 1000 and above. For the benefit of having a large number of participating learners and teachers, the cluster with the large size schools was selected. The second step, sampling, consisted of the selection of two schools with the farthest distance apart in the large size cluster schools to prevent a spill-over

effect (Gibson 2005). The third step consisted of a simple random selection of the two schools by the researcher into treatment and control schools through tossing a coin (Elkins 2007). These two schools were different schools to those used in the needs assessment study (phase 1).

6.3.5 Sample selection

The sample consisted of a convenient sample of teachers of LS and NST in Grades 4 to 7, and learners in Grades 5 and 6. Therefore all the teachers who consented and the learners who had parental consent and themselves assented were enrolled to participate in the implementation study. Grades 5 and 6 of the treatment school and Grade 5 of the control school each had five classes, while Grade 6 of the control school had 4 classes.

6.3.5.1 Inclusion criteria

- Teachers who gave informed consent.
- Learners who had parental consent to participate and who themselves gave assent to participate.
- Learners who were present on the day of data collection.

6.3.5.2 Exclusion criteria

- Learners who did not have parental consent and who did not assent.

Learners in the treatment school who had no parental consent to participate were not excluded from the classroom NE lessons but did not participate in the pre- and post-implementation assessments which involved completion of the nutrition KAP questionnaire.

6.4 NUTRITION EDUCATION PROGRAMME IMPLEMENTATION

6.4.1 Intervention

The features of the NEP were described in chapter 5. The goal of the NEP was to improve the teachers' delivery of classroom NE to learners (chapter 5, section 5.4.2.1). The objectives of the programme were to (i) define the educational strategy, (ii) explain the concepts of the chosen theories in context of the nutrition topics, (iii) integrate the concepts of the theories into the nutrition topics, and (iv) verify the developed context specific NE with the stakeholders (chapter 5, section 5.4.2.2). A combination of the constructs of the SCT and the MLM were used to explain the nutrition topics of the DoBE curriculum while integrating the needs that were identified. The components of the NEP were:

- the context specific NE materials;
- implementation of the NE materials to the learners following the allotted hours and time in the DoBE's curriculum;
- training session for teachers and re-orientation sessions prior to implementation in each term;
- monitoring of the implementation with the teachers at the completion of each nutrition topic through a one-on-one interview;
- provision of food items and materials for teachers' use in class demonstration and practical sessions;
- impact evaluation of the NEP.

The implementation of the NEP was as follows:

6.4.1.1 Implementation to the teachers

The developed context specific NE manual was introduced to the teachers of the treatment school in a one day workshop at the Department of Human Nutrition, University of Pretoria on 8 November 2014. The researcher presented the nutrition topics and the study leader (main supervisor) facilitated the sessions of the workshop. The sessions of the workshop proceeded through the presentation and discussion of the following:

i. The workshop goal which was to familiarise teachers with the NE manual and to receive the teachers' input on the outline, content and practical implementation of the manual.
ii. The workshop objectives which were (i) to explain the use of the selected constructs of the SCT and the MLM in presenting nutrition messages, (ii) to enhance teaching skills for improving learners' eating behaviours, and (iii) to contribute to the content and practical implementation of the NE manual.
iii. An overview of the NE manual, which included how the manual was developed, the organisation and the selected constructs of the theories used.
iv. Explanation on the constructs of theory and how they could be used in presenting nutrition messages to learners.
v. The template that conceptualised the use of the constructs, while accommodating the learners' situation, was explained in light of the DoBE curriculum nutrition topics:
    - Healthy eating for children.
    - Nutrients in foods.

- Nutrition.
- Food processing.
- Food hygiene.

vi. Teachers' comments and questions were taken and responded to.

vii. What would follow the implementation:

- The pre-implementation assessment.
- The implementation to the learners.
- The post-implementation assessment.

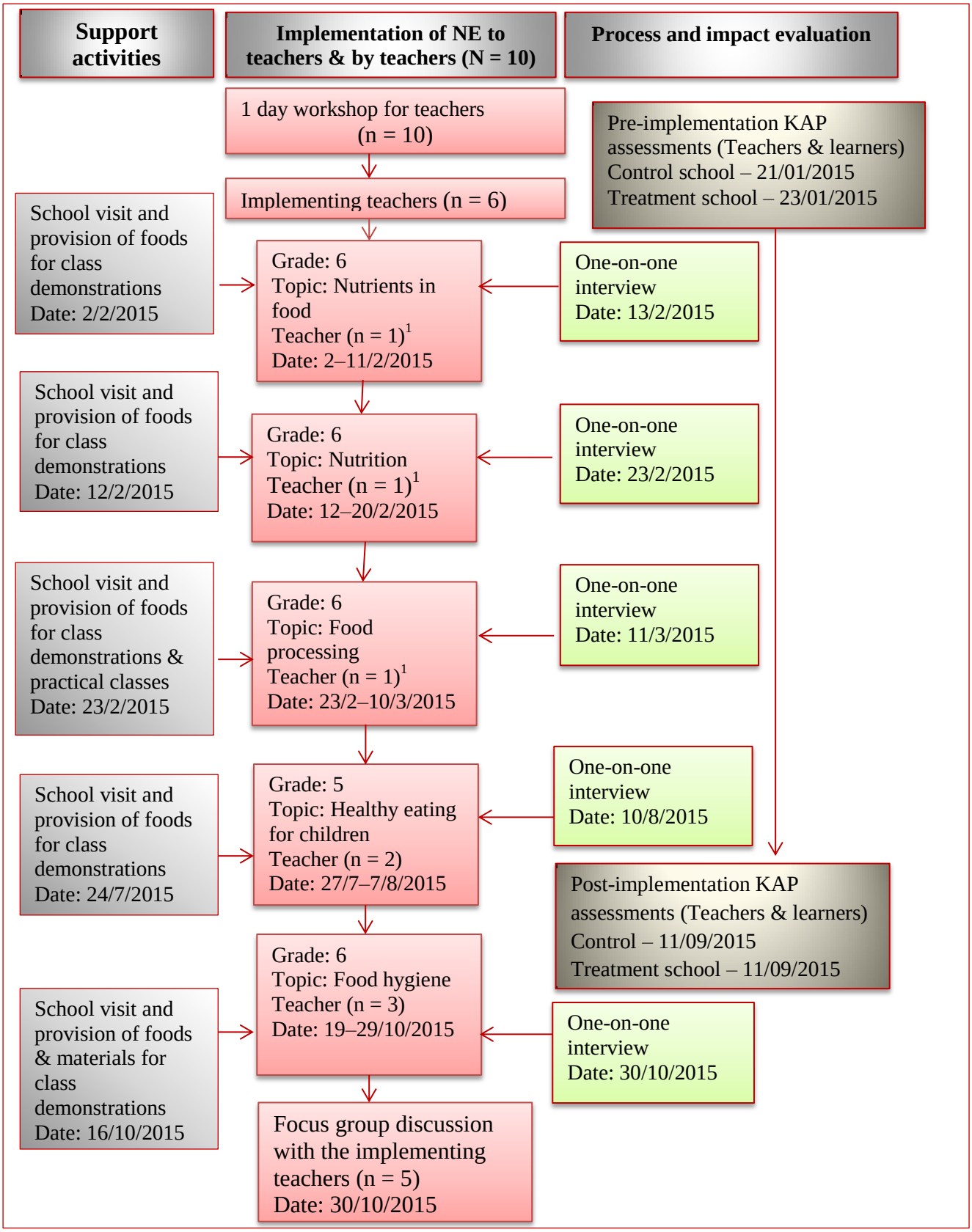
6.4.1.2 Implementation to the learners

The developed context specific NE manual was used by the teachers to teach nutrition topics in LS and NST to Grades 5 and 6 learners in the treatment school following the allotted periods and time in the DoBE's curriculum (table 6.1). The teaching of nutrition in these two Grades started on 2 February 2015 with the topic *Nutrients in foods* in Grade 6 and ended on 29 October 2015 with the topic *Food hygiene* in Grade 6. Before the commencement of the nutrition topics, the researcher conducted a re-orientation session with all the implementing teachers to refresh their understanding on the use of the manual in teaching the nutrition topics. The first re-orientation session included all the teachers of LS and NST in Grades 5 and 6. During the implementation to the learners, the researcher followed up with the provision of foods and materials for class demonstrations and practical purposes as needed. The visits in addition to several telephone calls created opportunity to further interact with the implementing teachers to give support, receive their comments and challenges as the intervention progressed. Meetings were held with the principal of the treatment school to ensure an enabling atmosphere for the implementing teachers. The detail activities of the implementation of the NEP to the teachers and the learners, including the assessments, are shown in figure 6.1.

Table 6.1: Nutrition education topics as implemented

Nutrition topics	Sub-topics	Date and duration	Grade involved
Nutrients in food	Nutrient: Carbohydrates Nutrient: Proteins Nutrient: Fats Nutrients: Vitamins and minerals Reading of labels	2 to 11 February 2015 (1½ weeks)	Grade 6
Nutrition	The South African Food Groups Balanced diet and meal planning Unhealthy diets Problems caused by unhealthy diets	12 to 20 February 2015 (1½ weeks)	Grade 6
Food processing	Introduction to food processing Food processing methods Food cooking methods Indigenous dishes Hands-on preparation of vegetable relish Hands-on preparation of 'Phuthu' with 'masonja' Hands-on preparation of butternut porridge	23 February to 10 March 2015 (2½ weeks)	Grade 6
Healthy eating for children	South African Food Based Dietary Guidelines (SAFBDGs) (Part 1) South African Food Based Dietary Guidelines (SAFBDGs) (Part 2) Classes of nutrients and the South African food guide	27 July to 7 August 2015 (2 weeks)	Grade 5
Food hygiene	Hygiene in food handling and preparation Food storage Safe and harmful ingredients Food borne diseases	19 to 29 October 2015 (2 weeks)	Grade 6

Note: Practical sessions which comprised the preparation of local meals were included in food processing nutrition topic.



[1]Same teacher

Figure 6.1: Implementation of nutrition education programme

6.5 ASSESSMENTS

The nutrition KAP of the teachers and the learners were assessed at pre- and post-implementation in the treatment and control schools, and also the process evaluation of the NEP with the teachers at the treatment school only.

6.5.1 Data collection instruments

The instruments used in phase 3 were the teachers' nutrition KAP questionnaire (Appendix 15), the workshop evaluation questionnaire for teachers (Appendix 12), an one-on-one Likert type questionnaire for teachers (Appendix 13), a question guide for the FGD with the teachers (Appendix 14), and the learners' nutrition KAP questionnaire (Appendix 16). The nutrition KAP questionnaires for teachers and learners, used in the needs assessment study (phase 1), were modified to include the content of the developed contextual NE manual for the phase 3 assessment.

6.5.1.1 Nutrition knowledge, attitudes and dietary practices questionnaire for teachers

The nutrition KAP questionnaire developed from three standardised questionnaires (described in section 4.4.1, Appendix 8) used in the needs assessment was adjusted to include the content of the NE manual.

The nutrition knowledge questions were changed as follows:

i. Question 2 – "How many servings of fruit and vegetables a day do experts advise children to eat? (please write the number, e.g. 3)" was rephrased to "The healthy eating message 'eat plenty of vegetables and fruit every day' means that people aged 5 and above (a) Be encouraged to eat vegetables in at least one or two mixed meals every day; (b) Should have one vegetable or fruit a day that provides beta carotene; (c) Should eat not less than five vegetables and fruit every day; (d) (a) and (b) above)".
ii. Questions 1.5, 6.6, 8.6 and 11 were removed due to repetition.
iii. A section on food processing was added which consisted of five questions: "Processed foods are injurious to health (Yes, No)"; "Highly processed foods are not much different than minimally processed foods (Yes, No)"; "It is possible to steam vegetables at home without using the steamer (Yes, No)"; "Bread and maize meal are by law fortified with extra minerals and vitamins in South Africa (Yes, No)"; "Indigenous foods are not as nutritious as processed foods (Yes, No)".

iv. A section on food hygiene consisting of four questions was added: "Meat, fish and chicken will not spoil if you store them in the fridge for two days only (Yes, No)"; "Food that is contaminated with germs or harmful micro-organisms can safely be eaten if the food does not smell bad or change colour (Yes, No)"; "The presence of germs or harmful micro-organisms in food is of no consequence if the food is full of nutrients (Yes, No)"; "Serious diseases such as staphylococcus intoxication and salmonellosis can be caused by eating contaminated foods (Yes, No)".

The practices questions were adjusted as follows:

vii. Questions 1, 4, 5, 8, 9, 14 and 17 on the category of personal eating habits were removed and the following questions were added: "How often do you eat (i) Meals that contain different kinds of foods", (ii) "Drink a glass of low fat milk", (iii) "Vegetables in at least two meals a day" and (iv) "Dry beans, split peas, lentils or soya products".

viii. Questions 25, 27, 28, 29, 30 and 31 on the category of classroom food practices were removed because they indicated the same meaning.

ix. Questions 35, 41, 42, 44, 45, 46, 48, and 51 on the category on the school-wide food practices because they connoted the same meaning.

x. Question 58 on the category of food behaviour in hygiene was removed because of repetition.

The nutrition attitudes questions were adjusted as follows:

xi. Questions 3 and 11 on the nutrition attitudes questions were removed due to repetition and question 1 was adjusted to read "I need to have a good mixed meal for breakfast". Question 8 was adjusted to read "I need to drink up to eight glasses of clean, safe water every day".

After modification the final questionnaire (Appendix 15) consisted of 53 *knowledge* items presented in five knowledge categories: current dietary recommendations for children, sources of nutrients, diet disease relationship, food processing and food hygiene.

The *practices* items were presented as 36 Likert type questions addressing four broad areas. The areas were personal dietary habits (options of never, 1 time a month or less, 2-3 times a month, 1-2 times a week, 3-4 times a week and 5+ times a week); eating habits at school (options of never, 4 or more times per week, 1-3 times per week, 2-3 times per month, 1 time

per month or less and items are not available); classroom food practices (options of likely, somewhat likely, not likely and uncertain) and school wide food practices (options of strongly disagree, disagree, uncertain, agree and strongly agree).

The *attitudes* items were 12 Likert questions with the options of agree, do not agree and not sure.

6.5.1.2 Workshop evaluation questionnaire

The questionnaire for evaluating the workshop content and overall quality of the workshop was a Likert type questionnaire (Appendix 12) developed by the researcher based on the aim of the workshop. The responses were on a five point with the options 'very much so', 'for the most part', 'somewhat', 'only slightly' and 'not at all'. The questionnaire consisted of 16 questions including questions such as "I feel that I understood the important concepts and skills presented in the workshop" and "The information presented will be valuable to me in teaching nutrition topics to learners". The questionnaire was subjected to face validity by the researcher's colleagues.

6.5.1.3 Process evaluation questionnaire

A questionnaires (Appendix 13) developed by the researcher was used to obtain feedback regarding the implementation of NEP to learners. The questionnaire was a four point Likert type questions with the options 'strongly disagree', 'disagree', 'agree' and 'strongly agree'. Five different questionnaires were developed to address each of the five different topics of the NE manual. The questionnaires consisted of between eleven and 13 questions. Examples of the questions were "Learners found the goal setting sections for the sub-topics in their work book easy to use and exciting" and "The allotted time was enough to cover the important things learners should know in the topic of food hygiene". The questionnaires were subjected to face validity by the study leaders and the researcher's nutrition colleagues.

6.5.1.4 Focus group interview guide for phase 3

An interview guide of 12 questions (Appendix 14), based on the aim of the FGD was developed by the researcher. The interview guide was subjected to face and content validity by the study leaders and the researcher's nutrition colleagues. Examples of the questions were "In your own opinion would you say that presenting nutrition messages to learners using the NE manual could help learners to adopt healthy eating?" and "What part(s) of the lesson did learners enjoy the most?"

6.5.1.5 Nutrition knowledge, attitudes and dietary practices questionnaire for learners

The learners' nutrition KAP questionnaire, adapted from the HELIC questionnaires (described in section 4.4.4), which had been used in the needs assessment study was adjusted to reflect the content of the developed contextual NE manual.

Knowledge questions were adjusted as follows:

i. Questions 6, 7, 11, 16, 19, 20 and 26 were removed but replaced with the following questions: (i) "All of these are signs of food borne disease except...", (ii) "Sugar contains a lot of vitamins and minerals", (iii) "To which of the following has iodine been added....", (iv) "Rice with fish and vegetables is a good mixed meal", (v) "The best place to keep uncooked meat is...." (vi) "Foods can become contaminated with germs if we prepare foods in a dirty environment", and (vii) "The following are examples of highly processed foods except...."
ii. Question 8 was rephrased to read "Foods like fat cakes, doughnuts and cakes give lots of energy with minerals and vitamins".
iii. Question 13 was rephrased to read "If we lack nutrients it would be hard for us to focus in class".
iv. Question 17 was rephrased to read "It is not necessary to wash vegetables like carrots before you eat them".
v. Question 17 was rephrased to read "Which foods contain a lot of fibre...."?

One practice question was adjusted as follows:

vi. Question 31 was rephrased to read "I eat mixed meals" from "I eat a balanced diet".

One question was added to the attitudes questions:

vii. "I eat foods high in fat to be healthy".

The final questionnaire comprised 23 *knowledge* questions addressing five categories which were: food nutrients and functions, food and energy, nutrient deficiencies, food choices and sources of nutrients. There were nine *practice*s questions, and eleven *attitudes* Likert type questions with the options of agree, do not agree and not sure.

6.5.1.6 Pretesting of instruments

The teachers' nutrition KAP questionnaire and the learners' nutrition KAP questionnaire were pretested as reported in section 5.4.7.4. Administration of the questionnaires for teachers was self-administered. The questionnaires were completed by the teachers during the long break in the presence of the researcher to provide clarification where needed. The exercise was completed in 30 minutes. Administration of questionnaires for the learners was done with assistance as reported in section 4.4.5.

6.5.1.7 Adjustment on the questionnaires

After pretesting, the questions were reported to be clear and understandable therefore no change was effected on any of the questionnaires. Tables 6.2 and 6.3 present the topics of the NE manual and the corresponding knowledge questions in the teachers' and learners' questionnaires.

Table 6.2: Topics of the nutrition education manual and the corresponding knowledge questions in the teachers' questionnaire

Topics	Sub-topics	[1]Corresponding questions
Healthy eating for children	• South African Food Based Dietary Guidelines (SAFBDGs) (Part 1) • South African Food Based Dietary Guidelines (SAFBDGs) (Part 2) • Classes of nutrients and the South African food guide	Q1.[1]Health experts recommend that children should eat more, or less of the following foods Q2.The healthy eating message 'eat plenty of vegetables and fruit every day' means that people aged 5 and above (a) Be encouraged to eat vegetables in at least one or two mixed meals every day; (b) Should have one vegetable or fruit a day that provides beta carotene; (c) Should eat not less than five vegetables and fruit every day; (d) (a) and (b) above Q3.The instructions outlined in South African Food-Based Dietary guidelines (SAFBDGs) will not meet the needs for children Q4.It is okay for children to drink lots of cold-drinks because they need lots of energy to grow Q7.[1]Are the following foods high or low in salt? Q9.[1]Are the following foods high or low in fibre/roughage? Q10. A glass of unsweetened fruit juice counts as a serving of fruit Q11.[1]Which of these breads contains the most fibre? Q21.[1]Which is the healthiest eating behaviour? Q26. Bread and maize meal are by law fortified with extra minerals and vitamins in South Africa
Nutrients in food	• Nutrient: Carbohydrates • Nutrient: Proteins • Nutrient: Fats • Nutrients: Vitamins and minerals • Reading of labels	Q5. [1]Do you think the following foods are high or low in fat? Q8. [1]Are the following foods high or low in protein? Q12. There is more calcium in a glass of whole milk than in a glass of fat-free milk Q13. Which one of the following has the highest amount of energy per 100g serving size? (a) Sugar; (b) Starchy foods; (c) Fibre/roughage; (d) Fat Q14. Harder fats contain more monounsaturated, polyunsaturated and saturated fat

[1]Full question in appendix 15
Abbreviations: SAFBDGs – South African Food based Dietary Guidelines, Q – Question.

Continued/…….

Table 6.2: Topics of the nutrition education manual and the corresponding knowledge questions in the teachers' questionnaire continued

Topics	Sub-topics	Corresponding questions
Nutrition	• The South African food groups • Balanced diet and meal planning • Unhealthy diets • Problems caused by unhealthy diets	Q6. Which of the following do experts put in the starchy foods group? (a) cheese; (b) spaghetti; (c) butter; (d) nuts, (e) rice Q15. Major health problems or diseases may be related to how much sugar people eat Q16. The amount of salt people take is not related to health problems or diseases Q17. The amount of fat people eat has nothing to do with health problems or diseases Q18. A person can prevent heart disease by eating more fibre and less saturated fat Q19. A person can prevent heart disease by eating more vegetables and fruits Q20. Which is a healthy diet? (a) a diet rich in different foods; (b) a diet whose foods are rich in protein; (c) a diet without fats; (d) eating fish very often Q22. Which is the healthiest choice of food? (a) drinking 2 glasses of milk/eating 2 cups of yogurt every day (b) preferring cooked vegetables to uncooked vegetables (c) always eating cheese instead of meat (d) when you eat snacks, preferring fruit
Food processing	• Introduction to food processing • Food processing methods • Food cooking methods • Indigenous dishes • Hands-on preparation of vegetable relish • Hands-on preparation of 'phuthu' with 'masonja' • Hands-on preparation of butternut porridge	Q23. Processed foods are injurious to health Q24. Highly processed foods are not much different than minimally processed foods Q25. It is possible to steam vegetables at home without using the steamer (a special type of pot for steaming foods) Q27. Indigenous foods are not as nutritious as processed foods
Food hygiene	• Hygiene in food handling and preparation • Food storage • Safe and harmful ingredients • Food borne diseases	Q28. Meat, fish and chicken will not spoil if you store them in the fridge for two days only Q29. Food that is contaminated with germs or harmful micro-organisms can safely be eaten if the food does not smell bad or change colour Q30. The presence of germs or harmful micro-organisms in food is of no consequence if the food is full of nutrients Q31. Serious diseases such as staphylococcus intoxication and salmonellosis can be caused by eating contaminated foods

Abbreviation: Q – Question.

Table 6.3: Topics of the nutrition education manual and the corresponding knowledge questions in the learners' questionnaire

Topics	Sub-topics	Corresponding questions
[1]Healthy eating for children	• South African Food Based Dietary Guidelines (SAFBDGs) (Part 1) • South African Food Based Dietary Guidelines (SAFBDGs) (Part 2) • Classes of nutrients and the South African food guide	Q4. Salty food is not good for health Q8. To which of the following has iodine been added (a) bread; (b) maize meal; (c) salt; (d) powdered milk Q10. To keep a healthy body weight, we need to have healthy eating plan and exercise Q26. Which foods contain a lot of fibre? (a) brown bread, dry beans, oats; (b) milk, yoghurt, cheese; (c) fish, chicken, eggs; (d) margarine, mayonnaise, sunflower oil
Nutrients in food	• Nutrient: Carbohydrates • Nutrient: Proteins • Nutrient: Fats • Nutrients: Vitamins and minerals • Reading of labels	Q5. [1]Food is important for growth Sugar contains a lot of vitamins and minerals Q9. [1]Energy to learn and play comes from (a) food; (b) air; (c) water; (d) don't know Q11. [1]Foods like fat cakes, doughnuts and cakes give lots of energy with minerals and vitamins Q20. [1]Food that is low in fat is (a) water melon; (b) chocolate; (c) ice-cream; (d) don't know Q21. [1]Calcium is mostly found in(a) fruit juice; (b) cold drinks; (c) milk; (d) don't know
Nutrition	• The South African food groups • Balanced diet and meal planning • Unhealthy diets • Problems caused by unhealthy diets	Q12. [1]We will get sick more easily, if our body lacks nutrients Q13. [1]If we lack nutrients it would be hard for us to focus in class Q14. [1]Food that is high in fat can cause diseases Q15. [1]Breakfast must consist of foods that are healthy choices Q16. [1]Rice with fish and vegetables is a good mixed meal

[1]Questions were covered by the topic – Healthy eating for children
Abbreviations: SAFBDGs – South African Food based Dietary Guidelines, Q – Question.

Continued/…….

Table 6.3: Topics of the nutrition education manual and the corresponding knowledge questions in the learners' questionnaire continued

Topics	Sub-topics	Corresponding questions
Food processing	• Introduction to food processing • Food processing methods • Food cooking methods • Indigenous dishes • Hands-on preparation of vegetable relish • Hands-on preparation of 'phuthu' with 'masonja' • Hands-on preparation of butternut porridge	Q22. Highly processed foods always contain more nutrients than minimally processed foods Q23. Which of the following cooking methods will retain more nutrients in vegetables? (a) frying; (b) boiling in water; (c) steaming; (d) roasting Q24. The following are the reasons for processing foods except (a) to prevent spoilage; (b) to make them edible; (c) to produce more convenient foods; (d) to produce foods that prevent tooth decay 25. The following are examples of highly processed foods except (a) corn flakes; (b) jam; (c) margarine; (d) samp
Food hygiene	• Hygiene in food handling and preparation • Food storage • Safe and harmful ingredients • Food borne diseases	Q6. All of these are signs of food borne disease except (a) stomach pain; (b) night blindness; (c) vomiting; (d) diarrhoea Q17. It is not necessary to wash vegetables like carrots before you eat them Q18. The best place to keep uncooked meat is (a) in the refrigerator; (b) in the freezer; (c) on the kitchen cabinet; (d) don't know Q19. Foods can become contaminated with germs if we prepare foods in a dirty environment

Abbreviation: Q – Question.

6.5.2 Data collection

Data were collected between 21 and 23 January 2015 in respect of the pre-implementation assessment and between 11 September and 30 October 2015 in respect of the post-implementation assessment (a duration of eight months). Data collection started with the control school and then the treatment school for both the pre- and post-implementation assessments. The process evaluation data were collected between March and October 2015.

6.5.2.1 Assessment of teachers' nutrition knowledge, attitudes and dietary practices

A self-administered questionnaire (Appendix 15) was used to assess the teachers' nutrition KAP at pre- and post-implementation. The questionnaires were self-administered in a 30 minute working lunch session which took place during the long break in the staff common

room. The teachers' informed consent (Appendix 5) was previously received at the workshop session. Only the two teachers who were not present at the workshop provided informed consent before the questionnaires were administered. At the control school, the informed consent was first received from the teachers before the questionnaires were given to them for completion. The researcher explained the instructions on the questionnaire and was available for clarification purposes and the collection of the completed questionnaires.

6.5.2.2 Evaluation of the workshop for the training of the teachers

A Likert type questionnaire (Appendix 12) was used to receive participants' comments on the workshop content, skills and knowledge acquired, workshop materials and instructors, and overall quality of the workshop. The questionnaires were self-administered at the end of the workshop.

6.5.2.3 Evaluation of the implementation of nutrition education programme to learners

In an one-to-one interview, the teachers completed the Likert type questionnaire (Appendix 13) and were allowed to describe their own experiences and explain their opinions regarding their experiences in using the manual to teach nutrition. An one-to-one interview offers the benefit of accessing in-depth information from the responder (Moore et al. 2012). An independent researcher (Postgraduate nutrition researcher), who was not part of the study, conducted the interviews with the teachers at the completion of each of the five nutrition topics. As a result, five sessions of one-to-one interviews were conducted with the teachers at different times to assess the five major topics of the NE manual (figure 6.1).

6.5.2.4 Focus group discussion

An interview guide (Appendix 14) was used to explore the teachers' perceptions of the impact of the implementation of the NEP on their teaching of nutrition to the learners in an FGD. The FGD was conducted by the researcher with the assistance of two research assistants. The conduct of the FGD followed the procedure described in section 4.5.4, and lasted for 56 minutes.

6.5.2.5 Assessment of learners' nutrition knowledge, attitudes and dietary practices

The learners' KAP questionnaires (Appendix 16) were administered with assistance by research assistants in their classes during school hours. Learners' KAP assessments were done at pre- and post-implementation. Before the commencement of questionnaire administration, the researcher introduced the study and explained what was expected of the learners. The

class teachers requested the learners who had submitted the signed consent forms from their parents to signify by standing. (At the end of the exercise, the researcher further confirmed the parental consent by merging the learners' assent with the corresponding parental consent.) Those learners who had parental consent were asked to give their assent by signing the assent form after which each learner received a copy of the questionnaire. The questions were then read aloud to the learners and they were instructed to tick their answers on the questionnaire. This method allows for uniform understanding of the questions among the learners (Wall et al. 2012). At post-implementation assessment the learners received the questionnaires and were instructed to tick their answers as the research assistant read the questions. Ethics considerations are as described in chapter 3, section 3.5 and are included in appendix 6 and 7.

6.6 DATA MANAGEMENT AND ANALYSES

6.6.1 Quantitative data

6.6.1.1 Data management

The data were coded and personally entered by the researcher. Duplicate data entry was done using the Microsoft® Excel® with the assistance of a research assistant. The two data sets were compared and errors were corrected before the data were analysed. The scoring of the nutrition knowledge and attitudes data and the classification of the percentage mean scores into low, average and good scores are as discussed in chapter 4, section 4.6.1.

The method of scoring response options of Likert type data as described by Boone and Boone (2012) and in Kubik et al.'s (2002) study was used. Response options on practices questions for teachers were summed under the different categories to a possible lowest (zero) and highest score (table 6.3). Questions addressing healthy and unhealthy practices in the same category were summed separately. (Example: how often do you eat fried chicken, potato chips, corn snacks and how often do you eat vegetables in at least two meals a day). The learners' practices items were nine and were assigned scores as described by Shariff et al. (2008). The first three questions had four options, a score of one was given to the options that were consistent with healthy eating and the others were given the score of zero. The last six questions had four options of 'almost every day', 'several times a week', 'occasionally' and 'never'. A score of 1 was given to the option of almost every day and several times a week, while a zero score was given to the option of occasionally and never.

Table 6.4: Summing of teachers' practices responses into scores

Categories of practices	Number of response options	Scoring	Healthy category		Unhealthy category	
			Number of questions	Maximum possible score	Number of questions	Minimum possible score
Personal dietary practices	6	Never = 0, 5+times a week = 5	6	30	5	25
Dietary practices at school	6	4 or more times per week = 0, items are not available = 5	2	10	2	10
[1]Classroom food practices	4	Likely = 0, uncertain = 3	4	12	-	-
School wide food practices	5	Strongly disagree = 0, strongly agree = 4	7	28	3	12
[1]Food behaviour in hygiene	4	Always = 0, sometimes = 3	4	12	-	-

[1]Data were only available in the healthy category

6.6.1.2 Data analyses

The Stata® Statistical Software® Release 10, (2007) was used for all the statistical analyses. The demographic variables of age and years of teaching experience were analysed using the t test and were described by means and standard deviations. The variables of gender, race, employment status, highest education and learners' source of nutrition information were analysed using the Fischer's exact or the Pearson's chi squared and were described by frequencies and percentages.

The nutrition KAP data were analysed for descriptive statistics (means, standard deviations, frequencies and percentages). The Shapiro Wilk test was used to assess the continuous variables for normality. The questionnaires were tested for internal consistency before data collection using the Cronbach's alpha (section 6.5.1.7). The pre-implementation and post-implementation results were summarised and presented as means with standard deviations for continuous variables which included the nutrition KAP. The dietary practices results being

categorical variables were initially summed into scores as described in section 6.6.1.1, to prepare the data for inferential analysis.

Analysis of variance (ANOVA) (Hair et al. 2010) with adjustment for pre-implementation scores was used to compare the percentage mean scores between the schools at pre- and post-implementation for nutrition KAP. A random effects Generalised Least Squares (GLS) regression analysis (Muthén & Kaplan 1985) was used to estimate the overall change in the percentage mean score for nutrition KAP between the schools from pre-implementation to post-implementation while accounting for missing scores at post-implementation. The GLS regression was used to estimate the performance of Grade 5 in comparison to Grade 6 learners from pre- to post-implementation in both schools. The within school differences in the nutrition KAP from pre- to post-implementation and the coefficient of differences were estimated using the random effects GLS regression analysis. Analyses for differences were calculated as the difference in the post-implementation and the pre-implementation scores.

The response options on all the nutrition KAP questions at pre- and post-implementation for both the teachers' and the learners' data and the teachers' evaluation of the training workshop were summarised and presented as frequencies and percentages. The level of significance to test the hypotheses was set at 0.025 for a one-tailed test, and that of demographic variables was set at 0.05 for a two-tailed test.

6.6.2. Qualitative data

The qualitative data from the FGD were analysed following the thematic approach of the framework method (Dixon-Woods 2011) as was explained in chapter 4, section 4.6.2. The thematic framework approach steps, namely familiarisation, identifying a thematic framework, indexing, charting and mapping and identification were followed.

The data from the one-on-one interview with the teachers were expressed as numbers and percentages based on the number of activities completed (Wilson et al. 2009), and were described in terms of completeness, fidelity, dose and reach (Moore et al. 2012). Teachers indicated their options on the Likert type questions and provided explanations for their choices. The teachers' explanations of options were summarised through the deductive approach as described by Folkestad (2008).

6.7 QUALITY CONTROL

6.7.1 Validity, reliability and control of bias

The following measures assured the validity and reliability of the measurements that were done:

- The questionnaires used in assessing the nutrition KAP of the teachers and the learners were adapted from standardised questionnaires. (The adjustments made were discussed in sections 6.5.1.1 and 6.5.1.5.)
- The nutrition KAP questionnaires for teachers and learners were pretested in a school with similar characteristics to the treatment and control schools.
- The questionnaire administration for the learners was done by research assistants in the presence of their teachers who clarified issues in the language of the learners without giving the answers.
- The questionnaires were subjected to face and content validity by NE experts at the University of Pretoria and the teachers in one of the schools in the Bronkhorstspruit district.
- The Cronbach's alpha reliability test was used to measure the internal consistency of the questionnaires. The Cronbach's alpha for the reliability test on the teachers' nutrition KAP questionnaire indicated 0.9, 0.7 and 0.9 for the knowledge, attitudes and practices items respectively. The reliability test for the learners' nutrition KAP questionnaire indicated 0.6, 0.6 and 0.5 for the knowledge, attitudes and practices items respectively.

6.7.2 Trustworthiness of the qualitative data

The trustworthiness of the qualitative data was assured as follows:

- The audio tape recording of the FGD and the comprehensive field notes ensured the completeness of information.
- The qualitative data were complemented with information obtained from process evaluation data.
- The question guide for the FGD and the Likert questionnaire for process evaluation developed by the researcher were subjected to face and content validity by the study leaders and nutrition colleagues of the researcher.
- The process evaluation data were collected through one-on-one interviews by independent researchers who were not part of the programme planning.

CHAPTER 7

RESULTS OF PHASE 3

7.1 INTRODUCTION

This chapter presents the participants' demographic characteristics, the pre- and post-implementation assessments results and the programme process evaluation.

The results of the quantitative data in respect of the nutrition knowledge, attitudes and dietary practices are presented as means and standard deviations (SD) as all these variables showed normal distribution with the Shapiro Wilk (W) test (table 7.1). Large values of 'W' (> 0.8) are indicative of normal data (Royston 1995). The results for dietary practices and the NE workshop evaluation were categorical variables and are reported as frequencies and percentages and represented in bar graphs. The ANOVA results for nutrition KAP present the comparison between schools, and between Grades 5 and 6 of the mean percentage scores and standard deviations at pre- and post-implementation. The random effects GLS regression analysis results for nutrition KAP variables present the overall comparison between the schools (treatment versus control) and implementation (pre- to post-) along with their interactions. The GLS regression analysis results for nutrition knowledge and attitudes present the overall comparison between Grades 5 and 6 and pre- to post-implementation along with their interactions. The random effects GLS regression analysis was also done within school with respect to the mean percentage scores comparing pre- and post-implementation.

The significance referred to in reporting on the results of the implementation study (phase 3) is that of a statistical significance ($P < 0.025$).

Participants who dropped out at post-implementation were accounted for. There were three drop-outs among the teachers and 37 drop-outs among the learners (figure 7.1 and 7.2).

The results for the qualitative data from the one-on-one interviews are presented in respect to the completeness, fidelity, dose and reach of the implementation. Data from the FGD are presented as themes and sub-themes and are supported by the teachers' quotes.

Table 7.1: Normality distribution (Shapiro Wilk test) for measurement variables

Variables	Shapiro Wilk value (W)	P-value
Teachers (N = 23)		
Age	0.934	0.165
Years of teaching experience	0.959	0.627
Categories of nutrition knowledge		
Current dietary recommendations for children	0.906	0.033
Sources of nutrients	0.980	0.909
Diet disease relationship	0.956	0.389
Food processing	0.961	0.488
Food hygiene	0.920	0.068
Nutrition attitudes	0.937	0.152
Categories of dietary practices		
Healthy personal dietary practices	0.941	0.191
Unhealthy personal dietary practices	0.984	0.963
Healthy dietary practices at school	0.945	0.238
Unhealthy dietary practices at school	0.834	0.001
classroom food practices	0.944	0.222
Healthy school wide food practices	0.875	0.008
Unhealthy school wide food practices	0.957	0.407
Practices in food hygiene	0.979	0.884
Learners (N = 681)		
Age	0.962	< 0.001
Categories of nutrition knowledge		
Food nutrients and functions	0.997	0.242
Food and energy	0.991	< 0.001
Nutrient deficiency	0.998	0.505
Food choices	0.996	0.115
Sources of nutrients	0.993	0.004
Nutrition attitudes	0.987	< 0.001
Dietary practices	0.998	0.709

***P-values less than 0.05 show that the data are not normally distributed, however Shapiro Wilk "W" values greater than 0.8 are indicative of normally distributed data (Royston 1995).**

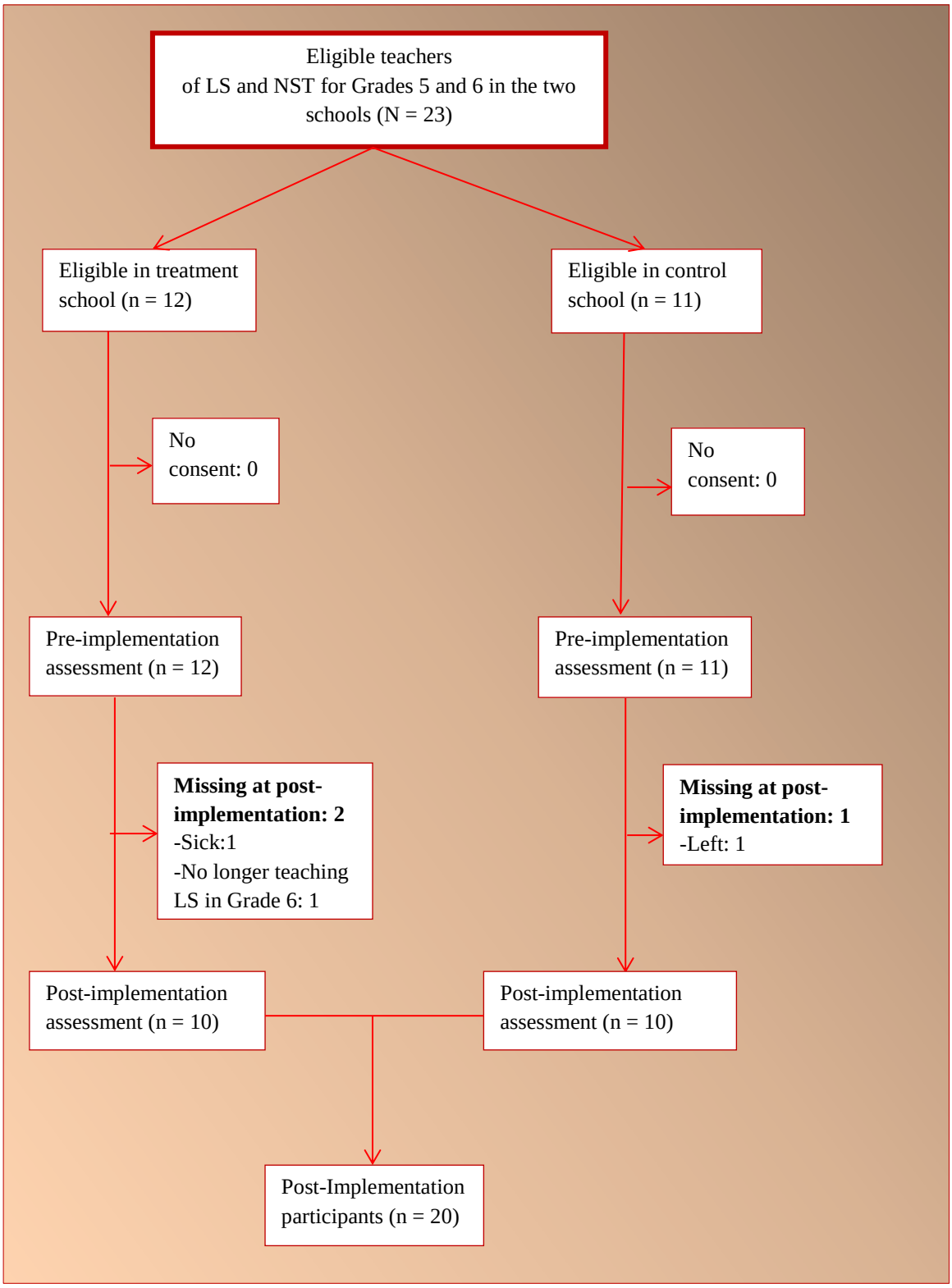


Figure 7.1: Flow of participating teachers through the study

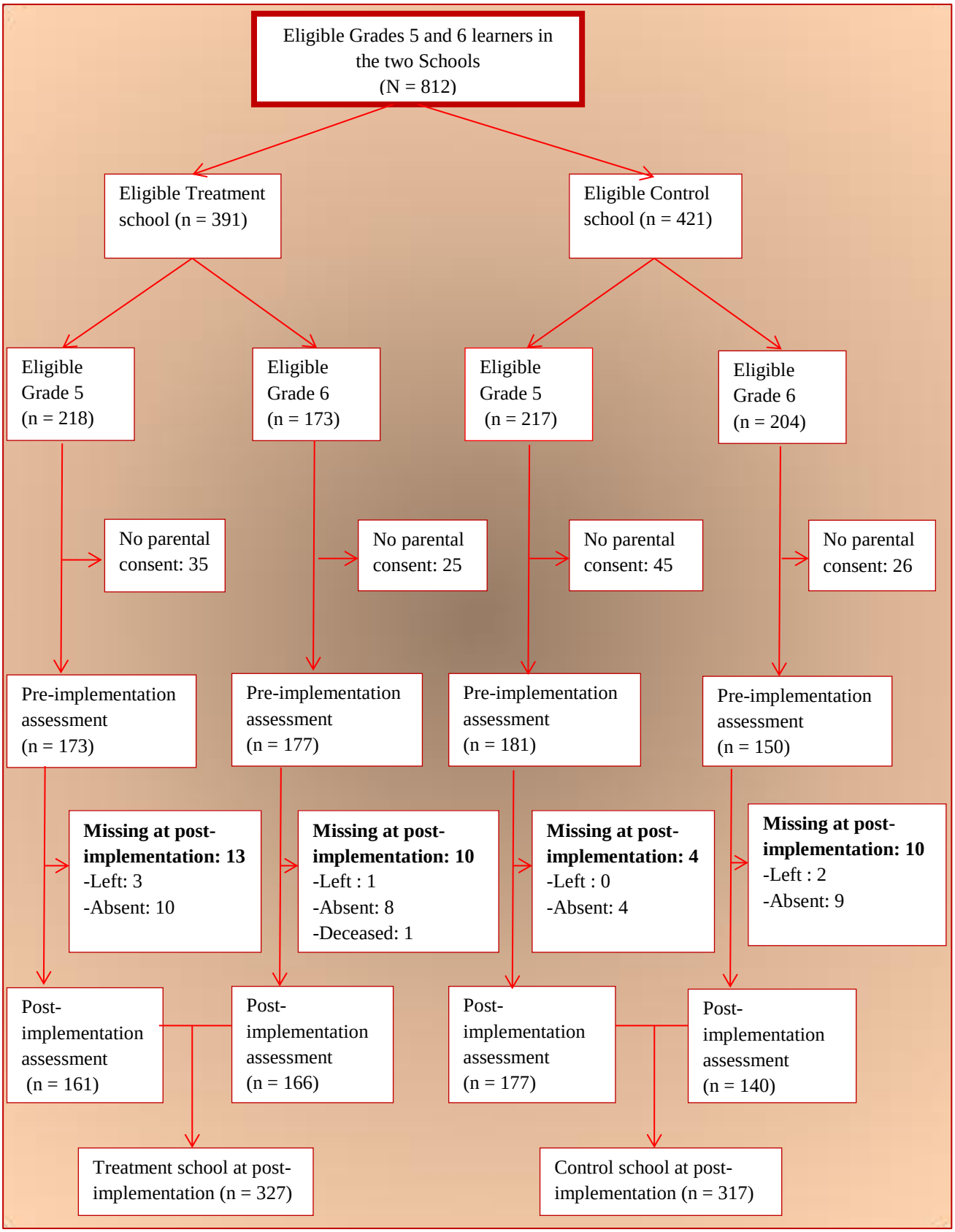


Figure 7.2: Flow of participating learners through the study

7.2 DEMOGRAPHIC CHARACTERISTICS OF THE PARTICIPANTS

7.2.1 Teachers

A total of 23 teachers participated in the study, comprising teachers in the treatment school (n = 12) and in the control school (n =11) (table 7.2). The mean age of the teachers was 46 ± 7.9 years and they had 18 ± 9.7 mean years of teaching experience. All the teachers were of the black race, the majority (82.5%) of whom were on full time employment, and women (60.9%) and nearly half (47.8%) had a teaching diploma as their highest education qualification. The two schools were not significantly different in respect to any of the variables ($P \geq 0.05$).

Statistical significance was measured on the demographic variables at post-implementation to estimate for the effect of the total number of drop outs. At post-implementation, the two schools were also not significantly different in respect of any of the variables ($P \geq 0.05$). There was no difference in the distribution of demographic variables from pre- to post-implementation.

Table 7.2: Demographic characteristics of the teachers: comparisons between treatment and control schools at pre-and post-implementation (N = 23)

Variables	Pre-implementation		P-value	Post-implementation		P-value
	Treatment school (n = 12)	Control school (n = 11)		Treatment (n = 10)	Control (n = 10)	
Mean age (in years)	(n = 11) 44.9 ± 5.6	(n = 10) 47.1 ± 10.2	[1]0.545	(n = 9) 44.9 ± 6.09	(n = 9) 45.9 ± 10.07	[1]0.802
Mean years of teaching experience	(n = 8) 14.0 ± 8.8	(n = 9) 21.3 ± 10.7	[1]0.146	(n = 7) 13.9 ± 8.8	(n = 9) 21.3 ± 10.7	[1]0.123
Gender (Frequency (%)) Male Female	 6 (50.0) 6 (50.0)	 3 (27.3) 8 (72.7)	[2]0.400	 6 (60.0) 6 (40.0)	 3 (30.0) 7 (70.0)	[2]0.401
Race (Frequency (%)) Black	 12 (100)	 11 (100)	-	 10 (100)	 10 (100)	-
Employment status (Frequency (%)) Employed full time Employed part time Others	 10 (83.3) 2 (16.7) 0 (0.0)	 9 (81.8) 0 (0.0) 2 (18.2)	[2]0.230	9 (90.0) 1 (10.0) 0 (0.0)	8 (80.0) 0 (0.0) 2 (20.0)	[2]0.227
Highest education (Frequency (%)) Teaching diploma University first degree Others	 6 (50.0) 5 (41.7) 1 (8.3)	 5 (45.5) 4 (36.7) 2 (18.2)	[2]1.00	 6 (60.0) 3 (30.0) 1 (10.0)	 5 (50.0) 3 (30.0) 2 (20.0)	[2]1.00

[1]P-value was derived from t-test
[2]P-value was derived from Fisher's exact

7.2.2 Learners

A total of 681 learners comprising Grades 5 and 6 learners in the treatment (n = 350) and control (n = 331) schools participated in the study (table 7.3). The mean age of Grade 5 learners was 10.5 ± 1.2 years, and that of Grade 6 learners was 11.6 ± 1.0 years. The learners showed an almost equal distribution of 338 males and 334 females, however the gender distribution within Grade 5 was significantly different (P = 0.016) between the two schools. The learners were primarily of the black race (98.9%), and the remaining few were coloured.

The majority of the learners (91%) had at one time or another heard about healthy eating from teachers (38%) and doctor or nurse (26%) in the treatment school, and from family members (33%) in the control school (table 7.4). Learners' awareness about a healthy diet and who told them about a healthy diet were significantly different between the treatment and control schools (P = 0.008 and P < 0.001).

The effect of the total number of drop outs at post-implementation measured on the demographic variables showed similar levels of significance as the pre-implementation for all the variables (P ≥ 0.05). There was no difference in the distribution of demographic variables from pre- to post-implementation.

Table 7.3: Demographic characteristics of the learners: comparison between treatment and control schools at pre- and post-implementation (N = 681)

Variables	Pre-implementation		P-value	Post-implementation		P-value
	Treatment school (n = 350)	**Control school (n = 331)**		**Treatment (n = 327)**	**Control (n = 317)**	
Mean age (in years)	**(n = 339)**	**(n = 314)**		**(n = 298)**	**(n = 298)**	
Grade 5	10.5 ± 1.1	10.4 ± 1.2	[1]0.457	10.5 ± 1.1	10.4 ± 1.1	[1]0.202
Grade 6	11.6 ± 0.9	11.5 ± 1.0	[1]0.423	11.6 ± 0.9	11.5 ± 1.0	[1]0.460
Gender Frequency (%)						
Grade 5	**(n = 171)**	**(n = 180)**		**(n = 158)**	**(n = 176)**	
Male	75 (43.9)	102 (56.7)	[2]0.016*	70 (44.3)	99 (56.3)	[2]0.029
Female	96 (56.1)	78 (43.3)		88 (55.7)	77 (43.8)	
Grade 6	**(n = 174)**	**(n = 147)**		**(n = 164)**	**(n = 137)**	
Male	78 (44.8)	83 (56.5)	[2]0.038	73 (44.5)	77 (56.2)	[2]0.043
Female	96 (55.2)	64 (43.5)		91 (55.5)	60 (43.8)	
Race						
Grade 5	**(n = 171)**	**(n = 180)**		**(n = 158)**	**(n = 176)**	
Black	168 (98.2)	177 (98.3)	[2]0.949	155 (98.1)	173 (98.3)	[2]0.894
Coloured	3 (1.8)	3 (1.7)		3 (1.7)	3 (1.7)	
Grade 6	**(n = 174)**	**(n = 147)**	[2]0.192	**(n = 164)**	**(n = 137)**	[2]0.195
Black	172 (98.9)	147 (100)		162 (98.7)	137 (100)	
Coloured	2 (1.1)	0 (0.0)		2 (1.3)	0 (0.0)	

[1]P-value was derived from t-test
[2]P-value was derived from chi squared
One sided test, *P<0.025

Table 7.4: Learners' sources of nutrition information: comparisons between treatment and control schools at pre- and post-implementation (N = 681)

Questions	Pre-implementation		[1]P-value	Post-implementation		[1]P-value
	Treatment school (n = 350)	Control school (n = 331)		Treatment school (n = 327)	Control school (n = 317)	
Have sometimes been told about having a healthy diet	**(n = 342)**	**(n = 326)**		**(n = 319)**	**(n = 312)**	
Yes	301 (88.0)	311 (95.4)	0.001**	281 (88.1)	298 (95.5)	0.001**
No	41 (12.0)	15 (4.6)		38 (11.9)	14 (4.5)	
Who told you about having a healthy diet:	**(n = 342)**	**(n = 324)**		**(n = 319)**	**(n = 310)**	
Family Members	83 (24.3)	108 (33.3)	< 0.001***	78 (24.5)	103 (33.2)	< 0.001***
Friend	23 (6.7)	24 (7.4)		20 (6.3)	24 (7.7)	
Doctor / Nurse	90 (26.3)	111 (34.3)		83 (26.0)	104 (33.6)	
Teacher	131 (38.3)	72 (22.2)		123 (38.6)	70 (22.6)	
Tuck-shop worker	4 (1.2)	1 (0.3)		4 (1.3)	1 (0.3)	
Other	11 (3.2)	8 (2.5)		11 (3.5)	8 (2.6)	
Where information about healthy diet was obtained:	**(n = 339)**	**(n = 324)**		**(n = 317)**	**(n = 310)**	
Media (TV, magazines, newspapers)	46 (13.6)	51 (15.7)	0.097	45 (14.2)	49 (15.8)	0.094
School	195 (57.5)	156 (48.2)		183 (57.7)	149 (48.0)	
Hospital / Clinic	78 (23.0)	97 (29.9)		71 (22.4)	92 (29.7)	
Other	20 (5.9)	20 (6.2)		18 (5.7)	20 (6.5)	

[1]P-value was derived from chi squared
One sided test, **P<0.01, ***P<0.001

7.3 NUTRITION KNOWLEDGE, ATTITUDES AND DIETARY PRACTICES OF THE TEACHERS

7.3.1 Nutrition knowledge and attitudes of the teachers

Table 7.5 shows the mean total nutrition knowledge score which comprises the mean scores for all the categories of nutrition knowledge at pre- and post-intervention for both schools. There was a significant difference (P = 0.003) between the treatment and control schools in the difference in the total knowledge percentage scores from pre- to post-implementation.

The mean scores for the categories of nutrition knowledge are presented in table 7.6. At pre-implementation, results of ANOVA showed no significant differences in any of the categories on nutrition knowledge between the schools although the control school had higher mean scores in the category of current dietary recommendations for children (77.3 ± 21.5% against 75.0 ± 15.0%), and in the category on food hygiene 75.0 ± 19.4% against 70.8 ± 17.9%. At post-implementation, the random effects GLS regression for the difference in the total nutrition knowledge scores between the two schools, indicated that the treatment school had a higher significant total nutrition knowledge mean score (85.5 ± 8.2% against 73.4 ± 10.3%, P = 0.003).The treatment school had higher mean scores for all the categories of nutrition knowledge, but only showed a significant difference for the category on sources of nutrients (86.1± 10.2% against 69.6 ± 13.1%, P = 0.0009). Estimation of differences between the schools from pre- to post-implementation by the random effects GLS regression indicated that the treatment school had a significantly higher mean score than the control school (P < 0.001) for the category on sources of nutrients.

Table 7.5: Comparison of the mean % total nutrition knowledge score (on all categories) of the teachers at pre- and post-implementation between the schools (N = 23)

Schools	N		Mean % ± SD		[1]Mean change %	[2]P-value	[3]P-value
	Pre	Post	Pre	Post			
Treatment	12	10	71.3 ± 8.2	85.5 ± 8.2	14.1	<0.001***	0.003**
Control	11	10	71.5 ± 10.4	73.4 ± 10.3	0.9	0.786	

[1]Discrete change from the base level derived from random effects GLS regression (post-implementation score minus pre-implementation score)
[2] Within school difference
[3]Difference between the mean changes between schools from pre- to post-implementation derived from random effects GLS regression
One sided test, **P<0.01, ***P<0.001

Table 7.6: Comparison of the mean % scores for the categories of nutrition knowledge of the teachers from pre- to post-implementation between the schools (N = 23)

Variables	Pre-implementation			Post-implementation			[2]P-value Pre- to post-implementation
	Treatment school (n =12) (% Score)	Control school (n =11) (% Score)	[1]P-value	Treatment school (n =10) (% Score)	Control school (n =10) (% Score)	[1]P-value	
Current dietary recommendations for children	75.0 ± 15.0	77.3 ± 21.5	0.77	91.3 ± 8.4	88.8 ± 9.2	0.64	0.59
Sources of nutrients	71. 1 ± 9.9	70.1 ± 9.9	0.83	86.1± 10.2	69.6 ± 13.1	0.0009***	<0.001***
Diet disease relationship	69.8 ± 17.2	69.3 ± 15.1	0.95	83.8 ± 13.2	71.3 ± 21.3	0.13	0.19
Food processing	70.0 ± 23.4	70.9 ± 18.7	0.92	74.0 ± 23.2	68.0 ± 19.3	0.38	0.44
Food hygiene	70.8 ± 17.9	75.0 ± 19.4	0.59	87.5 ± 17.7	80.0 ± 19.7	0.31	0.24

[1]Difference between schools derived from analysis of variance
[2]Difference of between schools changes from pre- to post-implementation derived from random effects GLS regression
One sided test, ***P<0.001

Table 7.7 shows the within school differences in the categories of nutrition knowledge from pre- to post-implementation and the coefficient of difference as estimated by the random effects GLS regression. The mean scores for the treatment school significantly increased for categories on dietary recommendations for children (P = 0.002), sources of nutrients (P < 0.001) and food hygiene (P = 0.005). In contrast, the mean scores for the control school increased for three categories, namely current dietary recommendations for children, diet disease relationship and food hygiene, but the differences were not significant (P = 0.116, P = 0.713 and P = 0.558 respectively).

The results of ANOVA and the random effects GLS regression on the mean score of the teachers' attitudes in the treatment and control schools are shown in table 7.8. The treatment school had a higher mean score (84.2 ± 16.4%) than the control school (75.8 ± 17.3%) at post-implementation. However, the difference between the mean change between schools from pre- to post-implementation was not significant (P = 0.531).

The random effects GLS regression analysis for within schools differences in the mean scores of the teachers' attitudes are given in table 7.9. Both the treatment and the control schools increased in the mean score with a mean change of 9.1% and 4.2% respectively, but the differences were not significant (P = 0.093 and P = 0.479 respectively).

Table 7.7: Differences in the mean % scores for the categories of nutrition knowledge within the schools from pre- to post-implementation among the teachers (N = 23)

Variables	Schools	N		Mean % ± SD		[1]Mean change %	[2]P-value
		Pre	Post	Pre	Post		
Current dietary recommendations for children	Treatment	12	10	75.0 ± 15.0	91.3 ± 8.5	16.2	0.002**
	Control	11	10	77.3 ± 21.5	88.8 ± 9.2	10.7	0.116
Sources of nutrients	Treatment	12	10	71.1 ± 9.9	86.1± 10.2	14.3	<0.001***
	Control	11	10	70.1 ± 9.9	69.6 ± 13.1	-1.6	0.653
Diet disease relationship	Treatment	12	10	69.8 ± 17.2	83.8 ± 13.2	14	0.036
	Control	11	10	69.3 ± 15.1	71.3 ± 21.3	2.2	0.713
Food processing	Treatment	12	10	70.0 ± 23.4	74.0 ± 23.2	4	0.594
	Control	11	10	70.9 ± 18.7	68.0 ± 19.3	-2.9	0.726
Food hygiene	Treatment	12	10	70.8 ± 17.9	87.5 ± 17.7	17.8	0.005**
	Control	11	10	75.0 ± 19.4	80.0 ± 19.7	5	0.558

[1]Discrete change from the base level derived from random effects GLS regression (post-implementation scores minus pre-implementation score
[2]P-value was derived from a random effects GLS regression taking into account missing values at post-implementation
One sided test, **P<0.01, ***P<0.001

Table 7.8: Comparison of the mean % nutrition attitudes scores of the teachers from pre- to post-implementation between the schools (N = 23)

Schools		Pre-implementation		Post-implementation			[1]Pre-post P-value
	N	Mean % ± SD	P-value	N	Mean % ± SD	P-value	
Treatment	12	73.6 ± 20.0	0.83	10	84.2 ± 16.4	0.40	0.531
Control	11	71.9 ± 14.1		10	75.8 ± 17.3		

[1]Difference of between schools changes from pre- to post-implementation derived from random effects GLS regression

Table 7.9: Differences in the mean % nutrition attitudes scores within the schools in from pre- to post-implementation among the teachers (N = 23)

Schools	N		Mean % ± SD		[1]Mean change %	[2]P-value
	Pre	Post	Pre	Post		
Treatment	12	10	73.6 ± 20.0	84.2 ± 16.4	9.1	0.093
Control	11	10	71.9 ± 14.1	75.8 ± 17.3	4.2	0.479

[1] Discrete change from the base level derived from random effects GLS regression (post-implementation score minus pre-implementation score)
[2]P-value was derived from a random effects GLS regression taking into account missing values at post-implementation

7.3.2 Dietary practices of the teachers

Table 7.10 shows the analysis of variance and the random effects GLS regression analysis on all the categories of the teachers' dietary practices. The categories were healthy personal dietary practices, unhealthy personal dietary practices, healthy dietary practices at school, unhealthy dietary practices at school, classroom food practices, healthy school wide food practices, unhealthy school wide food practices and practices in food hygiene. There were no significant differences in the changes between the schools from pre- to post-implementation for all the categories of dietary practices (P = 0.34, P = 0.17, P = 0.52, P = 0.87, P = 0.20, P = 0.55, P = 0.67 and P = 0.88) respectively.

The random effects GLS regression analysis for within schools differences for all the categories of the teachers dietary practices from pre- to post-implementation are shown in table 7.11. For all the categories of dietary practices, there were no significant within school differences in either the treatment or the control schools. For example, in the treatment school, there were increases in the mean percentage scores for the categories of healthy personal dietary practices, unhealthy personal dietary practices, healthy dietary practices at school, unhealthy dietary practices at school, healthy school wide food practices and practices in food hygiene, however, the increases were not significant (P = 0.93, P = 0.51, P = 0.17, P = 0.09, P = 0.43 and P = 0.91).

Table 7.10: Comparison of the mean % scores for the categories of dietary practices of the teachers from pre- to post-implementation between the schools (N = 23)

Variables	Pre-implementation			Post-implementation			[2]P-value Pre- to post-implementation
	Treatment school (n =12) (% Score)	Control school (n =11) (% Score)	[1]P-value	Treatment school (n =10) (% Score)	Control school (n =10) (% Score)	[1]P-value	
Healthy personal dietary practices	70.8 ± 19.0	51.2 ± 17.8	0.019	70.3 ± 15.7	59.7 ± 14.4	0.130	0.34
Unhealthy personal dietary practices	40.0 ± 20.9	30.9 ± 18.6	0.285	45.6 ± 12.5	39.6 ± 23.7	0.489	0.17
Healthy dietary practices at school	51.7 ± 34.3	63.6 ± 28.0	0.646	73.0 ± 22.1	53.0 ± 34.3	0.139	0.52
Unhealthy dietary practices at school	62.5 ± 24.1	67.3 ± 21.0	0.646	76.0 ± 8.4	55.0 ± 35.4	0.084	0.87
Classroom food practices	24.3 ± 15.7	21.9 ± 20.2	0.758	19.2 ± 18.5	15.8 ± 12.7	0.644	0.20
Healthy school wide food practices	81.9 ± 15.2	83.8 ± 11.5	0.116	83.9 ± 10.3	85.0 ± 16.1	0.861	0.55
Unhealthy school wide food practices	38.9 ± 21.7	21.2 ± 15.1	0.036	31.7 ± 22.5	23.3 ± 22.8	0.422	0.67
Practices in food hygiene	22.9 ±14.9	27.3 ± 15.6	0.468	23.8 ± 17.1	25.0 ± 10.2	0.845	0.88

[1]Difference between schools derived from analysis of variance
[2] Difference of between schools changes from pre- to post-implementation derived from random effects GLS regression

Table 7.11: Differences in the mean % scores for the categories of dietary practices within the schools from pre- to post-implementation among the teachers (N = 23)

Variables	Schools	N		Mean% ± SD		[1]Mean Change %	[2]P-value
		Pre	Post	Pre	Post		
Healthy personal dietary practices	Treatment	12	10	70.8 ± 19.0	70.3 ± 15.7	0.4	0.93
	Control	11	10	51.2 ± 17.8	59.7 ± 14.4	7.9	0.19
Unhealthy personal dietary practices	Treatment	12	10	40.0 ± 20.9	45.6 ± 12.5	3.4	0.51
	Control	11	10	30.9 ± 18.6	39.6 ± 23.7	8.3	0.22
Healthy dietary practices at school	Treatment	12	10	51.7 ± 34.3	73.0 ± 22.1	21.4	0.17
	Control	11	10	63.6 ± 28.0	53.0 ± 34.3	-10.7	0.35
Unhealthy dietary practices at school	Treatment	12	10	62.5 ± 24.1	76.0 ± 8.4	14.2	0.09
	Control	11	10	67.3 ± 21.0	55.0 ± 35.4	-12.7	0.18
Classroom food practices	Treatment	12	10	24.3 ± 15.7	19.2 ± 18.5	-4.7	0.36
	Control	11	10	21.9 ± 20.2	15.8 ± 12.7	-6.0	0.37
Healthy school wide food practices	Treatment	12	10	81.9 ± 15.2	83.9 ± 10.3	2.9	0.43
	Control	11	10	83.8 ± 11.5	85.0 ± 16.1	1.2	0.84
Unhealthy school wide food practices	Treatment	12	10	38.9 ± 21.7	31.7 ± 22.5	-6.5	0.36
	Control	11	10	21.2 ± 15.1	23.3 ± 22.8	1.7	0.85
Practices in food hygiene	Treatment	12	10	22.9 ±14.9	23.8 ± 17.1	0.8	0.91
	Control	11	10	27.3 ± 15.6	25.0 ± 10.2	-2.3	0.58

[1]Discrete change from the base level derived from random effects GLS regression (post-implementation score minus pre-implementation score)
[2]P-value was derived from a random effects GLS regression taking into account missing values at post-implementation

7.3.2.1 Personal dietary practices of the teachers at pre- and post- implementation

Table 7.12 presents the frequency distribution of options for practices statements at pre- and post-implementation. The teachers in both schools indicated healthy eating practices at pre-implementation which were maintained to varying levels at post-implementation. Bar graphs have been used to show a clearer presentation of the eating patterns for selected practices statements from pre- to post-implementation (figures 7.3 to 7.6). The selection of the practice statements was based on the influence of such practices on healthy eating.

Figure 7.3 shows that 50% of the teachers in the treatment school ate fried chicken two to three times a month at pre-implementation and this practice was maintained at post-implementation. On the contrary, 45% of the teachers in the control school who ate fried chicken two to three times a month reduced to 30% at post-implementation. Likewise, the intake of fried chicken at one to two times a week by 25% of the treatment school teachers increased to 30% of the teachers at post-implementation. In the control school, 9% indicated the intake of fried chicken at one to two times a week at pre-implementation, but at post-implementation, 30% of the teachers took fried chicken three to four times a week.

The intake of drinks such as Oros, Coca-cola products and flavoured drinks among the teachers is shown in figure 7.4. The pattern of intake of drinks did not show a definite positive shift towards healthy eating practices. For example, about 17% of the teachers in the treatment school consumed the drinks one to two times a week at pre-implementation, which increased to 50% of the teachers at post-implementation. The intake of the drinks at three to four times a week among 8% of the treatment school teachers at pre-implementation increased to 20% of the teachers at post-implementation. Likewise, at the control school, the intake of the drinks at three to four times a week was by 9% of the teachers at pre-implementation, but the percentage who took the drinks one to two times a week increased to 20% of the teachers at post-implementation.

Figure 7.5 presents the teachers' intake of meals that contained different types of food, i.e. a mixed meal. The eating of mixed meals more than five times a week by half (50%) of the treatment school teachers at pre-implementation reduced to 30% of the teachers at post-implementation. However, the intake at three to four times a week increased from 17% of the teachers to 30% pre- to post-implementation. In the control school, there was no intake of mixed meals more than five times a week at pre-implementation and this increased to 20% at post-implementation. The intake of a mixed meal at three to four times a week increased from 18% to 20% pre-to post-implementation at the control school.

The eating of vegetables in at least two meals a day among the teachers is presented in figure 7.6. A similar pattern occurred between the two schools. The eating of vegetables in at least two meals a day was by 17% of the treatment school teachers at pre-implementation and increased to 40% of the teachers at post-implementation. Likewise, in the control school, 27% of the teachers indicated the eating of vegetables in at least two meals a day at pre-

implementation, while at post-implementation, the intake of vegetables in at least two meals a day was by 50% of the teachers.

Table 7.12: Personal dietary practices of the teachers at pre- and post-implementation in the treatment and control schools (N = 23)

How often do you take:	Pre-implementation						Post-implementation					
	Never (%)	**1 time a month n (%)**	**2-3 times a month n (%)**	**1-2 times a week n (%)**	**3-4 times a week n (%)**	**5+ times a week n (%)**	**Never n (%)**	**1 time a month n (%)**	**2-3 times a month n (%)**	**1-2 times a week n (%)**	**3-4 times a week n (%)**	**5+ times a week n (%)**
fried chicken												
Treatment school	2 (16.7)	1 (8.3)	6 (50.0)	3 (25.0)	-	0 (0.0)	-	1 (10.0)	5 (50.0)	3 (30.0)	1 (10.0)	-
Control school	0 (0.0)	4 (36.4)	5 (45.5)	1 (9.1)	-	1 (9.1)	-	4 (40.0)	3 (30.0)	-	3 (30.0)	-
salad dressing (not low fat)												
Treatment school	1 (8.3)	2 (16.7)	2 (16.7)	6 (50.0)	1 (8.3)	-	0 (0.0)	2 (20.0)	5 (50.0)	2 (20.0)	-	1 (10.0)
Control school	4 (36.4)	1 (9.1)	3 (27.3)	3 (27.3)	0 (0.0)	-	1 (10.0)	3 (30.0)	2 (20.0)	4 (40.0)	-	0 (0.0)
muffins, cakes, biscuits, cookies												
Treatment school	3 (25.0)	3 (25.0)	2 (16.7)	3 (25.0)	-	1 (8.3)	0 (0.0)	5 (50.0)	1 (10.0)	4 (40.0)	0 (0.0)	0 (0.0)
Control school	2 (18.2)	5 (45.5)	2 (18.2)	2 (18.2)	-	0 (0.0)	2 (20.0)	3 (30.0)	3 (30.0)	0 (0.0)	1 (10.0)	1 (10.0)
cheese, cheese spread (not low fat)												
Treatment school	1 (8.3)	1 (8.3)	5 (41.7)	5 (41.7)	-	0 (0.0)	0 (0.0)	3 (30.0)	4 (40.0)	1 (10.0)	2 (20.0)	0 (0.0)
Control school	4 (36.4)	3 (27.3)	3 (27.3)	0 (0.0)	-	1 (9.1)	2 (20.0)	3 (30.0)	2 (20.0)	1 (10.0)	1 (10.0)	1 (10.0)
drinks, e.g. Oros, Coca-Cola products and flavoured drinks												
Treatment school	2 (16.7)	4 (33.3)	2 (16.7)	2 (16.7)	1 (8.3)	1 (8.3)	1 (10.0)	1 (10.0)	1 (10.0)	5 (50.0)	2 (20.0)	0 (0.0)
Control school	3 (27.3)	3 (27.3)	3 (27.3)	0 (0.0)	1 (9.1)	1 (9.1)	1 (10.0)	2 (20.0)	4 (40.0)	2 (20.0)	0 (0.0)	1 (10.0)

Continued/…….

Table 7.12: Personal dietary practices of the teachers at pre- and post-implementation in the treatment and control schools (N = 23) continued

How often do you take:	Pre-implementation						Post-implementation					
	Never (%)	1 time a month n (%)	2-3 times a month n (%)	1-2 times a week n (%)	3-4 times a week n (%)	5+ times a week n (%)	Never n (%)	1 time a month n (%)	2-3 times a month n (%)	1-2 times a week n (%)	3-4 times a week n (%)	5+ times a week n (%)
meals that contain different kinds of foods												
Treatment school	-	0 (0.0)	3 (25.0)	1 (8.3)	2 (16.7)	6 (50.0)	0 (0.0)	1 (10.0)	0 (0.0)	3 (30.0)	3 (30.0)	3 (30.0)
Control school	-	1 (9.1)	5 (45.5)	3 (27.3)	2 (18.2)	0 (0.0)	1 (10.0)	1 (10.0)	1 (10.0)	3 (30.0)	2 (20.0)	2 (20.0)
a glass of low fat milk												
Treatment school	0 (0.0)	3 (25.0)	1 (8.3)	3 (25.0)	3 (25.0)	2 (16.7)	1 (10.0)	1 (10.0)	0 (0.0)	5 (50.0)	1 (10.0)	2 (20.0)
Control school	2 (18.2)	4 (36.4)	1 (9.1)	2 (18.2)	1 (8.3)	1 (8.3)	3 (30.0)	2 (20.0)	2 (20.0)	2 (20.0)	0 (0.0)	1 (10.0)
baked fish, chicken, lean meat												
Treatment school	-	2 (16.7)	2 (16.7)	4 (33.3)	4 (33.3)	0 (0.0)	-	0 (0.0)	2 (20.0)	5 (50.0)	3 (30.0)	0 (0.0)
Control school	-	3 (27.3)	3 (27.3)	1 (9.1)	3 (27.3)	1 (9.1)	-	1 (10.0)	2 (20.0)	4 (40.0)	2 (20.0)	1 (10.0)
vegetables in at least two meals a day												
Treatment school	-	0 (0.0)	4 (33.3)	2 (16.7)	2 (16.7)	4 (33.3)	-	-	0 (0.0)	3 (30.0)	4 (40.0)	3 (30.0)
Control school	-	2 (18.2)	2 (18.2)	1 (9.1)	3 (27.3)	3 (27.3)	-	-	1 (10.0)	2 (20.0)	5 (50.0)	2 (20.0)
any fresh fruit												
Treatment school	-	-	0 (0.0)	1 (8.3)	5 (41.7)	6 (50.0)	-	-	-	1 (10.0)	6 (60.0)	3 (30.0)
Control school	-	-	3 (27.3)	2 (18.2)	3 (27.3)	3 (27.3)	-	-	-	2 (20.0)	3 (30.0)	5 (50.0)
dry beans, split peas, lentils or soya products												
Treatment school	0 (0.0)	1 (8.3)	2 (16.7)	3 (25.0)	1 (8.3)	5 (41.7)	1 (10.0)	1 (10.0)	1 (10.0)	3 (30.0)	1 (10.0)	3 (30.0)
Control school	2 (18.2)	4 (36.4)	3 (27.3)	2 (18.2)	0 (0.0)	0 (0.0)	1 (10.0)	3 (30.0)	2 (20.0)	2 (20.0)	2 (20.0)	0 (0.0)

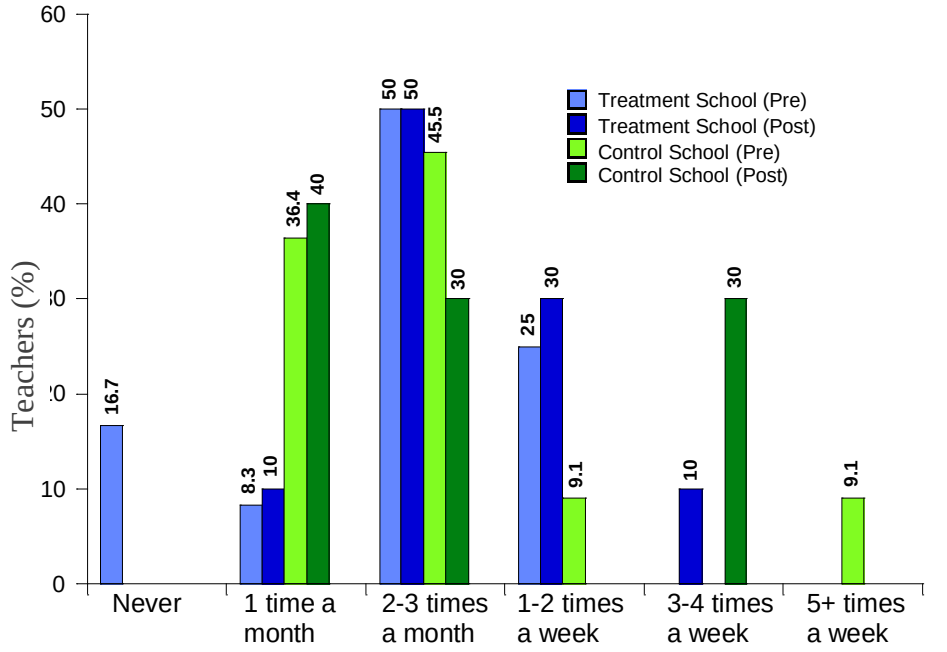


Figure 7.3: Eating of fried chicken by the teachers in both schools at pre- and post-implementation (N = 23)

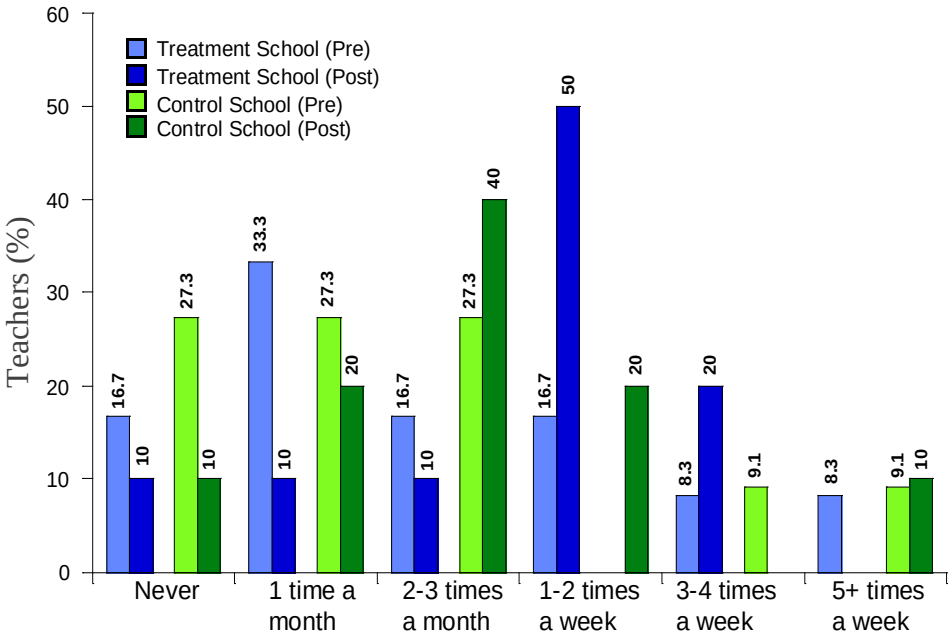


Figure 7.4: Teachers' intake of drinks such as Oros, Coca-cola products and flavoured drinks in both schools at pre- and post-implementation (N= 23)

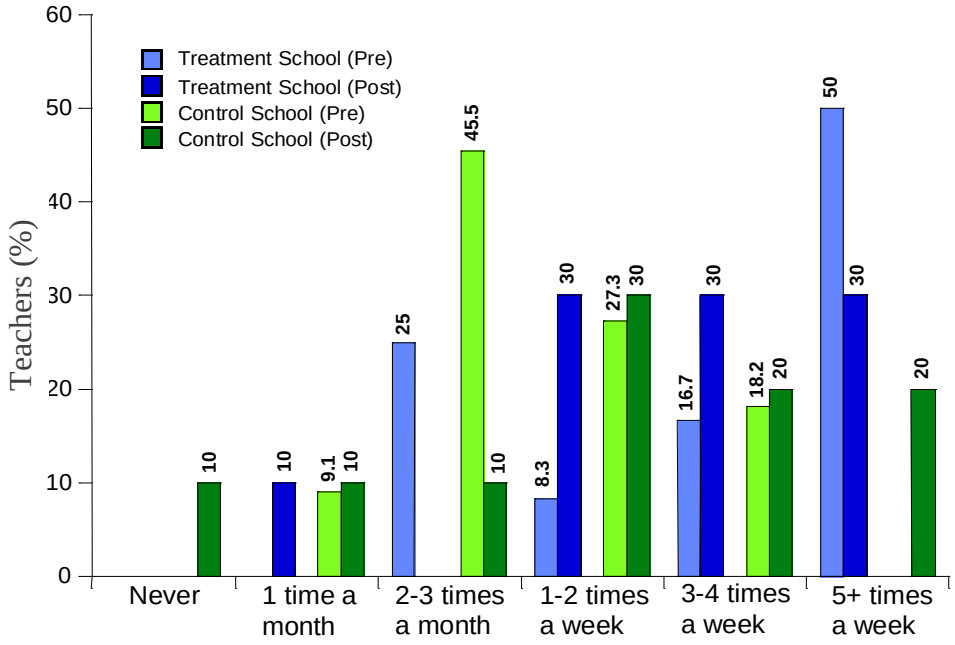


Figure 7.5: Eating of meals that contained different kinds of foods by the teachers in both schools at pre- and post-implementation (N= 23)

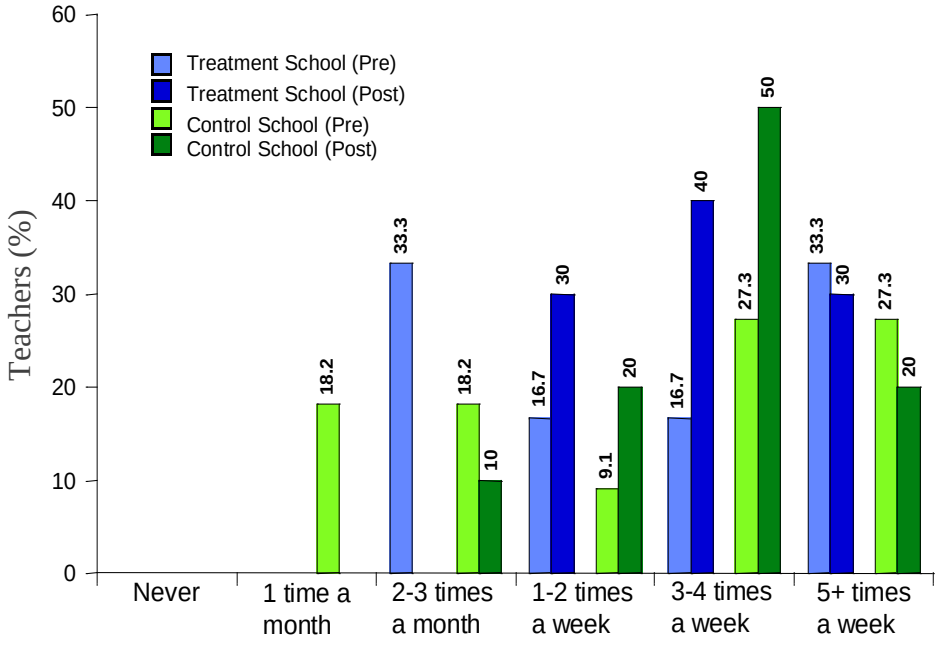


Figure 7.6: Eating of vegetables in at least two meals a day by the teachers in both schools at pre- and post-implementation (N= 23)

7.3.2.2 Dietary practices at school of the teachers at pre- and post-implementation

Table 7.13 shows the dietary practices at school of the teachers as reflected by their food and beverage purchasing practices while at school. It was indicated that the teachers frequently purchased both healthy and unhealthy choices of foods. Most (67%) of the teachers in the treatment school frequently (three to four times a week) bought foods such as candy, chips, cookies or fat cakes at pre-implementation which increased to 90% of the teachers at post-implementation. Likewise, the purchase of foods such as bread, fruits or vegetables three to more than five times a week was by 58% of the teachers at pre-implementation, which also increased to 80% of the teachers at post-implementation. On the contrary, the purchase of candy, chips, cookies or fat cakes by the control school teachers three to more than five times a week was by 55% of the teachers at pre-implementation, which reduced to 50% at post-implementation. The purchase of foods such as bread, fruits or vegetables three to more than five times a week was by 54% of the control school teachers at pre-implementation and this practice reduced to 40% at post implementation. The trend of purchases of healthy choices of food seemed to increase among the treatment school teachers, but reduced among the control school teachers.

7.3.2.3 Classroom food practices of the teachers at pre- and post-implementation

The classroom food practices of the teachers at pre- and post-implementation for both schools are presented in table 7.14. The teachers demonstrated classroom food practices that were consistent with healthy eating and maintained these practices at post-implementation. Most of the teachers in the treatment school (58%) and in control school (82%) would not likely use foods such as fat cakes, cakes, cookies, candies, chocolates and ice-cream as rewards or incentive for learners. This practice increased to 60% with the treatment school teachers but reduced to 60% with the control school teachers at post-implementation. It is noteworthy that 33% of the treatment school teachers would likely use these foods as rewards at pre-implementation but reduced to 10% at post-implementation, while the control school teachers increased from 18% to 30% pre- to post-implementation.

Table 7.13: Dietary practices at school of the teachers at pre- and post-implementation in the treatment and control schools (N = 23)

How often do you buy these items from school tuck shop, shops or food vendors around the school:	Pre-implementation						Post-implementation					
	Never n (%)	1 time a month n (%)	2-3 times a month n (%)	1-2 times a week n (%)	3-4 times a week n (%)	5+ times a week n (%)	Never n (%)	1 time a month n (%)	2-3 times a month n (%)	1-2 times a week n (%)	3-4 times a week n (%)	5+ times a week n (%)
Food or beverage												
Treatment school	-	4 (33.3)	0 (0.0)	2 (16.7)	6 (50.0)	-	0 (0.0)	2 (20.0)	1 (10.0)	0 (0.0)	7 (70.0)	-
Control school	-	4 (36.4)	1 (9.1)	4 (36.4)	2 (18.2)	-	1 (10.0)	1 (10.0)	2 (20.0)	5 (50.0)	1 (10.0)	-
Candy, chips, cookies or fat cakes												
Treatment school	1 (8.3)	1 (8.3)	1 (8.3)	1 (8.3)	8 (66.7)	0 (0.0)	0 (0.0)	-	-	1 (10.0)	9 (90.0)	0 (0.0)
Control school	0 (0.0)	1 (9.1)	1 (9.1)	3 (27.3)	4 (36.4)	2 (18.2)	2 (20.0)	-	-	3 (30.0)	3 (30.0)	2 (20.0)
Bread, fruits or vegetables												
Treatment school	3 (25.5)	1 (8.3)	0 (0.0)	1 (8.3)	6 (50.0)	1 (8.3)	0 (0.0)	2 (20.0)	0 (0.0)	0 (0.0)	7 (70.0)	1 (10.0)
Control school	0 (0.0)	1 (9.1)	3 (27.3)	0 (0.0)	3 (27.3)	4 (36.4)	1 (10.0)	3 (30.0)	1 (10.0)	1 (10.0)	3 (30.0)	1 (10.0)
Cold drinks like Oros and wild Island												
Treatment school	1 (8.3)	1 (8.3)	2 (16.7)	0 (0.0)	8 (66.7)	0 (0.0)	0 (0.0)	0 (0.0)	1 (10.0)	1 (10.0)	8 (80.0)	0 (0.0)
Control school	1 (9.1)	0 (0.0)	2 (18.2)	1 (9.1)	6 (54.6)	1 (9.1)	3 (30.0)	1 (10.0)	1 (10.0)	1 (10.0)	2 (20.0)	2 (20.0)
100% fruit juice, bottled water, low fat milk drinks												
Treatment school	3 (25.5)	2 (16.7)	0 (0.0)	1 (8.3)	6 (50.0)	0 (0.0)	0 (0.0)	1 (10.0)	-	0 (0.0)	8 (80.0)	1 (10.0)
Control school	1 (9.1)	2 (18.2)	2 (18.2)	2 (18.2)	1 (9.1)	3 (27.3)	1 (10.0)	3 (30.0)	-	1 (10.0)	3 (30.0)	2 (20.0)

Table 7.14: Classroom food practices of the teachers at pre- and post-implementation at both schools (N = 23)

Would you:	**Pre-implementation**				**Post-implementation**			
	Likely n (%)	**Some what Likely n (%)**	**Not likely n (%)**	**Uncertain n (%)**	**Likely n (%)**	**Some what Likely n (%)**	**Not likely n (%)**	**Uncertain n (%)**
use foods such as fat cakes, cakes, cookies, candies, chocolates and ice-cream as reward, incentive or special treat for learners?								
Treatment school	19 (8.3)	3 (25.0)	7 (58.3)	1 (8.3)	1 (10.0)	0 (0.0)	6 (60.0)	3 (30.0)
Control school	2 (18.2)	0 (0.0)	9 (81.8)	0 (0.0)	1 (10.0)	2 (20.0)	6 (60.0)	1 (10.0)
use fruits, vegetables, 100% fruit juice, low fat yoghurt, roast peanut as reward, incentive or special treat for learners?								
Treatment school	7 (58.3)	3 (25.0)	2 (16.7)	0 (0.0)	5 (50.0)	4 (40.0)	1 (10.0)	-
Control school	7 (63.6)	2 (18.2)	1 (9.1)	1 (9.1)	5 (50.0)	4 (40.0)	1 (10.0)	-
praise learners when you see them eating foods that are healthy choices, such as fruit or low fat snack items? Treatment school	6 (50.0)	3 (25.0)	3 (25.0)	0 (0.0)	8 (80.0)	2 (20.0)	-	-
Control school	8 (72.7)	2 (18.2)	0 (0.0)	1 (9.1)	8 (80.0)	2 (20.0)	-	-
eat lunch or break snacks with learners?								
Treatment school	2 (16.7)	4 (33.3)	6 (50.0)	0 (0.0)	4 (40.0	2 (20.0)	3 (30.0)	1 (10.0)
Control school	2 (18.2)	2 (18.2)	6 (54.5)	1 (9.1)	4 (40.0	2 (20.0)	4 (40.0	0 (0.0)
include information on nutrition and healthy eating as part of your lesson plans								
Treatment school	9 (75.0)	3 (25.0)	-	-	8 (80.0)	1 (10.0)	1 (10.0)	-
Control school	11 (100)	0 (0.0)	-	-	9 (90.0)	1 (10.0)	0 (0.0)	-

7.3.2.4 School wide food practices of the teachers at pre- and post-implementation

With respect to school wide food practices, the viewpoints of the teachers in both schools at pre- and post-implementation are presented in table 7.15. The teachers' views were consistent with healthy eating in most of the school wide food practices statements. The teachers' options to the statements were plotted on a bar graph to show a clearer understanding of the pattern from pre- to post- implementation. Figure 7.7 presents the teachers' views on the importance of the schools having a written school nutrition policy that addresses food related issues such as food in the classroom or food selections in tuck shops. All the treatment school teachers and 90% of the control school teachers agreed at pre- and post-implementation that schools should have a written school nutrition policy that addresses food related issues. One teacher in the control school strongly disagreed with this statement at pre- and post-implementation.

Figure 7.8 shows the teachers' views on the eating behaviours of teachers influencing the eating behaviours of learners. While one of the treatment school teachers disagreed to this statement, one of the control school teachers was uncertain about it at pre-implementation. The rest of the teachers, i.e. 92% of the treatment school and 91% of the control school teachers, agreed at pre- and post-implementation that the eating behaviours of teachers could influence the eating behaviours of learners.

The teachers' views on the fact that NE should give learners the skills to make healthy food choices are presented in figure 7.9. The teachers in the treatment school (83%) and all the teachers in the control school agreed at pre-implementation that NE should give learners the skills to make healthy food choices. The percentage increased to 100% with the treatment school teachers and that of the control school remained 100% at post-implementation.

Table 7.15: School wide food practices of teachers at pre- and post-implementation at both schools (N = 23)

Statements	Pre-implementation					Post-implementation				
	Strongly disagree n (%)	**Disagree n (%)**	**Uncert-ain n (%)**	**Agree n (%)**	**Strongly agree n (%)**	**Stron-gly disagre e n (%)**	**Disagree n (%)**	**Uncert-ain n (%)**	**Agree n (%)**	**Strong-ly agree n (%)**
School prepared lunches are healthy										
Treatment school	-	0 (0.0)	5 (41.7)	5 (41.7)	2 (16.7)	1 (10.0)	0 (0.0)	3 (30.0)	3 (30.0)	3 (30.0)
Control school	-	1 (9.1)	1 (9.1)	7 (63.6)	2 (18.2)	1 (10.0)	2 (20.0)	0 (0.0)	4 (40.0)	3 (30.0)
School lunch should include more fruits and vegetables										
Treatment school	1 (8.3)	-	-	3 (25.0)	8 (66.7)	-	0 (0.0)	1 (10.0)	4 (40.0)	5 (50.0)
Control school	0 (0.0)	-	-	7 (63.6)	4 (36.4)	-	1 (10.0)	0 (0.0)	1 (10.0)	8 (80.0)
Selling high fat, high sugar foods, such as candies and cookies, as part of school fund-raising is okay because it helps provide revenue for school programs and school activities										
Treatment school	4 (33.3)	3 (25.0)	2 (16.7)	2 (16.7)	1 (8.3)	4 (40.0)	3 (30.0)	2 (20.0)	1 (10.0)	-
Control school	6 (54.6)	3 (27.3)	1 (9.1)	1 (9.1)	0 (0.0)	6 (60.0)	2 (20.0)	2 (20.0)	0 (0.0)	-
It is important for schools to have a written school nutrition policy which addresses food related issues such as food in the classroom or food selections in tuck shops										
Treatment school	0 (0.0)	-	-	5 (41.7)	7 (58.3)	0 (0.0)	-	-	6 (60.0)	4 (40.0)
Control school	1 (9.1)	-	-	5 (44.5)	5 (44.5)	1 (10.0)	-	-	3 (30.0)	6 (60.0)
High fat and high sugar foods are used as reward and incentive in the classroom because learners prefer these kinds of foods										
Treatment school	3 (25.0)	4 (33.3)	1 (8.3)	3 (25.0)	1 (8.3)	2 (20.0)	5 (50.0)	1 (10.0)	2 (20.0)	0 (0.0)
Control school	8 (72.7)	1 (9.1)	2 (18.2)	0 (0.0)	0 (0.0)	5 (50.0)	3 (30.0)	1 (10.0)	0 (0.0)	1 (10.0)

Continued/…….

Table 7.15: School wide food practices of teachers at pre- and post-implementation at both schools (N = 23) continued

Statements	Pre-implementation					Post-implementation				
	Strongly disagree n (%)	Disagree n (%)	Uncert-ain n (%)	Agree n (%)	Strongly agree n (%)	Strong-ly disagre e n (%)	Disagree n (%)	Uncert-ain n (%)	Agree n (%)	Strong-ly agree n (%)
The eating behaviours of teachers influence the eating behaviours of learners										
Treatment school	-	0 (0.0)	1 (8.3)	6 (50.0)	5 (41.7)	-	-	-	5 (50.0)	5 (50.0)
Control school	-	1 (9.1)	0 (0.0)	4 (36.4)	6 (54.6)	-	-	-	3 (30.0)	7 (70.0)
The nutritional health of learners should be a school priority										
Treatment school	-	0 (0.0)	1 (8.3)	6 (50.0)	5 (41.7)	-	-	1 (10.0)	3 (30.0)	6 (60.0)
Control school	-	1 (9.1)	1 (9.1)	3 (27.3)	6 (54.6)	-	-			
Nutrition education should give learners the skills to make healthy food choices										
Treatment school	-	1 (8.3)	1 (8.3)	4 (33.3)	6 (50.0)	-	-	-	4 (40.0)	6 (60.0)
Control school	-	0 (0.0)	0 (0.0)	4 (36.4)	7 (56.5)	-	-	-	3 (30.0)	7 (70.0)
Learners should be able to buy soft drinks and candy at school										
Treatment school	1 (8.3)	3 (25.0)	7 (58.3)	1 (8.3)	-	1 (10.0)	5 (50.0)	2 (20.0)	2 (20.0)	-
Control school	3 (27.3)	3 (27.3)	3 (27.3)	2 (18.2)	-	3 (30.0)	3 (30.0)	2 (20.0)	2 (20.0)	-
It is important for schools to teach learners the basic skills of food preparation, so they can put nutrition knowledge into practice										
Treatment school	-	1 (8.3)	1 (8.3)	4 (33.3)	6 (50.0)	0 (0.0)	-	-	6 (60.0)	4 (40.0)
Control school	-	0 (0.0)	0 (0.0)	3 (30.0)	8 (80.0)	1 (10.0)	-	-	2 (20.0)	7 (70.0)

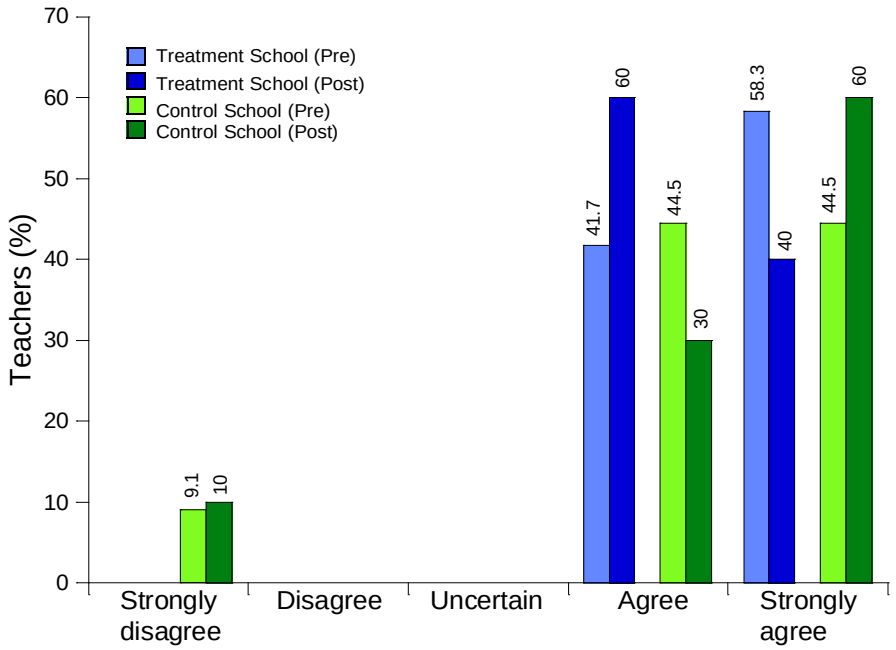


Figure 7.7: Teachers' views regarding the statement that the schools should have a written school nutrition policy that addresses food related issues in both schools (N = 23)

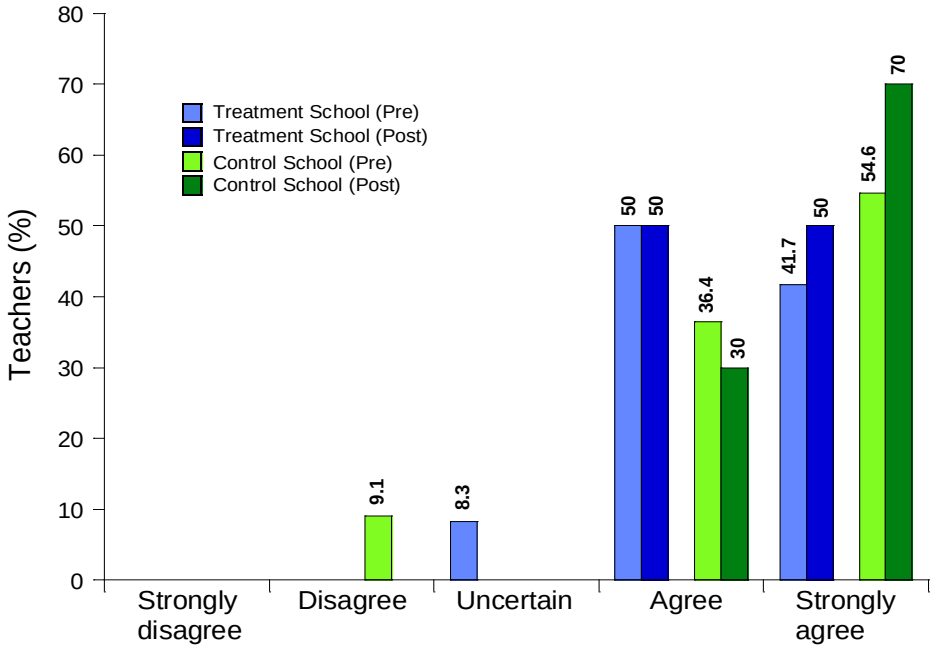


Figure 7.8: Teachers' views regarding the statement that eating behaviours of teachers influence the eating behaviours of learners in both schools (N = 23)

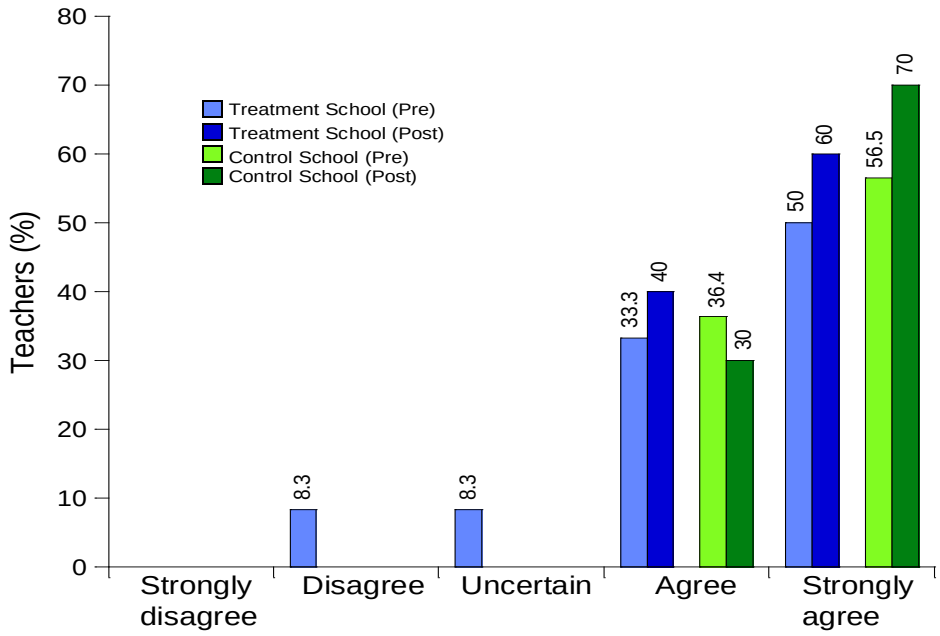


Figure 7.9: Teachers' views regarding the statement that nutrition education should give learners the skills to make healthy food choices in both schools (N = 23)

7.3.2.5 Practices in food hygiene of the teachers at pre- and post-implementation

The practices in food hygiene of the teachers at pre- and post-implementation are shown in table 7.16. The treatment school teachers (92%) always washed the fruits that must be peeled before eating at pre-implementation as did the control school teachers (73%). At post-implementation, the practice was slightly reduced among the treatment school teachers (90%), and increased among the control school teachers (80%). Regarding the practice of reading the instructions for use and for preservation written on food packages, 75% of the treatment school teachers always read the instructions while 25% sometimes did at pre-implementation, but at post-implementation 80% of the teachers always read the instructions while the percentage who sometimes read the instructions had reduced to 10% at post-implementation. Likewise, the percentage of control school teachers who always read food package instructions increased from 82% to 90%, and the percentage who sometimes read food package instructions reduced from 18% to 10% at pre- to post-implementation.

Table 7.16: Practices in food hygiene of the teachers at pre- and post-implementation in the treatment and control schools (N =23)

Hygiene practice statements	Pre-implementation			Post-implementation		
	Always n (%)	Sometimes n (%)	Never n (%)	Always n (%)	Sometimes n (%)	Never n (%)
When you buy packaged food, do you check the expiry date						
Treatment school	10 (83.3)	2 (16.7)	-	8 (80.0)	2 (20.0)	-
Control school	10 (90.9)	1 (9.1)	-	10 (100.0)	0 (0.0)	-
Do you read the instructions for use and for preservation written on the package						
Treatment school	9 (75.0)	3 (25.0)	-	8 (80.0)	1 (10.0)	1 (10.0)
Control school	9 (81.8)	2 (18.1)	-	9 (90.0)	1 (10.0)	0 (0.0)
Do you wash fruits that must be peeled before eating						
Treatment school	11 (91.7)	1 (8.3)	-	9 (90.0)	1 (10.0)	0 (0.0)
Control school	8 (72.7)	3 (27.3)	-	8 (80.0)	1 (10.0)	1 (10.0)
After using a glass of milk, do you put the milk in the fridge						
Treatment school	2 (16.7)	4 (33.3)	6 (50.0)	3 (30.0)	1 (10.0)	6 (60.0)
Control school	1 (9.1)	2 (18.2)	8 (72.7)	1 (10.0)	2 (20.0)	7 (70.0)

7.4 PROCESS EVALUATION

7.4.1 Evaluation of the workshop by the teachers

The frequency distribution of the teachers' responses regarding the workshop content, skills and knowledge acquired, workshop materials and instructors and the overall quality of the workshop were plotted on bar graphs. Ten (83%) of the twelve teachers, who were invited, participated in the workshop. Figure 7.10 shows the teachers' feedback regarding the workshop contents. Most (90%) of the teachers were of the view that the workshop objectives were clear, that the workshop contents were logically organised and developed, and that the pace of instruction was satisfactory. All the teachers indicated that the amount of time spent was fairly adequate. The teachers' responses regarding the skills and knowledge acquired in the workshop (figure 7.11) shows that most (90%) of the teachers felt that they both enhanced and acquired new skills and knowledge for teaching nutrition. The teachers (80%) indicated that the manual contributed to their learning, and all the teachers indicated that the instructors

gave clear and logical presentations (figure 7.12). Figure 7.13 shows the teachers' responses in respect of the overall quality of the workshop in which most (70%) of the teachers rated the quality of the workshop as good.

Comments (not reported in the questionnaires) were received from participants during the workshop and were used to make adjustments on the NE manual (chapter 5, section 5.4.7.1)

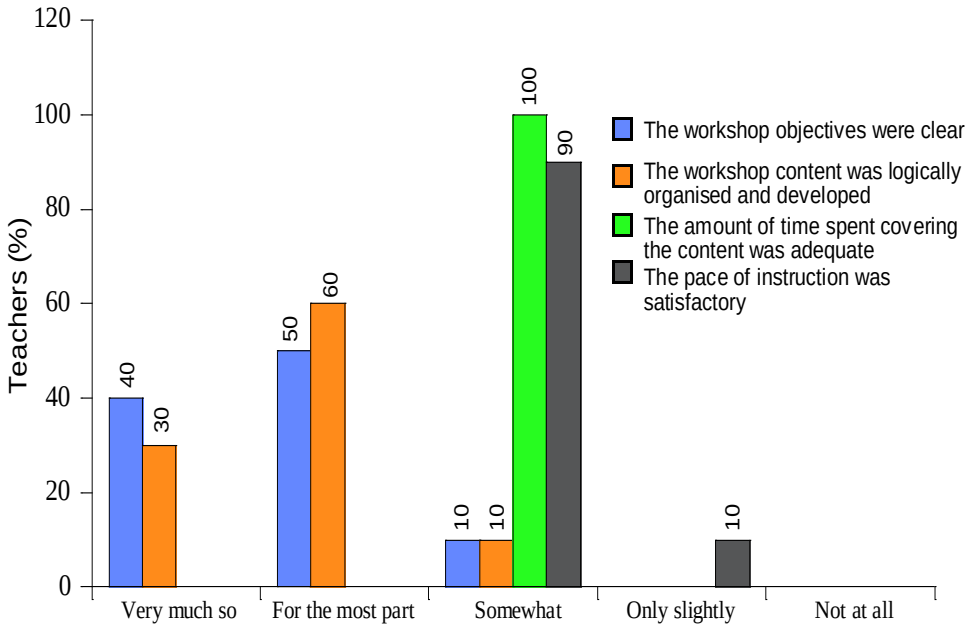


Figure 7.10: Teachers' responses regarding the workshop contents (N = 10)

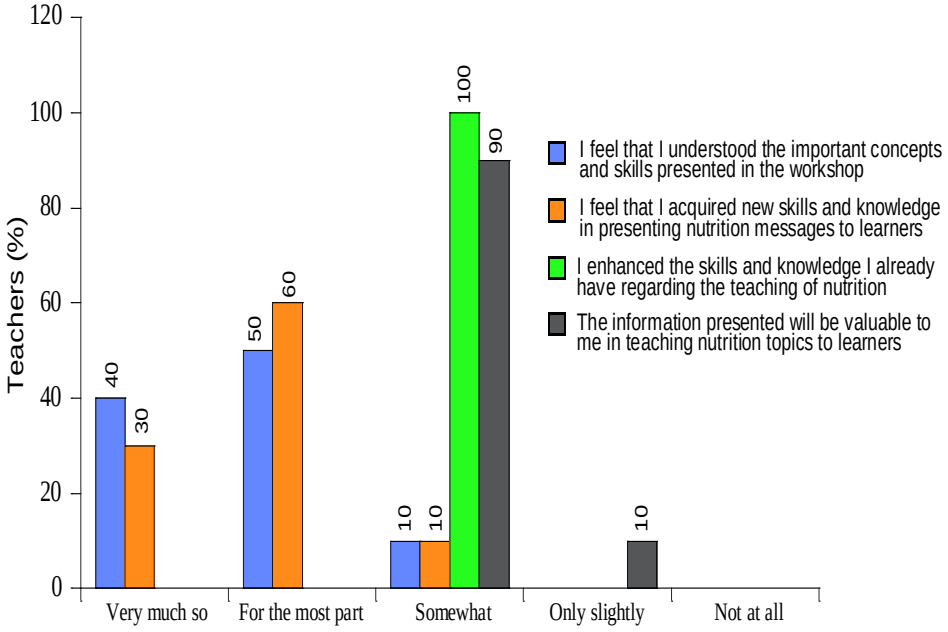
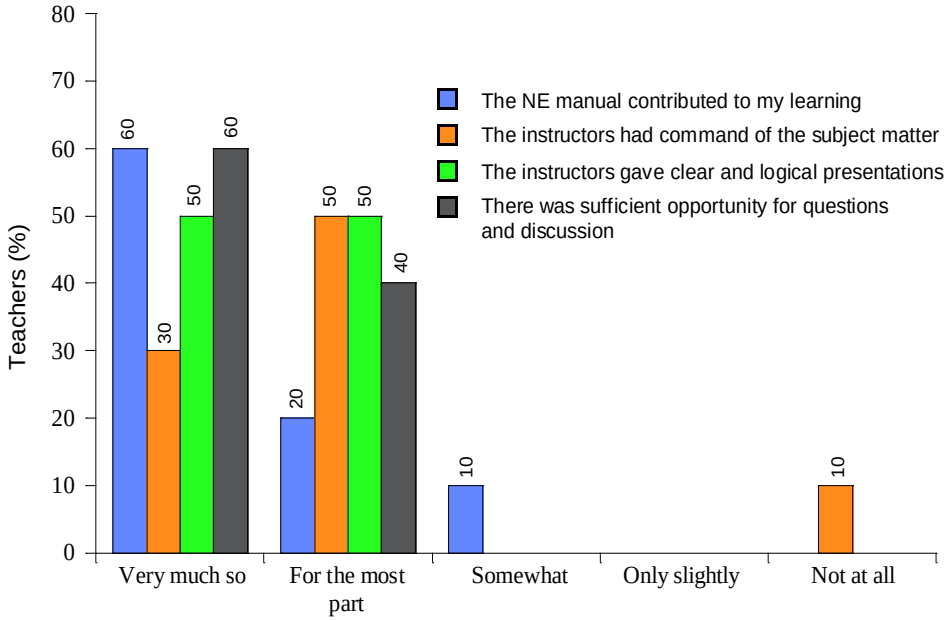
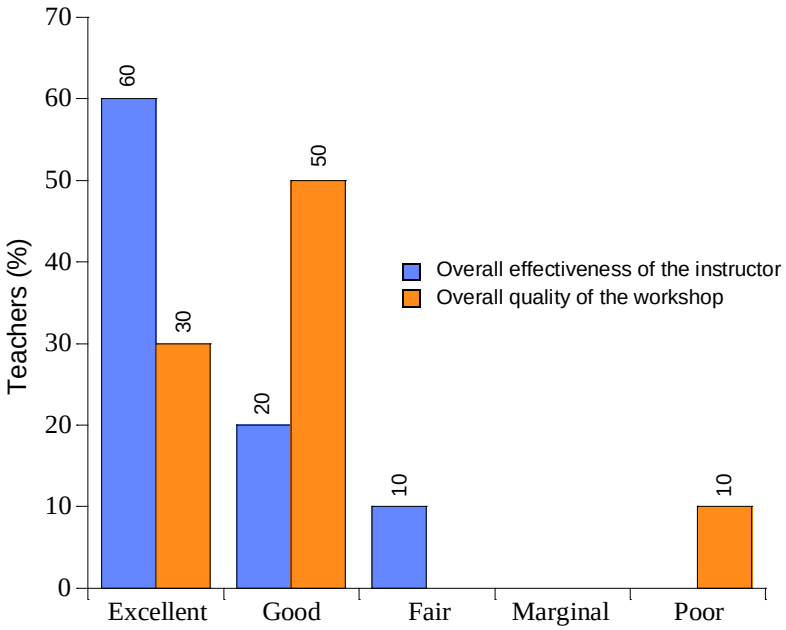


Figure 7.11: Teachers' responses regarding skills and knowledge acquired (N = 10)



Bar values were based on number of responses (e.g. 9 out of 10 teachers responded to the question "The manual contributed to my learning")

Figure 7.12: Teachers' responses regarding workshop materials and instructors (N = 10)



Bar values were based on number of responses (e.g. 9 out of 10 teachers responded to the question on "The overall effectiveness of the instructor")

Figure 7.13: Teachers' responses regarding the overall quality of the workshop (N = 10)

7.4.2 Evaluation of the implementation of the nutrition education programme by the teachers

The teachers' responses to the Likert type questions and their views were summarised and described deductively. The findings were reported in terms of completeness, fidelity, dose and reach of the implementation (Moore et al. 2012), and are presented in table 7.17. Completeness assessed the extent to which the content of the contextual NE manual was implemented as it had originally been planned (Androutsos et al. 2014). Fidelity measured the extent to which the NEP implementation was in compliance with the order in which the lessons were to be delivered (Yamada et al. 2010). The dose refers to the amount of the NEP components that was delivered by the teachers and received by the learners (Androutsos et al. 2014). The extent of completion of tasks was measured in terms of the dose delivered by the teachers, and the dose received by the learners and was expressed in percentages. The teachers' responses to the different questions were similar on all the different nutrition topics with the exception of two questions. The question that enquired whether the sub-topics adequately addressed what learners should know on the topic was answered with agree or strongly agree options by the teachers. The teachers explained that the features of the manual enhanced the learners' understanding of the subjects.

The other questions to which all the teachers agreed or strongly agreed included: the use of icons helped to make presenting nutrition messages more meaningful; the posters used were appropriate and helpful in illustrating the ideas about the topic; learners found the goal setting cards for the sub-topics easy to use and exciting; it was easy to use the manual; and the learner's work sheets for the sub-topics served the purpose of enhancing learners' reading skill. However, the question that enquired whether the learner's work sheet activities served the purpose of enhancing learners' reading skill was responded to with the disagree option by one teacher. The explanation was that the learners were too lazy to read and that the teacher's assistance was always needed to read for them. The teachers all indicated "disagree" to the questions enquiring whether the allotted time was enough to cover the important things learners needed to know about the topics. The teachers explained that there were many important things to cover and that the time was too short. Moreover, school programmes and or other extra-curricular assignments that teachers sometimes had, were often shared with the time allotted for teaching the nutrition lessons.

The implementation completeness was assessed from the teachers' responses to the allotted time for the teaching of the nutrition topics. All the sub-topics were taught in all five topics but the lessons were not implemented as planned. In respect of the fidelity of the implementation, though all the lessons were delivered, the outline of the NE manual was not strictly followed because of time constraints. The dose of the implementation was measured in terms of the number of lessons completed by the teachers and the number of the class activities completed by the learners. The dose delivery was 100% in all the topics, except in the topic on food processing where the dose delivery was 71%. All the lessons for the sub-topics of the main topics (i.e. healthy eating for children, nutrients in food, nutrition and food processing) were taught as reported by the teachers. The dose received by the Grade 5 learners in respect of the topic on healthy eating for children (Grade 5) could not be assessed because the engagement of the activities by all the learners in all the classes were not monitored by the teachers. However, the dose received by the Grade 6 learners in respect of the topics on nutrients in food, nutrition, food processing and food hygiene was 50%, 13%, 9% and 41% respectively. The reach of the implementation was assessed by the number of the learners who received the learner's work book and participated in the lessons. A total of 391 (figure 7.2) which comprised Grades 5 learners (218) and 6 learners (173) on the class register lists received a copy each of the learner's work books and participated in the nutrition lessons. The learners' actual attendance to the lessons was recorded by an attendance register.

Table 7.17: Summary of the teachers' evaluation of the implementation of the nutrition education programme in the one-on-one interviews (N = 5)

Evaluation indices / Topics	Healthy eating for children	Nutrients in food	Nutrition	Food processing	Food hygiene
Completeness (were all the lessons implemented as planned?)	The lessons were not all implemented as planned because of time constraints	The lessons were not all implemented as planned because of time. Some of the allotted periods for the lessons were lost to school programmes	The lessons were not all implemented as planned. The topics were taught briefly in order to make up for the periods lost to other school programmes	The lessons were not implemented as planned. The practical classes could not be conducted for each class as planned	The lessons were not all implemented as planned. Teachers had to rush through the lessons in order to finish within the allotted time
Fidelity (were the implementation in conformity with the outline of the NE manual?)	The lessons were all delivered but the group discussions and work sheets activities were done haphazardly	The lessons were all delivered but learners could not complete all the group discussions and work sheets. The posters were not used at all	The lessons were all delivered but the learners could not complete all the group discussions and the work sheet activities	Not all the lessons were delivered and the ones taught were taught briefly with the learners not being able to do most of the work book activities	The lessons were all taught briefly with more attention on the demonstration on hand washing procedure
Dose delivered (how many of the lessons were taught?)	The three lessons were delivered as reported by the teacher (dose = 100%)	All five lessons were delivered as reported (dose delivered = 100%)	All four lessons were delivered as reported by the teacher (dose delivered = 100%)	Five out of seven lessons were delivered as reported by the teacher (dose delivered = 71%)	The teachers delivered all the four lessons (dose delivered = 100%)

Continued/…….

Table 7.17: Summary of the teachers' evaluation of the implementation of the nutrition education programme in the one-on-one interviews (N = 5) continued

Dose received (how much of the implementation was received by learners?)	Although group discussions, goal setting and work sheet activities were done by learners, they were not monitored by the teachers. As a result some learners did the exercises while some did not	Two group discussions out of five and three work sheet activities out of five were done by learners (dose received = 50%)	Learners were only able to do one work sheet activity out of four and could not do any of the four group discussions (dose received = 13%)	Learners were only able to do one out of three practical sessions, and could not do any of the four group discussions or any of the four work sheet activities (dose received = 9%)	Three teachers taught this topic; the learners were therefore in three groups. The class activities comprised four group discussions and four work sheet activities. Group one did one group discussion and three work sheet activities, group two and three only did three and two work sheet activities respectively (dose received = 41.6%)
Reach (how many of the learners received the lessons?)	All the learners in Grade 5 received the learners work book and participated in nutrition lessons taught by using the NE manual	All the learners in the five classes of Grade 6 received the learners work book and participated in the nutrition lessons taught by using the NE manual	All the learners in the five classes of Grade 6 received the nutrition lessons taught by using the NE manual	All the learners in the five classes of Grade six received the nutrition lessons taught by using the NE manual	All the learners in Grade six were taught the topic using the NE manual

7.4.3 Perceptions of the teachers on the impact of the implementation of the nutrition education programme on their teaching of nutrition

The opinions of the teachers on the impact of the implementation of the NEP on their teaching of nutrition were explored in three areas. The areas were teachers' perceptions of the manual, teachers' perceptions of the supporting materials and activities and recommendations for improvement. Selected quotes designated with the teachers' participating number (e.g. P2 – participant 2) were used to explain and support the results.

7.4.3.1 Perceptions of the nutrition education manual by the teachers

The perceptions of the manual by the teachers evolved into three main themes, which were the description of the contextual NE manual; the impact of the use of the manual on the learners' eating behaviours and the contrast between the manual and DoBE recommended textbooks. Direct quotes from the teachers (Table 7.18) substantiate the results.

The teachers described the manual as being rich in information and well laid-out with nutrition concepts well illustrated in colourful pictures (P5). It was explained how the pictures on the cover page gave messages about what to expect in the manual and were relevant to the learners' environment. The manual was described as easy to use and to understand (P2).

The teachers' viewed the impact that the teaching of nutrition by using the NE manual may have on the learners' eating behaviours in different ways. The learners were believed to have gained nutrition knowledge which could be useful to them for future use (P4). The teachers expressed the fact that the learners' low economic background and the inadequate time for teaching nutrition could limit the impact of the NEP on the learners' eating behaviour (P3). However, the teachers perceived that the learners were impacted to some extent by those practical demonstrations in which they participated in class, and which they could implement in their homes, for example the effective hand washing demonstration.

In contrast to the DoBE recommended textbooks for nutrition topics, the NE manual was assessed by the teachers to have more information relevant to the learners' situation, used step by step explanations with illustrations and practical classes (P1, P4).

Table 7.18: Teachers' quotes regarding the description of the contextual nutrition education manual

Sub-themes	Teachers' quotes
Description of the contextual NE manual	*"As for me the content is correct, it is at the level of understanding of the learners, the information is adequate. It has bright pictures for our learners who appreciate colours of the foods that are discussed in lessons."* – P5. *"It is easy to use the manual and to understand. The mere looking at the manual with the colourful pictures makes it easy to use it to teach. It is very easy to understand.*" – P2.
Impact of the use of the manual on the learners' eating behaviours	"*It will help learners to know what they didn't know before. If they couldn't practise what they know now because they couldn't afford the foods, they will be able to use the knowledge to benefit their lives in future.*" – P4. "*For learners to be able to use what they learnt in class to benefit their lives, more time was needed for the lessons. There was need to do more demonstration and practical classes which take time."* – P3.
Contrast between the manual and DoBE recommended textbooks	"*The manual gave us more information than the textbooks that we were using. Like the textbooks were not explaining step by step what must be done as this manual presented step by step on what must be done with side by side pictures."* – P1. "*The manual was more practical..... Moreover the foods mentioned in the manual were what the learners were familiar with which they also used in their homes*." – P4.

7.4. 3.2 Perceptions of the teachers on the supporting materials and activities

The teachers' perception of the supporting materials and the activities accompanying the NE manual was discussed in respect of the following: the usefulness of the posters and picture book in teaching the nutrition lessons; the influence of goal setting on learners' eating behaviours; the influence of work sheet activities on learners' understanding; the influence of

group discussions on learners' understanding and the parts of the lesson that the learners enjoyed the most. (The teachers' direct quotes are presented in table 7.19.)

The posters and the picture book were viewed as complementary to the manual as helping to consolidate the nutrition messages thereby making teaching effective (P2). The goal setting activity was perceived by the teachers as an exercise in which the learners had to make decisions over which they had no control (P5). Learners only ate what the parents provided, and some learners depended on foods they got from the school as there might be no food at their homes. The teachers therefore reasoned that the exercise was unlikely to influence the learners' eating behaviours positively.

The learners' practices in the purchase of unhealthy choices of foods around the school with the small amount of money they brought to school were discussed. It was reported that the food vendors complied with the instruction to sell healthy choice of foods such as fruits. Despite this development, the learners' purchases of unhealthy choice of foods did not change much because learners took pride in these practices.

The work sheet activities were also perceived as not being able to influence learners' understanding very much. The reason was that the learners preferred non-writing activities such as an acrostic, drawing and merging pictures with words all of which were very few in the learner's work book (P4, P3). The problem-based group discussions presented opportunity for learners to learn from each other. In addition, the classroom demonstrations and practical sessions gave opportunities for learners to work in groups (P2).

The parts of the lessons that learners enjoyed the most included consequences of a poor diet which learners made fun about (P3). Teachers reported how every learner wanted to participate in the practical sessions and demonstrations and that the learners drew their future aspirations with excitement (P1, P4).

Table 7.19: Teachers' quotes regarding perceptions of the supporting materials and activities

Sub-themes	Teachers' quotes
Usefulness of the posters and picture book in teaching the nutrition lessons	*"The picture book was helpful because when we taught the lessons we used the pictures in the picture book to show learners examples. The posters were also helpful in that it enabled us to show to the learners what we have mentioned in the lesson."* – P2.
Influence of goal setting on learners' eating behaviours	"*For learners to set their goals was difficult for them because they didn't have choice, it was what their parents gave that they would eat.*" – P5.
Influence of work sheet activities on learners' understanding	"*The work sheets required more of writing which our learners do not like so much. Our learners like to cut and paste pictures and also drawing rather than writing.*" – P4 "*The exercise involving the crossword puzzle in the food hygiene topic was completed within few minutes by the learners, it was the kind of the activities they liked to do."* – P3
Influence of group discussions on learners' understanding	"*The group discussion helped them to learn, because they have opportunity to share ideas and learn from the ideas of the other members of the group."* – P2
Parts of the lesson that the learners enjoyed the most	"*The learners got excited and made fun about the consequences of eating unhealthy diets. This might lead them to want to change behaviour*." – P3 "*The part of demonstrating effective washing of hands was very interesting for learners, they had said we thought when we wet our hands it was fine, ... They saw that wetting of hands was not fine when we did the demonstration.*" – P1 *"As for the aspect about learners drawing their aspiration, the learners enjoyed that aspect and they did the exercise with excitement."* – P4

7.4. 3.3 Recommendations of the teachers for improvement

Three themes, namely the teachers' decision on the continuation of the use of the manual, the strengths of the manual and suggestions for improvement emerged from the discussion on the teachers' recommendations for improvement. (The teachers' direct quotes are presented in table 7.20). The teachers expressed the fact that they would like to continue to use the manual to teach nutrition. Various reasons were given for their decision, including the manual's clear outline, attractive design and simple language; its practical orientation and its ease of use. In addition, the content was in line with the existing curriculum and the messages were implementable (P4, P3).

Table 7.20: Teachers' quotes regarding recommendations for improvement

Sub-themes	Teachers' quotes
Teachers' decision on continuation of use of the manual	*"Yes, I would like to continue to use this manual. What I liked in the manual is the colourful pictures and the language with which it is written which is understandable both for the teachers and the learners."* – P4. "*If ever it was my choice, I will like that all the other aspects in NST be like this manual. Because the manual was easy when I was using it to teach and again it is more practical oriented. The manual does not require you to go and search the meaning of some things elsewhere before coming to explain to the learners.*" – P3.
Strength of the manual	"*It is valuable in the sense that it taught learners what could practically be done. Even if they were not able to implement some of the things because of their low economic background, they could have the knowledge with them and use in the future."* – P4
Suggestions for improvement	"*Let there be more activities in the learners' work book so the teachers can have options from which to pick more important activities for learners to do."* – P3 "*Let there be improvement in the quality of the posters, they can be laminated so they can last longer."* – P1 "*In addition, the posters can be put together i.e. a flipchart so that the teacher can come to the class with it to teach the learners*." – P4

The strengths of the manual that were emphasised by the teachers were that the messages of the manual were implementable and that the attractive presentation with illustrations, made teaching meaningful (P4).

For improvement of the manual, the teachers suggested that the learner's work book should include more learner activities to choose from, and should feature more of hands-on activities (P3). In addition, lamination of the posters to improve the quality and combining the posters into a flipchart were suggested (P1, P4).

7.5 NUTRITION KNOWLEDGE, ATTITUDES AND DIETARY PRACTICES OF LEARNERS

7.5.1 Nutrition knowledge and attitudes of the learners

Table 7.21 presents the mean total nutrition knowledge scores for the learners at pre- and post-implementation for both schools. There was a significant difference (P = 0.001) between the treatment and control schools in the difference in the mean percentage scores for total nutrition knowledge from pre- to post-implementation.

The mean percentage scores for the categories of nutrition knowledge of the learners are shown on table 7.22. At pre-implementation, results of the ANOVA showed significant differences in three categories of nutrition knowledge. The control school had significantly higher mean scores than the treatment school in the category on food nutrients and functions (52.7 ± 26.9% against 48.8 ± 24.5%, P = 0.013), in the category on nutrient deficiency (63.5 ± 32.8% against 55.5 ± 33.1, P = 0.002) and in the food choices category (66.1 ± 26.6% against 57.1 ± 24.4%, P = <0.001).

At post-implementation, estimation of differences in the total nutrition knowledge scores between the schools by the random effects GLS regression indicated that the treatment school had a significantly higher mean score than the control school (53.2 ± 16.9 against 53.1 ± 17.6, P = 0.001). The treatment school had significantly higher mean scores than the control school for the category on food and energy (77.9 ± 26.5% against 67.6 ± 30.6%, P = <0.001) and for the category on sources of nutrients (36.4 ± 22.6% against 32.8 ± 18.7%, P = 0.02). However, the control school still had a significantly higher mean score than the treatment school for the category on food nutrients and functions (53.4 ± 23.4% against 46.6 ± 22.1%, P = 0.0006). Estimation of the differences between the schools from pre- to post-implementation by the random effects GLS regression indicated that the treatment school had significantly higher

mean percentage scores than the control school for the category on food and energy ($P < 0.001$), for the category on nutrient deficiency ($P = 0.008$) and for the category on sources of nutrients ($P = 0.002$).

Table 7.21: Comparison of the mean % total nutrition knowledge score (on all categories) of the learners at pre- and post-implementation between the schools (N = 681)

Schools	Learners (n)		Mean % ± SD		[1]Mean change %	[2]P-value	[3]P-value*
	Pre	Post	Pre	Post			
Treatment	350	327	48.3 ± 14.5	53.2 ± 16.9	4.9	<0.001***	0.001**
Control	331	317	53.2 ± 16.7	53.1 ± 17.6	-0.1	0.96	

[1]Discrete change from the base level derived from random effects GLS regression (post-implementation score minus pre-implementation score)
[2]Within school difference
[3]Difference between the mean changes between schools from pre- to post-implementation derived from random effects GLS regression
One sided test, **P<0.01, ***P<0.001

Table 7.22: Comparison of the mean % scores for the categories of nutrition knowledge of the learners from pre- to post-implementation between the schools (N = 681)

Nutrition knowledge categories	Pre-implementation			Post-implementation			[2]Pre-post P-value
	Treatment school (n =350) (% Score)	Control school (n =331) (% Score)	*P-value	Treatment school (n =327) (% Score)	Control school (n =317) (% Score)	[1]P-value	
Food nutrients and functions	48.8 ± 24.5	52.7 ± 26.9	0.013*	46.6 ± 22.1	53.4 ± 23.4	0.0006***	0.192
Food and energy	68.3 ± 29.5	70.6 ± 31.2	0.284	77.9 ± 26.5	67.6 ± 30.6	<0.001***	<0.001***
Nutrient deficiency	55.5 ± 33.1	63.5 ± 32.8	0.002**	62.0 ± 32.3	61.2 ± 33.8	0.39	0.008**
Food choices	57.1 ± 24.4	66.1 ± 26.6	<0.001***	63.4 ± 26.7	67.6 ± 27.9	0.25	0.073
Sources of nutrients	30.0 ± 17.0	32.5 ± 17.8	0.115	36.4 ± 22.6	32.8 ± 18.7	0.02*	0.002**

[1]Difference between schools derived from analysis of variance
[2] Difference of between schools changes from pre- to post-implementation derived from random effects GLS regression
One sided test, **P<0.01, ***P<0.001

Within school differences in the categories of the learners' nutrition knowledge from pre- to post-implementation and the coefficient of difference as estimated by the random effects GLS regression are presented in table 7.23. The mean percentage scores for the treatment school significantly increased for four categories of nutrition knowledge, namely food and energy ($P < 0.001$), nutrient deficiency ($P = 0.009$), food choices ($P = 0.001$) and sources of nutrients ($P < 0.001$). The control school also showed an increases in mean percentage scores for the categories on food nutrients and functions, food choices and sources of nutrients, but the changes were not significant ($P = 0.558$, $P = 0.336$, $P = 0.813$).

The results of ANOVA and the random effects GLS regression on the mean percentage score of the learners' attitudes in the treatment and control schools are shown in table 7.24. There was no significant difference at pre-implementation, but at post-implementation the treatment school had a significantly higher mean score than the control school ($63.9 \pm 19.7\%$ against $56.8 \pm 19.6\%$, $P < 0.001$). The random effects GLS regression estimation of difference from pre- to post-implementation showed that the dietary attitudes mean percentage score for the treatment school was significantly higher than that of the control school ($P = 0.002$).

Table 7.25 shows the random effects GLS regression analysis for within schools differences in the mean scores of the learners' dietary attitudes. Both the treatment and the control schools had higher mean scores from pre- to post-implementation with the mean change of 6.9 and 1.1 respectively. While the within school difference for the treatment school showed a significant difference ($P < 0.001$), that of the difference within the control school was not significant ($P = 0.419$).

Table 7.23: Differences in the mean % scores for the categories of nutrition knowledge within the schools from pre- to post-implementation among the learners (N = 681)

Nutrition knowledge categories	Schools	Learners		Mean % ± SD		[1]Mean change %	[2]P-value
		Pre (n)	Post (n)	Pre	Post		
Food nutrients and functions	Treatment	350	327	48.8 ± 24.5	46.6 ± 22.1	-2.2	0.222
	Control	331	317	52.7 ± 26.9	53.4 ± 23.4	0.8	0.558
Food and energy	Treatment	350	327	68.2 ± 29.5	77.9 ± 26.5	9.5	<0.001***
	Control	331	317	70.6 ± 31.2	67.6 ± 30.6	-2.9	0.168
Nutrient deficiency	Treatment	350	327	55.5 ± 33.1	61.9 ± 32.3	6.4	0.009**
	Control	331	317	63.5 ± 32.8	61.2 ± 33.8	-2.4	0.275
Food choices	Treatment	350	327	57.1 ± 24.4	63.4 ± 26.7	6.3	0.001**
	Control	331	317	66.1 ± 26.6	67.6 ± 27.9	1.7	0.336
Sources of nutrients	Treatment	350	327	30.0 ± 17.0	36.4 ± 22.6	6.4	<0.001***
	Control	331	317	32.5 ± 17.8	32.8 ± 18.7	0.3	0.813

[1]Discrete change from the base level derived from random effects GLS regression (post-implementation score minus pre-implementation score)
[2]P-value was derived from a random effects GLS regression taking into account missing values at post-implementation
One sided test, **P<0.01, ***P<0.001

Table 7.24: Comparison of the mean % scores for nutrition attitudes of the learners from pre- to post-implementation between the schools (N = 681)

Schools		Pre-implementation		Post-implementation			[2]Pre-post P-value
	N	Mean% ± SD	[1]P-value	N	Mean % ± SD	[1]P-value	
Treatment	350	56.9 ± 18.0	0.83	327	63.9 ± 19.7	<0.001***	0.002**
Control	331	55.7 ± 19.4		317	56.8 ± 19.6		

[1]Difference between schools derived from analysis of variance
[2] Difference of between schools changes from pre- to post-implementation derived from random effects GLS regression
One sided test, **P<0.01, ***P<0.001

Table 7.25: Differences in the mean % scores for nutrition attitudes within the schools from pre- to post-implementation among the learners (N = 681)

Schools	N		Mean% ± SD		[1]Mean change %	[2]P-value
	Pre	Post	Pre	Post		
Treatment	350	327	56.9 ± 18.0	63.9 ± 19.7	6.9	<0.001***
Control	331	317	55.7 ± 19.4	56.8 ± 19.6	1.1	0.419

[1]Discrete change from the base level derived from random effects GLS regression (post-implementation score minus pre-implementation score)
[2]P-value was derived from a random effects GLS regression taking into account missing values at post-implementation
One sided test, ***P<0.001

7.5.1.1 Learners' performance on the nutrition knowledge questions

A comparison of the performance of Grade 5 and Grade 6 learners in the treatment and control schools is shown in table 7.26. The random effects GLS regression analysis for difference between the mean scores for the total nutrition knowledge of Grades 5 and 6 learners in the treatment school showed that Grade 6 had a significantly higher mean scores than Grade 5 from pre- to post-implementation (P = 0.025). In the control school the mean scores of Grades 5 and 6 showed no significant differences from pre- to post-implementation (P = 0.122), though the mean score for Grade 5 was significantly higher than that of Grade 6 (56.3 ± 18.9% versus 49.1 ± 14.9%, P = 0.001) at post-implementation.

Table 7.26: Comparison of the mean % total nutrition knowledge score (on all categories) of Grades 5 and 6 learners at pre- and post-implementation in both schools (N = 681)

Grades/ Schools	Learners (n)		Pre		Post		[2]P-value
	Pre	Post	Mean % ± SD	[1]P-value	Mean % ± SD	[1]P-value	
Treatment school Grade 5	173	160	49.8 ± 15.1	0.061	48.8 ± 16.8	< 0.001***	0.025*
Grade 6	177	167	46.9 ± 13.8		57.5 ± 16.1		
Control school Grade 5	181	177	52.5 ± 17.5	0.386	56.3 ± 18.9	0.001**	0.122
Grade 6	150	140	54.1 ± 15.7		49.1 ± 14.9		

[1]Difference between Grades 5 and 6 scores derived from analysis of variance
[2]Difference of between Grades 5 and 6 changes from pre- to post-implementation derived from random effects GLS regression
One sided test, *P<0.025, **P<0.01, ***P<0.001

The results of the frequency distribution of learners' options for correct answers to the nutrition knowledge questions at pre- and post-implementation are shown in tables 7.27 and 7.28. The learners' performance at pre- to post-implementation did not follow a definite trend in either of the schools. While there were improvements (i.e. more learners answering correctly) from pre- to post-implementation in some questions, there were declines (i.e. fewer learners answering correctly) in others from pre- to post-implementation. The results for Grade 5 are presented separately from Grade 6 to show the learners' performance with respect to their Grades. Selected questions are presented in line graphs to show a clearer comparison between the pre- and post-implementation percentage. The selection was based on the implication of the question to the values of healthy eating.

The percentage of learners who correctly answered the question on salty food is good for health in the two schools and the change from pre- to post-implementation are presented in figure 7.14. In the treatment school, a lower percentage of learners in Grade 5 correctly answered the question (60% to 51%) at post-implementation, while a greater percentage of Grade 6 learners (47% to 52%) correctly answered the question at post-implementation. In the control school, the reverse was the case as the Grade 5 learners showed improvement (51% to 77%), while Grade 6 learners declined (83% to 52%). While Grade 5 of the treatment school showed a decline, Grade 6 showed an improvement, but in the control school, Grade 5 improved and Grade 6 declined.

Figure 7.15 shows the percentage of learners who correctly answered that foods like fat cakes, doughnuts and cakes do not give lots of energy with minerals and vitamins in the two schools at pre- and post-implementation. In the treatment school, at post-implementation, a higher percentage of both Grades 5 and 6 learners correctly answered that foods like fat cakes, doughnuts and cakes do not give lots of energy (57% to 64% and 62% to 77% respectively). In the control school, at post-implementation, the percentage of learners in Grades 5 who correctly answered that foods like fat cakes, doughnuts and cakes do not give lots of energy remained the same (64% to 64%), but that of Grade 6 declined (81% to 65%).

The percentage of learners who correctly answered that if we lack nutrients it would be hard for us to focus in class in the two schools at pre- and post-implementation are shown in Figure 7.16. The percentage of Grade 5 learners who correctly answered this question at post-implementation increased in the treatment school (56% to 59%) and in the control school (67% to 81%). The percentage of Grade 6 learners who answered correctly also increased in the treatment school (55% to 61%), but declined in the control school (65% to 59%).

Figure 7.17 presents the percentage of learners who correctly answered that it is necessary to wash vegetables like carrots before you eat them in the two schools at pre- and post-implementation. The percentage of Grade 5 learners who correctly answered this question at post-implementation increased in the treatment school (34% to 49%), but declined in the control school (64% to 61%). The percentage of Grade 6 learners who answered correctly in both schools increased at post-implementation (46% to 61% and 43% to 50%).

The percentage of learners who correctly answered that calcium is mostly found in milk in the two schools at pre- and post-implementation are shown in figure 7.18. Only the Grade 6 learners in the treatment school increased in the percentage of learners who correctly

answered this question at post-implementation (31% to 40%). The percentage of Grade 5 learners (46% to 31%) in the treatment school and Grades 5 (45% to 42%) and 6 learners (26% to 27%) in the control school, who correctly answered, declined at post-implementation.

In summary, Grade 5 learners in the treatment school improved in 12 questions out of the 23 knowledge questions, while Grade 6 learners improved in 22 questions. In the control school, Grade 5 improved in 13 of the 23 knowledge questions, while Grade 6 only improved in nine of the 23 questions. In respect of the questions that were related to the topic – "Healthy eating for children" which was the topic for Grade 5, Grade 5 learners in the treatment school improved in six out of the 14 questions, while Grade 5 in the control school improved in ten questions.

Table 7.27: Grade 5 learners (%) who correctly answered nutrition knowledge questions at pre- and post-implementation (N = 354)

Statements (response options; correct options underlined)	Pre-implementation		Post-implementation	
	Treatment Grade 5 (n = 173) n (%)	Control Grade 5 (n = 181) n (%)	Treatment Grade 5 (n = 161) n (%)	Control Grade 5 (n = 177) n (%)
Food nutrients and function				
Salty food is not good for health (True, false, don't know)	103 (59.5)	93 (51.4)	82 (50.9)	134 (75.7)
Food is important for growth (True, false, don't know)	132 (76.3)	125 (69.1)	110 (68.3)	155 (87.6)
All of these are signs of food borne disease except (Stomach pain, night blindness, vomiting and diarrhoea)	77 (44.5)	37 (20.4)	41 (25.5)	62 (35.0)
Sugar contains a lot of vitamins and minerals (True, false, don't know)	115 (66.5)	105 (58.0)	90 (55.9)	95 (53.7)
To which of the following has iodine been added (Bread, maize meal, salt and powdered milk)	56 (32.4)	42 (23.2)	33 (20.5)	43 (24.3)
Food and energy				
Energy to learn and play comes from (Food, air, water and don't know)	131 (75.7)	113 (62.4)	120 (74.5)	117 (66.1)
To keep a healthy body weight, we need to have a healthy eating plan and exercise (True, false, don't know)	137 (79.2)	143 (79.0)	131 (81.4)	141 (79.7)
Foods like fat cakes, doughnuts and cakes give lots of energy with minerals and vitamins (True, false, don't know)	99 (57.2)	116 (64.1)	103 (63.9)	113 (63.8)

Continued/…….

Table 7.27: Grade 5 learners (%) who correctly answered nutrition knowledge questions at pre- and post-implementation (N = 354) continued

Statements (response options; correct options underlined)	Pre-implementation		Post-implementation	
	Treatment Grade 5 (n = 173) n (%)	Control Grade 5 (n = 181) n (%)	Treatment Grade 5 (n = 161) n (%)	Control Grade 5 (n = 177) n (%)
Nutrient deficiency				
We will get sick more easily, if our body lacks nutrients (True, false, don't know)	85 (49.1)	123 (67.9)	85 (52.8)	105 (59.3)
If we lack nutrients it would be hard for us to focus in class (True, false, don't know)	96 (55.5)	122 (67.4)	95 (59.0)	143 (80.8)
Food that is high in fat can cause diseases (True, false, don't know)	118 (68.2)	115 (63.5)	96 (59.6)	111 (62.7)
Food choices				
Breakfast must consist of foods that are healthy choices (True, false, don't know)	145 (83.8)	143 (79.0)	123 (76.4)	150 (84.7)
Rice with fish and vegetables is a good mixed meal (True, false, don't know)	82 (47.4)	130 (71)	99 (61.5)	142 (80.2)
It is not necessary to wash vegetables like carrots before you eat them (True, false, don't know)	58 (33.5)	115 (63.5)	79 (49.1)	108 (61.0)
The best place to keep uncooked meat is (In the refrigerator, in the freezer, on the kitchen cabinet and don't know)	64 (36.9)	101 (55.8)	66 (40.9)	108 (61.0)
Foods can become contaminated with germs if we prepare foods in a dirty environment (True, false, don't know)	111 (64.1)	100 (55.2)	105 (65.2)	139 (78.5)

Continued/……...

Table 7.27: Grade 5 learners (%) who correctly answered nutrition knowledge questions at pre- and post-implementation (N = 354) continued

Statements (response options; correct options underlined)	Pre-implementation		Post-implementation	
	Treatment Grade 5 (n = 173) n (%)	Control Grade 5 (n = 181) n (%)	Treatment Grade 5 (n = 161) n (%)	Control Grade 5 (n = 177) n (%)
Sources of nutrients				
Food that is low in fat is (Watermelon, chocolate, ice cream and don't know)	83 (48.0)	96 (53.0)	76 (47.2)	95 (53.7)
Calcium is mostly found in (Fruit juice, cold drinks, milk and don't know)	79 (45.7)	81 (44.8)	50 (31.1)	74 (41.8)
Highly processed foods always contain more nutrients than minimally processed foods (True, false, don't know)	35 (20.23)	57 (31.9)	39 (24.2)	67 (37.9)
Which of the following cooking methods will retain more nutrients in vegetables? (Frying, boiling in water, steaming and roasting)	16 (9.3)	17 (9.4)	20 (12.4)	24 (13.6)
The following are the reasons for processing foods except (To prevent spoilage, to make them edible, to produce more convenient foods and to produce foods that prevent tooth decay)	47 (27.1)	38 (20.9)	45 (27.9)	31 (17.5)
The following are examples of highly processed foods except (Corn flakes, jam, margarine and samp)	35 (20.2)	71 (39.23)	24 (14.9)	12 (6.8)
Which foods contain a lot of fibre? (Brown bread, dry beans oats; milk, yoghurt, cheese; fish, chicken eggs; margarine, mayonnaise sunflower oil)	76 (43.9)	103 (56.9)	84 (52.2)	121 (68.4)

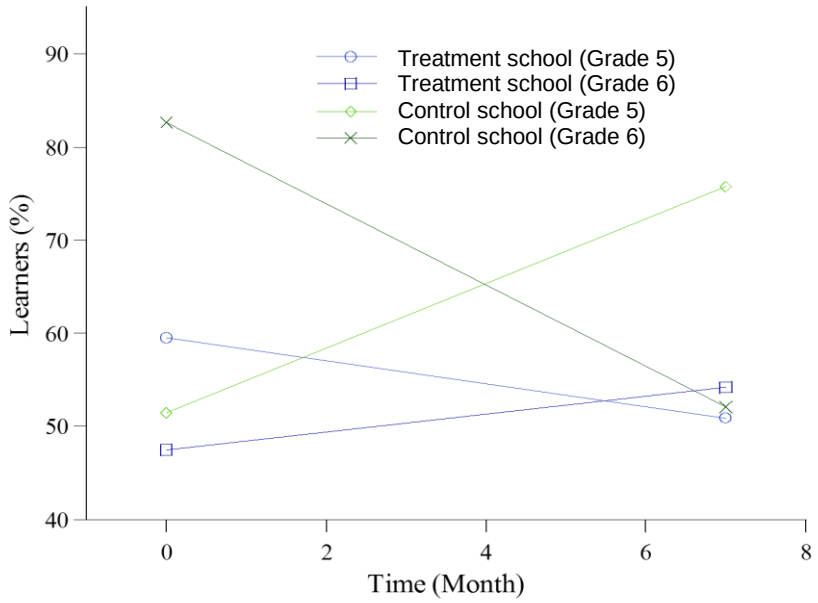


Figure 7.14: Learners (%) in both schools who correctly answered "Salty food is not good for health" at pre- and post-implementation (N = 681)

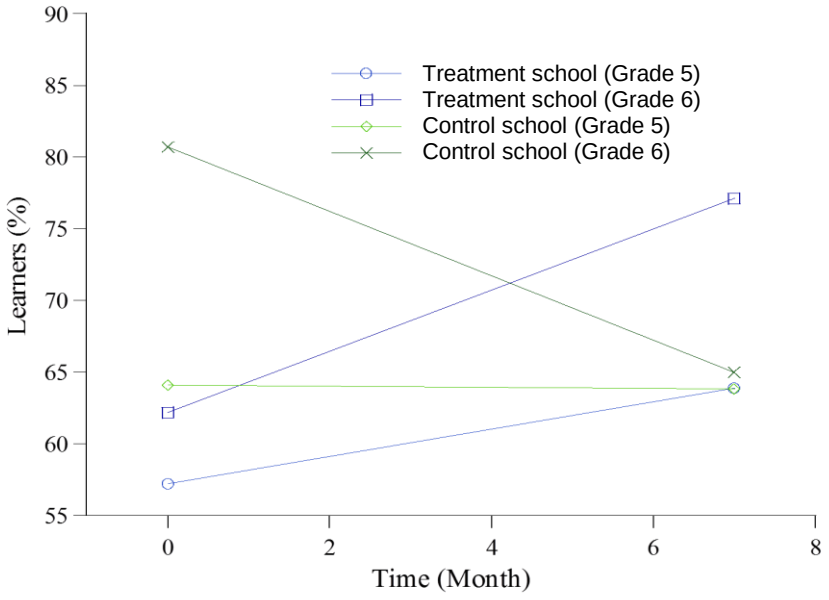


Figure 7.15: Learners (%) in both schools who correctly answered "Foods like fat cakes, doughnuts and cakes give lots of energy with minerals and vitamins" at pre- and post-implementation (N = 681)

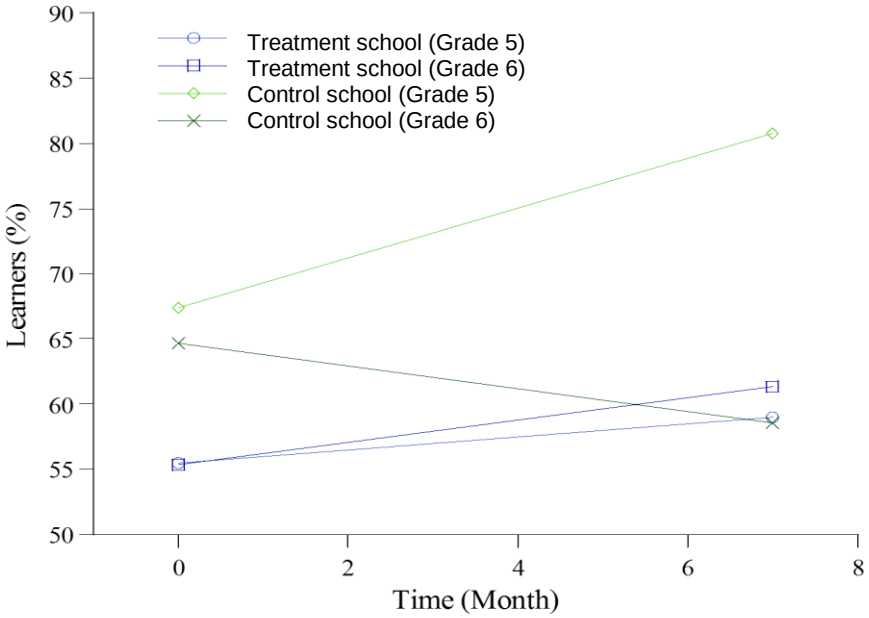


Figure 7.16: Learners (%) in both schools who correctly answered "If we lack nutrients it would be hard for us to focus in class" at pre- and post-implementation (N = 681)

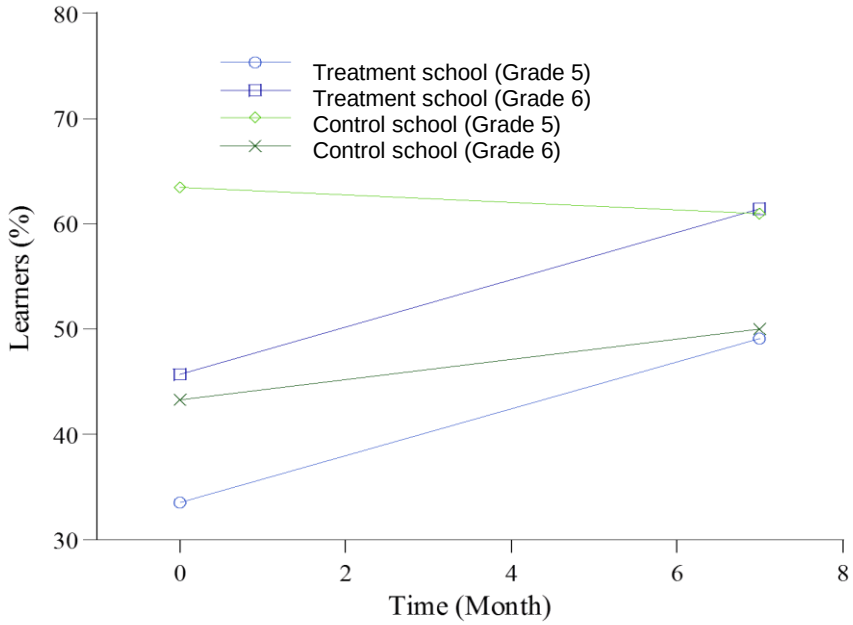


Figure 7.17: Learners (%) in both schools who correctly answered "It is not necessary to wash vegetables like carrots before you eat them" at pre- and post-implementation (N = 681)

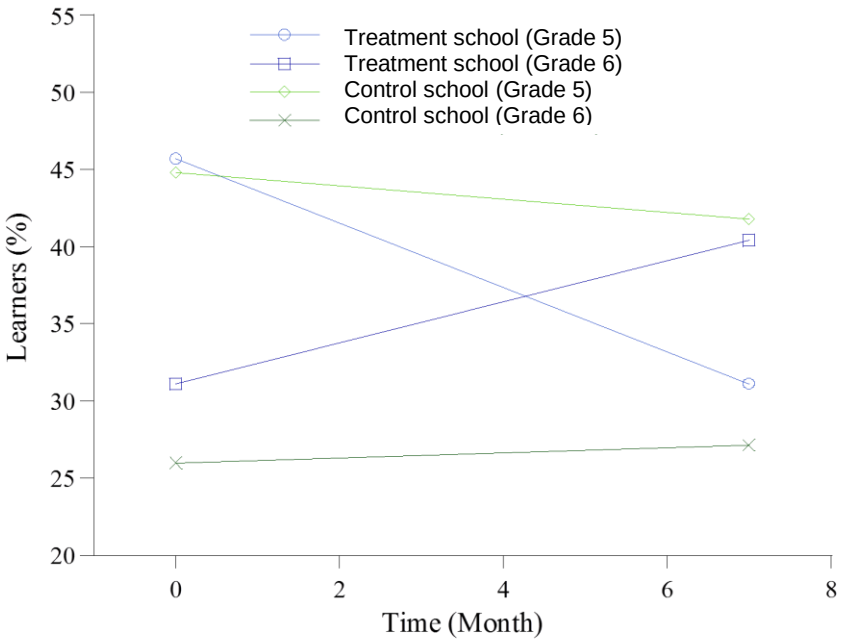


Figure 7.18: Learners (%) in both schools who correctly answered "Calcium is mostly found in milk" at pre- and post-implementation (N = 681)

Table 7.28: Grade 6 learners (%) who correctly answered nutrition knowledge questions at pre- and post-implementation (N = 327)

Statements (response options; correct options underlined)	Pre-implementation		Post-implementation	
	Treatment Grade 6 (n = 177) n (%)	Control Grade 6 (n = 150) n (%)	Treatment Grade 6 (n = 166) n (%)	Control Grade 6 (n = 140) n (%)
Food nutrients and function				
Salty food is not good for health (True, false, don't know)	84 (47.5)	124 (82.7)	90 (54.2)	73 (52.1)
Food is important for growth (True, false, don't know)	130 (73.5)	127 (84.7)	138 (83.1)	113 (80.7)
All of these are signs of food borne disease except (Stomach pain, night blindness, vomiting and diarrhoea)	68 (38.4)	49 (32.7)	32 (19.3)	48 (34.3)
Sugar contains a lot of vitamins and minerals (True, false, don't know)	60 (33.9)	85 (56.7)	96 (57.8)	74 (52.8)
To which of the following has iodine been added (Bread, maize meal, salt and powdered milk)	29 (16.4)	85 (56.7)	50 (30.1)	49 (35.0)
Food and energy				
Energy to learn and play comes from (Food, air, water and don't know)	103 (58.2)	84 (56.0)	128 (77.1)	63 (45.0)
To keep a healthy body weight, we need to have a healthy eating plan and exercise (True, false, don't know)	137 (77.4)	124 (82.7)	153 (92.2)	118 (84.3)
Foods like fat cakes, doughnuts and cakes give lots of energy with minerals and vitamins (True, false, don't know)	110 (62.2)	121 (80.7)	128 (77.1)	91 (65.0)

Continued/…….

Table 7.28: Grade 6 learners (%) who correctly answered nutrition knowledge questions at pre- and post-implementation (N = 327) continued

Statements (response options; correct options underlined)	Pre-implementation		Post-implementation	
	Treatment Grade 5 (n = 173) n (%)	Control Grade 5 (n = 181) n (%)	Treatment Grade 5 (n = 161) n (%)	Control Grade 5 (n = 177) n (%)
Nutrient deficiency				
We will get sick more easily, if our body lacks nutrients (True, false, don't know)	86 (48.6)	82 (54.7)	95 (57.2)	55 (39.3)
If we lack nutrients it would be hard for us to focus in class (True, false, don't know)	98 (55.4)	97 (64.7)	102 (61.4)	82 (58.6)
Food that is high in fat can cause diseases (True, false, don't know)	100 (56.5)	92 (61.3)	135 (81.3)	86 (61.4)
Food choices				
Breakfast must consist of foods that are healthy choices (True, false, don't know)	144 (81.4)	117 (78.0)	139 (83.7)	114 (81.4)
Rice with fish and vegetables is a good mixed meal (True, false, don't know)	110 (62.2)	114 (76.0)	104 (62.5)	78 (55.7)
It is not necessary to wash vegetables like carrots before you eat them (True, false, don't know)	81 (45.7)	65 (43.3)	102 (61.4)	70 (50.0)
The best place to keep uncooked meat is (In the refrigerator, in the freezer, on the kitchen cabinet and don't know)	84 (47 5)	88 (58.7)	92 (55.4)	64 (45.7)
Foods can become contaminated with germs if we prepare foods in a dirty environment (True, false, don't know)	120 (67.8)	121 (80.7)	128 (77.1)	99 (70.7)

Continued/…….

Table 7.28: Grade 6 learners (%) who correctly answered nutrition knowledge questions at pre- and post-implementation (N = 327) continued

Statements (response options; correct options underlined)	Pre-implementation		Post-implementation	
	Treatment Grade 5 (n = 173) n (%)	Control Grade 5 (n = 181) n (%)	Treatment Grade 5 (n = 161) n (%)	Control Grade 5 (n = 177) n (%)
Sources of nutrients				
Food that is low in fat is (Watermelon, chocolate, ice cream and don't know)	107 (60.5)	71 (47.3)	112 (67.5)	63 (45.0)
Calcium is mostly found in (Fruit juice, cold drinks, milk and don't know)	55 (31.1)	39 (26.0)	67 (40.4)	38 (27.1)
Highly processed foods always contain more nutrients than minimally processed foods (True, false, don't know)	36 (20.3)	51 (34.0)	36 (21.7)	33 (23.6)
Which of the following cooking methods will retain more nutrients in vegetables? (Frying, boiling in water, steaming and roasting)	24 (13.6)	18 (12.0)	55 (33.1)	15 (10.7)
The following are the reasons for processing foods except (To prevent spoilage, to make them edible, to produce more convenient foods and to produce foods that prevent tooth decay)	41 (23.1)	32 (21.3)	53 (31.9)	45 (32.1)
The following are examples of highly processed foods except (Corn flakes, jam, margarine and samp)	22 (12.4)	14 (9.33)	60 (36.1)	37 (26.4)
Which foods contain a lot of fibre? (Brown bread, dry beans oats; milk, yoghurt, cheese; fish, chicken eggs; margarine, mayonnaise sunflower oil)	80 (45.2)	66 (44.0)	113 (68.1)	73 (52.1)

7.5.1.2 Learners whose responses to attitude statements were consistent with healthy eating

Table 7.29 shows the comparison of the performance of Grade 5 and Grade 6 learners from pre- to post-implementation as estimated by the random effects GLS regression both in the treatment and control schools. There were no significant differences in the mean scores for nutrition attitudes from pre- to post-implementation in either the treatment school (P = 0.108) or the control school (P = 0.060).

Table 7.29: Comparison of the mean % nutrition attitudes score of Grades 5 and 6 learners at pre- and post-implementation in both schools (N = 681)

Grades/Schools	Learners (n)		Pre		Post		[2]P-value
	Pre	Post	Mean % ± SD		Mean % ± SD	[1]P-value	
Treatment school							
Grade 5	173	160	58.3 ± 17.1	0.161	59.7 ± 16.5	< 0.001***	0.108
Grade 6	177	167	55.6 ± 18.8		67.8 ± 21.7		
Control school							
Grade 5	181	177	52.6 ± 20.9	0.001***	57.1 ± 20.4	0.752	0.060
Grade 6	150	140	59.4 ± 16.9		56.4 ± 18.5		

[1]Difference between pre- and post-implementation scores derived from analysis of variance
[2]Difference of between Grades 5 and 6 changes from pre- to post-implementation derived from random effects GLS regression
One sided test, ***P<0.001

The frequency distribution of learners' options for attitudes statement, at pre- and post-implementation are presented in tables 7.30 and 7.31. The learners' options from pre- to post-implementation were consistent with healthy eating in some attitudes statements; however, were not in some others. The results of selected attitudes statements are represented in line graphs to show the learners' options at pre- and post-implementation. Figure 7.19 shows the learners' attitudes to eating foods like dry beans, split peas and lentils regularly at pre- and post-implementation. The percentage of Grade 5 learners (56% to 63%) and Grade 6 learners (50% to 66%) in the treatment school who had a positive attitude to this statement increased from pre-implementation to post-implementation. In the control, school the percentage of Grade 5 learners (51% to52%) with a positive attitude to the statement increased, while that of Grade 6 learners (47% to 39%) declined at post-implementation.

Figure 7.20 shows the learners' attitudes concerning the choice of delicious food, regardless of its nutritional value. The percentage of Grade 5 learners (30% to 47%) and Grade 6 learners (24% to 45%) in the treatment school who would not choose delicious food

regardless of its nutritional value increased from pre- to-post-implementation. On the contrary, the percentage of Grade 5 learners (37% to 31%) in the control school who had a positive attitude to the statement declined, while that of Grade 6 learners (33% to 33%) remained the same.

In summary, Grade 5 learners in the treatment school improved in six out of the eleven attitude statements, while Grade 6 learners improved in all of the eleven statements. In the control school, Grade 5 learners improved in eight of the eleven attitudes statements, while Grade 6 learners only improved in three statements.

Table 7.30: Grade 5 learners (%) whose attitudes were consistent with healthy eating in both schools at pre- and post-implementation (N = 354)

Statements	Pre-implementation		Post-implementation	
	Treatment Grade 5 (n = 173) n (%)	Control Grade 5 (n = 181) n (%)	Treatment Grade 5 (n = 161) n (%)	Control Grade 5 (n = 177) n (%)
Breakfast is very important for me	140 (80.9)	132 (72.9)	134 (83.2)	135 (76.3)
I need to eat a lot in order to grow fast	51 (29.5)	42 (23.2)	51 (31.6)	47 (26.6)
I need to drink plenty of clean, safe water	134 (77.5)	128 (70.7)	124 (77.0)	125 (70.6)
I need to eat a variety of foods	76 (43.9)	92 (50.8)	59 (36.6)	76 (42.9)
I need to eat foods like dry beans, split peas and lentils regularly	96 (55.5)	94 (51.3)	102 (63.4)	92 (51.9)
I like eating vegetables	146 (84.4)	129 (71.3)	139 (86.3)	143 (80.8)
To keep a healthy body, I must learn about food	131 (75.7)	101 (55.8)	118 (73.3)	129 (72.9)
I will choose delicious food, regardless of its nutritional value	51 (29.5)	67 (37.0)	75 (46.6)	55 (31.1)
I am still young, I can eat whatever I want. I will look after my diet when I am older	77 (44.5)	71 (47.3)	84 (52.1)	92 (51.9)
I eat foods high in fat to be healthy	83 (47.9)	86 (47.5)	73 (45.3)	96 (54.2)
I like to try new foods	124 (71.7)	105 (58.0)	92 (57.1)	121 (68.4)

Table 7. 31: Grade 6 learners (%) whose attitudes were consistent with healthy eating in both schools at pre- and post-implementation (N = 327)

Statements	Pre-implementation		Post-implementation	
	Treatment Grade 6 (n = 177) n (%)	Control Grade 6 (n = 150) n (%)	Treatment Grade 6 (n = 166) n (%)	Control Grade 6 (n = 140) n (%)
Breakfast is very important for me	147 (83.1)	128 (85.3)	154 (92.8)	123 (87.9)
I need to eat a lot in order to grow fast	58 (32.8)	45 (30.0)	69 (41.7)	40 (28.6)
I need to drink plenty of clean, safe water	141 (79.7)	121 (80.7)	137 (82.5)	111 (79.2)
I need to eat a variety of foods	69 (38.9)	78 (52.0)	79 (47.6)	47 (33.6)
I need to eat foods like dry beans, split peas and lentils regularly	89 (50.3)	70 (46.7)	107 (64.5)	55 (39.2)
I like eating vegetables	145 (81.9)	128 (85.3)	142 (85.5)	119 (85.0)
To keep a healthy body, I must learn about food	138 (77.9)	117 (78.0)	143 (86.1)	103 (73.6)
I will choose delicious food, regardless of its nutritional value	42 (23.7)	49 (32.7)	75 (45.2)	46 (32.8)
I am still young, I can eat whatever I want. I will look after my diet when I am older	76 (42.9)	71 (39.2)	106 (63.9)	71 (50.7)
I eat foods high in fat to be healthy	58 (32.8)	72 (48.0)	104 (62.7)	63 (45.0)
I like to try new foods	119 (67.2)	10 (67.3)	130 (78.3)	90 (64.3)

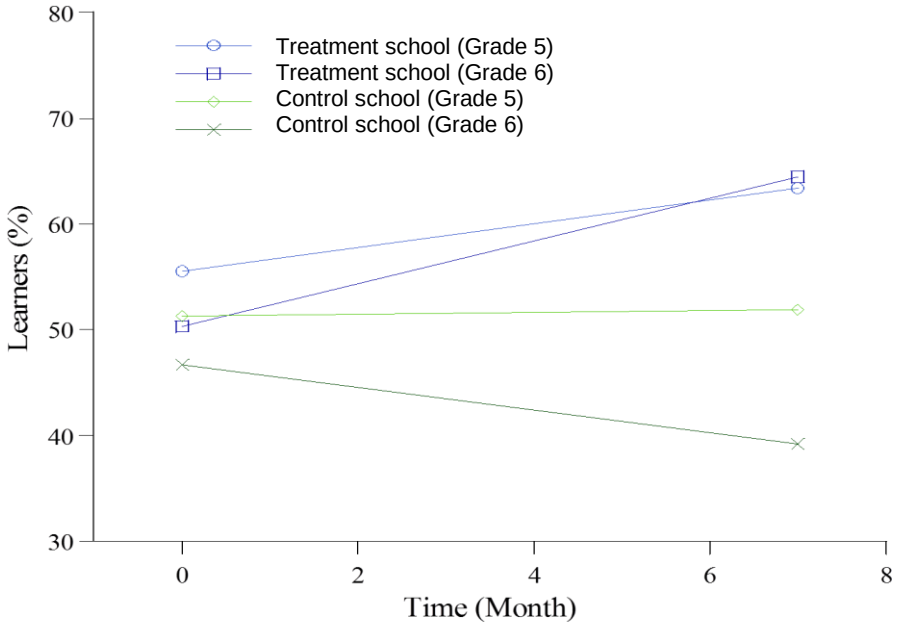


Figure 7.19: Learners (%) with positive attitude regarding "I need to eat foods like dry beans, split peas and lentils regularly" in both schools ant pre- and post-implementation (N = 681)

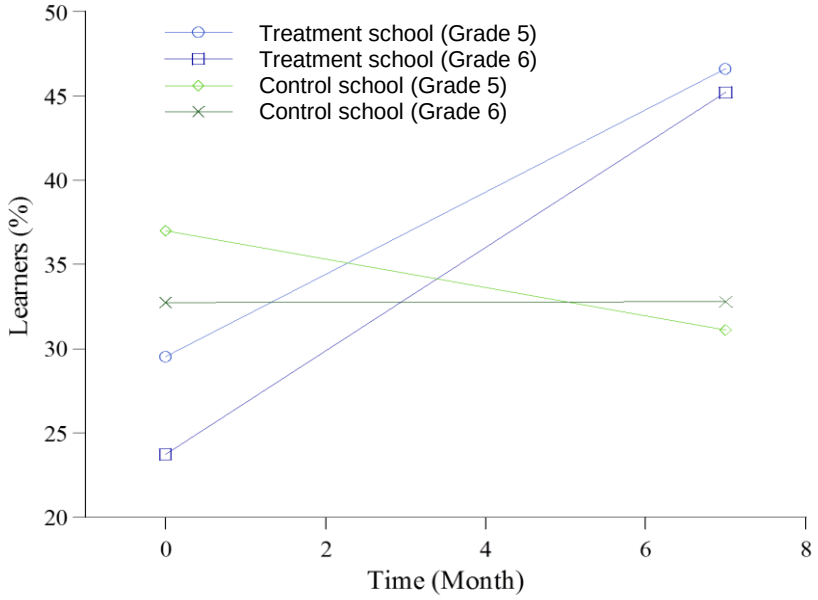


Figure 7.20: Learners (%) with positive attitude regarding "I will choose delicious food, regardless of its nutritional value" in both schools and pre- and post-implementation (N = 681)

7.5.2 Dietary practices of the learners

Table 7.32 shows the results of ANOVA and the random effects GLS regression analysis for the learners' dietary practices. There was no significant difference between the changes in the dietary practices of the learners between the two schools from pre- to post- implementation (P = 0.24). The random effects GLS regression analysis for within schools difference in the learners' dietary practices from pre- to post-implementation are shown in table 7.33. Both the treatment and the control schools reduced in the dietary practices mean scores with the mean change of -2.5 and -0.1 respectively, however, the negative trends were not significant (P = 0.039 and P = 0.93 respectively).

Table 7.32: Comparison of the mean % scores for the dietary practices of the learners from pre- to post-implementation between the schools (N = 681)

Schools		Pre-implementation		Post-implementation			[2]Pre-post P-value
	N	Mean % ± SD	P-value	N	Mean % ± SD	[1]P-value	
Treatment	350	63.1 ± 16.9	0.52	327	60.0 ± 19.7	0.20	0.24
Control	331	62.3 ± 17.5		317	62.2 ± 16.8		

[1]Difference between schools derived from analysis of variance
[2] Difference of between schools changes from pre- to post-implementation derived from random effects GLS regression

Table 7.33: Differences in the mean % scores for the dietary practices within the schools from pre- to post-implementation among the learners (N = 681)

Schools	N		Mean % ± SD		[1]Mean change %	[2]P-value
	Pre	Post	Pre	Post		
Treatment	350	327	63.1 ± 16.9	60.0 ± 19.7	-2.5	0.039
Control	331	317	62.3 ± 17.5	62.2 ± 16.8	-0.1	0.93

[1]Discrete change from the base level derived from random effects GLS regression (post-implementation score minus pre-implementation score)
[2]P-value was derived from a random effects GLS regression taking into account missing values at post-implementation

Table 7.34 shows the frequency distribution of the learners' options for practices statements at pre- and post-implementation. The learners in both schools indicated varying eating practices at pre- and post-implementation. Results of selected practices statements were plotted on bar graphs to show a clearer presentation of the eating patterns from pre- to post-implementation. The percentage of Grade 5 learners who ate breakfast almost every day increased in both treatment (67% to 74%) and control schools (61% to 74%) (figure 7.21). Likewise did the percentage of Grade 6 learners who ate breakfast in the treatment school (69% to 79%) and in the control school (67% to 76%) increase from pre- to post-implementation (figure 7.22).

The eating of sweets, chocolates and ice-cream among the Grade 5 learners is shown in figure 7.23. The percentage of learners in the treatment school (21% to 21%) who ate the foods almost every day remained the same from pre- to post-implementation, meanwhile the percentage of learners (44% to 38%) who took sweets, chocolates and ice-cream almost every day in the control school reduced from pre- to post-implementation. With respect to Grade 6 learners, the percentage who ate sweets, chocolates and ice-cream almost every day in the treatment school reduced (26% to 24%), but increased (13% to 21%) in the control school (figure 7.24).

Figure 7.25 shows the eating of vegetables in at least one or two meals a day by Grade 5 learners. The percentage of Grade 5 learners who engaged in this practice in the treatment school increased (44% to 51%) from pre- to post-implementation. Likewise, the percentage of Grade 5 learners in the control school increased from 54% at pre-implementation to 59% at post-implementation. The eating of vegetables in at least one or two meals a day among Grade 6 learners in the two schools at pre- and post-implementation is shown in figure 7.26. The eating of vegetables in at least one or two meals a day almost every day was by 39% of the learners at pre-implementation in the treatment school, which increased to 58% at post-implementation. In the control school, the percentage of Grade 6 learners (41% to 51%) who ate vegetables in at least one or two meals a day also increased from pre- to post-implementation.

The dietary practices of the learners in the treatment and control school show a similar pattern. The learners in both schools improved in healthy dietary practices such as eating of breakfast. However, those practices that were contrary to healthy eating such as the eating of sweets and chocolate either did not change, changed a bit or even increased.

Table 7.34: Dietary practices of the learners in both schools at pre- and post-implementation (N = 681)

Food practice statements with options	Pre-implementation				Post-implementation			
	Treatment school		Control school		Treatment school		Control school	
	Grade 5 n (%)	Grade 6 n (%)	Grade 5 n (%)	Grade 6 n (%)	Grade 5 n (%)	Grade 6 n (%)	Grade 5 n (%)	Grade 6 n (%)
1. The food learners always eat during break	**(n =172)**	**(n =177)**	**(n =180)**	**(n =148)**	**(n =160)**	**(n =166)**	**(n =174)**	**(n =140)**
Porridge or pap	103 (59.9)	94 (54.0)	95 (52.8)	100 (67.6)	86(53.8)	72(43.4)	99(56.9)	84(65.6)
Sweets or Chocolates	37 (21.5)	45 (25.9)	42 (23.3)	25 (16.9)	31(19.40	68(41.0)	41(23.6)	31(24.2)
Ice Cream/Carbonated Drinks	18 (10.5)	24 (13.8)	27 (15.0)	16 (10.8)	26(16.3)	18(10.8)	29(16.7)	13 (10.2)
Others not specified	14 (8.2)	11 (6.3)	16 (8.8)	7 (4.7)	17(10.6)	8(4.8)	5(2.9)	10(0.0)
2. The foods that learners always eat for lunch	**(n =173)**	**(n =172)**	**(n =179)**	**(n =148)**	**(n =160)**	**(n =166)**	**(n =177)**	**(n =140)**
Rice, fish, and chicken and vegetables	52 (30.1)	70 (40.7)	70 (39.1)	50 (33.8)	45(28.1)	47(28.3)	74(41.8)	43(30.7)
Pap and vegetables	55 (31.8)	46 (26.7)	56 (31.3)	42 (28.4)	49(30.6)	36(21.7)	40(22.6)	37(26.4)
Kwota (Bread + chips + polony + tomato sauce)	65 (32.4)	51 (29.7)	46 (25.7)	48 (32.4)	55(34.4)	78(47.0)	55(31.1)	55(39.3)
Others not specified	10 (5.7)	5 (2.9)	7 (3.9)	8 (5.4)	11(6.9)	5(3.0)	8(4.5)	5 (3.6)
3. The foods that learners always choose as snacks	**(n =170)**	**(n =176)**	**(n =179)**	**(n =148)**	**(n =160)**	**(n =166)**	**(n =177)**	**(n =140)**
Fruits	70 (41.2)	84 (47.7)	66 (36.9)	76 (51.4)	74(46.3)	66(39.8)	67(37.9)	55 (39.3)
Corn snacks (Simba) Potato chips (Lays)	61 (35.9)	66 (31.3)	54 (30.2)	38 (25.7)	51(31.9)	74(44.9)	56(31.6)	63 (45.0)
Ice Cream, chocolates, sweets	20 (11.8)	20 (11.3)	34 (19.0)	18 (12.2)	15(9.4)	20(12.1)	25()14.1	11(7.9)
Cakes, fat-cakes, buns	10 (5.9)	15 (8.5)	19 (10.6)	7 (4.7)	11(6.9)	4(2.4)	23(12.99)	9(6.4)
Others not specified	9 (5.3)	2 (1.1)	6 (3.6)	9 (6.1)	9(5.6)	2(1.3)	6(3.4)	2(1.4)

Percentage was based on total number of responses per question per grade

Continued/…….

Table 7.34: Dietary practices of the learners in both schools at pre- and post-implementation (N = 681) continued

Food practice statements with options	Pre-implementation				Post-implementation			
	Treatment school		Control school		Treatment school		Control school	
	Grade 5 n (%)	Grade 6 n (%)	Grade 5 n (%)	Grade 6 n (%)	Grade 5 n (%)	Grade 6 n (%)	Grade 5 n (%)	Grade 6 n (%)
4. The eating of fast foods (McDonalds, Pizza, KFC, etc)	**(n =171)**	**(n =175)**	**(n =181)**	**(n =146)**	**(n =160)**	**(n =166)**	**(n =177)**	**(n =140)**
Almost every day	42 (24.6)	53 (30.3)	41 (22.65)	24 (16.44)	30(18.8)	30 (18.1)	38 (21.5)	17 (12.1)
Several times a week	62 (36.3)	65 (37.1)	75 (41.4)	50 (34.3)	65 (40.6)	76 (45.8)	69 (39.0)	54 38.6)
Occasionally	31 (18.1)	24 (13.7)	47 (25.7)	54 (36.9)	33 (20.6)	40 (24.1)	44 (24.9)	52 (37.1)
Never	36 (21.1)	33 (18.9)	18 (9.9)	18 (12.3)	31 (19.4)	20 (12.1)	26 (14.7)	17 (12.1)
5. The eating of mixed meals (e.g. pap with fish with vegetables and a fruit)	**(n =171)**	**(n =176)**	**(n =181)**	**(n =149)**	**(n =160)**	**(n =166)**	**(n =177)**	**(n =140)**
Almost every day	75 (43.9)	66 (37.5)	79 (43.7)	77 (51.7)	61 (38.1)	64 (38.55)	93 (52.54)	39 (27.9)
Several times a week	40 (23.4)	66 (37.5)	52 (28.7)	36 (24.2)	52 (32.5)	61 (36.8)	54 (30.5)	53 (37.9)
Occasionally	21 (12.3)	21 (11.9)	36 (19.9)	24 (16.1)	20 (12.50)	28 (16.9)	14 (7.9)	29 (20.7)
Never	35 (20.7)	23 (13.1)	14 (7.7)	12 (8.1)	27 (16.88)	13 (7.8)	16 (9.0)	19 (13.6)
6. The eating of breakfast	**(n =172)**	**(n =176)**	**(n =179)**	**(n =149)**	**(n =160)**	**(n =166)**	**(n =177)**	**(n =140)**
Almost every day	116 (67.4)	120 (68.6)	109 (60.6)	100 (67.1)	118 (73.8)	131 (78.9)	130 (73.5)	106 (75.7)
Several times a week	28 (16.3)	33 (18.9)	35 (19.4)	22 (14.8)	29 (18.1)	24 (14.5)	22 (12.4)	17 (12.1)
Occasionally	14 (8.1)	12 (6.9)	19 (10.6)	13 (8.7)	4 (2.5)	9 (5.4)	13 (7.3)	13 (9.3)
Never	14 (8.1)	10 (5.7)	17 (9.4)	14 (9.4)	9 (5.6)	2 (1.2)	12 (6.8)	4 (2.9)

Percentage was based on total number of responses per question per grade

Continued/…….

Table 7.34: Dietary practices of the learners in both schools at pre- and post-implementation (N = 681) continued

Food practice statements with options	Pre-implementation				Post-implementation			
	Treatment school		Control school		Treatment school		Control school	
	Grade 5 n (%)	Grade 6 n (%)	Grade 5 n (%)	Grade 6 n (%)	Grade 5 n (%)	Grade 6 n (%)	Grade 5 n (%)	Grade 6 n (%)
7. The intake of milk, yoghurt or maas	**(n =172)**	**(n =176)**	**(n =179)**	**(n =149)**	**(n =160)**	**(n =166)**	**(n =177)**	**(n =140)**
Almost every day	74 (43.0)	62 (35.2)	75 (41.9)	44 (29.5)	47 (29.4)	42 (25.3)	75 (42.4)	26 (18.6)
Several times a week	80 (46.5)	95 (53.9)	70 (39.1)	73 (49.0)	71 (44.4)	97 (58.4)	80 (45.2)	77 (55.0)
Occasionally	16 (9.3)	19 (10.8)	33 (18.4)	32 (21.5)	41 (25.6)	27 (16.3)	22 (12.4)	36 (25.7)
Never	2 (1.2)	0 (0.0)	1 (0.6)	0 (0.0)	1 (0.6)	0 (0.0)	0 (0.0)	1 (0.7)
8. The eating of sweets / chocolates / ice cream	**(n =168)**	**(n =174)**	**(n =179)**	**(n =144)**	**(n =160)**	**(n =166)**	**(n =177)**	**(n =140)**
Almost every day	35 (20.8)	45 (25.7)	79 (44.4)	19 (13.2)	34 (21.3)	40 (24.1)	67 (37.9)	29 (20.7)
Several times a week	56 (33.3)	69 (39.7)	44 (24.7)	54 (37.5)	68 (42.5)	66 (39.8)	73 (41.2)	53 (37.9)
Occasionally	33 (19.6)	27 (15.5)	33 (18.5)	51 (35.4)	29 (18.1)	34 (20.5)	22 (12.4)	40 (28.6)
Never	44 (26.2)	33 (18.7)	22 (12.4)	20 (13.9)	29 (18.1)	26 (15.7)	15 (8.5)	18 (12.9)
9. The eating of vegetables in at least one or two meals	**(n =169)**	**(n =175)**	**(n =179)**	**(n =146)**	**(n =160)**	**(n =166)**	**(n =177)**	**(n =140)**
Almost every day	75 (44.4)	68 (38.9)	96 (53.6)	60 (41.1)	82 (51.3)	97 (58.4)	105 (59.3)	72 (51.4)
Several times a week	61 (36.1)	76 (43.4)	44 (24.6)	50 (34.3)	46 (28.8)	49 (29.5)	57 (32.2)	44 (31.4)
Occasionally	20 (11.8)	24 (13.7)	30 (16.8)	27 (18.5)	19 (11.9)	17 (10.2)	11 (6.21)	20 (14.3)
Never	13 (7.7)	7 (4.0)	9 (5.1)	9 (6.2)	13 (8.1)	3 (1.8)	4 (2.3)	4 (2.9)

Percentage was based on total number of responses per question per grade

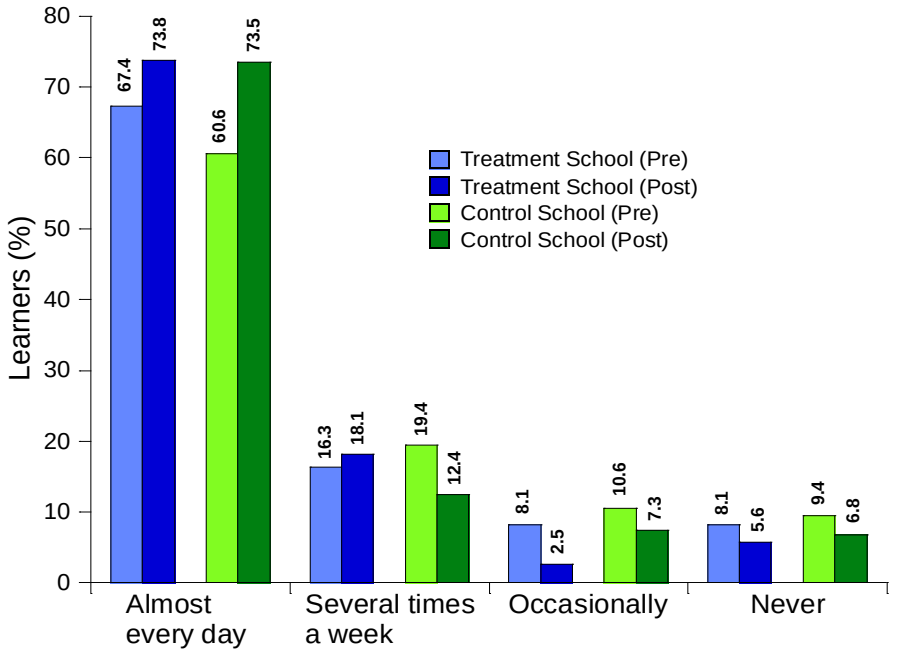


Figure 7.21: Eating of breakfast by Grade 5 learners in both schools at pre- and post-implementation (N = 354)

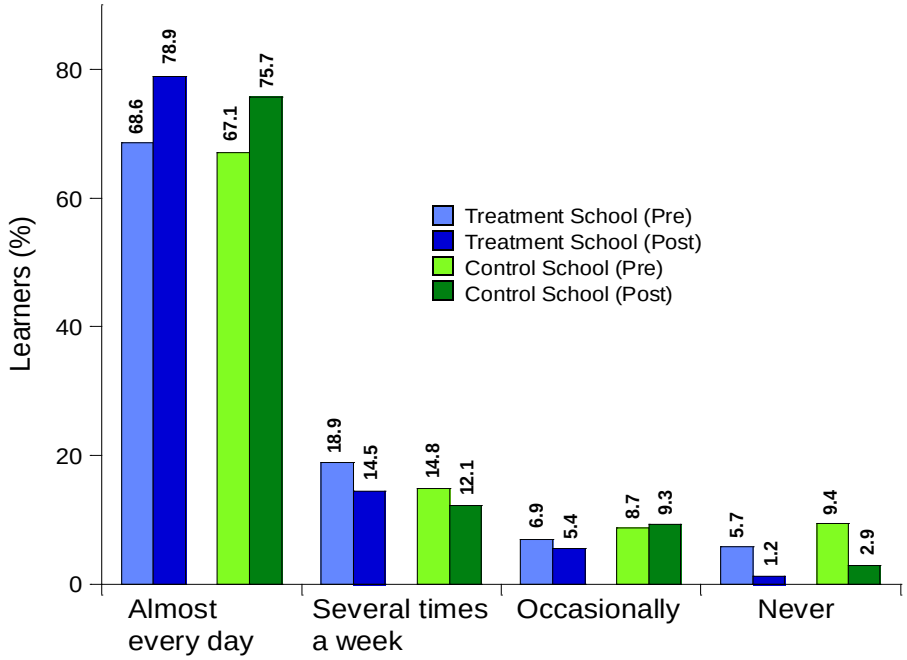


Figure 7.22: Eating of breakfast by Grade 6 learners in both schools at pre- and post-implementation (N = 327)

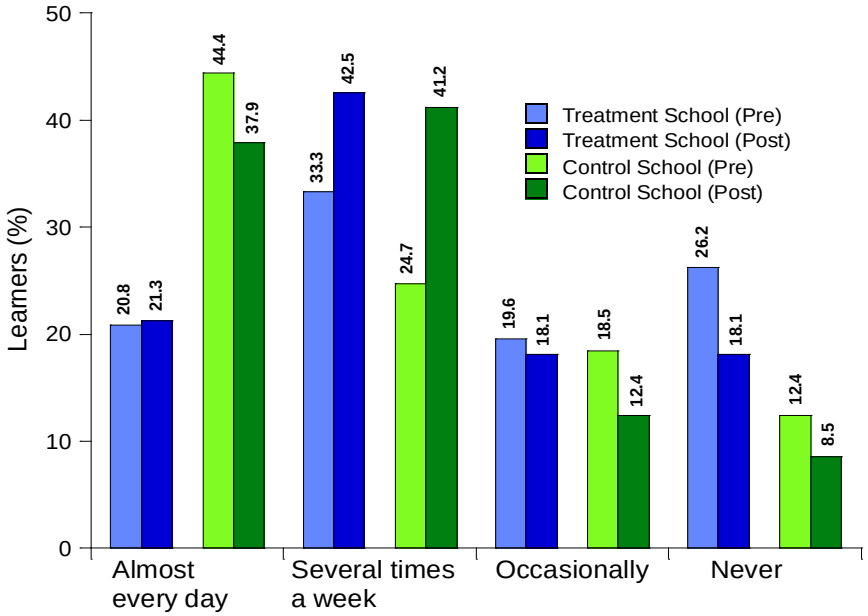


Figure 7.23: Eating of sweets, chocolates / ice cream by Grade 5 learners in both schools at pre- and post-implementation (N = 354)

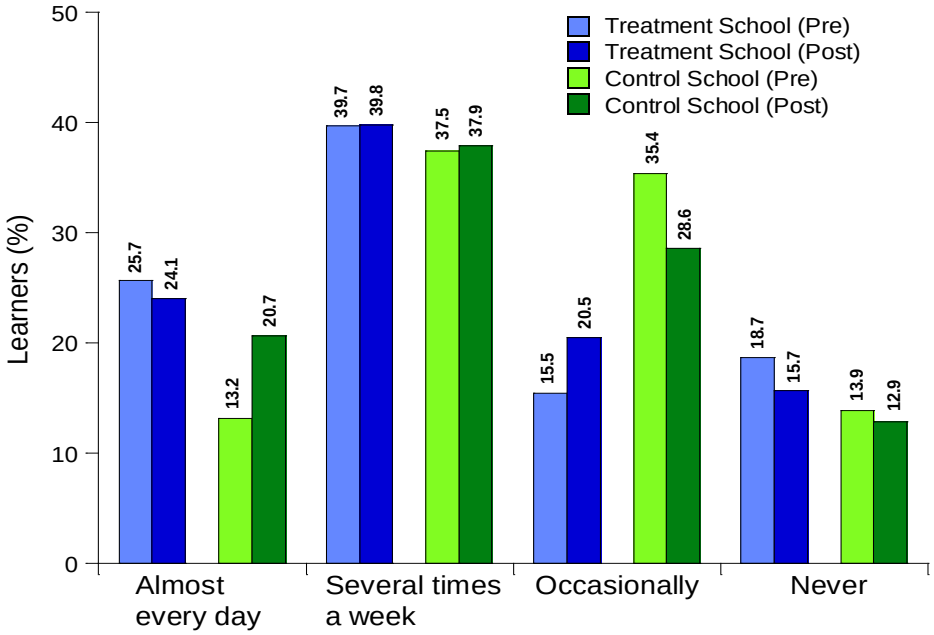


Figure 7.24: Eating of sweets, chocolates / ice cream by Grade 6 learners in both schools at pre- and post-implementation (N = 327)

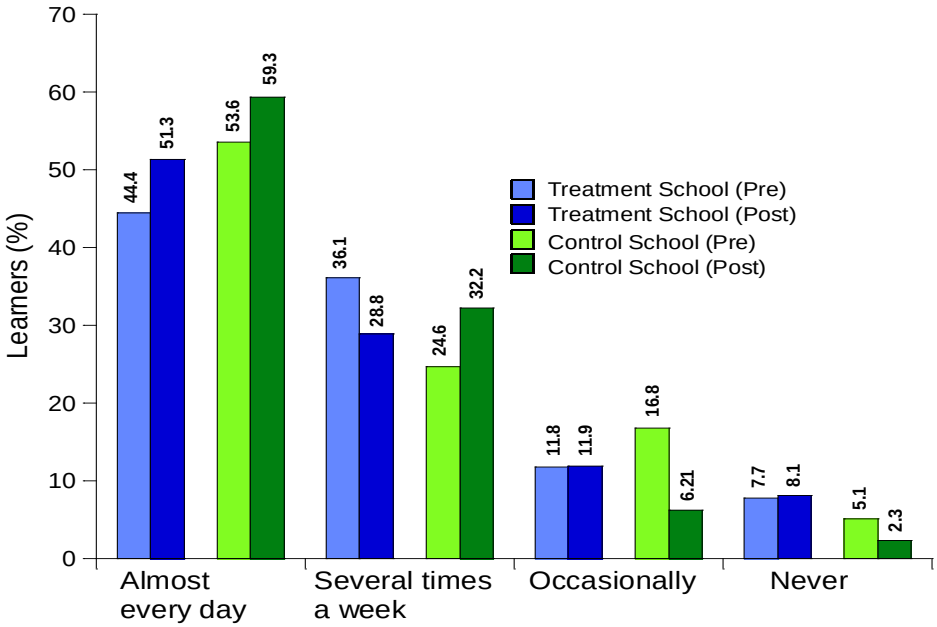


Figure 7.25: Eating of vegetables in at least one or two meals a day by Grade 5 learners in both schools at pre- and post-implementation (N = 354)

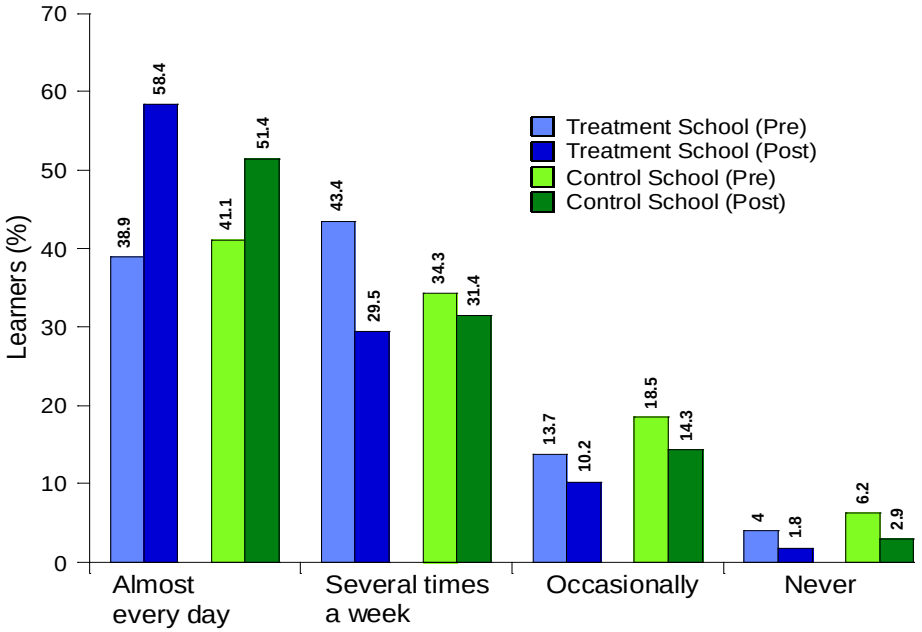


Figure 7.26: Eating of vegetables in at least one or two meals a day by Grade 6 learners in both schools at pre- and post-implementation (N = 327)

CHAPTER 8

DISCUSSION OF PHASE 3

8.1 INTRODUCTION

Phase 3 aimed at evaluating the impact of the context specific NEP on the teachers' skills in teaching nutrition and on the nutrition KAP of the teachers and the learners respectively. The study hypothesised that the NEP would lead to significant improvement in the nutrition KAP of the teachers and learners in the treatment school from pre- to post-implementation, and in comparison to the control school.

The discussion is done in the following order:

- Impact of the NEP on the nutrition knowledge of the teachers
- Impact of the NEP on the nutrition attitudes of the teachers
- Impact of the NEP on the dietary practices of the teachers
- Process evaluation
  - Teachers' feedback on workshop evaluation
  - Teachers' evaluation of the implementation of the NE manual to the learners
  - Teachers' perceptions of the impact of the implementation of the NE manual on their teaching of nutrition
- Impact of the NEP on the nutrition knowledge of the learners
- Impact of the NEP on the nutrition attitudes of the learners
- Impact of the NEP on the dietary practices of the learners
- Strengths and limitations of phase 3
- Conclusion
- Recommendation.

8.2 IMPACT OF THE NUTRITION EDUCATION PROGRAMME ON THE TEACHERS' NUTRITION KNOWLEDGE

The first hypothesis (chapter 6 section 6.2.3.1) which stated that the teachers in the treatment school, compared with the teachers in the control school, would significantly improve in the nutrition KAP relates to this assessment. The results support this hypothesis in respect of

nutrition knowledge. There was a significant improvement (P = 0.003) in the nutrition knowledge of the teachers in the treatment school compared with the teachers in the control school. This result is in line with previous studies where NE intervention led to significant improvement in the nutrition knowledge of teachers in the intervention group (Arcan et al. 2013; Motamedrezaei et al. 2013; Oldewage-Theron & Egal 2012; Chen et al. 2010). The mean nutrition knowledge of the teachers in both the treatment and control schools were good at pre-implementation. The significant improvement observed with the treatment school is therefore remarkable. A similar trend was reported in the intervention of a NEP for educators in South Africa that reported an improvement in the mean nutrition knowledge score from 63 ± 30.2% to 80 ± 21.1% (Oldewage-Theron & Egal 2012).

The reason for the improvement in the nutrition knowledge could be linked with the exposures that the teachers in the treatment school had during the implementation. The teachers attended the workshop session where they received explanations on the teaching of the nutrition topics, using the selected constructs of the SCT and the MLM. In addition, the teachers had three re-orientation sessions where the topics to be taught were reviewed prior to the implementation to the learners. Moreover, the fact that the teachers had to teach the lessons to the learners could further facilitate their preparation and hence improved knowledge. Engaging teachers in a number of activities in preparation for implementation was reported in a study where workshops and wellness programmes accorded the teachers the opportunity to increase knowledge on the subject matter (Snelling, Ernst & Belson 2013). Another study that explored the relationship between resources for teaching nutrition and nutrition knowledge found that the nutrition knowledge of the teachers was positively associated with the nutrition lessons they taught (Jones & Zidenberg-Cherr 2015).

The nutrition knowledge was assessed in five categories, namely current dietary recommendations for children; sources of nutrients; diet disease relationship; food processing and food hygiene. The treatment school had higher mean scores than the control school in all the categories of nutrition knowledge with a significant difference (P < 0.001) in the category on sources of nutrients. This category featured the highest number of the knowledge questions (28 out of 53) and consisted of questions covering the areas such as carbohydrate, fat, protein and vitamin sources. However, a contrary trend was reported in a study by Chen et al. (2010) where there was significant improvement with the health promoting school teachers (Dietary group) on all the categories of nutrition knowledge that were assessed.

The within school changes in the nutrition knowledge of the teachers in the two schools relate to the second hypothesis which stated that the teachers in the treatment school would have significantly better within school improvements in the nutrition KAP. The results for within school changes in nutrition knowledge of the teachers uphold this hypothesis. The teachers in the treatment school significantly improved in the categories on dietary recommendations for children, sources of nutrients and food hygiene from pre- to post-implementation. Improvement was also observed with the teachers in the control school with respect to the categories on current dietary recommendations for children, diet disease relationship and food hygiene. The increases were not significant. The improvement in the three categories of nutrition knowledge observed with the teachers in the control school might be explained by the fact that the teachers also taught the same nutrition topics to the learners. Their preparation to teach the topics could have enhanced their nutrition knowledge in the topics as revealed in a study by Jones and Zidenberg-Cherr (2015). The significant improvement in the category on food hygiene by the treatment school teachers was despite the fact that they had not yet taught the topic at the time of the assessment. However, the teachers were exposed to the topic during the one day workshop, where they were trained on the use of the NE manual. The categories on sources of nutrients and food processing witnessed a reduction in the mean scores from pre- to post-implementation among the teachers in the control school. The significant improvement in the nutrition knowledge of treatment school teachers could positively impact their teaching of nutrition as well as on their eating behaviours as was also revealed in the study by Chen et al. (2010).

8.3 IMPACT OF THE NUTRITION EDUCATION PROGRAMME ON THE TEACHERS' NUTRITION ATTITUDES

The nutrition attitudes assessment of the teachers relates to the first hypothesis that stated that the teachers in the treatment school, would significantly improve in the nutrition KAP compared with the control school. The results regarding the nutrition attitudes of the teachers did not support this hypothesis regarding the nutrition attitudes. The treatment school improved in the dietary attitudes compared to the control school (means scores of 84.2 ± 16.4% and 75.8 ± 17.3% for treatment and control schools respectively) though the difference was not significant (P = 0.531). A study assessed the nutrition attitudes of child care teachers and found an average score of 41.3 points out of 50 points (83%) and that the older teachers tended to have more desirable attitudes (Choi 2010). The findings regarding the nutrition

attitudes of the teachers in the treatment school are still good notwithstanding the non-significant improvement within the school and in comparison with the control school. The positive attitudes of the teachers in the treatment school could have positive implications upon their supportive roles for NE in the school (Chen et al. 2010). The fact that the teachers in the present study were more of the older age group (mean age 46 ±7.9 years) could make them more supportive of healthy nutrition attitudes as revealed by Choi (2010). Though the study by Choi (2010) was a survey, that investigated methods of improving capacity for nutrition management for children among child care teachers, it provided insight into what the nutrition attitudes among teachers could typically be. The improvement observed in the nutrition attitudes of control school teachers could be explained by the fact that the teachers probably made a deliberate effort to improve on their scores knowing that they were participating in a study.

The results in respect of within school differences in the nutrition attitudes of the teachers relate to the second hypothesis. It stated that the teachers in the treatment school would have significantly better within school improvements in the nutrition KAP compared with the teachers in the control school. The findings also refute this hypothesis. The treatment and the control school teachers both had a non-significant within school improvement in the nutrition attitudes from pre- to post implementation (mean change 9.1, P = 0.093 and 4.2, P = 0.479 for treatment and control school respectively). A study by Murimi, Sample and Hunt (2008) revealed that teachers with family and consumer sciences background were more likely to demonstrate positive attitudes than those who did not have a training background. The teachers in the present study were teachers of NST and LS. LS comprised learning areas of life applications such as health and environmental responsibility, physical education and creative arts. The teachers of LS in South African primary schools do not necessarily have background training in some of the learning areas that make up the subject of LS (Van Deventer 2009). Though the within school difference in the nutrition attitudes of the treatment school was not significant, the improvement (a difference of 4.9%) over that of the control school was meaningful.

8.4 IMPACT OF THE NUTRITION EDUCATION PROGRAMME ON THE TEACHERS' DIETARY PRACTICES

The dietary practices assessment of the teachers relates to the first hypothesis which stated that the teachers in the treatment school compared with the teachers in the control school

would significantly improve in the nutrition KAP. The dietary practices results of the teachers refute this hypothesis. The treatment school teachers did not significantly improve compared to the control school teachers in any of the categories on dietary practices. The results of the teachers' dietary practices assessments also refute the second hypothesis. The second hypothesis stated that the teachers in the treatment school would have significantly better within school improvements in the nutrition KAP compared with the teachers in the control school. The treatment school teachers did not have better significant within school changes in comparison to the control school teachers in any of the categories on dietary practices.

The teachers' dietary practices were assessed in five categories, namely teachers' personal eating habits; teachers' eating habits at school; teachers' classroom food practices; teachers' school wide food practices and teachers' practices in food hygiene.

The teachers' personal dietary practices in both treatment and control schools depicted healthy eating to varying degrees. However, the treatment school appeared to have improved more in some dietary practices such as the eating of meals that contain different kinds of foods (mixed meal) and the eating of vegetables in at least two meals a day (table 7.12 and figure 7.5). For example, more teachers (60%) in the treatment school than 40% teachers in the control school practised the eating of mixed meals more frequently (three to four times a week and more than five times a week) at post-implementation. Likewise, the practices of eating of fried chicken more than three times a week among the treatment school teachers was only by 10% of the teachers at post-implementation, while 30% of the teachers in the control school still engaged in this practice at post-implementation (figure 7.3). However, more teachers (20%) in the treatment school than in the control school (10%) engaged in the frequent intake of drinks such as Oros, Coca-cola products and flavoured drinks at post-implementation (figure 7.4). A survey of the dietary variety of South Africans revealed a generally low dietary variety with a particularly low mean dietary diversity score of 3.6 among the black South Africans. The most neglected food groups were the vitamin A rich fruits and vegetables and legumes and nuts (Labadarios, Steyn & Nel 2011). Findings from previous studies within and outside South Africa show that the improvement observed with the treatment school teachers in the present study is commendable. Low intake of fruits and vegetables are not limited to the South African population. Studies outside South Africa found quite low fruit and vegetable and high fried foods intake among the teachers surveyed (Sharma et al. 2013; Kubik et al. 2002).

Regarding the teachers' dietary practices at school, teachers from the treatment school frequently (more than three times a week) purchased both healthy and unhealthy choices of foods at school than teachers from the control school (table 7.13). This practice increased at post-implementation. For example, the percentage of the treatment school teachers who purchased foods such as candy, chips, cookies or fat cakes more than three times a week increased at post-implementation, but the percentage of the control school teachers decreased. The purchase of bread, fruits or vegetables also increased with the treatment school teachers and decreased among the control school teachers. The NEP did not seem to affect the treatment school teachers' dietary practices at school. This result unfortunately contradicts the teachers' perceptions of the dietary practices of learners as revealed in the FGDs with teachers in the needs assessment study (phase 1) and with these teachers in the phase 3 study. The teachers had condemned the learners' purchases of unhealthy choices of foods at school, and also the selling of unhealthy choices of foods by the food vendors. The teachers' frequent purchase of unhealthy choices of food at school may be explained from two points of views. Firstly, that the school food environment which might not be supportive of healthy eating influenced what the teachers ate at school (De Villiers et al. 2015a; McNulty 2013). The teachers might have faced limited choices which made them to purchase the foods that were available. Nevertheless, these teachers improved in some personal dietary practices. Secondly, that good nutrition knowledge alone does not necessarily translate to healthy eating behaviours (Lakshman et al. 2010). This practice could undermine the teachers' role in modelling healthy eating for the learners as reasoned by Rafiroiu and Evans (2005), and could weaken the impact of the school NE intervention (Chen et al. 2010). In the studies that used the instrument similar to the one used in this study, most of the teachers were reported to engage in purchasing and eating unhealthy choices of foods such as sweetened drinks and high fat snacks at school (Rossiter et al. 2007; Kubik et al. 2002). Though these studies were not intervention studies, they provided information on what teachers typically ate at school.

In respect to the classroom food practices of the teachers, the teachers in the treatment school improved more than the teachers in the control school (table 7.14). For example, the percentage of treatment school teachers who would not likely use foods such as fat cakes, cakes, cookies, candies, chocolates and ice-cream as rewards for learners increased from pre- to post-implementation, but declined in the control school. The result of this present study corroborates the findings of a study where NE intervention was reported to reduce teachers' use of foods such as candy and fast foods as incentives for learners (Arcan et al. 2013). In the

study by Rossiter et al. (2007), most of the prospective teachers favoured the use of foods such as candy and pizza as incentives for learners. It is interesting to note that the treatment school teachers, who did not improve in the eating of unhealthy choices of foods, would not use such foods as reward or incentive for learners. The viewpoint of the treatment school teachers holds good prospects for school NE, however their own eating habits at school is also of great importance. The dietary practices that teachers engage in especially at school send more messages to the learners than the opinions that the teachers hold (Rossiter et al. 2007; UNICEF 2009). In the study by Chen et al. (2010), it was noted that even with better NE, a high percentage of the teachers in all the health promoting schools still engaged in unhealthy dietary practices.

The findings of the present study on the teachers' views regarding school wide food practices confirmed their support for healthy eating (Snelling, Ernst & Belson 2013; Rossiter et al. 2007). This position was observed with the two schools. The teachers supported that there should be a written school nutrition policy to address food related issues, that dietary practices of teachers influence the dietary practices of learners and that NE should give learners the skills to make healthy food choices. The teachers in the treatment school however showed little improvement compared to the control school in the selected statements indicated above. For example, 100% of the teachers consistently agreed with the statements at post-implementation (figures 7.7, 7.8 and 7.9). The opinions of teachers in previous studies were in support of a healthy school food environment (Snelling, Ernst & Belson 2013; Rossiter et al. 2007). The position of the teachers in the present study implied that teachers could influence the school food environment in support of healthy eating (United Nations Educational Scientific and Cultural Organization (UNESCO) 2013).

The teachers' practices in food hygiene depicted that the teachers in both schools had hygiene practices that were consistent with healthy eating. For example, most of the teachers always checked the expiry date and washed fruits that must be peeled before eating. The teachers in the treatment school had a non-significant within school improvement with a mean change of 0.8% as against -2.3% in the control school for practices in food hygiene (table 7.11). This result is in line with the findings of a study that reported that the hygiene level of the teachers was low before NE intervention but increased considerably after the intervention (Motamedrezaei et al. 2013). However, the teachers in the present study had good hygiene practices before the implementation of the NEP. Moreover, food hygiene was one of the topics of the NE manual that was discussed with the teachers during the workshop, though the

topic had not been taught by the teachers at the time of post-implementation assessment. It is therefore expected that the teachers in the treatment school would demonstrate hygiene practices that are consistent with healthy eating. The teachers' hygiene practices could have positive implications for their support for NE in the school.

8.5 PROCESS EVALUATION OF THE NUTRITION EDUCATION PROGRAMME

8.5.1 Evaluation of the workshop by the teachers

Teachers' comments regarding the workshop on the implementation of the NEP were obtained on four areas. The areas included workshop content; skills and knowledge acquired; workshop materials and instructors, and the overall quality of the workshop. The teachers rated the workshop content as having clear objectives and indicated that they were satisfied with the way in which the contents were logically arranged and presented. This result is comparable with the findings of a study that reported how teachers were motivated by a pre-intervention workshop where a detailed teacher manual with clear learning objectives was implemented (Jørgensen et al. 2014). The one day workshop in this study started with presentation of the objectives of the workshop. Some of the objectives were: to discuss how learners could increase knowledge of foods that are good choices in order to develop their ability for healthy eating; to discuss how learners could increase knowledge of food nutrients, and desire to choose nutritious foods.

The teachers were of the view that they enhanced existing and acquired new skills and knowledge for teaching nutrition. This feedback is in line with the findings of a study where teachers reported that they felt more knowledgeable after receiving training on NE on growth monitoring (Mandiwana et al. 2015). The three hour training programme by Mandiwana and colleagues is comparable to the one day workshop in this present study which lasted for six hours. Though the teachers in the two studies were of different profiles, the purpose for training, which was to improve the knowledge and skills of the teachers, was similar. Teachers tend to feel more confident teaching nutrition when they received appropriate training in nutrition (McCaughtry et al. 2012; Murimi, Sample & Hunt 2008). The nutrition topics outlined in the curriculum of the DoBE were presented with an explanation on how the selected constructs of the SCT and the MLM could be used to explain the nutrition messages to learners. The introduction of theoretical concepts to nutrition lessons was new to the

teachers. However, the way the application was simplified and the benefits of the use of theories in promoting learning and making nutrition messages more understandable might explain the teachers' positive feedback. The approach of training employed in the present study is similar to that of Fahlman et al.'s (2011) in-service training for the teachers in their NE intervention which included components for improving the skills of the teachers in teaching nutrition. In a review that assessed the impact of implementation on programme outcomes, it was revealed how training of intervention implementers helped to prepare them for their new task by developing skills for the intervention (Durlak & DuPre 2008).

In respect of the workshop materials and instructors, the teachers indicated that they understood the ideas presented in the manual. The reasons the teachers gave was that the instructors gave clear and logical presentations of the concepts in the manual. Each of the topics in the manual was presented under the following headings: preparation for the lesson, establishing prior knowledge, participatory teaching and learning, problem based group discussions and the activities for the learners. The results of the present study are in line with the findings that in-service training of teachers in combination with adequate instructional materials led to improvement in the teachers' skill in teaching nutrition (Fahlman et al. 2011).

The teachers indicated that the overall quality of the workshop was good. Aside the contents of the workshop; the venue, arranged transportation, and the welfare package (refreshment, lunch, photographs, and certificate of attendance) which accompanied the workshop might have added to the value of the workshop. Durlak and DuPre (2008) noted that the inclusion of a good welfare package could facilitate the success of trainings to enhance professional skills.

Additional comments received from the teachers were used to make adjustments on the manual. Some of the adjustments were the inclusion of a section in the manual indicating the important things that learners need to know on each sub-topic, page referencing for ease of use and a glossary of terms for difficult words. Feedback from process evaluation participants could constitute formative tools useful for necessary adjustment in an on-going NEP (Johnson et al. 2010).

8.5.2 Implementation of the contextual nutrition education programme to the learners

The teachers' responses were mostly positive regarding how the various features of the NEP such as the use of the icons and the supporting materials, i.e. the posters, picture book and learner's work book were helpful in presenting the nutrition lessons. The explanation on the

use of the selected constructs of the SCT and the MLM to explain nutrition concepts was presented in icons (Duncan et al. 2011; Babadogan & Unal 2011; Francis, Nichols & Dalrymple 2010). One of the teachers explained how he got insight from the icon for the expectation construct of the SCT which he used to correct the learners' misunderstanding of the term "dream". The learners had misunderstood the term "dream" to mean the dream of the night, while it actually referred to their future aspirations.

The positive contribution of the use of the supporting materials as reported by the teachers in the present study was also reported in a study where the teachers expressed satisfaction in the content and the approaches of the NE materials (Sherman & Muehlhoff 2007). One teacher however had the view that the activities in the learner's work book did not contribute much to the learners' reading skills because the learners were too lazy to read. A logical comment on this view would be that teachers could use this situation as a platform to encourage the learners to read. It was reported in a study how the intervention component included an appealing learner's work book to encourage learners' participation (Aarestrup et al. 2014). The findings of the needs assessment (phase 1) further corroborate the teachers' views in this present study. The teachers in the needs assessment study mentioned improving the teaching of nutrition in the classroom as one of the positive environmental factors for enhancing healthy eating among learners.

The supporting materials that served the purpose of effective teaching aids in the lessons' delivery might explain the teachers' positive responses to the use of the posters and the picture book. The use of additional materials was recommended to accompany the teacher's manual in the teaching of nutrition in primary schools (Oldewage-Theron & Napier 2011).

In this study, the teachers consistently indicated that time allotted was not enough to teach the important things that the learners needed to know. The allotted time was according to the DoBE CAP curriculum 2011 (DoBE 2011a, DoBE 2011b). The explanation for time constraint was in two fold. Firstly, the allotted time according to the curriculum was just not enough. Secondly, the allotted time sometimes had to be shared with other school activities or with other non-curricular activities of the teachers. Time constraint as a challenge in the effective implementation of NE in schools has been consistently reported in the literature (Prelip et al. 2012; Steyn et al. 2009). In the study conducted by Gross, Pollock and Braun (2010), the fact that teachers' time had to be shared with many activities in the school affected the effective delivery of the NEP. This finding is also confirmed from that of the needs

assessment study (phase 1); the teachers were of the view that the time allocation for the teaching of nutrition was not enough to help learners to adopt healthy eating. If the benefits of school NE are to be fully realised, time allotted to teach nutrition in the classroom needs to be reviewed.

The completeness of the NE implementation relates to the issue of time. Although all the topics were implemented, they were not implemented as had been planned because of limited time. Teachers had to teach the sub-topics therefore, superficially. The report of the present study is consistent with the findings of a study that reported time pressure of the school curriculum as the reason for the non-completion of the intervention (Lakshman et al. 2010). In a study that examined the barriers and facilitators to teachers' implementation of a school NE intervention it was reported how some of the teachers could not implement the programme as planned because of time constraints (Jørgensen et al. 2014).

In respect of the fidelity of implementation, the programme was not implemented with a high degree of fidelity. This shortcoming could not be ascribed to lack of commitment on the side of the teachers but rather on the limitation of time. A similar finding was reported in a study where the shortfall in the implementation was due to factors beyond the control of the programme staff (Johnson et al. 2010). The order in which the lessons were to be presented in the present study was not strictly followed by the teachers. This finding is contrary to a study that reported that very few teachers were willing to commit to a plan of action for the intervention which resulted in a revision of the action planning process for the programme (Draper et al. 2010).

The dose of the implementation delivered by the teachers with respect to the topics, except for one topic, was 100%. The fact that the teaching of all the topics was considered as a duty that had to be performed might explain this result. The teachers might be required to indicate their regular reports of the completion of the topics in the curriculum. The topics of the contextual NE manual were the topics outlined in the DoBE curriculum which were to be taught within the period allocated for them in the subject areas. The high dose of implementation obtained in the present study is corroborated with the findings of a study by Johnson et al. (2014) that reported a high level of programme implementation by the implementation staff. A hundred percent implementation was also reported in a study by Dunton et al. (2014).

The dose of implementation received by the learners in all the topics was rather low ranging from 9% to 50%. Dose received by the learners is a measure of the amount of the class

activities that the learners engaged in. This result is contrary to the findings of the Action Wellness programme where the dose received by the participants was high (Johnson et al. 2010). The low dose of implementation received by the learners in the present study could be explained by a number of reasons. As explained by the teachers, there was not enough time to give adequate explanations to the learners. There was inadequate time to assess what the learners did in some of the activities.

The implementation of the contextual NE manual reached all the learners in Grades 5 and 6 in the treatment school. All the learners received the learner's work book and used the work book to do the lesson activities. It could be assumed that the use of class attendance register to monitor the learners' attendance in all the lessons could have provided a more comprehensive report. However, the official lessons timetable for teaching the classes, where the learners all received the learner's work book and were taught by using the NE manual was considered to be adequate for the present study. Moreover, taking class attendance record in the class that included learners with no parental consent or assent to participate in the study was not ethically covered by the study's ethical approval.

8.5.3 Teachers' perceptions of the impact of the implementation of the nutrition education programme on their teaching of nutrition

The teachers described the manual as rich information, well-illustrated with graphics and colourful pictures and that the manual was easy to use. A study by Norman et al. (2016) described barriers and facilitators that influenced the implementation of a NE intervention in the disadvantaged areas of Stockholm, Sweden. It was reported that some teachers perceived the teacher's manual and the materials were helpful, with clear instructions and good arrangement. Others were of the view that the children found the lesson activities difficult to perform. The components of NE manual and its user friendliness are some of the factors that could motivate or demotivate teachers in effectively implementing NEPs (Jørgensen et al. 2014; Draper et al. 2010).

The teachers perceived the impact of their using the manual on learners' eating behaviour in two ways. Firstly, that the learners have received nutrition knowledge which could be with them more so for their future use. The learners' low economic background and the inadequate time for the teaching of the lessons were the reasons for the teachers' negative perceptions. A constrained socio-economic background (De Villiers et al. 2015a; Kupolati, Gericke &

MacIntyre 2015; David et al. 2008) and time constraints (Jørgensen et al. 2014) have been identified as hindrances to the success of school NE intervention studies.

The nutrition knowledge acquired by learners through a NE intervention in resources limited communities needs more careful consideration. McNulty (2013) reasoned that school NE should equip the learners to be future parents who could take responsibility for the nutritional well-being of themselves and that of their families. It is of no use creating frustration for learners by giving information which they could not implement because of their low economic background. McNulty's argument supports the teachers' perceptions in this present study that the learners received the nutrition knowledge that could be with them more so for their future use. This argument is also in line with the suggestion by David, Kimiywe and Waudo (2012) that NE be introduced in the early years of schooling so that learners who drop out of school or stopped at primary education to start raising a family, could benefit from NE. Effective school NE can prepare learners to be nutritionally literate parents who will use acquired nutrition information to the benefit of the family (FAO 2006).

The results of the quantitative assessments for this study also confirm the teachers' views that the learners actually improved in nutrition knowledge due to the NEP, though the knowledge might not immediately translate into healthy eating practices by the learners. The nutrition knowledge and attitudes mean scores for the learners showed significant improvement while the dietary practices did not significantly improve.

Secondly, that the learners learnt from some of the demonstrations carried out in the classroom which they could go and practise at their homes. An example was the effective hand washing demonstration. A study reported how learners went on to develop their own vegetable gardens at home after participating in the school vegetable garden in a NE intervention programme (David et al. 2008).

The teachers were of the view that the NE manual was more beneficial than the textbooks they had been using before. The fact that the NE manual was contextual in orientation, rich in information with a clearly structured outline could explain the reason for these results. The supporting materials of the NE manual (the posters, picture book and the work book) which featured the learners' goal setting, problem based group discussions and activities were perceived by the teachers as helpful in promoting nutrition knowledge among the learners. This result is similar to the findings of Jørgensen et al. (2014) that a detailed NE manual and lesson plans encouraged teachers to implement a NEP.

However, the possibility of the learners' goal setting endeavour, group discussions and work book activities translating into the learners practising healthy eating in the present situation was with mixed feelings. The perceptions were that the learners might only be able to practise a few of the things they learnt in the present situation but would be able to use the information in the future. The teachers perceived that the parts that the learners enjoyed most were those areas that dealt with practical demonstrations, consequences of poor diets and the drawing of their future aspirations. Results similar to the finding of the present study have been reported in the literature. Learners always show more interest and enthusiasm when learning is accompanied with activities than when learning is with instructions only (Lakshman et al. 2010; David et al. 2008). Learners were also perceived to be motivated to change to healthy eating when confronted with consequences of a poor diet, although the change in behaviour might be short lived (Kupolati, Gericke & MacIntyre 2015).

The teachers indicated their willingness to continue with the use of the NE manual if given the opportunity. The reasons given emphasised what was previously expressed by the teachers and included the manual's attractive design, simple language, practical orientation, ease of use and the contents being in line with the DoBE curriculum. A similar result was reported in previous studies where teachers expressed satisfaction with the educator's manual and the NE materials which eased their teaching (De Villiers 2015a; Jørgensen et al. 2014). Aligning a NEP with the existing curriculum guidelines is more likely to receive the co-operation of the school authority and the teachers (Duncan 2011). The fact that the NE manual was in line with the DoBE's curriculum and was taught by trained teachers aligned it with the findings from previous studies that integrating school-based NE into an existing curriculum brings about desirable results (Dudley, Cotton & Peralta 2015; Faber et al. 2013; Oldewage-Theron & Egal 2012; Steyn et al. 2009).

The technical support that the teachers received during the implementation of this intervention could further explain their satisfaction with the NEP and their willingness to continue with the programme. Offering technical assistance once the programme starts such as re-training, offering solutions to problems and providing emotional support, could motivate implementers thereby leading to effective implementation of interventions (Durlak & DuPre 2008).

The teachers suggested that the learner's work book should include more activities out of which teachers could choose and that the learner's work should feature more hands-on activities. Supporting materials for school NE was recommended to include a variety of

resources in different presentations to enhance effective teaching of nutrition in schools (Oldewage-Theron & Egal 2012). The teachers' suggestion to enhance the quality of the posters through lamination further indicated the teachers' desire to continue with the use of the NE manual. The teachers indicated that the posters would not be suitable for use the following year because they were getting torn.

8.6 IMPACT OF THE NUTRITION EDUCATION PROGRAMME ON THE LEARNERS' NUTRITION KNOWLEDGE

The third hypothesis relates to the learners nutrition knowledge assessment. It stated that the learners in the treatment school compared with the learners in the control school would significantly improve in the nutrition KAP. The results uphold this hypothesis in respect of nutrition knowledge. The learners in the treatment school, compared with learners in the control school, had a significantly higher total mean nutrition knowledge score at post-implementation ($P = 0.001$). This result is in agreement with the significant improvement in the nutrition knowledge ($F = 17.72$, $P < 0.001$) reported in a study that used the same instrument that was used in the present study (Shariff et al. 2008). A South African study reported a significant improvement in the nutrition knowledge (45% to 58%, $P = 0.00$) of Grade 7 learners after a NE intervention (Oosthuizen, Oldewage-Theron & Napier 2011). Likewise a significantly improvement in the nutrition knowledge (mean difference of 1.88, $P =.021$) of learners in the intervention school was reported a study by De Villiers et al. (2015b). Lakshman et al. (2010) also demonstrated a significant improvement ($F = 67.07$, $P <$ 001) in the nutrition knowledge of the learners in the intervention school.

A number of reasons could explain the result of this present study. The approach of teaching employed was a participatory approach which promotes active and interactive learning (Keengwe, Onchwari & Oigara 2014; McNulty 2013). Each of the learners was provided with the learner's work book that enhanced their participation in class discussions. The attractive design and feel of the book also enhanced their learning as reported by the teachers in the FGD. The teaching of the topics was accompanied with posters and provision of foods and materials for class demonstration and practical purposes. NE intervention to learners accompanied with education materials such as posters, work books and games as well as food materials have been reported to lead to improvement in learners' nutrition knowledge (Sherman & Muehlhoff 2007; FAO 2006). Also the practical and class demonstration aspects of the lessons provided the learners the opportunity for experiential learning, an approach

reported as a strong strategy in improving the nutrition knowledge of primary school learners (Dudley, Cotton & Peralta 2015). The fact that the NE topics were taught by the teachers who were trained on the use of the NE manual might have contributed to the significant improvement. Panunzio et al. (2011) established that NE intervention provided by teachers who were trained in nutrition led to improvement in the nutrition knowledge of learners. Moreover, the teaching of the nutrition topics was in context of the environment of the learners (FAO 2006). The results of this study are consistent with many studies that established significant improvement in the nutrition knowledge of learners through NE intervention (Carraway-Step et al. 2015; Vierregger et al. 2015; Shah et al. 2010; Fahlman et al. 2008; Muth et al. 2008; Ellis & Ellis 2007).

The learners were assessed on five categories of nutrition knowledge, namely food nutrients and functions; food and energy; nutrient deficiency; food choices and sources of nutrients. The learners in the treatment school, compared with the learners in the control school, achieved significantly higher mean scores in the categories on food and energy ($P < 0.001$), nutrient deficiency ($P = 0.008$) and sources of nutrients ($P = 0.002$). However, the learners in the control school had non-significantly higher mean scores than the learners in the treatment school in the categories on food nutrients and functions ($P = 0.192$) and food choices ($P = 0.073$). In the study that aimed to improve the nutrition-related knowledge and behaviour of school children, it was reported that about half of the children did not know the dietary sources of vitamins and fibre but recorded significant improvements at post-intervention (Shah et al. 2010).

The within school changes in the learners' nutrition knowledge from pre- to post-implementation relate to the fourth hypothesis. The hypothesis stated that the learners in the treatment school would have significantly better within school improvements in the nutrition KAP compared with the learners in the control school. The findings regarding the within school changes in nutrition knowledge of the learners support this hypothesis. The learners in the treatment school had significantly within school improvement in all the categories of nutrition knowledge ($P < 0.001$, $P = 0.009$, $P = 0.001$ and $P < 0.001$), except in the category on food nutrients and functions which showed a decline in performance. The learners in the control school had non-significant within school improvements in the categories on food nutrients and functions ($P = 0.558$), food choices ($P = 0.336$) and sources of nutrients ($P = 0.813$ and declined in the categories on food and energy and nutrient deficiency. It should be noted that despite a significant within group improvement in the category on the sources of

nutrients the mean score remained very low (from 30.0 ± 17.0% to 36.4 ± 22.6% for treatment school and 32.5 ± 17.8% to 32.8 ± 18.7% for control school, pre- to post-implementation) (table 7.22). This contributed to the low total mean scores of 53.2 ± 16.9% and 53.1 ± 17.6% for the treatment and control schools respectively. The low mean score for the category on the sources of nutrients in both schools could have implications for the learners' skill in identifying healthy foods. The finding of the present study corroborated the findings in an intervention to improve nutrition knowledge in children which found no improvement in the children's ability to identify healthier foods in both the intervention and control schools (Lakshman 2010).

Considering the percentage of learners who correctly answered nutrition knowledge questions by Grades, results show that more Grade 6 learners than Grade 5 learners answered the questions correctly. For example, the question "Foods like fat cakes, doughnuts and cakes give lots of energy with minerals and vitamins" was answered correctly by 57% to 64% of Grade 5 learners and by 62% to 77% of Grade 6 learners in the treatment school from pre- to post-implementation (figure 7.15). In all, Grade 5 learners in the treatment school improved in 12 questions out of 23 knowledge questions, while Grade 6 improved in 22 questions. This was expected in light of the fact that the two Grades were not at the same education level. Moreover, they were not exposed to the same curriculum content with respect of the NE manual implementation. The Grade 5 curriculum featured one topic (Healthy eating in children) of the five topics of the NE manual while Grade 6 curriculum featured four topics of the NE manual (Nutrients in food, nutrition, food processing and food hygiene) as outlined in chapter 5, table 5.3. A study by David, Kimiywe and Waudo (2012) on the assessment of the nutrition knowledge of Grades 5 and 6 learners reported a non-significant difference in the nutrition knowledge of Grades 5 and Grade 6 learners. Their result implied that higher classes do not have better knowledge regarding nutrition. The findings of David, Kimiywe and Waudo (2012) confirm the findings of the present study, as revealed from the performance in the control school. In the control school, Grade 5 learners improved in 13 of the 23 knowledge questions while Grade 6 learners only improved in nine of the 23 questions, implying that the difference observed in Grade 6 of the treatment school was due to the NEP. The significant improvement in the mean nutrition knowledge scores of Grade 6 over that of Grade 5 in the treatment school further supports the positive impact of the NEP (table 7.26). Grade 5 learners in the treatment school were only taught one topic out of the five topics of the NE manual while Grade 6 learners were taught four topics.

8.7 IMPACT OF THE NUTRITION EDUCATION PROGRAMME ON THE LEARNERS' NUTRITION ATTITUDES

The results of the learners' nutrition attitudes relate to the third hypothesis that stated that, the learners in the treatment school, compared with the learners in the control school would significantly improve in the nutrition KAP. The results for the nutrition attitudes of the learners uphold this hypothesis. The learners in the treatment school significantly improved ($P = 0.002$) compared with the learners in the control school regarding the mean nutrition attitudes score. This result is in agreement with the findings of Shariff et al. (2008) who used the same instrument that was used in the present study and reported a significant change ($F = 6.41$, $P < 0.05$) in the attitudes of the learners. The reason for the significant improvement in the present study might be associated with the improvement in the learners' nutrition knowledge. NE aims at improving nutrition knowledge towards enhancing nutrition attitudes and behaviours (Deckelbaum & Williams 2012). The relationship between these two variables often presents negative to weak positive associations (Spronk et al. 2014). A study that implemented NE to primary school children by using the traffic light nutrition tool reported negative changes in attitudes scores towards healthy choices of food, and also in positive attitudes towards foods that were unhealthy choices (Ellis & Ellis 2007).

Considering the learners' performance in the attitudes statements according to their Grades in both schools at pre- to post-implementation, a higher percentage of Grade 6 learners than Grade 5 learners had positive responses to the attitudes statements. As was revealed, Grade 5 learners in the treatment school improved in six out of the eleven attitudes statements, while Grade 6 learners improved in all the eleven statements (tables 7.30 and 7.31).

The within school differences in the learners nutrition attitudes relate to the fourth hypothesis which stated that the learners in the treatment school would have significantly better within school improvements in the nutrition KAP compared with the learners in the control school. The learners' nutrition attitudes results in respect of within school differences support this hypothesis. The learners in the treatment school had significantly better within school improvement ($P < 0.001$) compared to the learners in the control school.

8.8 IMPACT OF THE NUTRITION EDUCATION PROGRAMME ON THE LEARNERS' DIETARY PRACTICES

The third hypothesis relate to the learners' dietary practices assessment which stated that the learners in the treatment school, compared with the learners in the control school would significantly improve in the nutrition KAP. The results of dietary practices of the learners contradict this hypothesis. The learners in the treatment school did not significantly improve in the mean scores for dietary practices compared with the learners in the control school (P = 0.24). The within school differences in the learners' dietary practices relate to the fourth hypothesis. It stated that the learners in the treatment school would have significantly better within school improvements in the nutrition KAP compared with the learners in the control school. The results of within school differences for the learners' dietary practices did not uphold this hypothesis. The dietary practices of the learners in the treatment school did not improve but declined (-2.5%, P = 0.039).

The resource constrained background of the learners and the fact that the learners had no control over what they ate in their homes as revealed in the FGD with the teachers might explain the results of learners' dietary practices in this present study. In a study by Gorely et al. (2009) it was explained how parental influence plays a role in a non-significant improvement that was observed the learners' intake of fruits and vegetables. The non-significant decline in the dietary practices of the learners in the treatment school in the present study is despite the significant improvement in the nutrition knowledge and attitudes respectively. The results of the present study together with the findings of previous studies in the literature point to the fact that, improvement in nutrition knowledge does not always translate to healthy dietary practices (Schmidt et al. 2010; Gorely et al. 2009). These results are similar to the findings of the HeatlthKick intervention in Western Cape that reported significant improvement in the nutrition knowledge and self-efficacy of primary schoolchildren with no improvement in their eating behaviour (De Villiers et al. 2015b).

The learners in both schools showed small improvements from pre- to post-implementation in respect of some healthy eating practices such as the eating of breakfast almost every day and the eating of vegetables in at least one or two meals a day. Previous studies have established how NE intervention led to improvement in learners' dietary behaviour in specific areas such as fruit and vegetable intake (Fahlman 2008; Centers for Disease Control and Prevention (CDCP) 2008; Powers et al. 2005). The learners in the present study received healthy meals in

school every day and the fact that most (81%) South African children usually eat breakfast at home (Shisana et al. 2013) might explain this result. The needs assessment study (phase 1) revealed how some learners refused to eat from the NSNP whenever foods that include vegetables were served. The impact of the NEP might have possibly helped the learners to avail themselves the opportunity of eating vegetables in at least one of their daily meals through the NSNP.

However, in respect of unhealthy eating practices such as the eating of sweets, chocolates and ice-cream, the percentage of the learners who engaged in this practice almost every day to several times a week increased from pre- to post-implementation. The trend with healthy and unhealthy dietary practices from pre- to post-implementation in Grades 5 and 6 learners in both schools was the same. For example, the percentage of Grade 5 learners who regularly (almost every day and several times a week) consumed sweets, chocolates and ice-cream was 54% to 64% and 69% to 79% at pre- to post-implementation in the treatment and control schools respectively (figure 7.23). The percentage for Grade 6 learners was 65% to 64% in the treatment, and 51% to 58% in the control school at pre- to post-implementation respectively (figure 7.24). A study conducted by Ellis and Ellis (2007) reported how their NE intervention did not seem to positively impact the dietary practices of the learners because of negative changes in behaviour towards foods that were healthy choices. The intervention by Duncan et al. (2011) also reported significant improvements on the other intervention outcomes but failed to record a significant effect on the learners' consumption of unhealthy drinks. There is evidence to the fact that NE intervention's impact on the dietary practices is seldom realised with short intervention duration (Spronk et al. 2014; David et al. 2008). The short duration of the NEP might not have been sufficient to establish a change in dietary practices among the learners. The learners were only exposed to the intervention in blocks as scheduled by the DoBE curriculum (between 2 weeks and 5½ weeks, table 6.1).

8.9 STRENGTHS AND LIMITATIONS OF PHASE 3

8.9.1 Strengths

The aspects of this study which contributed to its strength included the following:

- The implementation of the NE manual to the learners was done by the teachers who were trained on the use of the manual.

- The NE training that was provided for the teachers was not only for the teachers who implemented the NE manual to the learners, but to all the teachers who taught nutrition to learners in Grades 4 to 7. As a result, the teachers who did not implement the manual were able to provide a supportive role to the NEP.
- The implementation of the NE manual to the learners by the teachers was in line with the schedule of the DoBE curriculum, as a result of which the teachers implemented the NEP without compromising their official teaching duties. This approach also won the support of the principal of the treatment school for the study. Aligning a school NE initiative with the school curriculum is likely to increase buy-in from the school staff (Duncan et al. 2011).
- The outline of the NE manual into the various features (components) such as the objectives, preparation, learners' prior knowledge, active participatory teaching and the sub-topic notes made it easy for the teachers to use the manual to teach.
- Each of the learners was provided with a copy of the learner's work book which enhanced class participation and facilitated learning among the learners.
- Independent researchers were used to obtain information in an one-on-one interview with the teachers on their experiences in using the manual to teach the learners.
- The nutrition KAP assessment with the teachers was done in a session involving all the teachers at one time, thereby making no room for the teachers to obtain answers to knowledge questions from external sources.
- The nutrition KAP assessment for the learners was done in the presence of the teachers who clarified issues in the learners' language without providing the answers.
- The fact that the NEP was based on the existing DoBE curriculum and implemented by the teachers could enhance the sustainability of the programme, wherein continuous external input of nutrition experts or project staff might not be needed.

8.9.2 Limitations

- The number of schools involved and the approach of implementation made it impossible to use a randomised controlled trial (RCT) which is considered a gold standard in evaluation (Petersen & Fox 2007). Instead, a quasi-experimental design was used which precludes a random assignment of research participants to treatment and control groups (Shelley 2014). The study was also limited in the number of

teachers who participated in the study; involving a larger number of teachers and more schools could increase the chances of measuring the impact of the NEP.

- The study population was predominantly black, and took place in a resource limited community; therefore the findings of the present study may not be generalisable to a population of affluence communities.
- The NEP was limited to only Grades 5 and 6 learners, whereas a NEP involving the learners at the lower Grades in the school might have produced different results.
- The dietary practices were assessed by self-reported questionnaires. The teachers might have answered practices questions in generally acceptable ways, therefore the reported dietary practices may not fully reflect the dietary practices of the teachers.
- Due to the unavailability of a suitable questionnaire for the teachers in this study, the instrument used to assess the nutrition KAP of the teachers was adapted from three standardised questionnaires. The developed questionnaire needed to be validated and standardised (Spronk et al. 2014), although it had been pre-tested among a population with similar characteristics before it was used.
- One of the intentions of NE is to provide nutrition knowledge which is vital in obtaining behaviour change to healthy eating (Deckelbaun & Williams 2012; Petersen & Fox 2007). A relationship between nutrition knowledge assessed in this study and the dietary practices of the participants was not assessed due to the nature of the data set. Such a result could have added value to the implications of the findings of this study.
- The order of the presentation of the NE topics as outlined in the DoBE curriculum for Grade 6 was not in a straight order, therefore the retention of the nutrition information received by the learners might have been affected. Moreover, the regulation for the conduct of research in the school does not permit research activities beyond October; therefore the post-implementation assessment of the learners was done in September when the last topic (food hygiene) of the NE manual was yet to be taught. These shortcomings might have contributed to the low mean scores for nutrition knowledge and attitudes of the learners.
- The same questionnaire was used for Grade 5 and 6 learners, whereas the content of the NE manual for the two Grades was not the same. This unequal measure might have affected the performances of Grade 5 learners.

8.10 CONCLUSIONS

This phase comprised the implementation of the contextual NEP and the evaluation of the impact of the implementation on the nutrition KAP and teaching skills of the teachers, and on the nutrition KAP of the learners.

- It can be concluded that the NEP resulted in the significant improvement of the teachers' total nutrition knowledge. There were also significant within school improvements in the categories of nutrition knowledge except the food processing category.
- The NEP did not significantly improve the nutrition attitudes of the teachers even though there was an appreciable within school increase in the mean score in the nutrition attitudes of the treatment school teachers, and in comparison with the control school teachers.
- The NEP led to the improvement of dietary practices that support healthy eating among the teachers, but did not improve those dietary practices that are contrary to healthy eating.
- The NEP was acceptable to the teachers as they expressed satisfaction on both the training they had and the NE manual which they used to teach the learners. This was confirmed from their expressed views that they improved in their skills in teaching nutrition and that they would like to continue with the using of the manual to teach nutrition. The teachers also confirmed that the NEP increased the nutrition knowledge of the learners.
- The NEP resulted in the significant improvement in the learners' total nutrition knowledge. There were within school improvements in all the categories (except one category) of nutrition knowledge of the treatment school, and in comparison with the control school.
- The NEP led to significant within school improvement in the nutrition attitudes of the learners, and in comparison with the control school.
- Following the intervention (NEP) in the treatment school, Grade 6 learners had greater improvement in total nutrition knowledge (significant) and nutrition attitudes (non-significant) in comparison with Grade 5 learners.
- The NEP only partly improved the dietary practices of the learners; while healthy practices improved, unhealthy practices did not improve (i.e. decreased).

The NEP has demonstrated the feasibility of integrating a theory based context specific nutrition lessons implemented by teachers into the existing school curriculum for the realisation of improved skills in teaching nutrition. This strategy has potential for self-sustainability once the programme is initiated, thereby establishing and maintaining the benefits of school based NE, which includes enhanced nutrition knowledge and attitudes leading to healthy eating, as a continuous experience. The aim of the DoBE to enable the learners to benefit their lives with their knowledge (DoBE 2011a) could therefore be realised.

The selected constructs of the SCT and the MLM that were used in this study epitomised the contextual orientation of the NEP and perfectly aligned with the teaching plan in primary schools. The theory based template that guided the development of the NE manual could be used by teachers in planning nutrition lessons that are tailored to the needs of learners.

8.11 RECOMMENDATIONS

The following recommendations are made for future research:

- A study to determine if the improvement in the nutrition knowledge and attitudes among the teachers and the learners is sustainable over a period of time.
- A study to establish if these results can be confirmed in a larger but similar population of teachers, schools and learners.
- A study to examine the relationship between the nutrition knowledge and dietary attitudes and practices in the population studied, since the goal in NE is to improve knowledge and thereby encouraging healthy eating.
- A study to be carried out among the teachers of foundation classes (Grade R to 3) and the learners in the foundation classes to test the effectiveness of the NEP among younger learners in a similar setting.
- Given that the nutrition KAP questionnaire used for the teachers in this study was adapted from three different questionnaires, a further study is required to validate and standardise the questionnaire among primary school teachers in resource limited settings.

- Since this study was carried out in a resource limited setting, which constrained the generalisation of the findings, further study to test the impact of the NEP among similar populations in urban settings is recommended.

The following recommendations are made regarding the NEP

- A periodic in-service training for the teachers who teach nutrition topics to update their nutrition knowledge and nutrition teaching skills.
- A review of the allotted time for the teaching of nutrition so as to ensure adequate time is secured for effective teaching of nutrition in the classroom.
- Going by the teachers' suggestion, it is recommended that learner's work book should contain many non-writing activities. Also, the posters should be laminated to enhance their long lasting.
- Nutrition plays a vital role in the health of the individual and contributes to the nations' growth through manpower development. It is necessary that NE be recognised as one of the important subjects in the schools, and be accorded the necessary support from the school's authority and the DoBE.

REFERENCES

Aarestrup, AK, Jørgensen, TS, Due, P, & Krølner, R 2014, 'A six-step protocol to systematic process evaluation of multicomponent cluster-randomised health promoting interventions illustrated by the Boost study', *Evaluation and Program Planning*, vol. 46, pp. 58-71, viewed 23 November 2015, http://doi:10.1016/j.evalprogplan.2014.05.004.

Androutsos, O, Apostolidou, E, Iotova, V, Socha, P, Birnbaum, J, Moreno, L, De Bourdeaudhuij, I, Koletzko, B & Manios, Y 2014, 'Process evaluation design and tools used in a kindergarten-based, family-involved intervention to prevent obesity in early childhood, The ToyBox-study', *Obesity Reviews*, vol. 15, suppl. 3, pp. 74-80.

Arcan, C, Hannan, P.J, Himes, JH, Fulkerson, JA, Rock, BH, Smyth, M & Story, M 2013, 'Intervention effects on kindergarten and 1st grade teachers' classroom food practices and food-related beliefs in American Indian reservation schools', *Journal of the Academy of Nutrition and Dietetics*, vol. 113, no. 8, viewed 16 November 2015, http://doi.org/10.1016/j.jand.2013.04.019.

Babadogan, C & Unal, F 2011, 'Examples of instructional design for social studies according to meaningful learning and information processing theories', *Procedia - Social and Behavioural Sciences*, vol. 15, pp. 2155-2158, viewed 11 January 2014, http://.doi:10.1016/j.sbspro.2011.04.070.

Boone, HN & Boone, DA 2012, 'Analyzing Likert data', *Journal of Extension*, viewed 15 December 2015, http://www.joe.org/joe/2012april/pdf/JOE_v50_2tt2.pdf.

Carraway-Step, V, Hovland, J , Showers, C , Díaz, S, & Duffrin, MW 2015, 'Food-based science curriculum yields gains in nutrition knowledge', *Journal of School Health,* vol. 85, no. 4, pp. 231-240.

Centers for Disease Control and Prevention (CDCP) 2008, *Guidelines for school health programs to promote healthy eating, Morbidity and Mortality Weekly Report (MMWR),* vol. 45, no. 9, pp. 1-33.

Chen, YH, Yeh, CY, Lai, YM, Shyu, ML, Huang, KC & Chiou, HY 2010, 'Significant effects of implementation of health-promoting schools on school teachers' nutrition knowledge and dietary intake in Taiwan', *Public Health Nutrition*, vol. 13, no. 4, pp. 579-588.

Choi, KS 2010, 'A study on nutrition knowledge, dietary attitudes and nutrition education needs among child-care teachers', *Korean Journal of Community Nutrition*, vol. 15, no. 1, pp. 137-148.

David, DM, Kimiywe, JO, Waudo, JN & Orodho, JA 2008, 'Promotion of nutrition education interventions in rural and urban primary schools in Machakos district, Kenya', *Journal of Applied Biosciences*, vol, 6, pp. 130-139, viewed 25 December 2013, http://m.elewa.org/JABS/2008/6/1.pdf.

David, MD, Kimiywe, J & Waudo, J 2012, Nutritional Knowledge, Attitude and Practices and Nutritional Status of School-Going Children in Machakos District, Kenya: *International Conference on Nutrition and Food Sciences*, IPCBEE 39, IACSIT Press, Singapore.

Department of Basic Education (DoBE) 2011a, *National Curriculum Statement (NCS). Curriculum and Assessment Policy Statement (CAPS) Grades 4 - 6: Natural Sciences and Technology*, viewed 15 November 2012, http://www.edu.gov.za.

Department of Basic Education (DoBE) 2011b, *National Curriculum Statement (NCS). Curriculum and Assessment Policy Statement (CAPS) Grades 4 - 6: Life Skills*, viewed 15 November 2012, http://www.edu.gov.za.

De Villiers, A, Steyn, NP, Draper, CE, Hill, J, Dalais, L, Fourie,J, Lombard, C, Barkhuizen, G & Lambert, EV 2015a, 'Implementation of the HealthKick intervention in primary schools in low-income settings in the Western Cape Province, South Africa: a process evaluation', *BMC Public Health*, vol. 15, p. 818, viewed 23 November 2015, http://doi:10.1186/s12889-015-2157-8.

De Villiers, A, Steyn, NP, Draper, CE, Hill, J, Gwebushe, N, Lambert, EV & Lombard, C 2015b, 'Primary School Children's Nutrition Knowledge, Self-Efficacy, and Behavior, after a Three-Year Healthy Lifestyle Intervention (HealthKick)', *Ethnicity & Disease*, vol. 26, no. 2, pp. 171-180.

Deckelbaum, RJ, & Williams, CL 2012, 'Childhood obesity: the health issue', *Obesity Research*, vol. 9, Suppl. 11, pp. 239S-243S.

Dixon-Woods, M 2011, 'Using framework based synthesis for conducting reviews of quantitative studies', *BMC Medicine*, vol. 9, p. 39, viewed 30 July 2013, www.biomedcentral.com/1741-7015/9/39.

Draper, C, De Villiers, A, Lambert, E, Fourie, J, Hill, J, Dalais, L & Steyn, N 2010, 'HealthKick: a nutrition and physical activity intervention for primary schools in low-income settings', *BMC Public Health*, vol. 10, p. 398, viewed 23 November 2015, http://dx.doi:10.1186/1471-2458-10-398.

Dudley, DA, Cotton, WG & Peralta, LR 2015, 'Teaching approaches and strategies that promote healthy eating in primary school children: a systematic review and meta-analysis', *International Journal of Behavioral Nutrition and Physical Activity*, vol. 12, p. 28, viewed 23 June 2015, http://dx.doi.10.1186/s12966-015-0182-8.

Duncan, S, McPhee, JC, Schluter, PJ, Zinn, C, Smith, R & Schofield, G 2011, 'Efficacy of a compulsory homework programme for increasing physical activity and healthy eating in children: the healthy homework pilot study', *International Journal of Behavioral Nutrition and Physical Activity*, vol. 8, p. 127, viewed 13 October 2015, http://www.ijbnpa.org/content/8/1/127.

Dunton, GF , Liao, Y, Grana, R, Lagloire, R, Riggs, N, Chou, CP , Robertson, T 2014, 'State-wide dissemination of a school-based nutrition education programme: A RE-AIM (Reach, Efficacy, Adoption, Implementation, Maintenance) analysis', *Public Health Nutrition*, vol. 17, no. 2, pp. 422-430.

Durlak, JA & DuPre, EP 2008, 'Implementation matters: A review of research on the influence of implementation on program outcomes and the factors affecting implementation', *American Journal of Community Psychology*, vol. 41, pp. 327-350, viewed 23 November 2015, http://doi:10.1007/s10464-008-9165-0.

Elkins, J 2007, *Probability – theory of tossing coins*, viewed 21 August 2012, http://gwydir.demon.co.uk/jo/probability/info.htm.

Ellis, RM & Ellis, RCT 2007, 'Impact of a traffic light nutrition tool in a primary school', *Perspectives in Public Health*, vol. 127, no. 1, pp. 13-21.

Faber, M, Laurie, S, Maduna, M, Magudulela, T 2013, 'Is the school food environment conducive to healthy eating in poorly resourced South African schools?', *Public Health Nutrition*, vol. 7, no. 6, pp. 1214-1223.

Fahlman, M, McCaughtry, N, Martin J & Shen B 2011, 'School health educators' self-efficacy, intentions to teach, and implementation of nutrition education increases after in-service training', *American Journal of Health Education*, vol. 42, no. 3, pp. 181-190.

Fahlman, MM, Dake, JA, McCaughtry, N & Martin, J 2008, 'A pilot study to examine the effects of a nutrition intervention on nutrition knowledge, behaviors, and efficacy expectations in middle school children', *Journal of School Health*, vol. 78, pp. 216-222, viewed 19 November 2015, http://doi:10.1111/j.1746-1561.2008.00289.x.

Food and Agriculture Organization (FAO) 2006, *Nutrition education in primary schools: A planning guide for curriculum development*, viewed 21 June 2012, ftp://ftp.fao.org/docrep/fao/009/.

Folkestad, B 2008, 'Analysing interview data: Possibilities and challenges', *Eurosphere working paper series*, no. 13, viewed 8 November 2015, http://eurosphere.uib.no/knowledgebase/workingpapers.htm.

Francis, M, Nichols, SS & Dalrymple, N 2010, 'The effects of a school-based intervention programme on dietary intakes and physical activity among primary-school children in Trinidad and Tobago', *Public Health Nutrition*, vol. 13, no. 5, pp. 738-747.

Gibson, SR 2005, *Principles of nutritional assessment*. 2nd edn, Oxford University Press, New York NY.

Gorely, T, Nevill, ME, Morris, JG, Stensel ,DJ, Nevill, A 2009, 'Effect of a school-based intervention to promote healthy lifestyles in 7–11 year old children', *International Journal of Behavioral Nutrition and Physical Activity*, vol. 6, pp. 5, viewed 18 January 2016, http://doi:10.1186/1479-5868-6-5.

Gross, SM, Pollock, ED & Braun, B 2010, Family influence: key to fruit and vegetable consumption among fourth- and fifth-grade students', *Journal of Nutrition Education and Behavior*, vol. 42, no. 4, pp. 235-241.

Hair, JF, Black, WC, Babin, B J & Anderson, RE 2010, *Multivariate data analysis*. 7th edn. Prentice Hall, Englewood Cliffs.

Johnson, CC, Lai, YL, Rice, J, Rose, D, & Webber, LS 2010, 'ACTION live: using process evaluation to describe implementation of a worksite wellness program', *Journal of*

Occupational and Environmental Medicine/American College of Occupational and Environmental Medicine, vol. 52, suppl 1, pp. 14-21.

Jones, AM & Zidenberg-Cherr, S 2015, 'Exploring nutrition education resources and barriers, and nutrition knowledge in teachers in California', *Journal of Nutrition Education and Behavior*, vol. 47, no. 2, pp. 162-169.

Jørgensen, TS, Krølner, R, Aarestrup, AK, Tjørnhøj-Thomsen, T, Due, P & Rasmussen, M 2014, 'Barriers and facilitators for teachers' implementation of the curricular component of the boost intervention targeting adolescents' fruit and vegetable intake', *Journal of Nutrition Education and Behavior*, vol. 46, no. 5, pp. 1-8.

Joubert, G & Katzenellenbogen, J 2014, 'Population and sampling', in R Ehrlich & G Joubert (eds.), 'Epidemiology research manual for South Africa', 3rd edn, Oxford University, Cape Town.

Keengwe, J, Onchwari, G & Oigara, JN 2014, *Promoting active learning through the flipped classroom model*. Information Science Reference, Ashshey.

Kubik, MY, Lytle, LA, Hannan, PJ, Story, M & Perry, CL 2002, 'Food-related beliefs, eating behaviour, and classroom food practices of middle school teachers', *Journal of School Health*, no.72, pp. 339-345, viewed 20 November 2015, http://doi:10.1111/j.1746-1561.2002.tb07921.x.

Kupolati, MD, Gericke, GJ & MacIntyre, UE 2015, 'Teachers' perceptions of school nutrition education's influence on eating behaviours of learners in the Bronkhorstspruit District', *South African Journal of Education*, vol. 35, no. 2, pp. 1-10.

Labadarios, D, Steyn, PN & Nel, J 2011, 'How diverse is the diet of adult South Africans?', *Nutrition Journal*, vol. 10, no. 33, viewed 26 January 2016, http://www.nutritionj.com/content/10/1/33.

Lakshman, RR, Sharp, SJ, Ong, KK & Forouhi, NG 2010, 'A novel school-based intervention to improve nutrition knowledge in children: cluster randomised controlled trial', *BMC Public Health*, vol. 10, pp. 123-132.

Mandiwana, TC, Mbhenyane, XG, Mushaphi, LF, & Mabapa, NS 2015, 'Knowledge and practices of pre-school teachers on growth monitoring program – South Africa', *Health Promotion International*, vol. 30, no. 1. pp. 50-55.

McCaughtry, N, Martin, JJ, Fahlman, M & Shen, B 2012, 'Urban health educators' perspectives and practices regarding school nutrition education policies', *Health Education Research*, vol. 27, no. 1, pp. 69-80.

McNulty, J 2013, 'Challenges and issues in nutrition education. Rome: Nutrition Education and Consumer Awareness Group', *Food and Agriculture Organization of the United Nations*, viewed 12 March 2015, www.fao.org/ag/humannutrition/nutritioneducation/en.

Moore, G, Audrey, S, Barker, M, Bond, L, Bonell, C, Hardeman, W, Moore, L, O'Cathain, A, Tinati, T, Wight, D & Baird J 2012, 'Process evaluation of complex interventions', *UK Medical Research Council (MRC) Guidance*, viewed 30 April 2015, http://www.ioe.ac.uk/MRC_PHSRN_Process_evaluation_guidance.

Motamedrezaei, O, Moodi, M, Miri, MR & Khodadadi, M 2013, 'The effect of nutrition and food hygiene education on the knowledge of female elementary school teachers in city of Ferdows', *Journal of Education and Health Promotion*, vol. 2, no. 10, viewed 20 October 2015, http://doi.10.4103/2277-9531.107940.

Murimi, MW, Sample, A & Hunt, A 2008, 'Nutrition instruction in seventh grade: a comparison of teachers with and without FCS background', *Journal of Family and Consumer Science*, vol. 100, no.3, pp. 22-27.

Muth, ND, Chatterjee, A, Williams, D, Cross, A & Flower, K 2008, 'Making an IMPACT: effect of a school-based pilot intervention', *North Carolina Medical Journal*, vol. 69, no. 6, pp. 432-440.

Muthén, BO & Kaplan, D 1985, 'A comparison of some methodologies for the factor analysis of non-normal Likert variables', *British Journal of Mathematical and Statistical Psychology*, vol. 38, pp. 171-189, viewed 25 November 2015, http://escholarship.org/uc/item/49m7794d.

Norman, Å, Nyberg, G, Elinder, LS & Berlin, A 2016, 'One size does not fit all–qualitative process evaluation of the Healthy School Start parental support programme to prevent overweight and obesity among children in disadvantaged areas in Sweden', *BMC Public Health*, vol. 16. no. 37, viewed 18 January 2016, http://doi.10.1186/s12889-016-2701-1.

Oldewage-Theron, W & Egal, A 2012, 'Impact of nutrition education on nutrition knowledge of public school educators in South Africa: A pilot study', *Health SA Gesondheid*, vol. 17, no. 1, viewed 2 December 2012, http://dx.doi.org/10.4102/hsag.v17i1.602.

Oldewage-Theron, WH & Napier, CE 2011, 'Nutrition education tools for primary schools children in the Vaal region', *Development Southern Africa*, vol. 28, no. 2, pp. 283-292.

Oosthuizen, D, Oldewage-Theron, WH & Napier, C 2011, 'The impact of a nutrition education programme on the dietary intake patterns of primary school children', *South African Journal of Clinical Nutrition*, vol. 24, no. 920, pp. 75-81.

Panunzio, MF, Caporizzi, R, Antoniciello, A, Cela, EP, D'Ambrosio, P, Ferguson, LR, Ruggeri, S, Ugolini, G, Carella, F & Lagravinese, D 2011, 'Training the teachers for improving primary schoolchildren's fruit and vegetables intake: a randomized controlled trial'. *Annals of Science: Community Preventive Medicine*, vol. 23, no. 3, pp. 249-260.

Peterson, KE & Fox, MK 2007, 'Addressing the epidemic of childhood obesity through school-based interventions: what has been done and where do we go from here?', *The Journal of Law, Medicine & Ethics*, vol. 35, pp. 113-130, viewed 25 November 2015, http://doi:10.1111/j.1748-720X.2007.00116.x.

Powers, AR, Struempler, BJ, Guarino, A & Palmer, SM 2005, 'Effect of a nutrition education program on the dietary behaviour and nutrition knowledge of second grade and third grade students', *Journal of Health*, vol. 75, no. 4, pp. 129-133.

Prelip, M, Kinsler, J, Chan, LT, Erausquin, JT & Slusser, W 2012, 'Evaluation of a school-based multicomponent nutrition education program to improve young children's fruit and vegetable consumption', *Journal of Nutrition Education and Behavior*, vol. 44, no. 4, pp. 310-318.

Rafiroiu, AC & Evans, A 2005, 'Nutrition knowledge, attitudes and practices among nutrition educators in the South', *American Journal of Health Studies*, vol. 20, pp. 29-38.

Rossiter, M, Glanville, T, Taylor, J & Blum, I 2007, 'School food practices of prospective teachers', *Journal of School Health*, vol. 77, pp. 694- 700, viewed 20 November 2015, http://doi:10.1111/j.1746-1561.2007.00253.x.

Royston, P 1995, 'A Remark on Algorithm AS 181: The W-test for Normality', *Journal of the Royal Statistical Society*, Series C (Applied Statistics), vol. 44, pp. 547-551.

Schmidt, CO, Fahland, RA, Franze, M , Splieth, C , Thyrian, JC , Plachta-Danielzik, S , Wolfgang Hoffmann, W & Kohlmann, T 2010, 'Health-related behaviour, knowledge, attitudes, communication and social status in school children in Eastern Germany', *Health Education Research*, vol. 25, no. 4, pp. 542-551.

Shah, P, Misra, A, Gupta, N, Hazra, DK, Gupta, R, Seth, P, Agarwal, A. et al. 2010, 'Improvement in nutrition-related knowledge and behaviour of urban Asian Indian school children: findings from the 'Medical education for children/Adolescents for Realistic prevention of obesity and diabetes and for healthy ageing' (MARG) intervention study', *British Journal of Nutrition*, no. 104, pp. 427-436, viewed 20 November 2015, http:// doi:10.1017/S0007114510000681.

Shariff, ZM, Bukhari, SS, Othman, N, Hashim, N, Ismail, M, Jamil, Z, Kazim, SM, Paim, L, Samah, BA & Hussein, ZAM, 2008, 'Nutrition education intervention improves nutrition knowledge, attitude and practices of primary school children: a pilot study', *International Electronic Journal of Health Education*, vol. 11, no.1, pp. 119-132.

Sharma, S, Dortch, KS, Byrd-Williams, C, Truxillio, JB, Rahman, GA, Bonsu, P & Hoelscher, D 2013, 'Nutrition-related knowledge, attitudes, and dietary behaviours among head start teachers in Texas: a cross-sectional study', *Journal of the Academy of Nutrition and Dietetics*, viewed 20 November 2015, http://doi:10.1016/j.jand.2013.01.003.

Shelley GP 2014, *Quasi-Experimental Designs*. *The Encyclopedia of Criminology and Criminal Justice*, pp. 1-8, viewed 30 November 2015, http://doi:10.1002/9781118517383.wbeccj054.

Sherman, J & Muehlhoff, E 2007, 'Developing a Nutrition and Health Education Program for Primary Schools in Zambia', *Journal of Nutrition Education and Behavior*, vol. 39, no. 6, pp. 335-342.

Shisana, O, Labadarios, D, Rehle, T, Simbayi, L, Zuma, K, Dhansay, A, Reddy, P, Parker, W, et al. 2013, *South African National Health and Nutrition Examination Survey (SANHANES-1)*. HSRC Press, Cape Town.

Snelling, AM, Ernst, J, Belson, SI 2013, 'Teachers as role models in solving childhood obesity', *Journal of Paediatric Biochemistry*, vol. 3, no. 1, pp. 55-60.

Spronk, I, Kullen, C, Burdon, C & O'Connor, H 2014, 'Relationship between nutrition knowledge and dietary intake', *British Journal of Nutrition*, vol. 111, no. 10, pp. 1713-1726.

Steyn, NP, Lambert, EV, Parker, W, McHiza, Z & De Villiers, A 2009, 'A review of school nutrition interventions globally as an evidence base for the development of the HealthKick programme in the Western Cape, South Africa', *South African Journal of Clinical Nutrition*, vol. 22, no. 3, pp. 145-152.

United Nations Integrated Children's Education Fund (UNICEF) 2009, *Tracking progress of child and maternal nutrition – a survival and development priority*. UNICEF, NewYork, USA, viewed 26 May 2012, www.unicef.org/publications.

United Nations Educational, Scientific and Cultural Organization (UNESCO) 2013, *Making education a priority in the post-2015 development agenda*. UNESCO, Paris.

Van Deventer K 2009, 'Perspectives of teachers on the implementation of Life Orientation in Grades R–11 from selected Western Cape schools', *South African Journal of Education*, vol. 29, no. 1, pp. 127-145.

Vierregger, A, Hall, J , Sehi, N , Abbott, M , Wobig, K , Albrecht, JA , Anderson-Knott, M , Koszewski, W 2015, 'Growing healthy kids: A school enrichment nutrition education program to promote healthy behaviors for children', *Journal of Extension*, vol. 53, no. 5, viewed 20 December 2015, http://www.joe.org/joe/2015october/iw3.php.

Wall, DE, Least, C, Gromis, J & Lohse, B 2012,' Nutrition education intervention improves vegetable-related attitude, self-efficacy, preference, and knowledge of fourth-grade students', *Journal of School Health*, vol. 82, no. 1, pp. 37-43.

Wilson, DK, Griffin, S. Saunders, RP, Kitzman-Ulrich, H, Meyers, DC & Mansard L 2009, 'Using process evaluation for program improvement in dose, fidelity and reach: the ACT trial experience', *International Journal of Behavioral Nutrition and Physical Activity*, vol. 6, p. 79, viewed 28 June 2015, http://www.ijbnpa.org/content/6/1/79.

Yamada, J, Stevens, B, Sidani, S, Watt-Watson, J & de Silva, N 2010, 'Content Validity of a Process Evaluation Checklist to Measure Intervention Implementation Fidelity of the EPIC Intervention', *Worldviews on Evidence-Based Nursing*, vol. 7, no. 3, pp. 158-164.

CHAPTER 9

EXECUTIVE SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

9.1 INTRODUCTION

Inappropriate approach to school NE which is expressed in unsuitable educational strategies, ill-equipped teachers in nutrition and inadequate instructional materials weakens the influence of NE. Effective teaching of nutrition in primary schools holds great potential in enhancing nutrition knowledge of learners which could invariably translate to healthy eating behaviours (Dudley, Cotton & Peralta 2015; Mita et al. 2013). Implementing a contextual nutrition education programme (NEP) for teachers who teach nutrition have a far reaching effect in achieving healthy eating among learners and the teachers as well (Snelling, Ernst & Belson 3013; Sharma et al. 2013; Panuncio et al. 2011).

This chapter presents a summary of the study as a whole, the general conclusions and recommendations for future research and practice implementation respectively.

9.2 AIM AND OBJECTIVES OF THE STUDY

The purpose of this study was to develop, implement and evaluate a context specific NEP for primary school teachers in the Bronkhorstspruit district in order to improve skills in the teaching of nutrition, and improve the nutrition knowledge, attitudes and dietary practices of the teachers and the learners. The study was undertaken in three phases, each of which had its own aim and objectives.

9.2.1 Methods

The study engaged both quantitative and qualitative research methodologies in a way to complement each other and thereby increasing understanding of the subject (Östlunda et al. 2011). The study was conducted from May 2013 to October 2015.

Ethical approval for the study was obtained from the Research Ethics Committee of the Faculty of Natural and Agricultural Sciences, University of Pretoria (Number: EC130424-037). This study was part of a larger study – “Schools as sites for social change” which was undertaken by the Institute for Food, Nutrition and well-being (IFNW), of the University of Pretoria. The larger study obtained approval for intervention in the primary schools from the

Gauteng Department of Basic Education (DoBE) with the approval number: D2013/233. Additional approval was obtained from the Gauteng DoBE for this study to take place in the 13 government primary schools in the Bronkhorstspruit district (Number: D2014/199).

Informed consent for phases 1 and 3 was obtained from the teachers, the parents of the learners who participated in the study, and assent was obtained from the learners themselves (phases 1 and 3).

9.2.2 Study setting and population

The study was carried out in eleven primary schools in the Bronkhorstspruit district, and involved teachers who taught nutrition to learners in Grades 4 to 7 and learners in Grades 5 and 6.

9.3 PHASE 1: NEEDS ASSESSMENT

9.3.1 Aim

The aim of this phase was to explore the teachers' and the learners' nutrition knowledge, attitudes and dietary practices (KAP), as well as the situation of nutrition education (NE) in the schools to inform the development of a context specific NEP for the teachers. The objectives were to: (i) assess the nutrition KAP of the teachers in all the primary schools in the Bronkhorstspruit district, (ii) assess the practice of NE in the primary schools in the Bronkhorstspruit district, (iii) explore teachers' perceptions of the impact of school NE on learners' eating practices, and (iv) assess the nutrition KAP of Grades 5 and 6 learners in two selected schools in the Bronkhorstspruit district.

9.3.2 Methods

This phase employed quantitative research methodology by using questionnaire administration and qualitative research methodology by using a phenomenological approach (Houston & Mullan-Jensen 2012) in focus group interviews to collect data.

Participants included the teachers (N = 74) who taught nutrition to learners in Grades 4 to 7 and learners (N = 354) in Grades 5 and 6. Convenience sampling was used to select the teachers in eleven schools and the learners in two schools in respect of the quantitative assessment. Purposive sampling was used to select the teachers in respect of the qualitative assessment.

9.3.3 Main findings

Main findings from phase 1 are as follows:

- The teachers' mean score for nutrition knowledge and attitudes were good but needed improvement on certain nutrition topics, such as nutrient and energy content of food and diet and health relationship.
- Unavailability of up to date instructional materials for the teaching of nutrition such as a teacher's manual, posters, work books and hands-on materials.
- Lack of in-service nutrition training for the teachers and their desire for training to teach nutrition topics.
- Limited time for teaching nutrition.
- The learners' mean scores for nutrition knowledge and attitudes were low and needed general improvement.
- The learners' resource-constrained environment.
- The learners' dietary practices revealed a frequent intake of unhealthy choices of foods.

9.4 PHASE 2: PLANNING THE NUTRITION EDUCATION PROGRAMME

9.4.1 Aim

This phase aimed to develop a context specific NEP for teachers who taught nutrition to Grades 5 and 6 learners in primary schools in the Bronkhorstspruit district. The specific objectives were to: (i) define the educational strategy, (ii) explain the concepts of selected theories in context of the nutrition topics, (iii) integrate the concepts of theories into the nutrition topics, and (iv) to verify the developed NE materials with the teachers and stakeholders.

9.4.2 Methods

The integrated constructs of the Social cognitive theory (SCT) and the Meaningful learning model (MLM) were used to explain the nutrition topics in the existing curriculum while accommodating the needs identified in phase 1. The planned NEP consisted of the following:

- The aim of improving the teachers' delivery of classroom NE to learners.

- The teaching strategy of enhanced curriculum approach.
- Selected constructs of the SCT and the MLM.
- Template for the application of the constructs of the selected theories.
- Theory-based strategies and educational activities.
- Summary of the strategies and the educational activities involved in respect of the nutrition topics as a whole.
- Programme components which consisted of:
    - the context specific NE materials which comprised the teacher's manual, the learner's work book, the picture book and the posters,
    - a training session for teachers and re-orientation sessions prior implementation in each term,
    - monitoring of the implementation through one-on-one interviews with the teachers,
    - provision of food items and materials for teachers' use in class demonstrations and practical sessions.

These features of the NEP were the outcomes of phase 2.

9.5 PHASE 3: IMPLEMENTATION AND EVALUATION OF THE NUTRITION EDUCATION PROGRAMME

9.5.1 Aim

The aim of this phase was to implement the context specific NEP developed for teachers who taught nutrition to Grade 5 and 6 learners and to evaluate the impact of the NEP on the teachers' skill in teaching nutrition, and on the nutrition KAP of the teachers and the learners. The specific objectives were to:

i. implement the developed NEP to the teachers who taught nutrition to Grade 5 and 6 learners in the treatment school,
ii. implement the developed NEP to Grade 5 and 6 learners in the treatment school, through the teachers who were trained in the use of the manual,
iii. explore the teachers' perceptions of the impact of the implementation of the NEP on their teaching of nutrition to the learners,
iv. determine differences between the treatment and control schools regarding the nutrition KAP of the teachers from pre- to post-implementation,

v. determine within school differences in the teachers' KAP from pre- to post-implementation,
vi. determine differences between the treatment and control schools regarding the nutrition KAP of the learners from pre- to post-implementation, and
vii. determine within school differences in the learners' KAP from pre- to post-implementation.

It was hypothesised that the teachers and learners in the treatment school would significantly improve in the nutrition KAP and have better within school improvement compared with the teachers and learners in the control school.

9.5.2 Methods

A quasi-experimental study design was used to implement a NEP in two schools selected into the treatment and control schools. Participants were teachers (N = 23) who taught nutrition to Grades 4 to 7 learners and learners (N = 681) in Grades 5 and 6. The teachers in the treatment school received training on the use of the developed NE manual and the learners each received a copy of the work book. The control school received none of the developed NE materials but carried on with the teaching of nutrition according to the DoBE curriculum. The impact of the NEP was evaluated at the end of the teaching of nutrition topics to learners in September 2015.

The teachers' nutrition KAP was assessed by using a self-administered teachers' nutrition KAP questionnaire at pre- and post-implementation. The teachers' comments on the workshop content, skills and knowledge acquired, workshop materials and instructors and overall quality were obtained by using a Likert type questionnaire. The teachers' experiences in using the manual to teach nutrition was obtained by using a Likert type questionnaire in an one-on-one interview. An interview guide was used to explore the teachers' perceptions of the impact of the implementation of the NEP on their teaching of nutrition to the learners in a FGD. The learners' nutrition KAP was assessed using the learners' nutrition KAP questionnaire that was administered with assistance at pre- and post-implementation.

An analysis of variance (ANOVA) (Hair et al. 2010) with adjustment for pre-implementation scores was used to establish differences between the schools at post-implementation with respect to the nutrition KAP. A random effects GLS regression analysis (Muthén & Kaplan 1985) was used to estimate the overall change in the percentage mean score for nutrition KAP

between the schools from pre-implementation to post-implementation while accounting for missing scores at post-implementation. Within school differences in the nutrition KAP from pre- to post-implementation with the coefficient of differences were estimated using the random effects GLS regression. The response options on practices questions were summarised and presented as frequencies and percentages. The level of significance to test the hypotheses was set at 0.025 for a one-tailed test.

9.5.3 Nutrition education programme implementation

The developed context specific NE manual was explained to the teachers in the treatment school in a one day workshop at the Department of Human Nutrition, University of Pretoria on 8 November 2014. The researcher presented the nutrition topics and the study leader facilitated the sessions of the workshop. The workshop goal was to familiarise teachers with the NE manual and to receive the teachers' input on the outline, content and practical implementation of the manual. The workshop objectives were to (i) use selected constructs of the SCT and the MLM in presenting nutrition messages to learners, (ii) enhance the teaching skills for improving learners' KAP, and (iii) obtain the teachers' contributions to the content and practical implementation of the NE manual.

The teachers in the treatment school used the NE manual to teach nutrition topics in LS and NST to Grades 5 and 6 learners following the allotted periods and time in the DoBE's curriculum. The teaching of nutrition in these two classes started on 2 February 2015 with the topic "Nutrients in foods" in Grade 6, and ended on 6 November 2015 with the topic "Food hygiene" in Grade 6. Re-orientation sessions were held with the teachers prior to topic implementation.

9.5.4 Main findings

The results are presented for the teachers (N = 20, treatment and control n = 10 each) and learners (N = 644, treatment school n= 327) who completed the NE with the post-implementation assessments.

9.5.4.1 Impact of the nutrition education programme on the teachers' nutrition knowledge

Comparison between schools

The results of comparison between the schools were obtained using ANOVA with adjustment for pre-implementation mean scores. The impact of the NEP on the treatment school teachers when compared with the control school teachers indicated the following:

- A significant higher mean score in the total nutrition knowledge (85.5 ± 8.2% versus 73.4 ± 10.3%, P = 0.003) for the treatment and control schools.
- A non-significant higher mean score in the category on current dietary recommendations for children (91.3 ± 8.4% versus 88.8 ± 9.2%, P = 0.59) for the treatment and control schools.
- A significant higher mean score in the category on sources of nutrients (86.1± 10.2% versus 69.6 ± 13.1%, P < 0.001) for the treatment and control schools.
- A non-significant higher mean score in the category on diet disease relationship (83.8 ± 13.2% versus 71.3 ± 21.3%, P = 0.19) for the treatment and control schools.
- A non-significant higher mean score in the category on food processing (74.0 ± 23.2% versus 68.0 ± 19.3%, P = 0.44) for the treatment and control schools.
- A non-significant higher mean score in the category on food hygiene (87.5 ± 17.7% versus 80.0 ± 19.7%, P = 0.24) for the treatment and control schools.

Comparison within schools

The results for within group differences and the coefficients of difference were obtained using a random effects GLS regression analysis. Within school differences are reported with respect to the mean change value for both the treatment and the control schools as follows:

- A significant improvement (16.2%, P = 0.002), and a non-significant improvement (10.7%, P = 0.116) for the treatment and control schools respectively in the category on current dietary recommendations for children.
- The treatment school had a significant improvement (14.3%, P < 0.001), while the control school had a non-significant decline (-1.6%, P = 0.653) in the category on sources of nutrients.
- A non-significant improvement for both the treatment school (14%, P = 0.036) and the control school (2.2%, P = 0.713) in the category on diet disease relationship.

- A non-significant improvement (4%, P = 0.594) for the treatment school and a non-significant decline for the control school (-2.9%, P = 0.726) in the category on food processing.
- A significant improvement (17.8%, P = 0.005) and a non-significant improvement (5%, P = 0.558) for the treatment and control schools respectively in the category on food hygiene.

9.5.4.2 Impact of the nutrition education programme on the teachers' nutrition attitudes

Comparison between schools

The impact of the NEP on the treatment school when compared with the control school indicated:

- A non-significant higher mean score (84.2 ± 16.4% versus 75.8 ± 17.3%, P = 0.531) for nutrition attitudes for the treatment and control schools respectively.

Comparison within schools

Within school differences are reported in respect of the mean change value for both the treatment and the control schools and it indicated:

- A non-significant improvement (9.1%, P = 0.093 and 4.2%, P = 0.479) for treatment and control schools respectively.

9.5.4.3 Impact of the nutrition education programme on the teachers' dietary practices

Comparison between schools

Comparisons of the results between the schools were obtained using ANOVA with adjustment for pre-implementation mean scores. The dietary practices consisted of five categories (see table 6.4). As a result of scoring three of the dietary practices as either healthy or unhealthy practices, eight categories were created (chapter 6, section 6.6.1.1). The categories were healthy personal dietary practices, unhealthy personal dietary practices, healthy dietary practices at school, unhealthy dietary practices at school, classroom food practices, healthy school wide food practices, unhealthy school wide food practices and practices in food hygiene. The impact of the NEP on the treatment school teachers in comparison with the control school teachers indicated the following:

- A non-significant higher mean score in the healthy personal dietary practices (70.3 ± 15.7 % versus 59.7 ± 14.4%, P = 0.34) for the treatment and control schools.
- A non-significant higher mean score in the unhealthy personal dietary practices (45.6 ± 12.5% versus 39.6 ± 23.7%, P = 0.17) for the treatment and control schools.
- A non-significant higher mean score in the healthy dietary practices at school (73.0 ± 22.1% versus 53.0 ± 34.3%, P = 0.52) for the treatment and control schools.
- A non-significant higher mean score in the unhealthy dietary practices at school (76.0 ± 8.4% versus 55.0 ± 35.4%, P = 0.87) for the treatment and control schools.
- A non-significant higher mean score in the classroom food practices (19.2 ± 18.5% versus 15.8 ± 12.7%, P = 0.20) for the treatment and control schools.
- A non-significant lower mean score in the healthy school wide food practices (83.9 ± 10.3% versus 85.0 ± 16.1%, P = 0.55) for the treatment and control schools.
- A non-significant higher mean score in the unhealthy school wide food practices (31.7 ± 22.5 % versus 23.3 ± 22.8%, P = 0.67) for the treatment and control schools.
- A non-significant lower mean score in the practices in food hygiene (23.8 ± 17.1 % versus 25.0 ± 10.2%, P = 0.88) for the treatment and control schools.

Comparison within schools

Within school differences were estimated by the random effects GLS regression and are reported with respect to the mean change value for both the treatment and the control schools as follows:

- A non-significant decline (-0.4%, P = 0.93), and a non-significant improvement (7.9%, P = 0.19) for the treatment and control schools respectively in the healthy personal dietary practices.
- A non-significant improvement in both the treatment (3.4%, P = 0.51) and control schools (8.3%, P = 0.22) in the unhealthy personal dietary practices.
- A non-significant improvement (21.4%, P = 0.17) for the treatment school and a non-significant decline (-10.7%, P = 0.35) for the control school in the healthy dietary practices at school.
- A non-significant improvement (14.2%, P = 0.09) for the treatment school and a non-significant decline for the control school (-12.7%, P = 0.18) in the unhealthy dietary practices at school.

- A non-significant decline in both the treatment (-4.7%, P = 0.37) and control schools (-6%, P = 0.037) in the classroom food practices.
- A non-significant improvement in both the treatment (2.9%, P = 0.43) and control schools (1.2%, P = 0.84) in the healthy school wide food practices.
- A non-significant decline (-6.5%, P = 0.36) for the treatment school and a non-significant improvement for the control school (1.7%, P = 0.85) in the unhealthy school wide food practices.
- A non-significant improvement (0.8%, P = 91) for the treatment school and a non-significant decline for the control school (-2.3%, P = 0.58) in food hygiene.

9.5.4.4 Nutrition education process evaluation

9.5.4.4.1 Evaluation of the workshop prior to implementation by the teachers

The workshop evaluation by the teachers revealed the following:

- The teachers rated the workshop content as having clear objectives and indicated satisfaction with the way in which the contents were logically arranged and presented.
- The teachers felt they enhanced and acquired new skills and knowledge for teaching nutrition.
- The teachers understood the ideas presented in the manual because the instructors gave clear and logical presentations of the concepts of the manual.
- The overall quality of the workshop was rated good.

9.5.4.4.2 Evaluation of the implementation of the nutrition education programme by the teachers

The teachers' responses on their experiences in using the manual to teach the learners indicated the following:

- The teachers appreciated the various features of the manual such as the use of the icons, and the supporting materials, i.e. the posters, picture book and learner's work book activities were assessed as helpful in presenting the nutrition lessons.
- The time allotted (as stipulated in the DoBE curriculum) was not enough to teach the important things that the learners needed to know.

- In respect to completeness of the implementation, though the topics were all implemented, they were not implemented as planned.
- Implementation fidelity was low because the order in which the features of the manual were to be presented was not strictly followed.
- The dose of the NE implementation delivered by the teachers was 100% with respect to all the five topics.
- The dose of the NE implementation received by the learners in all the sub-topics was rather low; it ranged from 9% to 50%.
- The implementation of the contextual NE manual reached all the learners in Grade 5 and 6 in the treatment school. All the learners received a copy of the learner's work book and participated in the lessons.

9.5.4.4.3 Perceptions of the teachers on the impact of the implementation of the nutrition education programme on their teaching of nutrition

The teachers' perceptions of the impact of the implementation of the NEP manual on their teaching of nutrition indicated the following:

- The teachers described the manual as information rich and well laid-out with nutrition concepts beautifully illustrated in colourful pictures.
- The teachers perceived that the features of the manual and the supporting materials were helpful in promoting nutrition knowledge among the learners.
- The NE manual was indicated to be better in comparison with the DoBE recommended textbooks for nutrition topics.
- The teachers expressed satisfaction with the NE manual and would like to continue to use the manual to teach nutrition.
- The teachers suggested that the learner's work book should include more activities out of which teachers could choose.

9.5.4.5 Impact of the nutrition education programme on the learners' nutrition knowledge

Comparison between schools

The impact of the NEP on the learners in the treatment school, when compared with the learners in the control school are as follows:

- A significant higher mean score in the total nutrition knowledge (53.2 ± 16.9% versus 53.1 ± 17.6%, P = 0.001) for the treatment and control schools.
- A non-significant lower mean score in the category on food nutrients and functions (46.6 ± 22.1% versus 53.4 ± 23.4%, P = 0.192) for the treatment and control schools.
- A significant higher mean score in the category on food and energy (77.9 ± 26.5% versus 67.6 ± 30.6%, P < 0.001) for the treatment and control schools.
- A significant higher mean score in the category on nutrient deficiency (62.0 ± 32.3% versus 61.2 ± 33.8%, P = 0.008) for the treatment and control schools.
- A non-significant lower mean score in the category on food choices (63.4 ± 26.7% versus 67.6 ± 27.9%, P = 0.073) for the treatment and control schools.
- A significant higher mean score in the category on sources of nutrients (36.4 ± 22.6% versus 32.8 ± 18.7%, P = 0.002) for the treatment and control schools.

Within school comparisons

Within school differences (mean change) are reported for both the treatment and the control schools and they are as follows:

- A non-significant decline (-2.2%, P = 0.222) and a non-significant improvement (0.8%, P = 0.558) for the treatment and control schools respectively in the category on food nutrients and functions.
- A significant improvement (9.5%, P < 0.001) for the treatment school and a non-significant decline (-2.9%, P = 0. 168) for the control school in the category on food and energy.
- A significant improvement (6.4%, P = 0.009) for the treatment school and a non-significant decline (-2.4%, P = 0.275) for the control school in the category on nutrient deficiency.
- A significant improvement (6.3%, P = 0.001) for the treatment school and a non-significant improvement for the control school 1.7%, P = 0.336) in the category on food choices.
- A significant improvement (6.4%, P < 0.001) and a non-significant improvement (0.3%, P = 0. 813) for the treatment and control schools respectively in the category on sources of nutrients.

Comparison between Grade 5 and 6 learners

The comparison of the performance of Grade 5 and 6 learners regarding total nutrition knowledge showed that:

- Grade 6 learners in the treatment school had a significant higher mean score than Grade 5 learners (57.3 ± 16.1% versus 48.8 ± 16.8%, P = 0.025).
- Grade 6 learners in the control school had a non-significant lower mean score than Grade 5 learners (49.1 ± 14.9% versus 56.3 ± 18.9%, P = 0.122).

9.5.4.6 Impact of the nutrition education programme on the learners' nutrition attitudes

Comparison between schools

The impact of the NEP on the nutrition attitudes of learners in the treatment school when compared with the learners in the control school showed:

- A significant higher mean score (63.9 ± 19.7% versus 56.8 ± 19.6%, P = 0.002) in dietary attitudes for the treatment and control schools respectively.

Comparison within schools

Within school differences (mean change value) for both the learners in the treatment and the learners in the control schools indicated:

- A significant improvement (6.9%, P < 0.001) for the treatment school and a non-significant improvement (1.1%, P = 0.419)) for the control school in the nutrition attitudes.

Comparison between Grade 5 and 6 learners

The comparison of the performance of Grade 5 and 6 learners in respect of the nutrition attitudes showed that:

- Grade 6 learners had a non-significant higher mean score than Grade 5 learners (67.8 ± 21.7% versus 59.7 ± 16.5%, P = 0.108) in the treatment school.
- Grade 6 learners had a non-significant lower mean score than Grade 5 learners (56.4 ± 18.5% versus 57.1 ± 20.4%, P = 0.060) in the control school.

9.5.4.7 Impact of the nutrition education programme on the learners' dietary practices

Comparison between schools

The impact of the NEP on the learners in the treatment school when compared with the learners in the control school showed:

- A non-significant lower mean score (60.0 ± 19.7% versus 62.2 ± 16.8%, P = 0.24) in dietary practices for the treatment and control schools respectively.

Comparison within schools

Within school differences (mean change value) for both the learners in the treatment and the learners in the control schools indicated:

- A non-significant decline (-2.5%, P = 0.039) for the treatment school and a non-significant decline (-0.1%, P = 0.93) for the control school in the dietary practices.

9.6 STRENGTHS AND LIMITATIONS OF THE STUDY

9.6.1 Strengths

The main strengths of the study included the following:

Nutrition education programme development

- The development of the NE manual was based on a contextual needs assessment, accompanied with the use of selected constructs of the SCT and the MLM, and in line with the existing curriculum of the DoBE.
- The contextual orientation of the NEP which facilitated the presentation of the nutrition topics to the learners while accommodating their circumstances.
- The planning of the NEP was based on the SCT and the MLM that are known to enhance knowledge acquisition for behaviour change.

Nutrition education programme implementation

- Teachers were trained on how to implement the NE, which led to the improvement in their nutrition knowledge and attitudes. This approach, along with the use of the NE manual which was in line with the existing curriculum, could facilitate the sustainability of the NEP in the school once initiated.
- The training for teachers on the use of the NE manual was not limited to teachers who used the manual to teach Grade 5 and 6 learners, but to all the teachers of LS and NST

in Grade 4 to 7 in the treatment school. The strategy lent moral support to the NEP as well as developed capacity to teach nutrition among the teachers.

Nutrition education programme features

- The provision of the learner's work book for each of the participating learners enhanced class participation and contributed to learning among the learners.
- The use of both qualitative and quantitative methodologies which enabled access to information which would otherwise be impossible with one method (AHRQ 2013).
- The use of independent researchers to facilitate the one-on-one interviews with the implementing teachers in the process evaluation.

9.6.2 Limitations

The main limitations of the study included the following:

- A quasi-experimental design was used to evaluate the impact of the NEP instead of a randomised controlled trial (RCT) which is considered a gold standard in evaluation.
- The number of participating teachers was small (74 in phase 1 and 23 in phase 3). Involving a larger number of teachers and more schools would mean evaluating the impact of the NEP on a larger scale. In addition, the teachers were mostly experienced teachers; a different profile of participants (such as inexperienced teachers or an equal mix of experienced and inexperienced teachers) might have generated different results.
- The study population was predominantly black, and took place in a resource limited setting; therefore, the findings of the present study may not be generalisable to the general populace in South Africa.
- The NEP was limited to only Grades 5 and 6 learners, whereas a NEP involving the learners at the lower or higher grades in the school might have produced different results.
- The dietary practices were assessed by self-reported questionnaires. The possibility of the participants answering practices questions in generally acceptable ways could not be ruled out. Therefore, the reported dietary practices may not fully reflect the dietary practices of the teachers and the learners.
- Due to the unavailability of a suitable questionnaire for the teachers in this study, the instrument used to assess nutrition KAP of the teachers was adapted from three standardised questionnaires. Though the resulting questionnaire was pre-tested among

a population with similar characteristics, the questionnaire was not standardised with respect to the criteria that could enhance the quality of the questionnaire.

- The fact that the teachers in this study were employees under an authority might have led them to express their views with caution, particularly on matters relating to policy.
- The administration of questionnaires to the learners was done by dictating the questions to the large group of learners in a class, whereas a smaller group of learners could have enhanced a better control of the class and independent responses to the questions.
- One of the intentions of NE is to provide nutrition knowledge which is vital in facilitating behaviour change to healthy eating. The relationship between nutrition knowledge assessed in this study and the dietary practices of the participants was not established. The result of which could have added value to the implications of the findings of this study.

9.7 CONCLUSIONS

The following conclusions are drawn from the entire study:

Nutrition education programme development

- The developed NE manual and the supporting materials met the teachers' need for adequate instructional materials as was expressed by the teachers and they would like to continue in the using of the manual to teach nutrition.
- The overall goal which was to develop and implement a contextual NEP for primary school teachers within the confines of the existing curriculum of the DoBE has been demonstrated to be achievable.
- The use of theories improved the understanding of the concepts of nutrition in context of individual experiences among the learners and the teachers.

Nutrition education programme implementation

- The need for an improved approach in the delivery of NE by the teachers in the Bronkhorstspruit district for the realisation of the benefits of school NE was revealed in the needs assessment.
- The schools' support, the teachers' roles, the learners' nutrition attitudes and the environmental factors are important factors in addressing the issues that weaken the impact of NE in schools as was revealed in the needs assessment.

Nutrition education programme impact

- The NEP led to improved skills in teaching nutrition as was expressed by the teachers.
- The NEP significantly improved the teachers' total nutrition knowledge and there were significant within school improvements on three of the five categories of nutrition knowledge.
- The NEP did not significantly improve the nutrition attitudes of the treatment school teachers even though there was an appreciable within school improvement in the mean score, and in comparison with the control school teachers.
- The NEP did not significantly improve the dietary practices of the teachers. However, there was improvement in the personal dietary practices that support healthy eating, but unhealthy personal dietary practices did not improve.
- The NEP significantly improved the learners' nutrition knowledge and there were significant within school improvements in all the categories (except one category) of nutrition knowledge of the treatment school, and in comparison with the control school.
- The NEP led to significant within school improvement in the dietary attitudes of the learners, and in comparison with the control school.
- The NEP did not significantly improve the dietary practices of the learners. However, the learners improved in some healthy dietary practices but did not improve in unhealthy dietary practices.
- Finally, it can be concluded that implementing a contextual NEP for primary school teachers in a resource limited setting could bring about significant improvement in the teachers' and the learners' nutrition knowledge. The significant improvement in the nutrition knowledge of the learners has the benefit of equipping the learners with the nutrition knowledge which can be useful for them as adults. It has been advocated that NE for learners in a resource limited setting should target nutrition knowledge acquisition as future parents, and not create frustration by providing information they cannot implement due to their constrained economic background (McNulty 2013).

9.8 RECOMMENDATIONS FOR FUTURE RESEARCH

On the completion of this study, the following recommendations are made for future research:

- The NEP should investigate the relationship between the nutrition knowledge acquired by the participants and the nutrition attitudes and dietary practices to establish the extent to which nutrition knowledge and attitudes have translated into healthy eating.
- The NEP should investigate the relationship between the teachers' nutrition knowledge and that of the learners in order to establish the extent of transfer of nutrition information from the teachers to the learners.
- The NEP is recommended to be carried out among the teachers of foundation classes (Grade R to 3) and the learners in the foundation classes to test the effectiveness of the NEP among younger learners in a similar setting.
- In view of the fact that children learn differently based on their ages, it is recommended that the NEP be adapted (if necessary) and implemented to children in accordance to the different age groups.
- The nutrition KAP questionnaire used in this study was adapted from three different questionnaires. It is recommended that the questionnaire be validated and standardised among primary school teachers. The availability of a validated and standardised KAP questionnaire for teachers will benefit future NE research in South Africa.
- The NEP should be implemented and specifically evaluated on the adherence to the South African Food-Based dietary guidelines (SAFBDGs) as the main outcome. Since the guidelines were developed to guide South Africans aged five years and above to adopt healthy eating, research efforts into how this goal is met through the school NE curricula will be of commendable scientific value.

9.9 RECOMMENDATIONS FOR PRACTICE IMPLEMENTATION

On the completion of this study, the following recommendations are made for practice implementation:

- In view of the aim of the DoBE to ensure that learners receive NE to benefit their lives, it is recommended that the context specific NE manual and materials that were developed and used in this study be considered for use in teaching nutrition in the primary schools.

- In view of the inadequacy of the allotted time to teach nutrition which resulted in incomplete implementation of the NEP, the allotted time for NE in the primary schools need to be considered. More time implies more opportunities for learners to be practically involved in the lessons, which could possibly also improve the dietary practices of the learners.
- Given that the graphics and colourful presentation of the posters and the learner's work book enhanced learning among the learners in the present study, it is recommended that school NEPs be accompanied with appealing materials for learners such as the posters, flipcharts and work book used in this study. The activities in the learner's work book should comprise many options out of which the teachers can select for use. The activities should feature quite a number of hands-on activities.
- The school authorities should endeavour to make the school environment supportive of healthy eating by allowing foods that are healthy choices in the tuck shops and by influencing food vendors to sell healthy choices of food.
- Provision of periodic in-service training for the teachers who teach nutrition can facilitate continuous updating of the teachers' nutrition knowledge and skills for effective teaching of nutrition.
- In order to ensure consistency in implementing the NE curriculum, a continuous monitoring of the teaching, and discussion with teachers who teach nutrition, is recommended.
- The teachers in the needs assessment study identified the NSNP as a potential positive influence on learners' eating behaviour, but some learners ignorantly refused the school feeding scheme meals. It is therefore recommended that the implementation of NEP in schools should promote the values of the NSNP; thereby improving the learners' acceptance of the services of the NSNP that are meant to provide them with nutritious meals.
- Since children are more interested in what they participate in than what they are taught, it is recommended that experiential (work integrated learning) activities such as school vegetable garden and practical classes be part of school NE programme, and the learners should be actively involved.

REFERENCES

Agency for Healthcare Research and Quality (AHRQ) 2013, *Mixed methods: Integrating quantitative and qualitative data collection and analysis while studying patient-centered medical home models*, viewed 22 June 2015, https://pcmh.ahrq.gov/sites/default/files/attachments/MixedMethods_032513.

Dudley, DA, Cotton, WG & Peralta, LR 2015, 'Teaching approaches and strategies that promote healthy eating in primary school children: a systematic review and meta-analysis', *International Journal of Behavioral Nutrition and Physical Activity*, vol. 12, p. 28, viewed 23 June 2015, http://dx.doi.10.1186/s12966-015-0182-8.

Hair, JF, Black, WC, Babin, BJ & Anderson, RE 2010, *Multivariate data analysis*. 7th edn, Prentice Hall, Englewood Cliffs.

Houston, S & Mullan-Jensen, C 2012, 'Towards depth and width in Qualitative Social Work: Aligning interpretative phenomenological analysis with the theory of social domains', *Qualitative Social Work*, vol. 11 no. 3, pp. 266-281.

McNulty, J 2013, 'Challenges and issues in nutrition education, Rome: Nutrition Education and Consumer Awareness Group', *Food and Agriculture Organization of the United Nations*, viewed 12 March 2015, http://www.fao.org/ag/humannutrition/nutritioneducation/en.

Mita, SC, Li, E, Goodell, LS 2013, 'A qualitative investigation of teachers' information, motivation, and behavioural skills for increasing fruit and vegetable consumption in pre-schoolers', *Journal of Nutrition Education and Behavior*, vol. 45, no. 6, pp. 793-799.

Muthén, BO & Kaplan, D 1985, 'A comparison of some methodologies for the factor analysis of non-normal likert variables', *British Journal of Mathematical and Statistical Psychology*, vol. 38, pp. 171-189, viewed 25 November 2015, http://escholarship.org/uc/item/49m7794d.

Östlunda, U, Kiddb,L, Wengströmc, Y & Rowa-Dewar, N 2011, 'Combining qualitative and quantitative research within mixed method research designs: A methodological review', *International Journal of Nursing Studies*, vol. 48, no. 3, pp. 369-383.

Panunzio, MF, Caporizzi, R, Antoniciello, A, Cela, EP, D'Ambrosio, P, Ferguson, LR, Ruggeri, S, Ugolini, G, Carella, F & Lagravinese, D 2011, 'Training the teachers for

improving primary schoolchildren's fruit and vegetables intake: a randomized controlled trial'. *Annals of Hygiene: Community Preventive Medicine*, vol. 23, no. 3, pp. 249-260.

Sharma, S, Dortch, KS, Byrd-Williams, C, Truxillio, JB, Rahman, GA, Bonsu, P & Hoelscher, D 2013, 'Nutrition-related knowledge, attitudes, and dietary behaviours among head start teachers in Texas: a cross-sectional study', Journal of the *Academy of Nutrition and Dietetics*, viewed 20 November 2015, http://doi:10.1016/j.jand.2013.01.003.

Snelling, AM, Ernst, J, Belson, SI 2013, 'Teachers as role models in solving childhood obesity', *Journal of Pediatric Biochemistry*, vol. 3, no. 1, pp. 55-60.

APPENDIX 1: Ethical approval (Faculty of Natural and Agricultural Sciences)

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA
ETHICS COMMITTEE
Faculty of Natural and Agricultural Sciences

17 May 2013
Prof U MacIntyre
Department of Human Nutrition
University of Pretoria
Pretoria
0002

Dear Prof MacIntyre

EC130424-037: Development and Implementation of a Nutrition Education Programme for Primary School Teachers in Bronkhorstspruit, Gauteng Province, South Africa

This protocol conforms to the requirements of the NAS Ethics Committee.
The Committee takes note that intellectual property for this project resides with the University of Pretoria.
There are no invasive procedures and all human subjects' identities are kept confidential.

Kind regards

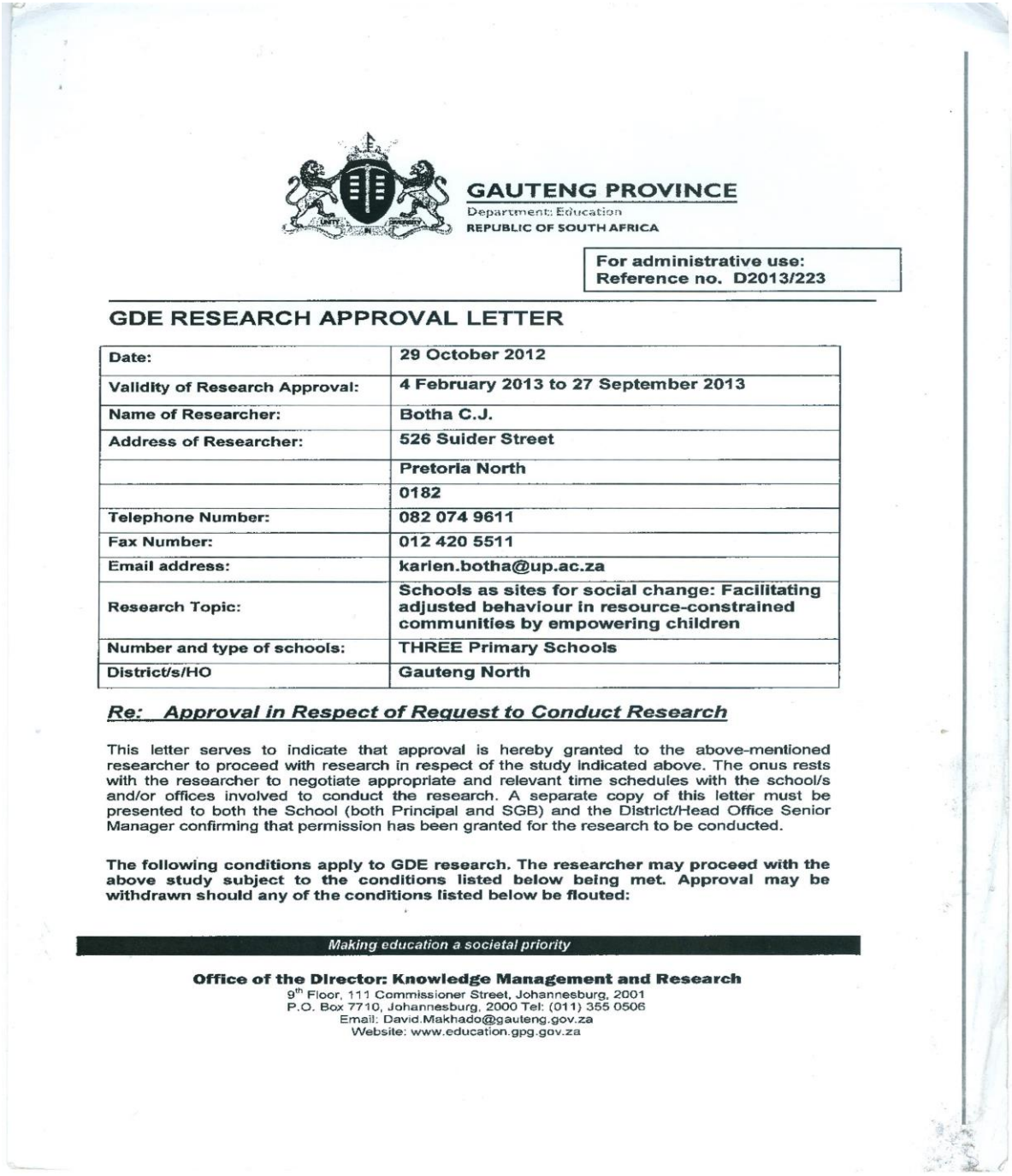
Prof NH Casey
Chairman: Ethics Committee

Agriculture Building 10-20
University of Pretoria
Private bag X20, Hatfield 0028
Republic of South Africa

Tel: 012 420 4107
Fax: 012 420 3290

ethics.nas@up.ac.za

APPENDIX 2: Department of Basic Education's approval for the larger study



GAUTENG PROVINCE
Department: Education
REPUBLIC OF SOUTH AFRICA

For administrative use:
Reference no. D2013/223

GDE RESEARCH APPROVAL LETTER

Date:	29 October 2012
Validity of Research Approval:	4 February 2013 to 27 September 2013
Name of Researcher:	Botha C.J.
Address of Researcher:	526 Suider Street
	Pretoria North
	0182
Telephone Number:	082 074 9611
Fax Number:	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 to conduct the research. A separate copy of this letter must be presented to both the School (both Principal and SGB) and the District/Head Office Senior Manager confirming that permission has been granted for the research to be conducted.

The following conditions apply to GDE research. The researcher 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:

Making education a societal priority

Office of the Director: Knowledge Management and Research
9th Floor, 111 Commissioner Street, Johannesburg, 2001
P.O. Box 7710, Johannesburg, 2000 Tel: (011) 355 0506
Email: David.Makhado@gauteng.gov.za
Website: www.education.gpg.gov.za

APPENDIX 3: Additional approval and renewals in 2014 and 2015 (Department of Basic education)

education
Department: Education
GAUTENG PROVINCE

For administrative use:
Reference no D2014/199

GDE CONDITIONAL RESEARCH APPROVAL LETTER

Date:	13 August 2013
Validity of Researcher	13 August 2013to 20 September 2013
Name of Researcher:	Kupolati, M.D
Address of Researcher:	10 Silverridge,
	358 President Street,
	Silverton 0184
Telephone Number:	Cell: 0731358613
Fax Number:	
Email address:	E-mail: mdkupolati@yahoo.com
Research Topic:	Development and Implementation of a Nutrition Education Programme for Primary School Teachers in Bronkhorstspruit, Gauteng Province, South Africa
Number and type of schools:	13 primary schools
District/s/HO	1 District

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 to conduct the research. A separate copy of this letter must be presented to both the School (both Principal and SGB) and the District/Head Office Senior Manager confirming that permission has been granted for the research to be conducted.

The following conditions apply to GDE research. The researcher 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:

1. *The District/Head Office Senior Manager/s concerned must be presented with a copy of this letter that would indicate that the said researcher/s has/have been granted permission from the Gauteng Department of Education to conduct the research study.*
2. *The District/Head Office Senior Manager/s must be approached separately, and in writing, for permission to involve District/Head Office Officials in the project.*

2013/08/13

Making education a societal priority

Office of the Director: Knowledge Management and Research
9th Floor, 111 Commissioner Street, Johannesburg, 2001
P.O. Box 7710, Johannesburg, 2000 Tel: (011) 355 0560
Email: David.Makhado@gauteng.gov.za
Website: www.education.gpg.gov.za

GAUTENG PROVINCE
Department: Education
REPUBLIC OF SOUTH AFRICA

For administrative use:
Reference no. D2014/308 A

GDE AMENDED RESEARCH APPROVAL LETTER

Date:	**26 November 2013**
Validity of Research Approval:	**10 February to 3 October 2014**
Previous GDE Research Approval letter reference number	**D2014/199 dated 13 August 2013**
Name of Researcher:	**Kupolatsi M.D.**
Address of Researcher:	**10 Silverridge**
	358 President Street
	Silverton
	0184
Telephone Number:	**073 135 8613**
Email address:	**mdkupolati@yahoo.com**
Research Topic:	**Development and implementation of a Nutrition Education Programme for Primary School Teachers in Bronkhorstspruit; Gauteng Province, South Africa**
Number and type of schools:	**THIRTEEN 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 to conduct the research. A separate copy of this letter must be presented to both the School (both Principal and SGB) and the District/Head Office Senior Manager confirming that permission has been granted for the research to be conducted.

Makhado
2013/11/27

1

Making education a societal priority

Office of the Director: Knowledge Management and Research
9th Floor, 111 Commissioner Street, Johannesburg, 2001
P.O. Box 7710, Johannesburg, 2000 Tel: (011) 355 0506
Email: David.Makhado@gauteng.gov.za
Website: www.education.gpg.gov.za

GAUTENG PROVINCE
Department: Education
REPUBLIC OF SOUTH AFRICA

For administrative use:
Reference no. D2015 / 374 A

GDE AMENDED RESEARCH APPROVAL LETTER

Date:	**14 January 2015**
Validity of Research Approval:	**9 February 2015 to 2 October 2015**
Previous GDE Research Approval letter reference number	**D2015/289 dated 2 September 2014** **D2014/308 dated 26 November 2013 and** **D2014/199 dated 13 August 2013**
Name of Researcher:	**Kupolatsi M.D.**
Address of Researcher:	**10 Silverridge; 358 President Street; Silverton; 0184**
Telephone / Fax Number/s:	**073 135 8613**
Email address:	**mdkupolati@yahoo.com**
Research Topic:	**Development and implementation of a Nutrition Education Programme for Primary School Teachers in Bronkhorstspruit; Gauteng Province, South Africa**
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:

2015/01/16

Office of the Director: Knowledge Management and Research
9th Floor, 111 Commissioner Street, Johannesburg, 2001
P.O. Box 7710, Johannesburg, 2000 Tel: (011) 355 0506
Email: David.Makhado@gauteng.gov.za
Website: www.education.gpg.gov.za

APPENDIX 4: Study introduction and informed consent letter for teachers (phase 1)

Dear Educator,

Development and implementation of a nutrition education programme for primary school teachers in Bronkhorstspruit

You have been selected as a participant in a nutrition education programme being undertaken as a part of the larger project of the Institute for Food Nutrition and Well-being, of the University of Pretoria and as a doctoral research programme. Part of the programme is the situation analysis of the practice of nutrition education in the primary schools in Bronkhorstspruit; and assessment of nutrition knowledge, attitudes and dietary practices of teachers. Your participation will require you to complete two sets of questionnaires which will not take you more than 40 minutes to complete. Please note that the information you give will be kept confidential and your name will not be revealed. You are free to decide to participate or not and your decision will not affect you in any way. The results of the study may be published.

If you have any question, please contact me or my supervisor at:

Kupolati, M.D, Department of Human Nutrition, University of Pretoria. E-mail: mdkupolati@yahoo.com

Prof, Una Maclntyre, Department of Human Nutrition, University of Pretoria. E-mail: unamaclntyre@up.ac.za

If you have any question about the conduct of this study or your right as a study participant, you can contact:

The Chairman, Ethics Committee, Faculty of Natural and Agricultural Sciences, University of Pretoria. ethics.nas@up.ac.za

By signing the form overleaf you have agreed to participate in the study.

Thank you,

Debbie Kupolati.

A. Teacher's consent

I agree to participate in the study, having been informed and made to understand that:

i. it is an exercise meant for research purpose,
ii. that my participation is voluntary,
iii. that information I will give shall remain confidential,
iv. that the results of the study may be published.

----------	----------	----------	----------
Name of teacher	Signature	Date	Witness

B. Researcher's commitment

i. Both verbal and written information concerning the proposed study were provided.
ii. I will be ready to answer further questions concerning the study.
iii. I will adhere to the approved protocol in the conduct of the study.

----------	----------	----------
Researcher's name	**Signature**	**Date**

APPENDIX 5: Study information and informed consent form for teachers (phase 3)

Dear Educator,

Development and implementation of a nutrition education programme for primary school teachers in Bronkhorstspruit

You have been selected as a participant in a nutrition education program being undertaken as a part of the larger project of the Institute for Food, Nutrition and Well-being of the University of Pretoria and as a doctoral research programme.

Purpose of study

The aim of the study is to develop, implement and evaluate a Nutrition Education Programme for primary school teachers in order to improve skills to teach nutrition which will enhance the nutrition knowledge, attitudes and dietary practices of the teachers and learners and hence foster desirable attitudes and values towards healthy eating practices.

What will be expected of you as a participant?

As a participant, you will participate in a workshop on the implementation of the contextual nutrition education programme for teachers (NEP) and may also participate in implementing the NEP to learners in Grades 5 and 6 as part of the normal school nutrition curriculum. You will also be required to participate in focus group discussions (FGD) during and after the implementation of the NEP, where you will contribute your opinions and recommendations regarding the content and implementation of the NEP. The FGD may be audio recorded and will take between one and one and half hours after school hours. The results of the study will be published.

After the implementation of the NEP to learners, you will be required to complete the nutrition knowledge, attitudes and dietary practices questionnaire.

Benefits of the study

The programme will help you to learn more about nutrition and equip you to teach nutrition to learners more effectively. It will help learners to receive nutrition information in ways that they can use the information to benefit their lives and that of their families.

Your right as a participant

Your participation is voluntary and you will not be adversely affected in any way if you decide not to give your consent to participate. You may withdraw from the study at any time without any adverse effects and without giving reasons.

Confidentiality

All information will remain confidential and your identity will not be revealed. Results will be published and presented in a manner that your identity and that of your school remain confidential.

Ethical approval.

This research study has been approved by the Ethics Committee, Faculty of Natural and Agricultural Sciences, University of Pretoria and by the Department of Basic Education. The approval numbers are EC130424-037 dated 17 May 2013 and D2014/199 dated 13 August 2013 respectively.

Information and contact persons

If you have any question, please contact me or my supervisor at:

Kupolati, MD, Department of Human Nutrition, University of Pretoria. E-mail: mdkupolati@yahoo.com.

Prof, Una MacIntyre, Department of Human Nutrition, University of Pretoria. E-mail: una.maclntyre@up.ac.za.

If you have any question about the conduct of this study or your rights as a study participant, you can contact:

The Chairman, Ethics Committee, Faculty of Natural and Agricultural Sciences, University of Pretoria. ethics.nas@up.ac.za

Please indicate your willingness to participate in the study by signing the Informed Consent form overleaf.

Thank you.

Yours sincerely,

Debbie Kupolati.

PhD Student.

A. Teacher's informed consent

I hereby confirm that I have been informed by the researcher, Mrs. MD Kupolati about the nature, conduct, benefits and risk of this study. I have read and understood the above written information (Participant's information leaflet and informed consent) regarding this study. I have the understanding of the above information before signing this form. I am aware that the results of this study including my personal details regarding my gender, age, employment status, years of teaching experience and educational qualification will be anonymously processed into a scientific report. I have had the opportunity to ask questions. I confirm that I am satisfied, and all my questions have been answered satisfactorily. I have received a copy of the informed consent agreement.

I agree to participate in the study, having been informed and made to understand that:

i. it is an exercise meant for research purposes,
ii. that my participation is voluntary and that I may withdraw from the study at any time.
iii. that information I will give shall remain confidential,
iv. that the results of the study may be published,
v. that FGD may be audio recorded.

| --- | --- | --- | --- |
| Name of Teacher | Signature | Date | Witness |

B Researcher's commitment

i. Both verbal and written information concerning the proposed study were provided.
ii. I will be ready to answer further questions concerning the study.
iii. I will adhere to the approved protocol in the conduct of the study.

APPENDIX 6: Study information and informed consent form for parents/guardians

Dear Parent / Guardian,

Development and implementation of a nutrition education programme for primary school teachers in Bronkhorstspruit

Your child's class has been selected to take part in a nutrition education program being undertaken as a part of the larger project of the Institute for Food Nutrition and Well-being, of the University of Pretoria and as a doctoral research programme. This programme will teach your child about good nutrition towards enhanced nutrition knowledge, attitudes and practices and hence foster values for healthy eating. The programme will include lesson periods and will take place during school hours. Lessons will be made up of topics in nutrition, learner's worksheets, practical, class demonstrations and posters. The teachers will be trained by the researcher on the use of a developed nutrition education manual. The teachers will use the manual to teach nutrition topics to the learners in Life Skills and Natural Science and Technology subjects.

As part of the programme, the learners will be complete a research questionnaire. The questionnaire will be used to assess the learners' nutrition knowledge, attitudes and practices before and after the nutrition lessons. The questionnaire should take not more than 30 minutes for each learner to complete. All information will remain confidential and your child's personal identity will not be revealed. The results of the research may be published.

I wish to ask for your consent for your child to participate in this study. Please note that your child's participation is voluntary and will not in any way affect his/her Grade in class. If you do not concede, your child will still be a part of the school lessons, but will not be asked to complete the questionnaire.

If you have any question, please contact me or my supervisor at:

Kupolati, M.D, Department of Human Nutrition, University of Pretoria. E-mail: mdkupolati@yahoo.com

Prof, Una Maclntyre, Department of Human Nutrition, University of Pretoria. E-mail: una.maclntyre@up.ac.za

If you have any question about the conduct of this study or the right of your child as a study participant, you can contact:

The Chairman, Ethics committee, Faculty of Natural and Agricultural Sciences, University of Pretoria. ethics.nas@up.ac.za
By signing the form overleaf you have agreed for your child to participate in the study.

Thank you,
Debbie Kupolati

A. Parent/Guardian's consent

I agree for my child/ward to participate in the study, having been informed and made to understand that:

i. it is an exercise meant for research purpose,
ii. that his/her participation is voluntary,
iii. that information he/she will give shall remain confidential,
iv. that the results of the study may be published.

| --- | --- | --- | --- |
| Name of learner | Signature | Date | Witness |

B. Researcher's commitment

i. Both verbal and written information concerning the proposed study were provided.
ii. I will be ready to answer further questions concerning the study.
iii. I will adhere to the approved protocol in the conduct of the study.

| --- | --- | --- |
| **Researcher's name** | **Signature** | **Date** |

Treatment school

Dear Parent / Guardian,

Development and implementation of a nutrition education programme for primary school teachers in Bronkhorstspruit

Your child's class has been selected to take part in a nutrition education program being undertaken as a part of the larger project of the Institute for Food Nutrition and Well-being, of the University of Pretoria and as a doctoral research programme. As part of the programme, data will be collected through research questionnaire. The data is a survey to assess the learners' nutrition knowledge, attitudes and dietary practices before and after the nutrition lessons in Life Skills and Natural Science and Technology subjects. The questionnaire should take not more than 30 minutes for each learner to complete. All information will remain confidential and your child's personal identity will not be revealed. The results of the research may be published.

I wish to ask for your consent for your child to participate in this study. Please note that your child's participation is voluntary and will not in any way affect his/her Grade in class. If you do not concede, your child will still be a part of the school lessons, but will not be asked to complete the questionnaire.If you have any question, please contact me or my supervisor at:

Kupolati, M.D, Department of Human Nutrition, University of Pretoria. E-mail: mdkupolati@yahoo.com
Prof, Una Maclntyre, Department of Human Nutrition, University of Pretoria. E-mail: una.maclntyre@up.ac.za

If you have any question about the conduct of this study or the right of your child as a study participant, you can contact:

The Chairman, Ethics committee, faculty of Natural and Agricultural Sciences, University of Pretoria. ethics.nas@up.ac.za
By signing the form overleaf you have agreed for your child to participate in the study.

Thank you,
Debbie Kupolati.

A. Parent/Guardian's consent

I agree for my child/ward to participate in the study, having been informed and made to understand that:

i. it is an exercise meant for research purpose,
ii. that his/her participation is voluntary,
iii. that information he/she will give shall remain confidential,
iv. that the results of the study may be published.

| --- | --- | --- | --- |
| Name of learner | Signature | Date | Witness |

B. Researcher's commitment

i. Both verbal and written information concerning the proposed study were provided.
ii. I will be ready to answer further questions concerning the study.
iii. I will adhere to the approved protocol in the conduct of the study.

| --- | --- | --- |
| **Researcher's name** | **Signature** | **Date** |

Control school

APPENDIX 7: Study information and assent form for learners

Dear Learner,

Development and implementation of a nutrition education programme for primary school teachers in Bronkhorstspruit

You are hereby requested to participate in a study about nutrition education. The study is being undertaken as a doctoral research programme at the University of Pretoria. Your participation will require you to complete questionnaire survey on two occasions, which will not take you more than 30 minutes to complete. The information you give, will be kept confidential, and your name will not be revealed. Note that you are free to decide to participate or not to participate and your decision will not affect your grade in class in any way. If you decide to participate and you later change your mind at any step of the project, you are free to withdraw your participation without any penalty. The results of the research may be published.

If you have any question or comments about this study, contact me or my supervisors at:

Kupolati, M.D, Department of Human Nutrition, University of Pretoria. E-mail: mdkupolati@yahoo.com
Prof. Una Maclntyre, Department of Human Nutrition, University of Pretoria. E-mail: unamaclntyre@up.ac.za

If you have any question about the conduct of this study or your right as a study participant, you can contact:

The Chairman, Ethics committee, faculty of Natural and Agricultural and Resources, University of Pretoria. ethics.nas@up.ac.za

By signing the form overleaf, you have agreed to participate in the study.

Thank you,
Debbie Kupolati.

A. Learner's assent

I agree to participate in the study, having been informed and made to understand that:

i. it is an exercise meant for research purpose,
ii. that my participation is voluntary,
iii. that information I will give shall remain confidential
iv. that the results of the study may be published.

| --- | --- | --- | --- |
| Name of learner | Signature | Date | Witness |

B. Researcher's commitment

i. Both verbal and written information concerning the proposed study were provided.
ii. I will be ready to answer further questions concerning the study.
iii. I will adhere to the approved protocol in the conduct of the study.

| --- | --- | --- |
| **Researcher's name** | **Signature** | **Date** |

APPENDIX 8: Nutrition knowledge, attitudes and dietary practices questionnaire for teachers (Phase 1)

Teachers' nutrition knowledge, attitudes and dietary practices questionnaire

Identifier: i. School number_____ ii. Study number _____

A. Demographic. (Tick as appropriate)

1. Gender

(a.) Male 1□

(b.) Female 2□

2. Age…… (Please write in years e.g.25 years)

3. Race

(a.) White 1□

(b.) Black 2□

(c.) Coloured 3□

(d.) Indian 4□

(e.) Others 5□

4. Employment status

(a.) Employed full time 1□

(b.) Employed part time 2□

(c.) Others 3□ .

5. Years of teaching experience ……. (Please write in years e.g. 5 years)

6. Highest education qualification

(a.) Teaching Diploma 1□

(b.) University first degree 2□

(c.) Master Degree 3□

(d.) PhD 4□

(e.) Others 5□

B. Nutrition knowledge

(i) Current dietary recommendations for children

1. Health experts recommend that children should eat more, or less of the following foods (Tick one box per food)

	More	Less
1.1 Vegetables	1□	2□
1.2 Sugary foods	1□	2□
1.3 Fatty foods	1□	2□
1.4 High fibre foods	1□	2□
1.5 Fruit	1□	2□
1.6 Salty foods	1□	2□

2. How many servings of fruit and vegetables a day do experts advise children to eat? (Please write the number e.g. 3)

. . . . . .

3. The instructions outlined in the South African Food-Based Dietary guidelines (SAFBDGs) will not meet the needs for children.

(a) True 1□
(b) False 2□
(c) Uncertain 3□

4. It is okay for children to drink lots of cold-drinks because they need lots of energy to grow

(a) True 1□
(b) False 2□
(c) Uncertain 3□

(ii) Sources of nutrients

5. Do you think the following foods are high or low in fat? (Tick one box per food)

	High	Low
5.1 Honey	1□	2□
5.2 Fried egg	1□	2□
5.3 Nuts	1□	2□
5.4 Bread	1□	2□
5.5 Cheddar cheese	1□	2□

6. Which of the following do experts put in the starchy foods group? (Tick one box per food)

	Yes	No
6.1 Cheese	1□	2□
6.2 Pasta	1□	2□
6.3 Butter	1□	2□
6.4 Nuts	1□	2□
6.5 Rice	1□	2□
6.6 Porridge	1□	2□

7. Are the following foods high or low in salt? (Tick one box per food)

	High	Low
7.1 Sausages	1□	2□
7.2 Pasta	1□	2□
7.3 Frozen vegetables	1□	2□
7.4 Polony	1□	2□

8. Are the following foods high or low in protein? (Tick one box per food)

	High	Low
8.1 Chicken	1□	2□
8.2 Cheese	1□	2□
8.3 Fruit	1□	2□
8.4 Baked beans	1□	2□
8.5 Butter	1□	2□
8.6 Cream	1□	2□

9. Are the following foods high or low in fibre/roughage? (Tick one box per food)

	High	Low
9.1 Cabbage	1□	2□
9.2 Baked potatoes with skins	1□	2□
9.3 Chicken	1□	2□
9.4 Baked beans	1□	2□

10. A glass of unsweetened fruit juice counts as a helping of fruit.

(a) Agree 1□

(b) Disagree 2□

11. There is more protein in a glass of whole milk than in a glass of fat-free milk.

(a) Agree 1□

(b) Disagree 2□

12. Which of these breads contain the most fibre? (Tick one)

(a) White 1□

(b) Brown 2□

(c) Whole-wheat 3□

13. There is more calcium in a glass of whole milk than a glass of skimmed milk.

(a) Agree 1□

(b) Disagree 2□

14. Which one of the following has the highest amount of energy per 100g serving size? (Tick one)

(a) Sugar 1□

(b) Starchy foods 2□

(c) Fibre/roughage 3□

(d) Fat 4□

15. Harder fats contain more: (Tick one)

(a) Monounsaturated 1□

(b) Polyunsaturated 2□

(c) Saturates 3□

(iii) Diet disease relationship

	Yes	No
16. Major health problems or diseases are related to a low intake of fibre	1	2
17. Major health problems or diseases may be related to how much sugar people eat	1	2
18. The amount of salt or sodium people take is not related to health problems or diseases	1	2
19. The amount of fat people eat has nothing to do with health problems or diseases	1	2
20. A person can prevent heart disease by eating more fibre and less saturated fat		
21. A person can prevent heart disease by eating more fruits and vegetables	1	2

C. Nutrition Practices

(i). Personal eating habits

How often do you eat …..?	Never	1 time a month or less	2-3 times a month	1-2 times a week	3-4 times a week	5+ times a week
A						
1. Beef cuts, ground beef, sausages (Polony)	1	2	3	4	5	6
2. Fried chicken	1	2	3	4	5	6
3. Salad dressing (not low fat)	1	2	3	4	5	6
4. Butter or stick margarine	1	2	3	4	5	6
5. Whole eggs (either boiled or fried)	1	2	3	4	5	6
6. Muffins, cakes, biscuits, corn chips, potato chips, crackers, cookies	1	2	3	4	5	6
7. Cheese, cheese spread (not low fat)	1	2	3	4	5	6
8. Whole milk	1	2	3	4	5	6
9. Ice cream	1	2	3	4	5	6

Continued/…….

(i). Personal eating habits continued

How often do you eat …..?	Never	1 time a month or less	2-3 times a month	1-2 times a week	3-4 times a week	5+ times a week
10. Drinks e.g. Oros, Coca-Cola products and flavoured drinks						
B						
11. Baked fish, chicken						
12. Fruit juice e.g. orange juice, apple juice (e.g. ligui fruit, not cold drinks)	1	2	3	4	5	6
13. Any fresh fruit	1	2	3	4	5	6
14. Green salad	1	2	3	4	5	6
15. Potatoes e.g. baked or boiled,	1	2	3	4	5	6
16.Vegetable soup or stewed vegetables	1	2	3	4	5	6
17. Other vegetables e.g. string beans, peas, corn, cabbage, lettuce.	1	2	3	4	5	6

(ii). Eating habits at school

18. On most days do you

(a.) Purchase lunch at the school 1□

(b.) Bring lunch from home 2□

(c.) Do not eat lunch 3□

19. How often do you purchase food or beverage items from school tuck shop, shops or food vendors?

(a.) 4 or more times per week 1□

(b.) 1-3 times per week 2□

(c.) 2-3 times per month 3□

(d.) 1 time per month or less 4□

(e.) Never 5□

If answer to question 19 is **Never** then go to question 24

How often do you purchase the following foods from the school tuck shop or vendors around the school?

	4 or more times per week	1-3 times per week	2-3 times per month	1 time per month or less	Never	Items are not available
20. High fat or high sugar items, like candy, chips, cookies or fat cakes	1	2	3	4	5	6
21. Low fat items like bread, fruits or vegetables	1	2	3	4	5	6
22. Cold drinks or fruit drinks, like Oros, Wild Island	1	2	3	4	5	6
23. 100% fruit juice, bottled water, low fat milk drinks	1	2	3	4	5	6

(iii). Classroom food practices

As a class teacher would you ……..	Likely	Some what likely	Not likely	Uncert-ain
24. Use sweets as reward, incentive or special treat for learners?	1	2	3	4
25. Use fat cakes, doughnuts or cookies as reward, incentive or special treat for learners?	1	2	3	4
26. Use fruits or vegetables as reward, as reward, incentive or special treat for learners?	1	2	3	4
27. Use drinks, as rewards, incentive or as a special treat for learners?	1	2	3	4
28. Use bottled water, 100% fruit juice or low fat milk drinks as reward, incentive or as a special treat for learners?	1	2	3	4
29. Allow learners to drink soft drinks during class time?	1	2	3	4
30. Allow learners to eat food items (including candy) during class time?	1	2	3	4
31. Withhold a food or beverage item from a learner as punishment?	1	2	3	4
32. Praise learners when you see those eating healthier foods, such as fruit juice or low fat snack items?	1	2	3	4
33. Eat lunch or break snacks with the learners?	1	2	3	4
34. Include information on nutrition and healthy eating as part of your lesson plans	1	2	3	4

(iv). School-wide food practices

Statements	Strongly disagree	Disagree	Uncertain	Agree	Strongly agree
35. The foods that learners eat during the school day affect their readiness to learn	1	2	3	4	5
36. School prepared lunches are healthy	1	2	3	4	5
37. School lunch should include more fruits and vegetables	1	2	3	4	5
38. Selling high fat, high sugar foods, such as candy and cookies, as part of school fund-raising is okay because it helps provide revenue for school programs and school activities	1	2	3	4	5
38. It is important for schools to have a written school nutrition policy which addresses food related issues, such as food in the classroom or food selections in tuck shops	1	2	3	4	5
40. High fat and high sugar foods are used as reward and incentive in the classroom because learners prefer these kinds of foods	1	2	3	4	5
41. Learners in my school seem to eat healthy diets	1	2	3	4	5
42. It is important to have a healthy school food environment so there is consistency with messages taught in the classroom	1	2	3	4	5
43. The eating behaviours of teachers influence the eating behaviours of learners	1	2	3	4	5

Continued/…….

(iv). School-wide food practices continued

Statements	Strongly disagree	Disagree	Uncertain	Agree	Strongly agree
44. As a teacher, I can influence school food policy	1	2	3	4	5
45. Schools should give adequate attention to learners' nutrition	1	2	3	4	5
46. Food habits are determined before learners reach middle school	1	2	3	4	5
47. The nutritional health of learners should be a school priority	1	2	3	4	5
48. Learners should be provided the foods they want at school	1	2	3	4	5
49. Nutrition education should give learners the skills to make healthy food choices	1	2	3	4	5
50. Learners should be able to buy soft drinks and candy at school	1	2	3	4	5
51. The food habits of children affect their health as adults	1	2	3	4	5
52. It is important for schools to teach learners the basic skills of food preparation, so they can put nutrition knowledge into practice	1	2	3	4	5

(v). Healthy and unhealthy dietary habits

53. Which is a healthy diet?

(a.) A diet rich in different foods 1□

(b.) A diet whose foods are rich in protein (meat, fish, eggs, cheese, dry legumes) 2□

(c.) A diet without fats 3□

(d.) Eating fish very often 4□

54. Which is the healthiest eating behaviour?

(a.) Drinking 2 glasses of milk/eating 2 cups of yogurt every day 1□

(b.) Preferring cooked vegetables to uncooked vegetables 2□

(c.) Always eating cheese instead of meat 3□

(d.) When you eat snacks, preferring fruit 4□

55. Which is the healthiest choice of food?

(a.) Washed vegetables ready to eat 1□

(b.) A canned food 2□

(c.) A food rich in dressing 3□

(d.) A fried food 4□

(vi). Food behaviour in hygiene

	Always	Sometimes	Never
56. When you buy packaged food, do you check the expiry date?	1	2	3
57. Do you read the instructions for use and for preservation written on the package?	1	2	3
58. Do you wash your hands before eating or touching foods?	1	2	3
59. Do you wash fruits that must be peeled before eating?	1	2	3
60. After using a glass of milk, do you put the milk in the fridge?	1	2	3

D. Nutrition attitudes

Please mark an (x) for the one that applies to you

		Agree	Do not agree	Not sure
1.	Breakfast is very important for me	1	2	3
2.	I need to eat a lot so I don't fall sick	1	2	3
3.	I need to have breakfast so I can be active through the day	1	2	3
4.	I need to eat a variety of food in order to receive all the nutrients my body needs	1	2	3
5.	I only need to consume a healthy diet when I am sick	1	2	3
6.	I like eating lots vegetables and fruits	1	2	3
7.	To maintain a healthy body and good stature, I must learn about food	1	2	3
8.	I will choose delicious food, regardless of its nutritional value	1	2	3
9.	I can eat whatever I want. I will look after my diet if I fall sick	1	2	3
10.	I eat high fat foods to because they are tasty	1	2	3
11.	I eat large meals at irregular interval	1	2	3
12.	Circumstances dictate my eating many times	1	2	3
13.	I like to eat small meals at regular interval	1	2	3
14.	I like to try new foods	1	2	3

APPENDIX 9: Nutrition education practices questionnaire

Questionnaire on the situation of nutrition education in primary schools

Identifier: i. School number_____ ii. Study number _____

1. Number of years of teaching in primary school……. (Please write in years e.g. 12 years)

2. The Grades taught (Please tick as appropriate)

a. Grades R through Grade 6 1□
b. Grades R – Grade 1 2□
c. Grades 2 – 4 3□
d. Grades 5 – 7 4□

3. What Grade are you currently teaching? ..... (Please write the Grade/Grades)

4. What subjects are you currently teaching?

a. Life Skills only 1□
b. Natural Science and Technology only 2□
c. Life Skills and other subjects 3□
d. Natural Science and Technology and other subjects 4□

5. Do you teach nutrition topics in your subjects?

a. Yes 1□
b. No 2□

6. Courses or trainings taken to prepare you to teach nutrition topics (Please answer each one)

	Yes	No
6.1 In-service training	1□	2□
6.2 Undergraduate or graduate training	1□	2□
6.3 Research and personal study	1□	2□
6.4 No training	1□	2□

7. Formal method used to prepare to teach nutrition (Please answer each one)

	Yes	No
7.1 By integrating lessons about nutrition into various subjects	1□	2□
7.2 By the placement of nutrition instruction into the curriculum	1□	2□

8. If answer to 7 above is by integration into other subjects (Please answer each one).

Subjects	Extent to which nutrition lessons are integrated			
	Great extent	Moderate extent	Small extent	Not at all
8.1 Life orientation	1	2	3	4
8.2 History / social studies	1	2	3	4
8.3 Mathematics	1	2	3	4
8.4 English language	1	2	3	4
8.5 Science	1	2	3	4

9. Do you have nutrition education instructional materials (Teaching and learning aids)?

a. Yes 1□
b. No 2□

10. If yes, are instructional materials of high quality? (In terms of age appropriateness, clarity and ease of understanding)

a. Yes 1□
b. No 2□

11. Source of instructional materials (Please answer each one)

		Yes	No
11.1	Department of education	1□	2□
11.2	School	1□	2□
11.3	Developed by self	1□	2□

12. Would you like to receive in-service training on various nutrition topics?

a. Yes 1□

b. No. 2□

13. Will you like to receive nutrition education materials to aid your nutrition teaching?

a. Yes 1□

b. No. 2□

14. Availability of resources in support of nutrition education in your school (Please answer each one).

	Availability			
Nutrition education resource.	Great extent	Moderate extent	Small extent	Not at all
14.1 High quality in-service training	1	2	3	4
14.2 School feeding meals	1	2	3	4
14.3 Reference materials at school	1	2	3	4
14.4 Support for use of instructional time	1	2	3	4
14.5 Written guideline on nutrition education	1	2	3	4
14.6 Co-ordinated school nutrition policy	1	2	3	4
14.7 Tuck-shop	1	2	3	4
14.8 Hawkers	1	2	3	4

15. Extent to which various resources can improve nutrition education (Please answer each one).

	Potential to improve nutrition education			
Nutrition education resource	Great extent	Moderate extent	Small extent	Not at all
15.1 High quality in-service training	1	2	3	4
15.2 School feeding meals	1	2	3	4
15 3 Reference materials at school	1	2	3	4
15 4 Support for use of instructional materials	1	2	3	4

16. Indicate the proportion of classes you taught which included nutrition in the previous academic year

16.1 Grade taught…….. (Please write the Grade/Grades)

16.2 Proportion of classes where nutrition was taught

f. 10 – 20 per cent 1□
g. 21 – 40 per cent 2□
h. 41 – 60 per cent 3□
i. 60 – 80 per cent 4 □
j. 81 – 100 per cent 5 □

17. Rate the quality of instructional materials currently in use for nutrition education (Please answer each one).

	Extent statement is true			
Quality index	Great extent	Moderate extent	Small extent	Not at all
17.1 Materials are up to date	1	2	3	4
17.2 Materials are age appropriate	1	2	3	4
17.3 Learners find materials appealing	1	2	3	4
17.4 Enough materials for all learners.	1	2	3	4

18. The extent to which various instructional materials will aid your teaching nutrition

	Extent to which materials would be useful			
Type of material	Great extent	Moderate extent	Small extent	Not at all
18.1 Teacher materials (e.g. curriculum)	1	2	3	4
18.2 Textbooks	1	2	3	4
18.3 Supplementary learner materials (e.g. worksheets)	1	2	3	4
18.4 Learner assessment materials	1	2	3	4
18.5 Computer software	1	2	3	4
18.6 Audio and visual aids (e.g. films, video-tapes, posters)	1	2	3	4

APPENDIX 10: Focus group interview guide (Phase 1)

Instruction for moderator: Use the information in brackets as a guide or probe in case of inadequate or non-response to a question.

A. Preliminaries

1. Moderator introduces herself, the co-moderator and the purpose of the group discussion.
2. Asks the participants to introduce themselves and say something about themselves.

B. Understanding of nutrition education

1. What is your understanding of nutrition education?
2. What is your understanding of the teaching of nutrition in Primary schools?

C. Factors influencing teaching of nutrition in primary schools

1. How do you feel teaching nutrition to learners? (Like do you feel comfortable or have a sense of inadequacy or guilt).

2. What are your priorities when you teach nutrition to learners? (Like for them to pass exams or for them to imbibe a healthy life-long dietary habits).

3. Do you think that teaching of nutrition in the classroom can translate into eating behavioural changes among the learners? How?

4. Discuss the different ways in which teachers can pass on nutrition messages to learners in the classroom setting aside from teaching. (Example through verbal and non-verbal communication).

5. Do you think environmental factors in the school setting are strong enough to influence learners' ability to translate the nutrition lessons they learnt in class into eating behaviours? Please explain how (Both positive and negative influences).

6. What is your opinion about making the teachers to share in the responsibility of raising a future generation of nutritionally adequate and healthy individuals?

D. Nutrition education needs in the school environment

1. What do you think are the learners' perception of their own nutrition need (Are learners receptive to change or are perceived to be resistant to change).
2. How do you perceive support for nutrition from your school authority (Evidence from the actions and facilities management has put in place in respect of nutrition issues)?
3. Do you think nutrition education is necessary in the school environment as a means to impact lifelong dietary changes rather than as a subject for educational purposes? How?
4. What can you say about time and resources allocated to nutrition education in your school (Whether they are sufficient to bring about healthy eating changes?).
5. What do you think are the very important factors that can positively influence learners' food behaviours in the school environment?

APPENDIX 11: Nutrition knowledge, attitudes and dietary practices questionnaire for learners (Phase 1)

Identifier: i. School number_____ ii. Study number _____

Instructions: Mark the answers applicable to you

A. DEMOGRAPHIC

1. Sex

(a.) Male 1□

(b.) Female 2□

2. Age …….. (Please write in years e.g. 14 years)

3. Race

(a.) White 1□

(b.) Black 2□

(c.) Coloured 3□

(d.) Indian 4□

(e.) Others 5□

B. NUTRITION INFORMATION

1. Have you ever been told about having a healthy diet?

a. Yes 1□

b. No 2□

2. If yes, who told you about having a healthy diet? (You may tick more than one answer)

a. Family Members 1□

b. Friend 2□

c. Doctor / Nurse 3□

d. Teacher 4□

e. Tuck-shop worker 5□

f. Other: _____ 6□

3. If yes, where? (You may tick more than one answer)

a. Media (TV, magazines, newspapers) 1□
b. School 2□
c. Hospital / Clinic 3□
d. Other : _____ 4□

C. KNOWLEDGE ITEMS

i Food nutrient and function

4. Salty food is not good for health

a. True 1□
b. False 2□
c. Don't Know 3□

5. Food is important for growth

a. True 1□
b. False 2□
c. Don't Know 3□

6. To be a brilliant learner, we need to eat nutritious food

a. True 1□
b. False 2□
c. Don't Know 3□

7. The most important meal that helps us to be active all day long is

a. Breakfast 1□
b. Lunch 2□
c. Dinner 3□
d. Don't know 4□

(ii) Food and energy

8. We need a lot of energy to

a. Sleep 1□
b. Play football 2□
c. Use the computer 3□
d. Don't know 4□

9. Energy to learn and play comes from

a. Food 1□
b. Air 2□
c. Water 3□
d. Don't know 4□

10. To keep a healthy body weight, we need to have a balanced diet and exercise

a. True 1□
b. False 2□
c. Don't Know 3□

(iii) Nutrient deficiency

11. A hungry learner cannot perform well in his studies

a. True 1□
b. False 2□
c. Don't Know 3□

12. We will get sick more easily, if our body lacks nutrients

a. True 1□
b. False 2□
c. Don't Know 3□

13. If we have 'lack of blood' (pale), it would be hard for us to focus in class.

a. True 1□
b. False 2□
c. Don't Know 3□

14. Which of the following is true?

a. Lack of nutrients can cause stunted growth 1□
b. Lack of nutrients can cause fatness 1□
c. Lack of nutrients can make us tall 1□
d. Don't know 1□

(iv) Food choices

15. Breakfast must consist of foods that are healthy choices

a. True 1□
b. False 2□
c. Don't Know 3□

16. Eating a lot of chocolates, sweets, and ice cream is good for your health

a. True 1□
b. False 2□
c. Don't Know 3□

17. Fruits are healthy snacks (Snacks are foods that are consumed between meals)

a. True 1□
b. False 2□
c. Don't Know 3□

18. Food that is high in fat can cause diseases

a. True 1□
b. False 2□
c. Don't Know 3□

19. We need to have 3 meals a day (Breakfast, Lunch, and Supper)

a. True 1□
b. False 2□
c. Don't Know 3□

20. Frequent eating of fast foods could risk our health (Fast foods e.g. KFC, Mc Donalds, Pizza Hut,)

a. True 1□
b. False 2□
c. Don't Know 3□

(v) Sources of nutrients

21. Food that is low in fat is

a. Watermelon 1□
b. Chocolate 2□
c. Ice Cream 3□
d. Don't know 4□

22. Calcium is mostly found in

a. Fruit beverages 1□
b. Carbonated drinks (Coke, Sprite, Pepsi, etc.) 2□
c. Milk 3□
d. Don't know 4□

23. Highly processed foods always contain more nutrients than minimally processed foods

a. True 1□
b. False 2□
c. Don't Know 3□

24. Which of the following cooking methods will retain more nutrients in vegetables?

a. Frying 1□
b. Boiling in water 2□
c. Steaming 3□
d. Roasting 4□

25. The following are the reasons for processing foods except

a. To prevent spoilage 1□
b. To make them edible 2□

c. To produce more convenient foods 3□

d. To produce foods that prevent tooth decay 4□

26. Rice with fish and vegetables is a balanced diet

a. True 1□

b. False 2□

c. Don't Know 3□

D. PRACTICE ITEMS

27. During break, the food that I always eat is: (Your answer may be more than one)

a. Porridge or pap 1□

b. Sweets or Chocolates 2□

c. Ice Cream/Carbonated Drinks 3□

d. Others (Specify) : _____ 4□

28. Foods that I always eat for lunch is

a. Rice, fish, and chicken + vegetables 1□

b. Pap and vegetables 2□

c. Kwota (Bread + chips + polony + tomato sauce) 3□

d. Others (Specify): _____ 4□

29. Food that I always choose as snacks are

a. Fruits 1□

b. Corn snacks (Simba) Potato chips (Lays) 2□

c. Ice Cream, chocolates, sweets 3□

d. Cakes, fat-cakes, buns 4□

e. Others : _____ 5□

30. I eat fast foods (McDonalds, Pizza, KFC, etc)

a. Almost every day 1□

b. Several times a week 2□

c. Occasionally 3□

d. Never 4□

31. I eat a balanced diet (pap/rice/bread with meat/fish/egg with vegetables/fruits and milk/dairy products)

a. Every day 1□
b. Several times a week 2□
c. Occasionally 3□
d. Never 4□

32. I have breakfast

a. Every day 1□
b. Several times a week 2□
c. Occasionally 3□
d. Never 4□

33. With breakfast, I always drink

a. Cordial drinks/ Carbonated drinks 1□
b. Fresh milk / UHT milk / Powder milk / Milo / Horlicks 2□
c. Coffee / Tea 3□
d. Others : _____ 4□

34. I eat sweets / chocolates / Ice cream

a. Every day 1□
b. Several times a week 2□
c. Occasionally 3□
d. Never 4□

35. I ONLY have drink (Hot chocolate, tea, fruit juice, sweetened drink) for breakfast

a. Every day 1□
b. Several times a week 2□
c. Occasionally 3□
d. Never 4□

E. ATTITUDES ITEMS

Please mark an (x) for the most suitable answer

		Agree	Do Not Agree	Not Sure
36.	Breakfast is very important for me.	1	2	3
37.	I need to eat a lot in order to grow fast.	1	2	3
38.	I need to have breakfast so I can focus in class.	1	2	3
39.	I need to eat a variety of food.	1	2	3
40.	I only need to consume a healthy diet when I am sick.	1	2	3
41.	I like eating vegetables.	1	2	3
42.	To keep a healthy body, I must learn about food	1	2	3
43.	I will choose delicious food, regardless of its nutritional value.	1	2	3
44.	I am still young, and I can eat whatever I want. I will look after my diet when I am older.	1	2	3
45.	I like to try new food	1	2	3

APPENDIX 12: Workshop evaluation questionnaire

Directions: Your responses to the following questions are valuable for taking this programme forward especially, implementing the manual to learners and for the future running of the workshop. Please answer all questions candidly. Encircle the letter of your choice and provide explanation if necessary. **YOUR WRITTEN COMMENTS ARE ESPECIALLY APPRECIATED.**

COURSE CONTENT

1. The workshop objectives were clear.

A. Very much so B. For the most part C. Somewhat D. Only slightly E. Not at all

2. The workshop content was logically organised and developed.

A. Very much so B. For the most part C. Somewhat D. Only slightly E. Not at all

3. The amount of time spent covering the content was adequate.

A. Very much so B. For the most part C. Somewhat D. Only slightly E. Not at all

4. The pace of instruction was satisfactory.

A. Very much so B. For the most part C. Somewhat D. Only slightly E. Not at all

SKILLS AND KNOWLEDGE

1. I feel that I understood the important concepts and skills presented in the workshop.

A. Very much so B. For the most part C. Somewhat D. Only slightly E. Not at all

2. I feel that I acquired new skills and knowledge in presenting nutrition messages to learners.

A. Very much so B. For the most part C. Somewhat D. Only slightly E. Not at all

3. I enhanced the skills and knowledge I already have regarding the teaching of nutrition to learners.

A. Very much so B. For the most part C. Somewhat D. Only slightly E. Not at all

4. The information presented will be valuable to me in teaching nutrition topics to learners

A. Very much so B. For the most part C. Somewhat D. Only slightly E. Not at all

COURSE MATERIALS

1. The participant materials (Nutrition education manual) contributed to my learning.

A. Very much so B. For the most part C. Somewhat D. Only slightly E. Not at all

2. The instructor materials (picture book) contributed to my learning.

A. Very much so B. For the most Part C. Somewhat D. Only slightly E. Not at all

INSTRUCTORS

1. The instructors had command of the subject matter.

A. Very much so B. For the most part C. Somewhat D. Only slightly E. Not at all

2. The instructors gave clear and logical presentations.

A. Very much so B. For the most part C. Somewhat D. Only slightly E. Not at all

3. There was sufficient opportunity for questions and discussion.

A. Very much so C. For the most part C. Somewhat D. Only slightly E. Not at all

4. Rate the overall effectiveness of the instructor.

A. Excellent B. Good C. Fair D. Marginal E. Poor

GENERAL COMMENTS

1. How would you rate the quality of this workshop?

A. Excellent B. Good C. Fair D. Marginal E. Poor

2 Comment on the strengths of the workshop if any.....

.....

3. Comment on the weaknesses of the workshop if any.....

.....

4. How would you rate the overall quality of the workshop?

A. Excellent B. Good C. Fair D. Marginal E. Poor

Please use the space below to write additional comments you may have about the workshop.

.....

.....

THANK YOU

APPENDIX 13: Process evaluation questionnaires

Topic: Healthy eating for children **Date**.....

Instruction: Please indicate the option that best describes your response to these questions

Questions	Strongly disagree	Disagree	Agree	Strongly agree
The sub-topics:				
1. 'South African Food Based Dietary Guidelines (SAFBDGs) (Part 1)' adequately addressed what learners need to know about healthy eating (Explain your answer…….....)	1	2	3	4
2. 'South African Food Based Dietary Guidelines (SAFBDGs) (Part 2)' adequately addressed what learners need to know about healthy eating (Explain your answer……...……)	1	2	3	4
3. 'Classes of nutrients and the South African Food Guide' addressed what learners need to know about nutrients in foods (Explain your answer…….	1	2	3	4
……)	1	2	3	4
4. The allotted time was enough to cover the important things learners should know in this topic - Healthy eating for children (Explain your answer…….)	1	2	3	4
4.1 Learners were able to do the group discussions (i) Yes (ii) No 4.2 Learners were able to complete the work sheets on 'My Aspiration (Dream)' (i) Yes (ii) No 4.3 Learners were able to complete the work sheet on 'Fueling your aspiration' (i) Yes (ii) No 4.4 Learners were able to complete the work sheet on 'Classes of nutrients' (i) Yes (ii) No				

Continued/…….

Topic: Healthy eating for children continued

Questions	Strongly disagree	Disagree	Agree	Strongly agree
5. Learners' participation during class discussions was enhanced by using this manual in presenting the lessons (Explain your answer……..…….. .....……)	1	2	3	4
6. The use of icons helped to make presenting nutrition messages more meaningful (Explain your answer…….. ……)	1	2	3	4
7. The posters used were appropriate and helpful in illustrating the ideas about nutrients in food (Explain your answer……..…….. ….....……)	1	2	3	4
8. Learners found the goal setting cards for the sub-topics easy to use and exciting (Explain your answer…….. ……)	1	2	3	4
9. The learner's work sheets for these sub-topics serve the purpose of enhancing learners' reading skill (If answer to any or all of 4.2, 4.3, & 4.4 is yes) (Explain your answer…..…….. ……)	1	2	3	4
10. The idea of 'My Aspiration (dream)' in the work sheet is helpful in motivating learners in making healthy food choices (If answer to 4.2 is yes) (Explain your answer …….....)	1	2	3	4
11. It is easy to use the manual (i.e. manual is user-friendly) (Explain your answer…….....)	1	2	3	4

Other comments or suggestions for improving the information or materials provided for this topic.....
.....

Topic: Nutrients in food **Date.....**

Instruction: Please indicate the option that best describes your response to these questions

Questions	Strongly disagree	Disagree	Agree	Strongly agree
The sub-topics:				
1. 'Nutrient: carbohydrates' adequately addressed what learners need to know about carbohydrates (Explain your answer…….. ……)	1	2	3	4
2. 'Nutrient: proteins' adequately addressed what learners need to know about proteins (Explain your answer ……..... ……...)	1	2	3	4
3. 'Nutrient: fats' adequately addressed what learners need to know about fats (Explain your answer…….. ……...)	1	2	3	4
4. 'Nutrients: minerals and vitamins' adequately addressed what learners need to know about minerals and vitamins (Explain your answer ..... ……...)	1	2	3	4
5. 'Reading of labels' adequately addressed what learners need to know about reading of labels on packaged foods (Explain your answer …… ……..)	1	2	3	4

Continued/…….

Topic: Nutrients in food continued

Questions	Strongly disagree	Disagree	Agree	Strongly agree
6. The allotted time was enough to cover the important things learners should know in this topic - Nutrients in food (Explain your answer……. ……)	1	2	3	4
7. 6.1. Learners were able to do the group discussions (i) Yes (ii) No 6.2. Learners were able to complete the work sheets on 'My dream' (i) Yes (ii) No 6.3 Learners were able to complete the work sheet on 'Food puzzle' (i) Yes (ii) No 6.4 Learners were able to complete the work sheet on 'Food label' (i) Yes (ii) No				
8. Learners' participation during class discussions was enhanced by using this manual in presenting the lessons (Explain your answer…… ……)	1	2	3	4
9. The use of icons helped to make presenting nutrition messages more meaningful (Explain your answer…… ……)	1	2	3	4
10. The posters used were appropriate and helpful in illustrating the ideas about nutrients in food (Explain your answer……. ……)	1	2	3	4

Continued/…….

Topic: Nutrients in food continued

Questions	Strongly disagree	Disagree	Agree	Strongly agree
11. Learners found the goal setting cards for the sub-topics easy to use and exciting (Explain your answer…… ……)	1	2	3	4
12. The learner's work sheets for these sub-topics served the purpose of enhancing learners' reading skill (If answer to any or all of 6.2, 6.3, & 6.4 is yes) (Explain your answer…….. ……)	1	2	3	4
13. The idea of 'My dream' in the work sheet was helpful in motivating learners to choose foods that are full of nutrients (If answer to 6.2 is yes) (Explain your answer……. ……)	1	2	3	4
14. The food puzzle in the work sheet helped learners' to understand that different foods provide many nutrients (If answer to 6.3 is yes) (Explain your answer……. ……)	1	2	3	4
15. It is easy to use the manual (i.e. manual is user-friendly) (Explain your answer…… ……)	1	2	3	4

Other comments or suggestions for improving the information or materials provided for this topic.....
.....

Topic: Nutrition **Date.....**

Instruction: Please indicate the option that best describes your response to these questions

Question	Strongly disagree	Disagree	Agree	Strongly agree
1. The allotted time was enough to cover the important things learners should know in this topic – Nutrition (Explain your answer…….. .....) 1.1 Learners were able to do the group discussions using the charts (i) Yes (ii) No 1.2 Learners were able to complete the work sheet on food group (i) Yes (ii) No 1.3 Learners were able to complete the work sheet on meal planning (i) Yes (ii) No 1.4 Learners were able to complete the work sheet on barriers to healthy eating (i) Yes (ii) No 1.5 Learners were able to complete the work sheet on preventing the consequences of unhealthy diets (i) Yes (ii) No	1	2	3	4

Continued/…….

Topic: Nutrition continued

Question	Strongly disagree	Disagree	Agree	Strongly agree
The sub-topics:				
2. 'South African food groups' adequately addressed what learners need to know about the different groups that foods eaten in South Africa fit into (Explain your answer ..... ……..……)	1	2	3	4
3. 'Balanced diet and meal planning' adequately addressed what learners need to know about balanced diet and planning of meals (Explain your answer……)	1	2	3	4
4. 'Unhealthy diets' adequately addressed what learners need to know about healthy and unhealthy choices of foods (Explain your answer...……..……. ……...)	1	2	3	4
5. 'Problems caused by unhealthy diets' adequately addressed what learners need to know about problems that can result from having unhealthy diet (Explain your answer……)	1	2	3	4
6. Using the nutrition education manual in teaching nutrition lessons to learners is unnecessary addition to teachers' workload (Explain your answer……..……)	1	2	3	4

Continued/…….

Topic: Nutrition continued

Question	Strongly disagree	Disagree	Agree	Strongly agree
7. The posters used were appropriate and helpful in illustrating the concepts of healthy and unhealthy diets (Explain your answer …….. ……..)	1	2	3	4
8. The learner's work sheets for these sub-topics served the purpose of enhancing learners' reading skill (If answer to any or all of 1.2, 1.3, 1.4 & 1.5 is yes) (Explain your answer……...…… ……...)	1	2	3	4
9. Learners were able to write their goals on the goal setting cards section in their workbooks (Explain your answer …… ……..)	1	2	3	4
10. Meal planning exercise and sorting of foods in meals in the learners work sheets helped them to understand balanced diet and food groups (If answer to 1.3 is Yes) (Explain your answer ……. ……..)	1	2	3	4

Other comments or suggestions for improving the information or materials provided for this topic.....
.....

Topic: Food processing **Date.....**

Instruction: Please indicate the option that best describes your response to these questions

Question	Strongly disagree	Disagree	Agree	Strongly agree
1. The allotted time is enough to cover the important things learners should know in this topic – Food processing (Explain your answer ……) 1.1 Learners were able to do the group discussions using the charts (i) Yes (ii) No 1.2 Learners were able to complete the work sheet on balancing of processed foods with fresh foods (i) Yes (ii) No 1.3 Learners were able to complete the work sheet on minimal and high processing of foods (i) Yes (ii) No 1.4 Learners were able to complete the work sheet on boiling and steaming cooking methods (i) Yes (ii) No	1	2	3	4
The sub-topics: 1. 'The meaning of food processing' adequately addressed what learners need to know about processed foods and reasons for processing foods (Explain your answer.....) 2. 'Food processing methods' adequately addressed what learners need to know about the transformation of raw foods to processed foods (Explain your answer…….) 3. 'Food cooking methods' adequately addressed what learners need to know about the various methods of cooking foods at home (Explain your answer……..)	1 1 1	2 2 2	3 3 3	4 4 4

Continued/…….

Topic: Food processing continued

Question	Strongly disagree	Disagree	Agree	Strongly agree
4. 'Indigenous dishes' adequately addressed what learners need to know about what indigenous dishes are and their nutrient contribution to the diet (Explain your answer.....)	1	2	3	4
5. 'Hands-on preparation of vegetable relish' helped learners to learn how to prepare vegetables into delicious and healthy vegetable relish (Explain your answer .....)	1	2	3	4
6. 'Hands-on preparation of phutu with masonja' helped learners to learn how to use maize meal and mopani worms to prepare delicious phuthu with masonja (Explain your answer ....)	1	2	3	4
7. 'Hands-on preparation of butternut porridge' helped learners to learn how to use maize meal and butternut to prepare delicious butternut porridge (Explain your answer ....)	1	2	3	4
8. Learners were able to set their goals using the goal setting card in the work sheet for all the sub-topics (Explain your answer ……..)	1	2	3	4
9. Learners participated well in the hands-on preparation of the indigenous dishes i.e. vegetable relish, phuthu with masonja and butternut porridge (Explain your answer .....)	1	2	3	4
10. The posters used were appropriate and helpful in illustrating the concepts of food processing and indigenous dishes (Explain your answer …… ……..)	1	2	3	4

Other comments or suggestions for improving the information or materials provided for this topic.....

.....

Topic: Food Hygiene **Date.....**

Instruction: Please indicate the option that best describes your response to these questions

Questions	Strongly disagree	Disagree	Agree	Strongly agree
The sub-topics: 1. 'Hygiene in food handling and preparation' adequately addressed what learners need to know about keeping food environment clean (Explain your answer…… ……)	1	2	3	4
2. 'Food storage' adequately addressed what learners need to know about the effective use of different storage areas to store foods in order to prevent spoilage (Explain your answer …… …….)	1	2	3	4
3. 'Safe and harmful ingredients' adequately addressed what learners need to know about the reasons for using non-food materials in processed foods (Explain your answer…….....)	1	2	3	4
4. 'Food borne diseases' adequately addressed what learners need to know about how foods can become contaminated, and signs of food borne diseases (Explain your answer…… ……)	1	2	3	4
5. The allotted time was enough to cover the important things learners should know in this topic – Food hygiene (Explain your answer……. ……...) 5.1 Learners were able to do the group discussions (i) Yes (ii) No 5.2 Learners were able to complete the work sheets on 'Clean and safe environment brochure' (i) Yes (ii) No	1	2	3	4

Continued/…….

Topic: Food Hygiene continued

Questions	Strongly disagree	Disagree	Agree	Strongly agree
5.3 Learners were able to complete the work sheet on 'the three different storage areas' (i) Yes (ii) No 5.4 Learners were able to complete the work sheet – the acrostic on 'Non-food ingredients' (i) Yes (ii) No 5.5 Learners were able to complete the worksheet on 'Preventing microorganisms from getting into foods' (i) Yes (ii) No				
6. Learners' participation during class discussions was enhanced by using this manual in presenting the lessons (Explain your answer..... ……)	1	2	3	4
7. The use of icons (Theory-based explanations on nutrition concepts in scroll shapes, positioned along the sides of the lesson plan) helped to make the teaching of nutrition more effective (Explain your answer……..…… ……)	1	2	3	4
8. The posters used were appropriate and helpful in illustrating the ideas about food hygiene (Explain your answer…….. ……)	1	2	3	4
9. Learners found the goal setting sections for the sub-topics in their workbook easy to use and exciting (Explain your answer…….. ……)	1	2	3	4
10. If answer to any or all of 5.2, 5.3, 5.4 & 5.5 is yes, did the learner's work sheets serve the purpose of enhancing learners' reading skill ((Explain your answer……)	1	2	3	4
11. It is easy to use the manual (i.e. manual is user-friendly) (Explain your answer……..)	1	2	3	4

Other comments or suggestions for improving the information or materials provided for this topic.....

APPENDIX 14: Focus group interview guide (Phase 3)

Aim: To explore the teachers' perceptions of the impact of the implementation of the NE programme on their teaching of nutrition to the learners

Instructions for moderator: Use the information in brackets as a guide or probe in case of inadequate or non-response to a question.

A. Preliminaries

1. Moderator introduces herself, the co-moderator and the purpose of the group discussion.

2. Asks the participants to introduce themselves and say something about themselves.

B. The manual

3. How will you describe the contextual nutrition education manual (NEM) for Grade 5 and 6 that was made available for you to teach nutrition to learners in terms of:

i. content (whether it was adequate, not adequate or too much, exact areas that more information was needed)
ii. layout in respect of outlook, book size and instruction
iii. ease of understanding and use.

4. In your own opinion would you say that using the NEM in teaching nutrition can help learners to adopt healthy eating? (For example in helping learners to reduce the purchase and intake of unhealthy choices of foods at school or for them to increase the intake of fruits and vegetables)

5. How would you compare the NEM to the textbooks you have used in teaching nutrition (What features differentiated the NEM from the other textbooks and could enhance its usefulness)

C. Supporting materials and activities

6. Would you say that the (i) posters and (ii) picture book were useful in helping you to present nutrition messages to learners more effectively? (How were they helpful?)

7. How did learners respond to setting their own goals using the goal setting cards? Do you perceive the exercise could influence learners in using what they have learnt in their everyday lives?

8. What would you say about the work sheet in respect to helping learners to understand the nutrition messages presented to them and internalising them?

9. Do you think the problem based group discussions have been helpful in making learners to internalise their learnings. How?

10. What part(s) of the lesson did learners enjoy the most?

11. Would you like to continue to use this method (the manual and the supporting materials) to teach nutrition topics to learners?

D. Recommendations

12. Explain the strength (if any) of using the NEM with posters and picture books in presenting nutrition messages to the learners (The overall value of the manual and the supporting materials to you as teacher).

13. Identify and explain the weaknesses or challenges with this method of presenting nutrition messages to learners.

14. What else will you suggest to be done to improve the manual and or the method of presenting nutrition messages?

APPENDIX 15: Nutrition knowledge attitudes and dietary practices questionnaire for teachers (Phase 3)

Identifier: i. School number_____ ii. Study number _____

A. Demographic. (Tick as appropriate)

1. Gender

(a.) Male 1□

(b.) Female 2□

2. Age…… (Please write in years e.g.25 years)

3. Race

(a.) White 1□

(b.) Black 2□

(c.) Coloured 3□

(d.) Indian 4□

(e.) Others 5□

4. Employment status

(a.) Employed full time 1□

(b.) Employed part time 2□

(c.) Others 3□

5. Years of teaching experience ……. (Please write in years e.g. 5 years)

6. Highest education qualification

(a.) Teaching Diploma 1□

(b.) University first degree 2□

(c.) Master Degree 3□

(d.) PhD 4□

(e.) Others 5□

B. Nutrition knowledge

(i). Current dietary recommendations for children

1. Health experts recommend that children should eat more, or less of the following foods (Tick one box per food)

	More	Less
1.1 Vegetables	1□	2□
1.2 Sugary foods	1□	2□
1.3 Fatty foods	1□	2□
1.4 High fibre foods	1□	2□
1.5 Salty foods	1□	2□

2. The healthy eating message ‘eat plenty of vegetables and fruit every day’ means that people aged 5 and above

(a) Be encouraged to eat vegetables in at least one or two mixed meals every day 1□
(b) Should have one vegetable or fruit a day that provides beta carotene 2□
(c) Should eat not less than 5 vegetables and fruit every day 3□
(d) (a) and (b) above 4□

3. The instructions outlined in South African Food-Based Dietary guidelines (SAFBDGs) will not meet the needs for children

(a) True 1□
(b) False 2□
(c) Uncertain 3□

4. It is okay for children to drink lots of cold-drinks because they need lots of energy to grow

(a) True 1□
(b) False 2□
(c) Uncertain 3□

(ii). Sources of nutrients

5. Do you think the following foods are high or low in fat? (Tick one box per food)

	High	Low
5.1 Honey	1□	2□
5.2 Fried egg	1□	2□
5.3 Nuts	1□	2□
5.4 Bread	1□	2□
5.5 Cheddar cheese	1□	2□

6. Which of the following do experts put in the starchy foods group? (Tick one box per food)

	Yes	No
6.1 Cheese	1□	2□
6.2 Spaghetti	1□	2□
6.3 Butter	1□	2□
6.4 Nuts	1□	2□
6.5 Rice	1□	2□

7. Are the following foods high or low in salt? (Tick one box per food)

	High	Low
7.1 Sausages	1□	2□
7.2 Spaghetti	1□	2□
7.3 Frozen vegetables	1□	2□
7.4 Polony	1□	2□

8. Are the following foods high or low in protein? (Tick one box per food)

	High	Low
8.1 Chicken	1□	2□
8.2 Cheese	1□	2□
8.3 Orange	1□	2□
8.4 Baked beans	1□	2□
8.5 Butternut	1□	2□

9. Are the following foods high or low in fibre/roughage? (Tick one box per food)

	High	Low
9.1 Cabbage	1□	2□
9.2 Baked potatoes with skins	1□	2□
9.3 Chicken	1□	2□
9.4 Sugar beans	1□	2□

10. A glass of unsweetened fruit juice counts as a serving of fruit

(a) Agree 1□

(b) Disagree 2□

11. Which of these breads contain the most fibre? (Tick one)

(a) White 1□

(b) Brown 2□

(c) Whole-wheat 3□

12. There is more calcium in a glass of whole milk than a glass of fat-free milk

(a) Agree 1□

(b) Disagree 2□

13. Which one of the following has the highest amount of energy per 100g serving size? (Tick one)

(a) Sugar 1□

(b) Starchy foods 2□

(c) Fibre/roughage 3□

(d) Fat 4□

14. Harder fats contain more: (Tick one)

(a) Monounsaturated fat 1□

(b) Polyunsaturated fat 2□

(c) Saturated fat 3□

(iii). Diet disease relationship

	Yes	No
15. Major health problems or diseases may be related to how much sugar people eat	1	2
16. The amount of salt people take is not related to health problems or diseases	1	2
17. The amount of fat people eat has nothing to do with health problems or diseases	1	2
18. A person can prevent heart disease by eating more fibre and less saturated fat	1	2
19. A person can prevent heart disease by eating more vegetables and fruits	1	2

20. Which is a healthy diet?

(a.) A diet rich in different foods 1□

(b.) A diet whose foods are rich in protein (meat, fish, eggs, cheese, dry legumes) 2□

(c.) A diet without fats 3□

(d.) Eating fish very often 4□

21. Which is the healthiest eating behavior?

(a.) Drinking 2 glasses of milk/eating 2 cups of yogurt every day 1□

(b.) Preferring cooked vegetables to uncooked vegetables 2□

(c.) Always eating cheese instead of meat 3□

(d.) When you eat snacks, preferring fruit 4□

22. Which is the healthiest choice of food?

(a.) Washed vegetables ready to eat 1□

(b.) A canned food 2□

(c.) A food rich in dressing 3□

(d.) A fried food 4□

(iv). Food processing

	Yes	No
23. Processed foods are injurious to health	1	2
24. Highly processed foods are not much different than minimally processed foods	1	2
25. It is possible to steam vegetables at home without using the steamer (a special type of pot for steaming foods)	1	2
26. Bread and maize meal are by law fortified with extra minerals and vitamins in South Africa	1	2
27. Indigenous foods are not as nutritious as processed foods	1	2

(vi). Food hygiene

	Yes	No
28. Meat, fish and chicken will not spoil if you store them in the fridge for two days only	1	2
29. Food that is contaminated with germs or harmful micro-organisms can safely be eaten if the food does not smell bad or change colour	1	2
30. The presence of germs or harmful micro-organisms in food is of no consequence if the food is full of nutrients	1	2
31. Serious diseases such as staphylococcus intoxication and salmonellosis can be caused by eating contaminated foods	1	2

C. Nutrition Practices

(i). Personal eating habits

How often do you eat/take …..?	Never	1 time a month or less	2-3 times a month	1-2 times a week	3-4 times a week	5+ times a week
A						
1. Fried chicken, potato chips, corn snacks	1	2	3	4	5	6
2. Salad dressing (not low fat), mayonnaise, stick margarine	1	2	3	4	5	6
3. Muffins, cakes, biscuits, cookies	1	2	3	4	5	6
4. Cheese, cheese spread (not low fat)	1	2	3	4	5	6
5. Drinks e.g. Oros, Coca-Cola products and flavoured drinks	1	2	3	4	5	6
B						
6. Meals that contain different kinds of foods	1	2	3	4	5	6
7. A glass of low fat milk?	1	2	3	4	5	6
8. Baked fish, chicken, lean meat	1	2	3	4	5	6
9. Vegetables in at least two meals a day	1	2	3	4	5	6
10. Any fresh fruit	1	2	3	4	5	6
11. Dry beans, split peas, lentils or soya products	1	2	3	4	5	6

(ii). Eating habits at school

12. On most days do you

(a.) Purchase lunch at the school 1□

(b.) Bring lunch from home 2□

(c.) Do not eat lunch 3□

13. How often do you purchase food or beverage items from school tuck shop, shops or food vendors?

(a.) 4 or more times per week 1□

(b.) 1-3 times per week 2□

(c.) 2-3 times per month 3□

(d.) 1 time per month or less 4□

(e.) Never 5□

If answer to question 13 is **Never** then go to question 18

How often do you purchase the following foods from the school tuck shop or vendors around the school?

	4 or more times per week	1-3 times per week	2-3 times per month	1 time per month or less	Never	Items are not available
14. High fat or high sugar items, like candies, chips, cookies or fat cakes	1	2	3	4	5	6
15. Low fat items like bread, fruits or vegetables	1	2	3	4	5	6
16. Cold drinks or fruit drinks, like Oros, Wild Island?	1	2	3	4	5	6
17. 100% fruit juice, bottled water, low fat milk drinks?	1	2	3	4	5	6

(iii). Classroom food practices

As a class teacher would you ……..	Likely	Some what likely	Not likely	Uncertain
18. Use foods such as fat cakes, cakes, cookies, candies, chocolates and ice-cream as reward, incentive or special treat for learners?	1	2	3	4
19. Use fruits, vegetables, 100% fruit juice, low fat yoghurt, roast peanut as reward, incentive or special treat for learners?	1	2	3	4
20. Praise learners when you see those eating foods that are healthy choices, such as fruit or low fat snack items?	1	2	3	4
21. Eat lunch or break snacks with learners?	1	2	3	4
22. Include information on nutrition and healthy eating as part of your lesson plans	1	2	3	4

(iv). School-wide food practices

	Strongly disagree	Disagree	Uncertain	Agree	Strongly agree
23. School prepared lunches are healthy	1	2	3	4	5
24. School lunch should include more fruits and vegetables	1	2	3	4	5
25. Selling high fat, high sugar foods, such as candies and cookies, as part of school fund-raising is okay, because it helps provide revenue for school programs and school activities	1	2	3	4	5
26. It is important for schools to have a written school nutrition policy which addresses food related issues, such as food in the classroom or food selections in tuck shops	1	2	3	4	5
27. High fat and high sugar foods are used as reward and incentive in the classroom because learners prefer these kinds of foods	1	2	3	4	5
28. The eating behaviours of teachers influence the eating behaviours of learners	1	2	3	4	5
29. The nutritional health of learners should be a school priority	1	2	3	4	5
30. Nutrition education should give learners the skills to make healthy food choices	1	2	3	4	5
31. Learners should be able to buy soft drinks and candy at school	1	2	3	4	5
32. It is important for schools to teach learners the basic skills of food preparation, so they can put nutrition knowledge into practice	1	2	3	4	5

(v). Food behaviour in hygiene

	Always	Sometimes	Never
33. When you buy packaged food, do you check the expiry date?	1	2	3
34. Do you read the instructions for use and for preservation written on the package?	1	2	3
35. Do you wash fruits that must be peeled before eating?	1	2	3
36. After using milk, do you sometimes forget to put the remaining milk in the fridge?	1	2	3

D. Nutrition attitudes

Please mark an (x) for the one that applies to you

		Agree	Do not agree	Not sure
1.	I need to have a good mixed meal for breakfast.....	1	2	3
2.	I need to eat a lot in order to build good immune system.....	1	2	3
3.	I need to eat a variety of food in order to receive all the nutrients my body needs.....	1	2	3
4.	I have personal dislike for vegetables and fruits.....	1	2	3
5.	I like eating plenty of vegetables.....	1	2	3
6.	I need to eat whole wheat bread, brown bread or whole grains as part of healthy eating plan.....	1	2	3
7.	I will choose delicious food, regardless of its nutritional value.....	1	2	3
8.	I need to drink up to eight glasses of clean, safe water every day.....	1	2	3
9.	I eat high fat foods because they are tasty	1	2	3
10.	Circumstances dictate my eating many times.....	1	2	3
11.	I need to eat small meals at meal times since I do not engage much physical activities.....	1	2	3
12.	I like to try new foods	1	2	3

APPENDIX 16: Nutrition knowledge attitudes and dietary practices questionnaire for learners (Phase 3)

Identifier: i. School number_____ ii. Study number _____

Instructions: Mark the answers applicable to you

A. DEMOGRAPHIC

1. Sex
   a. Male 1□
   b. Female 2□

2. Age …….. (Please write in years e.g. 14 years)

3. Race
   a. White 1□
   b. Black 2□
   c. Coloured 3□
   d. Indian 4□
   e. Others 5□

B. NUTRITION INFORMATION

1. Have you ever been told about having a healthy diet?
   a. Yes 1□
   b. No 2□

2. If yes, who told you about having a healthy diet? (You may tick more than one answer)
   a. Family Members 1□
   b. Friend 2□
   c. Doctor / Nurse 3□
   d. Teacher 4□
   e. Tuck-shop worker 5□
   f. Other: _____ 6□

3. If yes, where? (You may tick more than one answer)

a. Media (TV, magazines, newspapers) 1□
b. School 2□
c. Hospital / Clinic 3□
d. Other : _____ 4□

C. KNOWLEDGE ITEMS

(i). Food nutrient and functions

4. Salty food is not good for health

a. True 1□
b. False 2□
c. Don't Know 3□

5. Food is important for growth

a. True 1□
b. False 2□
c. Don't Know 3□

6. All of these are signs of food borne disease except

a. Stomach pain 1□
b. Night blindness 2□
c. Vomiting 3□
d. Diarrhoea 4□

7. Sugar contains a lot of vitamins and minerals.

a. True 1□
b. False 2□
c. Don't Know 3□

8. To which of the following has iodine been added

a. Bread 1□
b. Maize meal 2□
c. Salt 3□
d. Powdered milk 4□

(ii). Food and energy

9. Energy to learn and play comes from

a. Food 1□
b. Air 2□
c. Water 3□
d. Don't know 4□

10. To keep a healthy body weight, we need to have healthy eating plan and exercise

a. True 1□
b. False 2□
c. Don't Know 3□

11. Foods like fat cakes, doughnuts and cakes give lots of energy with minerals and vitamins

a. True 1□
b. False 2□
c. Don't Know 3□

(iii). Nutrient deficiency

12. We will get sick more easily, if our body lacks nutrients

a. True 1□
b. False 2□
c. Don't Know 3□

13. If we lack nutrients it would be hard for us to focus in class

a. True 1□
b. False 2□
c. Don't Know 3□

14. Food that is high in fat can cause diseases

a. True 1□
b. False 2□
c. Don't Know 3□

(iv). Food choices

15. Breakfast must consist of foods that are healthy choices

a. True 1□
b. False 2□
c. Don't Know 3□

16. Rice with fish and vegetables is a good mixed meal

a. True 1□
b. False 2□
c. Don't Know 3□

17. It is not necessary to wash vegetables like carrots before you eat them

a. True 1□
b. False 2□
c. Don't Know 3□

18. The best place to keep uncooked meat is

a. In the refrigerator 1□
b. In the freezer 2□
c. On the kitchen cabinet 3□
d. Don't know 4□

19. Foods can become contaminated with germs if we prepare foods in a dirty environment.

a. True 1□
b. False 2□
c. Don't Know 3□

(v). Sources of nutrients

20. Food that is low in fat is

a. Watermelon 1□
b. Chocolate 2□
c. Ice Cream 3□
d. Don't know 4□

21. Calcium is mostly found in

a. Fruit juice 1□
b. Cold drinks (Coke, Sprite, Pepsi, etc.) 2□
c. Milk 3□
d. Don't know 4□

22. Highly processed foods always contain more nutrients than minimally processed foods

a. True 1□
b. False 2□
c. Don't Know 3□

23. Which of the following cooking methods will retain more nutrients in vegetables?

a. Frying 1□
b. Boiling in water 2□
c. Steaming 3□
d. Roasting 4□

24. The following are the reasons for processing foods except

a. To prevent spoilage 1□
b. To make them edible 2□
c. To produce more convenient foods 3□
d. To produce foods that prevent tooth decay 4□

25. The following are examples of highly processed foods except

a. Corn flakes 1□
b. Jam 2□
c. Margarine 3□
d. Samp 4□

26. Which foods contain a lot of fibre?

a. Brown bread, dry beans, oats 1□
b. Milk, yoghurt, cheese 2□
c. Fish, chicken, eggs 3□
d. Margarine, mayonnaise, sunflower oil 4□

D. PRACTICE ITEMS

27. During break, the food that I always eat is: (Your answer may be more than one)

a. Porridge or pap 1□
b. Sweets or Chocolates 2□
c. Ice Cream/Carbonated Drinks 3□
d. Others (Specify) : _____ 4□

28. Foods that I always eat for lunch is

a. Rice, fish, and chicken + vegetables 1□
b. Pap and vegetables 2□
c. Kwota (Bread + chips + polony + tomato sauce) 3□
d. Others (Specify): _____ 4□

29. Food that I always choose as snacks are

a. Fruits 1□
b. Corn snacks (“Simba”) Potato chips (e.g. Lays) 2□
c. Ice-cream, chocolates, sweets 3□
d. Cakes, fat-cakes, buns 4□
e. Others : _____ 5□

30. I eat fast foods (McDonalds, Pizza, KFC, etc.)

a. Almost every day 1□
b. Several times a week 2□
c. Occasionally 3□
d. Never 4□

31. I eat mixed meals (e.g. pap with fish with vegetables and a fruit)

a. Every day 1□
b. Several times a week 2□
c. Occasionally 3□
d. Never 4□

32. I have breakfast

a. Every day 1□
b. Several times a week 2□
c. Occasionally 3□
d. Never 4□

33. I take milk, yoghurt or maas.

a. Every day 1□
b. Several times a week 2□
c. Occasionally 3□
a. Never 4□

34. I eat sweets / chocolates / ice cream

a. Every day 1□
b. Several times a week 2□
c. Occasionally 3□
d. Never 4□

35. I eat vegetables in at least one or two meals

a. Every day 1□
b. Several times a week 2□
c. Occasionally 3□
d. Never 4□

E. ATTITUDE ITEMS

Please mark an (x) for the most suitable answer

		Agree	Do not agree	Not sure
36.	Breakfast is very important for me.....	1	2	3
37.	I need to eat a lot in order to grow fast.....	1	2	3
38.	I need to drink plenty of clean, safe water.....	1	2	3
39.	I need to eat a variety of food.....	1	2	3
40.	I need to eat foods like dry beans, split peas and lentils regularly.....	1	2	3
41.	I like eating vegetables.....	1	2	3
42.	To keep a healthy body, I must learn about food....	1	2	3
43.	I will choose delicious food, regardless of its nutritional value.....	1	2	3
44.	I am still young, I can eat whatever I want. I will look after my diet when I am older.....	1	2	3
45.	I eat foods high in fat to be healthy.....	1	2	3
46.	I like to try new foods.....	1	2	3

APPENDIX 17: Proof of language editing of thesis

MAURINE FISCHER TRANSLATION AND EDITING SERVICES
P O Box 989
Somerset West
7130
TEL: 082 569 7457
mfporcelain@gmail.com
Fax: 0866 381 543
2016-03-30

TO WHOM IT MAY CONCERN

This serves to certify that the editing services described hereunder, have been performed by myself as the editor on the terms and conditions set out below:

Client:	Mojisola Deborah Kupolati

Submitted in fulfilment of the requirements of the degree PhD in Nutrition

Faculty of Natural and Agricultural Sciences

University of Pretoria, Pretoria.

Title of thesis edited:	Development and implementation of a nutrition education programme for primary school teachers in Bronkhorstspruit, Gauteng Province, South Africa
Supervisors:	Prof Una E MacIntyre and Ms Gerda J Gericke
Parameters of editing intervention:	Construction of sentences; Spelling, List of References.
Formatting style used:	Times New Roman 12
Referencing style used:	Monash-Harvard

I hereby declare that I have proof read and edited the above thesis.

Maurine Fischer