The development of a nutrition teaching programme for foundation phase learners in rural schools

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M Jerling

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Michelle Jerling

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OPSOMMING

Gesonde voeding is onontbeerlik vir die bevordering en instandhouding van die individu se gesondheid deur die hele lewensiklus. 'n Groot persentasie van jong en ontwikkelende kinders in Suid-Afrika word blootgestel aan onder- en wanvoeding vanweë armoede en/of ongesonde eetgewoontes. Wan- en ondervoeding kan permanente nadelige gevolge vir die fisieke, intellektuele en psigo-sosiale ontwikkeling van die kind inhou.

Die doel van die ondersoek was om:

- te bepaal in watter mate voorsiening gemaak word vir voedingsonderrig in die verskillende leerareas van die Nasionale Kurrikulumverklaring vir leerders in die grondslagfase;
- te bepaal hoe kundig grondslagfase-onderwysers in landelike skole is oor die kurrikulumriglyne en/of vereistes vir voedingsopvoeding;
- om te bepaal hoe kundig grondslagfase-onderwysers in landelike skole is oor die basiese aspekte van voeding;
- om te bepaal in watter mate hierdie onderwysers aspekte van voedingsopvoeding in die verskillende leerareas van die grondslagfase tot sy reg laat kom;
- ondersoek in te stel na die onderrigstrategieë wat die onderwysers gebruik wanneer hulle aspekte wat met voeding verband hou aan leerders onderrig;
- om te bepaal of hierdie onderwysers oor die nodige kennis en vaardighede beskik om 'n voedingonderrigprogram vir grondslagfase leerders in landelike skole te ontwikkel; en
- om 'n voedingonderrigprogram vir grondslagfase leerders in landelike skole te ontwikkel.

Kwalitatiewe navorsingsmetodes is in die empiriese ondersoek gevolg. Data is ingesamel deur middel van gestruktureerde onderhoude en klaskamerobservasies by vier plaasskole wat deur die Departement van Onderwys (Noordwes Provinsie) geïdentifiseer is om aan die navorsingsprojek oor voeding in landelike gebiede deel te neem.

Die volgende bevindinge het uit die ondersoek voortgespruit:

- Die Nasionale Kurrikulumverklaring maak voorsiening vir voedingsuitkomste in die leerarea Lewensoriëntering maar die assesseringsstandaarde is te vaag en algemeen.
- Alle opvoeders het geweet dat voedingsopvoeding deel sou vorm van die leerarea Lewensoriëntering.
- Alhoewel onderwysers opleiding ontvang het oor hoe om die Nasionale Kurrikulumverklaring te implementeer, was sommige van hulle onseker oor wat van hulle verwag word wanneer hulle 'n voedingsles moet aanbied.
- Die basiese voedingskennis van die onderwysers was goed en hulle het geweet dat voeding in al drie die leerareas van die grondslagfase onderrig kan word.
- Onderwysers in die vier plaasskole het nie gebruik maak van verskillende onderrigstrategieë in hulle lesaanbiedings nie.
- Die opvoeders in die vier plaasskole het nie oor die nodige kennis en vaardighede beskik om 'n voedingonderrigprogram vir landelike leerders in die grondslagfase te ontwikkel nie.

Die navorser het op grond van die bevindinge van die ondersoek 'n voedingsopvoedingsprogram vir opvoeders in landelike skole ontwikkel ten einde meer effektiewe voedingsopvoeding vir grondslagfase-leerders te kan aanbied.

Trefwoorde: *Voeding, voedingsopvoeding, skoolvoedingsprogramme, voedingsopvoedingsprogramme vir onderwysers; plattelandse skole.*

SUMMARY

Healthy nutrition is indispensable for the advancement and maintenance of an individual's health during the whole life cycle. A huge percentage of young and developing children in South Africa are subjected to undernourishment and malnourishment. Malnourishment and undernourishment can signify permanent negative consequences for the physical, intellectual and psycho-social development of the child.

The aim of the research was to:

- ascertain to which extent provision is made for nutrition education in the various learning areas of the National Curriculum Statement for learners in the Foundation Phase;
- ascertain to which extent Foundation Phase teachers in rural schools are on the Curriculum guidelines for nutrition;
- ascertain how knowledgeable Foundation Phase teachers in rural schools are on the basic aspects of nutrition;
- to ascertain to which extent these teachers address aspects of nutrition education in the various Learning Areas;
- to investigate the teaching strategies used by teachers when teaching aspects related to nutrition;
- to ascertain whether these teachers have the necessary knowledge and skills to develop a nutrition teaching programme for Ground Phase learners in rural schools; and
- to develop a nutrition teaching programme for Ground Phase learners in rural schools.

Qualitative research methods were used in the empirical research. Data was collected by means of structured interviews and classroom observations at four farm schools which were identified by the Department of Education (North-West Province) to take part in the research project on nutrition in rural areas.

The following findings emerged from the research:

- The National Curriculum Statement provides for nutrition outcomes in the Learning Area Life Orientation, but the assessment standards are too vague and general.
- All educators knew that nutrition education would form a part of the Learning Area Life Orientation.
- Although teachers are trained on how to implement the National Curriculum Statement, some of them were uncertain on what was expected from them when teaching a nutrition lesson.

- The basic nutritional knowledge of the teachers was good and they knew that nutrition can be taught in all three Learning Areas of the Foundation Phase.
- Teachers in the four farm schools did not use different teaching strategies in presenting their lessons.
- The educators in the four farm schools did not have the necessary knowledge and skills to develop a nutrition teaching programme for rural learners in the Foundation Phase.

On the basis of the findings of the research the researcher has developed a nutrition education programme for educators in rural schools with a view to be able to offer more effective nutrition education for Foundation Phase learners.

Key words: Nutrition; nutrition education; school feeding programmes; nutrition education programmes for teachers; rural schools.

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1 Introduction, problem statement, aims, method and plan of research

1.1 Introduction

Most of the world's children between five and fifteen years of age who attend school, do it under difficult circumstances (World Health Organisation, 2002). Worsley (2005) reported that a large group of children are underfed, poorly nourished and exposed to a range of parasitic and infectious diseases. Micronutrient deficiencies like iron, iodine and vitamin A are common in many parts of the world; overweight and obesity are also becoming serious problems for children in all countries. In Africa the impact of HIV/AIDS left substantial numbers of children without parents. Many of these undernourished school children live in poverty without healthy food, proper housing with poor water supplies and very little sanitation.

The education of millions of children throughout the world is being impeded by malnutrition (World Health Organisation, 1998). Malnutrition inhibits the learning potential and the well-being of children and it negatively affects their scholastic achievement. A malnourished child cannot adequately take advantage of instructional and learning materials (World Health Organisation, 1998). Malnutrition in South Africa is not just manifested in undernutrition but also in overnutrition. The National Food Consumption Survey found that in South Africa 6% of the children in the 1-9-year-old age group are overweight (National Food Consumption Survey Group, 2000). It is not only malnourishment that has negative effects on scholastic achievement; obesity also negatively affects children's school performance.

Galal and Hullet (2005) reported that there is a relationship between undernutrition and obesity particularly in relation to stunting. Stunting affects approximately one-third of the world's children. Galal and Hullet (2005) further reported that a fetal nutrition insult increases the vulnerability of the malnourished child to become obese. Obesity in children is not well researched especially in developing countries (Galal & Hullet, 2005). Good nutrition is essential to maximise the investments in education (World Health Organisation, 1998). The nutrition situation in South Africa is exacerbated by a lack of nutritional information and knowledge. Added to this there are detrimental dietary habits and nutrition-related practices, attitudes, perceptions

and socio-cultural influences that could negatively affect nutritional status. To attain good health and nutrition in South Africa, its people need sufficient knowledge and skills to grow, purchase, process, prepare, eat and feed their families a variety of foods in the right quantities and combinations (Department of Health, 2004).

Basic education is one of the most effective investments to improve economies and create literate, self-reliant and healthy societies. More than 46 million children in Africa do not attend school and they represent more than 40% of the world's children not attending school. During April 2000, 164 countries participated in the World Education Forum in Dakar, Senegal and adopted the Dakar Framework for Action to reaffirm the commitment of achieving education for all children by the year 2015. However, without a strong effort to reverse the current trends this goal will remain only a dream for Africa. All participants in the forum noted that poor health and nutrition are crucial underlying factors for low school enrolment, absenteeism, poor classroom performance and early school dropouts. In many African countries learning and school performance are compromised due to hunger, undernutrition and ill health, which affect a significant proportion of school-age children (UNESCO, 2002).

Education and healthy nutrition are fundamental conditions for health promotion (World Health Organization, 1986). Health, education and nutrition have a mutually supportive and reciprocal relationship with each other. For example, optimal nutrition improves scholastic potential and approved knowledge promotes nutrition. According to the National Food Consumption Survey Group (2000) the growth of one in five South African children is stunted because of dietary deficiencies. This study indicated that a large percentage of children in this country consume a diet that is low in energy and low in micronutrients (National Food Consumption Survey Group, 2000).

Malnutrition is a real and serious health problem in South Africa and the school is a powerful educational vehicle to combat the impact of malnutrition (Renkin, 1987). Schools would be the perfect environment to provide these children with material resources and education for their future lives (Worsley, 2005). According to the Food and Agricultural Organization (2004) of the United Nations, programmes that aim at simultaneously relieving a lack of education and malnutrition have achieved notable gains in several countries. A number of countries have recognised the

importance of education for rural people and adopted policies to make it more accessible and relevant to them (Food and Agriculture Organization, 2004).

Half of the rural schools in Columbia have emphasised participatory learning and they employed a curriculum that combined core national content with local modules relevant to the culture and needs of rural people (Food and Agriculture Organization, 2004). Communities and parents were actively engaged in these programmes.

The Indian state of Madhya Pradesh pledged to build schools within 90 days for any rural community that provided space and a hired qualified teacher (Food and Agriculture Organization, 2004). Today all school-aged children are enrolled in a school in this state.

In Bangladesh the Food for Education Programme contributed towards the decline in the rate of absentees and school dropouts (Food and Agriculture Organization, 2004). Mexico's programme of education provided rural families with cash as long as they send their children to school. This programme also supplied nutritional supplements for infants and small children (Food and Agriculture Organization, 2004). Perez-Rodrigo & Arancetta (2003) suggested that nutrition education should form part of the school curriculum and the curriculum should take into consideration the cultural background of the particular country (Perez-Rodrigo & Arancetta, 2003).

Sound nutrition is recognised as a basic human right under South Africa's Constitution and the Bill of Rights. Therefore, the Department of Health has an obligation to ensure that nutrition security is respected, protected, facilitated and provided to the people of South Africa (Department of Health, 2004).

The Primary School Nutrition Programme in South Africa was transferred from the Department of Health to the Department of Education in April 2004 (van Stuijvenberg, 2005). The main reasons for the transfer were that school feeding promotes educational outcomes and that the Department of Education is functionally responsible for schools. Nutrition education is a significant factor in improving dietary practices when behaviour change is set as the goal and when education strategies are directed towards that goal (Contento, Randell, & Basch, 2002). The transferral of the Primary School Nutrition Programme from the Department of Health to the Department of Education will to a great extent enhance the effective and efficient implementation of the school feeding program and these two departments are currently working together to facilitate a smooth transitional phase (van Stuijvenberg, 2005).

1.2 Problem statement

Although nutrition-promoting programmes have been implemented in South Africa since the 1960's these programmes were not very effective in reducing malnutrition, because they focused mainly on food provision and thus only addressed the immediate causes of malnutrition. In 1994 the then Minister of the Department of Health appointed a committee to develop a comprehensive nutrition strategy for South Africa. The primary aim of the investigation was to identify the causes of malnutrition and to communicate it to the different stakeholders in the community, so that everybody could work together towards alleviating the problem (Saitowitz & Hendricks, 1998).

School feeding was introduced on a national scale in South Africa in 1994, following President Nelson Mandela's "State of the Nation Address", in which he declared that a nutrition-feeding scheme would be implemented in every primary school where such a need existed. The school feeding programme was implemented by the National Department of Health and was managed at the provincial level by the nine provincial Departments of Health. This programme annually fed approximately 5 million children in 15,000 primary schools. Geographic areas with high poverty levels were targeted and priority was given to rural and farm schools and schools serving informal settlements (van Stuijvenberg, 2005).

South Africa introduced the Primary School Nutrition Programme (PSNP) on the 24th of May 1994. It was the lead project of the Reconstruction and Development Program (RDP) with a budget of R496 million. The specific aims of the PSNP were to:

- improve education by enhancing active learning capacity, school attendance and punctuality by providing an early morning snack;
- improve health through micro-nutrient supplementation;
- improve health through parasite control/eradication;
- improve health through providing education on health and nutrition and
- enhance broader development initiatives, especially in the area of combating poverty (McCoy, 1997).

The PSNP was evaluated in 1997 to provide data for future implementation. The evaluation was a national collaborative effort conducted by a number of multi-disciplinary research institutions. One of the recommendations made by this

evaluation team was that aspects related to nutrition should be incorporated in the school curriculum (McCoy, 1997).

One way to address the problem of malnutrition is to implement nutrition education programmes in our schools. Schools are the most effective and efficient vehicles of reaching large portions of the population, including young people, school personnel, families and community members (World Health Organisation, 1998).

According to Hamblett (1994) there is a risk that inadequate and unqualified teachers will promote fads rather than facts. Initial and in-service training of teachers regarding health education is often inadequate and at worst, totally lacking. According to the World Health Organization (1998), the training of teachers to facilitate nutrition education is an important factor in establishing a successful school health education programme. Nutrition education involves the influencing of attitudes and beliefs as well as the expansion of skills and knowledge to promote healthy human behaviour. In order to achieve this, teachers must be trained to use a wide variety of effective teaching methods (Hamblett, 1994).

Learning theories have changed dramatically since the 1960's. Traditional theories (based largely on a stimulus-response view of behaviour) have been superseded by newer theories based on cognitive psychology and a concern for social, cultural, and developmental factors. Traditionally learning has been defined as a change in behaviour or performance resulting from experience and practice. Although a concern for change is still evident the emphasis has shifted to the restructuring of knowledge and changes in understanding rather than changes in behaviour. Problem-solving rather than memorisation has become the prevailing metaphor (Shuell & Moran, 1994).

Teachers are viewed as important agents of change in the reform effort currently under way in education and thus are expected to play a key role in changing schools and classrooms but at the same time teachers are also viewed as obstacles to change because of their adherence to outdated forms of instruction that emphasise factual and procedural knowledge at the expense of deeper levels of understanding (Prawat, 1992).

Concern for the learners' needs must be the foundation of all instructional planning (Gunter, Estes, & Schwab, 1999). Teaching only takes place when learners are engaged in the process of understanding and if learners are in close contact with what the teacher wanted them to learn, and when learners have the opportunity to

explain what they understand. Only then learning is likely to occur. Learners must be meaningfully engaged in the process of learning, they need to be in direct contact with what is to be learned, they must have the opportunity to explain their understanding and they must use creative assessments to test what was taught (Gunter *et al.*, 1999). Individuals have different learning needs and it is important to realise that learners learn in different ways and that teachers have different styles of teaching. People can learn in various ways but they have preferences for how they like to learn and how they learn best. The more the teacher knows about the learning styles and the needs of learners, the more he or she is able to plan a variety of instructional approaches. If a teacher cannot vary instruction to meet the variety of needs, many learners will be left out of the instructional process (Gunter *et al.*, 1999).

Against the background of the afore-mentioned the researcher would like to address the following research questions:

1.2.1 To what extent is provision being made for nutrition education in the different learning areas of the Revised National Curriculum Statement for learners in the Foundation Phase?

1.2.2 How knowledgeable are Foundation Phase teachers in rural schools about the curriculum guidelines and or requirements for nutrition education?

1.2.3 How knowledgeable are Foundation Phase teachers in rural schools about basic aspects of nutrition?

1.2.4 To what extent do these teachers address aspects of nutrition education in the different learning programmes of the Foundation Phase?

1.2.5 Which teaching strategies do these teachers implement when they teach learners about nutrition?

1.2.6 Do these teachers possess the knowledge and skills to develop a teaching programme for rural learners in the Foundation Phase?

1.2.7 On the basis of the answers to the preceding questions, which aspects should be included in the development of a teaching programme for rural learners in the Foundation Phase?

1.3 Aims of the research

From the problems mentioned in the preceding paragraph the researcher wishes to determine the following:

1.3.1 What provision has been made for nutrition education in the different learning areas of the Revised National Curriculum Statement for learners in the Foundation Phase?

1.3.2 How knowledgeable are Foundation Phase teachers in rural schools about the curriculum guidelines and/or requirements for nutrition education.

1.3.3 How knowledgeable are Foundation Phase teachers in rural schools about basic aspects of nutrition.

1.3.4 To what extent do these teachers address aspects of nutrition education in the different learning areas of the Foundation Phase?

1.3.5 Which teaching strategies do these teachers implement when they teach learners about nutrition.

1.3.6 What knowledge and skills do these teachers possess about the development of a nutrition teaching programme for rural learners in the Foundation Phase.

1.3.7 On the basis of the preceding aims, the researcher wishes to develop an effective teaching programme for teachers of rural learners in the Foundation Phase.

1.4 Research method

1.4.1 Literature study

The literature study was done by utilising primary and secondary literature sources, including books, academic articles and the Internet. The literature study explored relevant and recent sources on nutrition and nutrition education. A literature review of existing nutrition programmes in developing and developed countries was done as well.

1.4.2 Empirical investigation

The empirical research was conducted by means of qualitative research methods. Data was gathered by means of structured interviews and classroom observations.

1.4.2.1 Population and sample

Four farm schools in the Potchefstroom district were selected by the Department of Education (North-West Province), to participate in a research project on nutrition in the rural areas. These four schools thus represent the study population of farm schools in the Potchefstroom district of the North-West Province. Seven Foundation Phase teachers of the selected four farm schools voluntarily participated in the investigation.

1.4.2.2 Data collection

In order to gather as much information as possible about research questions 1.2.1 to 1.2.6, a structured interview schedule was compiled (please consult Appendix 1). Interviews were held with the participants (Foundation Phase teachers at the selected farm schools). In addition to this, observations were also conducted in the classrooms, focussing specifically on aspects related to the participants' teaching strategies when teaching learners aspects of nutrition (please consult Appendix 2 for a copy of the observation schedule).

1.4.2.3 Data analysis

Qualitative data analysis was conducted and the findings were subjected to triangulation in order to come forward with valid and generalisable conclusions.

1.4.2.4 Ethical aspects

Signed and informed consent to conduct the research was obtained from the Department of Education (North-West Province) and from all the participants in the investigation. All the information was treated confidentially and no school or participant was identified.

1.4.3 Procedure

Structured interviews were held with the participants, to determine (1) their knowledge about the directives of the Revised National Curriculum Statement with regard to nutrition education in the Foundation Phase, (2) their knowledge, attitudes and skills regarding nutrition in general and specifically with regard to nutrition education and (3) the extent to which they address aspects related to nutrition in their teaching. In addition to this, the researcher also observed the teaching strategies of the participants in the classrooms. On the basis of the research findings, a nutrition teaching programme for Foundation Phase learners and teachers in rural schools was developed.

1.4.4 Plan of research

The dissertation is divided into the following chapters:

Chapter 1: Introduction, problem statements, aims, method and plan of research

Chapter 2: Relevance of nutrition and nutrition education for the development of the young school-going child

Chapter 3: An overview of existing nutrition education programmes in developed and developing countries

Chapter 4: Method of research

Chapter 5: Results, conclusions and recommendations

Chapter 6: A teaching programme for rural learners

Chapter 2

2 Relevance of nutrition and nutrition education for the development of the young school-going child

2.1 Introduction

In Africa, there are many children who do not have access to a healthy diet. The result of this is that they don't develop to their full potential – physically or psychologically. In this chapter, the relevance of nutrition and nutrition education for the development of young school-going children will be discussed.

2.2 Nutrition: A clarification of terminology and related terms

2.2.1 Healthy child

A healthy child is not only a child with no clinically apparent illnesses, but also a child who has adequate physical development, both in terms of achieved size and acquired motor skills together with adequate neurological, psychological and emotional development. Optimal growth and development therefore encompasses complete well-being – social, psychological and physical (Branca & Ferrari, 2002).

2.2.2 Optimal nutrition

Optimal nutrition takes many forms and is understood differently in different countries and amongst different cultures. Optimal nutrition achieved through a healthy diet, should be an integral part of an individuals lifestyle, which contributes to the physiological, mental and social well-being of individuals. Nutritional well-being is determined by consuming a wide variety of healthy food, as part of an energy-appropriate and balanced diet that includes adequate amounts of nutrients in relation to the body's requirements (World Health Organisation, 1998).

2.2.3 Malnutrition

Malnutrition is any physical condition resulting from an inappropriate or inadequate diet. Such a diet either provides too much (overnutrition) or too little of the necessary nutrients (undernutrition). Malnutrition negatively affects quality of life and impairs health, intellectual activity (learning), educational potential, adaptive behaviour, productivity and well-being, and can in extreme cases result in death (World Health Organisation, 1998).

Children who do not eat enough (both in terms of energy and nutrients such as protein, vitamins and minerals), to cover their nutritional needs are described as undernourished. (King & Burgess, 1996).

The two most common forms of malnutrition due to undernutrition, amongst children worldwide, are iron deficiency anaemia and stunting (not reaching full potential of height for age) (World Health Organisation, 1998).

2.2.4 Anaemia

The body is depleted of iron stores (reduced red blood cell count), hampering the body's ability to produce haemoglobin, which is needed to carry oxygen in the blood. This is most common in females (World Health Organisation, 1998).

2.2.5 Stunting

The anthropometric index height-for-age reflects linear growth achieved pre- and postnatal. Deficits on this index indicate the long-term cumulative effects of inadequate nutrition and/or health. Shortness in height refers to a low height-for-age ratio, that may either be ascribed to a normal variation in growth, or a deficit in growth. Stunting refers to a deficit or linear growth (shortness) in a child who has failed to reach his/her genetic potential as a result of poor diet and/or disease (World Health Organisation, 1998). Branca and Ferrari (2002) state that stunting is the process that can affect the development of the child from the early stages of conception, up until the third or fourth year of life, when the nutritional habits of both the mother and the child are essential determinants of growth (Branca & Ferrari, 2002). Stunting is the result of repeated insults to the growth plate, which reduce chondrocyte proliferation and maturation. A stunted child will have a lower height than his/her peers and will resemble the height of a two to three years younger child. Stunting is also associated with other developmental delays, and a retardation of the main developmental milestones, such as walking. Stunting is the second most important form of childhood malnutrition in the world (after anaemia), and is a debilitating condition.

In contrast to stunting, the term wasting, refers to a recent process that has resulted in a substantial weight loss, usually as a consequence of acute shortage of food and/or severe disease (World Health Organisation, 1998).

2.2.6 Intrauterine growth retardation

Intrauterine growth retardation is a condition resulting in a birth weight at or below the tenth percentile in terms of age and gender and a foetus that does not reach its full potential. Intrauterine growth retardation is usually a result of maternal malnutrition during pregnancy (Shabert, 2000).

2.2.7 Nutrition education

Nutrition education is defined as "*any set of learning experiences designed to facilitate the voluntary adoption of eating and other nutrition-related behaviours conducive to health and well-being*" (Contento *et al.*, 2002). Nutrition education helps people to learn new information about nutrition and to develop attitudes, skills and confidence that they need to improve their knowledge about the amount and the sort of food they eat (King & Burgess, 1996). According to Hamblett (1994), school health education is education which is planned and carried out in the school setting, with one of its primary aims to help students acquire nutrition knowledge and to acquire attitudes and behaviours conducive to the good health of the individual, family and community (Hamblett, 1994). School health education, aims to acquire the aforementioned by means of encouraging the development of learners' skills, for informed decision-making, gained through knowledge and self-empowerment. According to the World Health Organization (1998), nutrition education provides factual knowledge such as the relationship between eating and health and nutritional guidelines for healthy nutritional planning. Attitudes provide a personal perception for decisions such as feeling responsible for one's own health and the health of others. Skills provide a practical basis for mastering tasks and procedures related to healthy eating, such as skills for selecting and preparing healthy meals and practicing food safety.

2.3 The importance of nutrition for the developing child

2.3.1 Nutrition during pregnancy

According to Wooldridge (2002), reproduction of humans is interrelated with genetic, biological, environmental, and behavioural processes. These processes occur smoothly in males and females if favourable health conditions exist. However, less than optimal health conditions, such as acute under-nutrition or high levels of alcohol intake, can disrupt these processes. If conception occurs in the presence of a poor nutritional or health status of the mother, it will compromise foetal growth and development as well as the health of the mother during pregnancy (Wooldridge, 2002).

The nine months of pregnancy represent the most intense period of growth and development that humans experience during their life. Whether this growth and development takes place optimally, depends on many factors. The nutritional status of the expecting mother is the one controllable factor affecting foetal growth and development (Wooldridge, 2002).

Although various factors determine the outcome of a pregnancy and the health of the newborn, the nutritional status of the mother is one of the most important factors (Barker, 1995). The foetus is nourished by a complex supply line that depends on the mother's diet and absorption, endocrinal status and metabolism, cardiovascular condition and placental function (Fall, Yajnik, Rao, Davies, Brown, & Farrant, 2003). Micronutrients are essential for foetal growth and development, and maternal micronutrient deficiency, a condition frequently encountered amongst pregnant women in developing countries, may be the cause of intrauterine growth retardation. Pregnant and lactating women have to meet their own nutritional requirements and also supply nutrients to the growing foetus or the breastfed infant. A low dietary intake in these women will have adverse effects on the health and nutritional status of both the mother and her child (Fall *et al.*, 2003).

Several studies were carried out during the 1950's and 1960's to estimate the nutritional requirements of pregnant and lactating women (Ramachandran, 2002). These studies indicated that the mothers' energy needs increased during pregnancy because of the following factors: an increase in maternal body weight requiring additional energy to carry on with normal activities; a 10-15% increase in basal metabolic rate; the energy cost of the growing foetus and the physiological changes occurring during pregnancy (Ramachandran, 2002).

Foetal undernutrition which causes low birth weight affects large numbers of infants in developing countries (de Onis, Blossner, & Villar, 1998). Premature delivery is a major cause of low birth weight but unlike the situation in developed countries, intrauterine growth retardation is the predominant cause (Ashworth, 1998). Intrauterine growth retardation has short- and long-term consequences for the infant. The short-term consequences of intrauterine growth retardation includes increased risk of foetal, neonatal and infant death; impaired postnatal growth; immune dysfunction and delayed intellectual development (Barker & Fall, 2000). Long-term consequences include an increased risk of adult chronic disease such as cardiovascular disease and Type 2 diabetes (Barker, 1998). During the critical periods of early development, undernutrition affects foetal growth, the development of essential tissues, blood flow to the brain and abdominal viscera, muscle mass and the secretion of foetal growth hormones. The effects of undernutrition are negative

consequences for the post-natal development of the unborn child. For example a significant relationship between low birth weight and later insulin resistance, (a strong risk factor for both cardiovascular disease and type 2 diabetes), has been indicated in a number of populations (Newsome, Shiell, Fall, Phillips, Shier, & Law, 2003). Low birth weight has also been linked with high blood pressure amongst children and coronary heart disease amongst adults in developing countries (Fall *et al.*, 2003). Intrauterine growth retardation also has adverse implications for future generations because it forms part of an inter-generational cycle of deprivation. For example the poor postnatal growth of low-birth-weight girls increases their risk of producing low-birth-weight infants (Steketee, 2003).

2.3.2 Nutrition during infancy

2.3.2.1 Feeding infants

The first two years of a child's life is characterised by rapid physical and social growth and development. Many changes occur that affect the child's feeding and nutrient intake. Healthy, well-nourished infants have the energy to learn and respond to stimuli in their environment (Trahms, 2000). What about undernourished babies?

The length of gestation, the mother's pre-pregnancy weight and the mother's weight gain during gestation determine the infant's birth weight. After birth the growth of an infant is influenced by genetic factors and nourishment (Trahms, 2000).

King and Burgess (1996) state that the best food for babies is breast milk. Breast milk is sufficient to meet all an infant's needs for at least the first four months of life. Thereafter, breast milk is the main source of nutrients for several months and can provide at least one-third of a child's nutrient requirements up to the age of two years. Breast milk's composition provides the necessary energy and nutrients, in appropriate amounts and containing specific immune factors, that support and strengthen the immature immune system of the newborn and thus protect it against infections (Oddy, 2001). The nutritional needs of babies are constantly changing. Breast milk is remarkably variable and not only evolves during the period of lactation to meet the needs of the baby during the early months of life, but it also changes according to the mother's diet. The first four to six months of an infant's life is a period of rapid growth and development, in particular of the brain. The amino acid and fatty acid composition of breast milk is ideally suited to meet these needs (Wardley, Puntis, & Taitz, 1997). Breastfeeding also benefits the cognitive development of the infant (Angelsen, Vik, Jacobsen, & Bakketeig, 2001).

Infants lose weight during the first days after birth but they regain it by the seventh to tenth day. Infants double their birth weight by four to six months of age and triple it by the age of one year. The length of the infant increases by 50% during the first year and doubles by the age of four years. Total body fat increases during the first nine months after which the rate of fat gain tapers off throughout the rest of childhood. The body to water ratio decreases throughout infancy from 70% at birth to 60% at the age of one year. The stomach capacity of infants increases from 10 to 20ml at birth to 200ml by the age of one year. Fat absorption varies in the neonate and human milk fat is well absorbed. The neonate has functional but physiologically immature kidneys that increase in size during the early weeks of life. The kidneys double in weight by six months and triple their weight by the age of one year (Trahms, 2000).

2.3.2.2 Nutritional requirements of infants

Protein

Protein is needed for tissue replacement and growth. During the rapid growth period the protein requirements of the infant is higher per kilogram than those of adults and older children. The composition of breast milk is ideally suited to meet the infant's protein needs, and it is assumed that the efficiency of human milk use is 100%. The amount of protein in breast milk is adequate for the first six months of the infant's life and during the last six months of the first year, the diet of the infant should be supplemented with additional protein such as cereal mixes, formula milk, yogurt and strained meats (Trahms, 2000).

Fats

The current recommendation for infants younger than one year of age is to consume a minimum of 30g of fat per day. This quantity is present in breast milk and most infant formulas (Trahms, 2000).

Carbohydrates

Carbohydrates should supply 30% to 60% of the energy intake during infancy. Thirty-seven percent of the energy in breast milk and 40% to 50% of the energy in infant formulas is derived from lactose or other carbohydrates (Trahms, 2000).

Water

Under ordinary conditions, breast milk and formula that is properly prepared, supply adequate amounts of water (Trahms, 2000).

Minerals

Calcium

Breastfed infants retain approximately two thirds of their calcium intake; while infants fed with cow's milk-based formula only retain approximately 25 to 30% of the intake. The recommended adequate intake of milk/formula is 210mg per day for infant's aged 0 to 6 months (Trahms, 2000).

Iron

Recommended intakes for iron increase depending on the age, growth rate and iron reserves of the infant. At four to six months of age, infants who are fed only with breast milk are at risk of developing a negative iron balance and may deplete their iron reserves by the age of six to nine months. Iron in breast milk is highly bio-available, but breast-fed and formula-fed infants should receive an additional source of iron by four to six months of age. Iron-fortified cereals and infant formula are common food sources. Monitoring the iron status of infants is very important, as the long-term cognitive defects related to iron deficiency during infancy, are well researched. Low haemoglobin concentrations at eight months of age are correlated with impaired motor development at eighteen months (Sherriff, Emond, Bell, & Golding, 2001). Children who experienced chronic iron deficiency during infancy have demonstrated long-term developmental deficits and behavioural problems during early adolescence (Lozoff, Jimenez, Hagen, Mollen, & Wolf, 2000).

Zinc

Zinc is better absorbed from breast milk than from infant formula but both provide an adequate zinc supply during the first year of the infant's life. During the second year, food like meats and cereals should provide most of the zinc required (Trahms, 2000).

Fluoride

The importance of fluoride for preventing dental caries has been well documented. Breast milk has a very low fluoride content. Currently however, fluoride supplementation is not recommended for infants younger than six months of age. Thereafter, commercially prepared infant cereals and fruit juice produced with fluoridated water, are significant sources of fluoride for infants (Trahms, 2000).

Vitamins

Vitamin D

Breast milk derived from an adequately fed lactating mother supplies all the vitamins that the infant needs with the exception of vitamin D. Breast-fed infants should receive a supplement or be exposed to sunlight. Exposure to sunlight for 30 minutes per week is sufficient to meet vitamin D needs (Specker, Valanis, Hertzberg, Edwards, & Tsang, 1985).

2.3.2.3 The effect of HIV on infant feeding

In sub-Saharan Africa most women have their Human Immunodeficiency Virus (HIV) status diagnosed during pregnancy, when they visit prenatal clinics and HIV tests are done as part of the prevention of mother-to-child transmission of HIV-programmes. A diagnosis of HIV during pregnancy necessitates complex decision-making about the mother's participation in prevention of mother-to-child transmission programmes and infant feeding methods. The infant feeding method is challenging for a woman with HIV. Avoidance of any breastfeeding eliminates the risk of postnatal mother-to-child transmission of HIV. For women in rural areas and poor settings, the complete avoidance of breastfeeding is either not possible, or not the most favourable option. All mothers have the desire to protect their children but in many instances mothers face an internal struggle between prevention of infant HIV infection and the desire to breastfeed. Community health workers described how HIV has created confusion about infant feeding practices because of the mixed messages that mothers receive. For example, there are posters promoting breastfeeding and formula feeding simultaneously at the same clinic (Doherty, Chopra, Nkonki, Jackson, & Greiner, 2006).

2.3.2.4 Introducing supplementary and solid foods

Breastfeeding in South Africa is a common practice, but exclusive breastfeeding during the first six months, as recommended by the World Health Organization, is uncommon. This is mainly due to the early introduction of supplementary feeding (Delport, Becker, & Bergh, 1997). Most infant-feeding studies in South Africa indicated that approximately 35% to 50% of lactating women discontinue breastfeeding before three months and commonly introduce complementary foods sometimes as early as six weeks of age (Sibeko, Dhansay, Charlton, Johns, & Gray-Donald, 2005). Sibeko *et al.* (2005), also state that inappropriate substitute feeding for breast milk, inadequate sanitation and the low/poor nutritional quality of weaning foods, in addition to a host of other complex factors, attributable to the early introduction of solid foods, contribute to life-threatening infant health problems (Sibeko *et al.*, 2005).

Traditionally, women in the Limpopo Province of South Africa, have practised breastfeeding for a period of at least eighteen months (Mamabolo, Alberts, Mbenyane, Steyn, Nthangeni, Delemarre-van De Waal, & Levitt, 2004). The introduction of electricity and other modern conveniences in this semi-rural area, has led to the replacement of many traditional practices by "western" ones or the coexistence of modern and traditional practices (Mamabolo *et al.*, 2004). These practices include a shorter period of exclusive breastfeeding due to the earlier introduction of supplementary foods such as soft maize meal, tea and herbal drinks. According to Mamabolo *et al.*, (2004), studies undertaken in rural and semi-rural areas of South Africa have found that maize meal porridge is the major food supplement, compared to commercial cereals in urban areas. The practice of early introduction of solids is not confined to South Africa and researchers in several other countries have described the same tendency (Mamabolo *et al.*, 2004). This practice has been attributed to several factors: 1) the mother's opinion that she does not have enough milk, 2) separation of the mother from the infant due to work or schooling, 3) breast-related problems, and 4) lack of adequate information from the health workers about the importance of breastfeeding (Mamabolo *et al.*, 2004). The work of Mamabolo *et al.* (2004) also showed that stunting was evident in infants within the first month. The most likely explanation for the large deficit in growth, occurring during the first month and onward, is the feeding practices introduced from birth onward - in particular the early introduction of supplementary feeding. One of the hazards associated with the introduction of foods other than breast milk, may be the improper preparation of food and contamination of food which may lead to infections such as diarrhoea (Mamabolo *et al.*, 2004). Due to the possible consequences of food contamination, particularly in poor communities, the World Health Organization has recommended that exclusive breastfeeding be practised for at least six months (Mamabolo *et al.*, 2004).

According to King and Burgess (1996), at six to twelve months of age, the baby's energy and nutritional needs quickly increase. The mother must still continue to breastfeed as often as she can but the infant can also slowly be introduced to other solid foods. The introduction of solids into an infant's diet starts the weaning process, during which the infant changes from a diet of only breast milk, or formula, to a more varied one. The weaning process should proceed gradually and the weaning foods should be carefully chosen to ensure that the infant's nutritional needs are met (Trahms, 2000).

One to two spoonfuls of porridge can be given to the baby at about six months. As soon as the baby eats porridge, another food can be introduced such as mashed fruits or vegetables or undiluted fruit juices, either with the porridge, or at another time of the day (King & Burgess, 1996). Dark green or orange vegetables and fruit like paw-paw or mango must be

given to make sure the baby gets sufficient vitamin A. Suitable soft food that is being cooked for the family can also be tried. During this age, the mother must slowly increase the amount of food, the number of meals each day and the variety of food types. By the age of one year the child must be eating other foodstuffs about four to five times a day.

The following table suggests the ages for the introduction of juice, semi-solid foods and other foods to the baby's diet.

Table 2.1 Suggested ages for the introduction of juice, semisolid foods and table foods

Age in months			
Food	**4-6**	**6-8**	**9-12**
Iron-fortified cereals for infants	Add.		
Vegetables		Add strained	Gradually eliminate strained foods and introduce table foods.
Fruits		Add strained.	Gradually eliminate strained foods; introduce chopped, well cooked, or canned foods.
Meats		Add strained.	Decrease the use of strained meats and increase the varieties of table meats offered.
Finger foods, such as biscuits.		Add foods that can be secured with a palmar grasp.	Increase the use of small finger foods as the pincer grasp develops.
Well cooked mashed or chopped table foods prepared without added salt or sugar			Add
Juice of formula by cup			Add.

Adapted from Trahms (2000)

From the ages of one to three years, foods other than breast milk should become the main source of energy and nutrients. During this time the mother can breastfeed during the night but it is imperative that breast milk does not replace other meals. The child should be given meals about five times a day. For example, give two family meals, one meal of enriched porridge and two snacks a day. Staples (maize, rice, bread) with beans, peas, groundnuts and vegetables can be given but meat, fish, egg and milk should also be included, if

available (King & Burgess, 1996). The following table is an example of a one to three-year-old children's menu for one day.

Table 2.2 Daily menu for children one to three years of age (King & Burgess, 1996)

Early morning	Breastfeed
Breakfast	Enriched porridge – fruit
Midmorning	Breastfeed and left-over porridge
Lunch	Potato and vegetable stew from family pot
Afternoon	Breastfeed and mashed left-over potato
Early evening	Thick cereal porridge, beans and sauce from family meal
Late evening	Breastfeed
Night	Breastfeed

Adapted from (King & Burgess, 1996)

2.3.3 Nutrition during childhood

The period after infancy up until puberty is often referred to as the latent or quiescent period of growth. The first year of growth is substantial but although physical growth may be less remarkable during the preschool and middle school years, this is the time of significant growth in the social, cognitive and emotional areas (Lucas, 2000).

Body proportions of young children change significantly after the first year. Growth of the head is minimal, trunk growth slows substantially and limbs lengthen considerably, all of which create more mature body proportions. Growth is generally steady and slow during the pre-school and school-age years. The body composition of preschool and school-age children remains relatively constant (Lucas, 2000).

2.3.3.1 Nutritional requirements for pre-school and school-age children

Energy

The energy needs of healthy children are determined based on basal metabolism, rate of growth and energy expenditure. Energy intake of healthy, growing children of the same age and sex vary depending on their activity level. A 9-year-old boy and a 12-year-old girl, approaching puberty, have significantly different factors that determine their energy needs even though they fall in the same dietary intake reference age category. It is useful to determine energy requirements on an individual basis, calculating energy requirements per kilogram of weight or per centimetre of height (Lucas, 2000).

Protein

The daily need for protein per kilogram of body weight decreases from approximately 1.1g during early childhood to 0.95 g during late childhood (Lucas, 2000). The recommended daily level of protein intake is generally reached or exceeded in children consuming a healthy diet as well as vegetarian diets. Adequate energy intake has a protein sparing effect, which means that with adequate energy intake, protein is used for tissue repair and growth rather than for energy (Brown, Isaacs, Krinke, Murtaugh, Sharbaugh, Stang, & Wooldridge, 2004).

Minerals and Vitamins

Vitamins and minerals are necessary for normal growth and development. Impaired growth is often as a result of insufficient intake of minerals and vitamins (Lucas, 2000).

Iron

Children between one and three years of age are at high risk of iron deficiency anaemia. The rapid growth period of infancy is marked by an increase in haemoglobin (a protein that is the oxygen-carrying component of red blood cells). A decrease in haemoglobin concentration in red blood cells is a late indicator of iron deficiency and total iron mass (Brown *et al.*, 2004).

Calcium

Calcium intake for one to three year olds should be 500mg per day and for four to eight year old children, 800mg per day. Calcium is required for adequate mineralisation and maintenance of growing bone in children. Milk and other dairy products are the primary sources of calcium but other calcium sources are canned fish such as sardines and dark-green leafy vegetables. Children who consume no, or limited amounts of these foods, are at risk of poor bone mineralisation (Lucas, 2000). Adequate calcium intake during childhood affects peak bone mass formation and this protects the child against osteoporosis and fractures later in life. An important aspect related to adequate calcium intake in children is the development of eating patterns that will lead to adequate calcium intake later in childhood. (Brown *et al.*, 2004).

Zinc

Zinc is imperative for growth and a deficiency results in poor appetite, decreased taste acuity, poor wound healing and growth failure. An allowance of 3mg per day of zinc is recommended for one to three-year-olds, 5mg per day for four to eight-year-olds and 8mg per day for nine to thirteen years of age. The best sources of zinc are meats and seafood (Lucas, 2000).

Vitamin D

Vitamin D is required for the absorption of calcium. This nutrient is formed through exposure to sunlight, although in America, vitamin D-fortified milk is the primary source of this nutrient together with some breakfast cereals and non-dairy milk products which are fortified with vitamin D (Lucas, 2000).

According to the National Food Consumption Survey Study Group (2000), the growth of one in five South African children is stunted because of dietary deficiencies. This survey of eating patterns among South African children aged between one and nine years old, also found that one out of two children, has an intake of less than half the recommended level of a number of important nutrients such as iron, zinc and vitamins A and C. These deficiencies result in undernourished children who suffer from apathy, short attention span, a drop in learning ability due to iron deficiency, low weight gain and growth retardation, poor cell structure and function due to zinc deficiency, growth retardation, digestion dysfunction and limited mental alertness and poor resistance to infection because of a lack of vitamins (National Food Consumption Survey Group, 2000).

Table 8 outlines the conditions and symptoms associated with common nutrition problems.

Table 2.3 Conditions and symptoms associated with nutrient deficiency

Condition	Characteristics	Effects on children
Undernutrition	Not enough total food energy and nutrients are consumed	Low body weight, wasting of body fat and later of muscle
Protein-energy malnutrition (PEM)	Inadequate dietary intake of protein and/or energy	Failure to grow and thrive, less resistance and high susceptibility to infections
Wasting	Low weight for height	Failure to grow and thrive, less resistance and high susceptibility to infections
Stunting	Low height for age	Failure to grow and thrive, less resistance and high susceptibility to infections
Marasmus	Dietary deficiency of both protein and energy	Failure to grow and thrive, less resistance and high susceptibility to infections, (more severe) (mainly preschool-age)
Kwashiorkor	Dietary deficiency of protein with adequate (or even excessive) energy	Failure to grow and thrive, less resistance and high susceptibility to infections, (more severe) (mainly

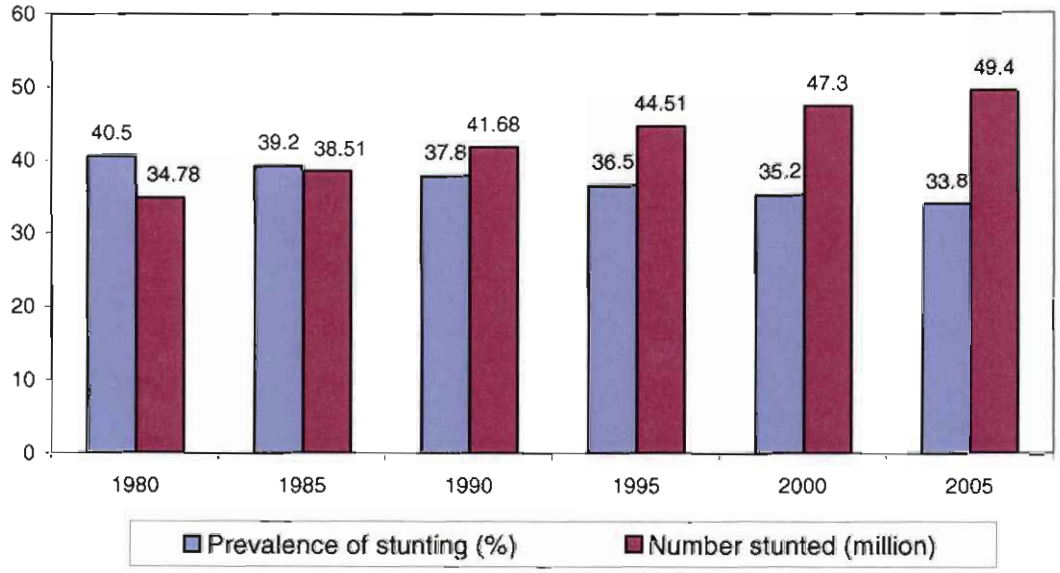
	intake	preschool-age)
Iron Deficiency Anaemia	Body is depleted of iron stores (reduced red blood cell count), hampering the body's ability to produce haemoglobin, which is needed to carry oxygen in the blood, most common in females	Increased fatigue, shortened attention span, decreased physical and intellectual work capacity, reduced resistance to infections, impaired intellectual performance
Vitamin A Deficiency	Body is low or depleted of vitamin A, which is vital for vision	Night blindness and eventually total blindness, reduced resistance to infection (mainly preschool-age)
Iodine Deficiency	Body is low or depleted of iodine which is vital for cell differentiation and thyroid hormone synthesis	Can affect brain development, learning disabilities and, when severe, grossly impairs mental development; impaired reproductive performance
Overnutrition (Overweight/Obesity)	More food energy is consumed than expended, resulting in excess of body fat	Elevated blood cholesterol and high blood pressure, associated with increased adult mortality
Eating Disorders	Severe disturbances in eating behaviour, resulting in extreme thinness or overweight	Lower self-esteem, feeling of inadequacy, anxiety, social dysfunction, depression, moodiness
Anorexia Nervosa	Intense fear of becoming obese and refusal to eat, leading to a significant weight loss	Lower self-esteem, feeling of inadequacy, anxiety, social dysfunction, depression, moodiness
Bulimia	Compulsion to binge eat and then purge the body by self-induced vomiting or use of laxatives	Lower self-esteem, feeling of inadequacy, anxiety, social dysfunction, depression, moodiness

Adapted from World Health Organisation (1998)

According to the United Nations' Administrative Committee on Coordination, Sub-Committee on Nutrition, nutritional deficiencies represent an extremely serious public health problem in Africa. Stunting, which reflects chronic, long-standing undernutrition, is more widely prevalent than wasting, which reflects an acute nutritional crisis. When stunted children remain in poor environments, the potential for catch-up growth, is thought to be limited after the age of two years (ACC/SCN, 2000). A recent study in the Philippines, showed that some catch-up between the ages of two and eight and a half years is feasible for children who

were not born with low birth weight or were not severely stunted in infancy. Stunting at the age of two years, regardless of whether catch-up was achieved or not, is significantly associated with later deficits in cognitive ability, further emphasizing the need to prevent early stunting (ACC/SCN, 2000). In Figure 2.1 below, the trends in stunting in Africa since 1980 are presented.

Figure 2.1: Trends in stunting in Africa since 1980. Adapted from the 4th Report on the World Nutrition Situation – Nutrition throughout the Life Cycle (ACC/SCN, 2000).



From Figure 2.1, it is clear that although the prevalence of stunting has decreased over the past 25 years, the growth in population has caused a rise in the actual number of stunted children in Africa.

Many factors affect how well children learn and the child's nutritional status is one of the crucial factors. The learning ability of children depends to a very large extent on the child's early and present nutritional status and whether the child has a heavy worm load or other diseases. An additional factor that will affect the child's learning ability is short-term hunger. Hungry children cannot concentrate and learn well in class (King & Burgess, 1996).

According to Wooldridge (2002), adequate nutrition plays a very important role during the primary school years (approximately 6 to 10 years) and the pre-adolescence years (9 to 11 years of age for girls and 10 to 12 years for boys), in assuring that children reach their full potential for growth, development, and health. Children continue to grow physically at a steady rate during these periods but development from a cognitive, emotional and social standpoint is tremendous. Nutritional problems such as iron-deficiency anaemia,

undernutrition, and dental caries can occur during this stage of the lifecycle. In terms of body mass, both ends of the spectrum are prevalent. The prevalence of obesity is increasing, but the beginnings of eating disorders can also be detected in some school-age and pre-adolescent children. Adequate nutrition and the establishment of healthy eating behaviours can help to prevent immediate health problems as well as promote a healthy lifestyle, which may reduce the risk of the child developing a chronic health condition, such as obesity or cardiovascular disease, later in life. Adequate nutrition has been directly associated with improved academic performance in school (Wooldridge, 2002).

According to the World Health Organization (1998), good nutrition strengthens the learning potential and well-being of children. Good health and nutrition are essential to achieve one's full educational potential because nutrition affects intellectual development and learning ability (Bryan, Osendarp, Hughes, Calvaresi, Baghurst, & van Klinken, 2004). Nutrition is important because it is one factor that can be modified in order to optimise cognitive development. The timing of these nutritional influences on the brain is important. The frontal lobes begin myelination at approximately 6 months of age and continue throughout childhood, adolescence and adulthood. The frontal lobes are responsible for cognitive activities such as planning, strategising, testing hypotheses when problem solving, focusing attention, inhibiting irrelevant stimulation and collating memories. Poor nutrition or nutritional interventions will have negative effects on the developing functions of the frontal lobes throughout childhood (Bryan *et al.*, 2004).

According to the World Health Organization (1998), healthy nutrition contributes to decreasing the risks of today's leading health problems. Avoiding obesity in childhood and youth is important because once attained, obesity tends to continue in adulthood, contributing to chronic diseases. The hardening of arteries and high blood cholesterol levels, which make a major contribution to coronary heart disease, are influenced by nutrition and lifestyle. Adequate nutrition and physical activity have long-term benefits in reducing the growing number of diet-related, non-communicable diseases.

Nutrition is necessary for children to become fit and productive adults. People who are well nourished and educated are more productive adults. Education and healthy nutrition are fundamental conditions for health promotion. Health, education and nutrition have a supportive and reciprocal relationship with each other. For example, optimal nutrition improves scholastic potential and improved knowledge promotes nutrition (World Health Organisation, 1998).

2.3.3.2 Providing an adequate diet for children

Food and eating are not only the simple provision of nutrients to the body for growth and maintenance. The development of all feeding skills, food habits and nutrition knowledge parallels the cognitive development that takes place in the series of stages, each stage laying the foundation for the next. In Table 9 the development of feeding skills in relation to Piaget's theory of cognitive development is given.

Table 2.4 Feeding, nutrition and Piaget's theory of cognitive development (Lucas, 2000)

Developmental period	**Cognitive characteristics**	**Relationships to feeding and nutrition**
Sensorimotor (birth-2yr)	Neonate progresses from automatic reflexes to a child with intentional interaction with the environment and the beginning use of symbols.	Progression involves advancing from sucking and rooting reflexes to the acquisition of self-feeding skills. Food is used primarily to satisfy hunger, as a medium to explore the environment and as an opportunity to practice fine motor skills.
Pre-operational (2-7yr)	Thought processes become internalised, they are unsystematic and intuitive. Use of symbols increases. Reasoning is based on appearances and happenstance. The child's approach to classification is functional and unsystematic. The child's world is viewed egocentrically.	Eating becomes less the center of attention and is secondary to social, literacy and cognitive growth. Food is described by colour, shape and quantity but the child has only a limited ability to classify food into "groups". Food tends to be categorized into "like" and "don't like". Foods can be identified as "good for you" but reasons they are healthy are unknown or mistaken.
Concrete operations (7-11yr)	The child can focus on several aspects of a situation simultaneously. Cause-and–effect reasoning becomes more rational and systematic. The ability to classify, reclassify and generalize emerges. A decrease in egocentrism permits the child to take another's view.	The child begins to realise that nutritious food has a positive effect on growth and health but has a limited understanding of how or why. Mealtimes take on a social significance. The expanding environment increases the opportunities for and the influences on food selection, for example, peer

		influence increases.
Formal operations (11yr and beyond)	Hypothetical and abstract thoughts expand. The child's understanding of scientific and theoretical processes deepens.	The concept of nutrients from physiological and biochemical perspectives can be understood. Conflicts in making food choices may be realised, that is, knowledge of the nutritious value of foods may conflicts with preferences and non-nutritive influences.

Adapted from Lucas (2000)

2.3.3.2.1 Feeding pre-school children

The period from one to six years is marked by vast overall development. One-year-old children use their fingers to eat and by two years, they can hold a cup and use a spoon. By the time they are six years old, they have refined their eating skills to such an extent that they can use a knife for cutting and spreading. During this time the growth is much slower and the appetite decreases (Lucas, 2000). According to King and Burgess (1996), children at this age should get all their nutrients from foods and not from supplementation. Children at this age do not need to eat as often as younger children, because their food needs per kilogram of weight have decreased. The child should eat small servings of food offered to them several times a day and they should get plenty of energy-rich and nutrient-dense foods from the family meals. The child also needs plenty of other foods, which are rich in protein and micronutrients especially vitamin A, iron and vitamin C, to prevent anemia. Some fats and oils are also important, especially polyunsaturated fats and omega-3 fatty acids. According to Lucas (2000), snacks are just as important as meals in contributing to the total daily nutrient intake. Snacks should be chosen carefully so that they are high in nutrients and least likely to promote dental caries. Wholesome snacks include fresh fruit, cheese, raw vegetables, milk, fruit juices, whole grain crackers, dry cereal and peanut butter sandwiches (Lucas, 2000).

Pre-school children want to be helpful and this characteristic makes the pre-school years a good time to teach children about foods, food selection and preparation, by involving them in simple food-related activities such as outings to a supermarket where children can be introduced to a variety of fresh vegetables and fruit. Allowing children to be involved in meal-related activities such as measuring of ingredients, setting the table, mashing bananas, scrubbing vegetables, etc can be constructive. Families of pre-school age children need to continue to be encouraged to eat together in order to develop social skills (Brown *et al.*,

2004). Children are predisposed to learn through experience and the quality and quantity of their experiences with food have powerful effects on their eating habits. The most important aspect of a young child's environment is probably the family and the child feeding practices of parents, particularly mothers, help to shape and maintain children's food preferences. The development of children's food preferences involves a complex interplay of innate, familial and environmental factors, not all of which are likely to promote a healthy and varied diet. Parents own food preferences, are extremely influential and eating together as a family provides a valuable opportunity for parents to method good eating habits (Cooke, 2004).

2.3.3.2.2 Feeding school-age children

School age children need to eat a variety of food, so that they can grow and have sufficient energy to work, play and learn. School-age children do not usually develop severe malnutrition unless there is famine. However children from poor homes may be undernourished in the following ways.

- Children may have been undernourished when they were younger or they could presently be malnourished. These children suffer more from fatigue, and illnesses and they are shorter and thinner than well-fed children.
- They may be hungry. This can also be called short-term hunger because they may not have had breakfast or lunch, so they are often hungry during the day. These children cannot study or work hard and they do not have the energy to play like other children.
- They may be anaemic. Anaemic children tire quickly and do not have sufficient energy to learn.
- They may lack iodine and develop goitre which leads to abnormalities in thyroid hormone metabolism (King & Burgess, 1996)

The school age child needs three meals and at least two snacks per day. Children need to eat breakfast - a cup of tea is not sufficient. Breakfast is especially important if children have to walk a long way to school. Porridge makes a good breakfast if it contains milk, groundnuts, eggs, margarine or oil. Children who skip breakfast tend to consume less energy and fewer nutrients than those who eat breakfast (Kleinman, Murphy, Little, Pagano, Wehler, Regal, & Jellinek, 1998). Reviews of the effect of breakfast on cognition and school performance, indicate that children who go to school without breakfast, are more likely to experience scholastic problems than those who eat breakfast (Kleinman *et al.*, 1998).

The midday meal should contain two or three different foods and a typical well-balanced lunch brought from home could include a sandwich with whole grain bread and a protein-rich filling, fresh fruit or raw vegetables, low-fat milk and possibly a cookie or a simple dessert (Lucas, 2000). However, in low income environments, some food is better than no food at all and children should have something, even if it is only cold maize porridge (King & Burgess, 1996)

2.4 School-age children are at high risk of undernutrition

The physical growth of school children aged six to nine years is the result of both environmental and genetic factors and the interaction between these factors. In poor populations, the main factors affecting the physical growth of school age children are environmental factors experienced before puberty. These factors include poor food consumption patterns, illness, lack of sanitation and poor health and hygiene practices (ACC/SCN, 2000).

According to King and Burgess (1996), children who are at special risk are those who:

- come from poor families with unemployed parents or divorced parents;
- have no parents or parents who are sick, mentally ill, or alcoholics;
- look after themselves because their families abandoned them; or
- live in areas where there are food shortages.

2.4.1 Nutrients for cognitive development in school-aged children

Nutrition is one of many factors that affect the development of the brain. The role that nutrition plays in cognitive development is very challenging because nutrition is likely to be an outcome of, or correlate with internal and external environmental factors such as health, social, behavioural, demographic and motivational influences (Pollitt, 2000). According to Bryan (2004), the role of nutrition is important because it is one factor that can be modified in order to optimise cognitive development (Bryan *et al.*, 2004).

2.4.1.1 Effects of nutrition on brain development

Wachs (2000), suggests that nutrition can affect the brain's macrostructure, that is development of brain areas such as the hypo campus, microstructures (e.g., myelination of neurons), and level and operation of neurotransmitters (e.g., dopamine levels or receptor numbers), all of which can have an impact on cognitive development. Scientists believe that there are critical periods of rapid brain growth and development from gestation until the first

two years of life, during which time brain development may be particularly sensitive to deficiencies in the diet. The slowest areas to fully myelinate are the frontal lobes, which begin myelination at approximately six months and continue throughout childhood, adolescence and adulthood (Bryan *et al.*, 2004). The frontal lobes are thought to be responsible for executive, 'higher-order' cognitive activities such as planning; developing strategies; testing hypotheses during problem-solving; focusing attention; inhibition of irrelevant environmental stimuli and collating memories (Anderson, Fenwick, Manly, & Robertson, 1998).

2.4.1.2 Undernutrition and cognitive development

The intake of nutrients will affect the brain and cognitive development. Several studies have investigated the effects of general undernutrition and protein-energy malnutrition on the cognitive development of children in developing countries. Results from these studies show that stunting in early life has long-lasting effects on the affected children's IQ scores and school performance (Bryan *et al.*, 2004). Research on the effects of undernutrition on cognitive development also raises the question whether protein-energy malnutrition alone, is responsible for cognitive deficits. Other nutrients such as iodine, iron, foliate, zinc, vitamin B_{12} and omega-3 polyunsaturated fatty acids also play key roles in the cognitive development of children (Wachs, 2000).

2.4.1.3 Cognitive development and Iodine

Iodine is required for the production of the thyroid hormones, triiodothyronine and thyroxine, both of which are essential for growth and development of the brain (World Health Organisation, 1996). Iodine deficiency has an effect on cognitive performance of children and eighteen studies done by Bleichrodt and Born (1994), indicated an IQ difference of 13.5 IQ points (effect size of 0.90) between chronically iodine-deficient and non-iodine-deficient children (Bleichrodt & Born, 1994).

2.4.1.4 Cognitive development and Iron

Brain tissue is very rich in iron, with concentrations differing according to brain region and stage of development (Beard, 2001). Some areas of the brain that are important for cognition such as the cortex, hypocampus and striatum, are more sensitive to iron deficiency than others (Youdim & Yehuda, 2000). According to Bryan *et al.* (2004), iron is a key nutrient in the cognitive performance and development of children especially with regard to executive cognitive functions. Iron deficiency is common in developing countries.

2.4.1.5 Cognitive development and zinc

Zinc deficiency in children has been associated with reduced growth and development, impaired immunity and increased morbidity from infectious diseases. Zinc deficiency is thought to be widespread in most developing countries but there are no reliable and feasible indicators to assess body zinc status (Bryan *et al.*, 2004). A recent review concluded that current evidence linking zinc deficiency to children's cognitive performance lacks a clear consensus, highlighting the need for additional research in zinc deficiencies (Black, 2003).

2.5 The role of the school with regard to nutrition education

The implementation of health promotion programmes in established educational systems has proven to be one of the most cost-effective public health promotion strategies (Maier, 2000). Schools are important venues for health promotion programmes because they reach a high proportion of children and adolescents. Schools are nested in neighbourhoods and have close connections with families and community-based institutions (Blom-Hoffman, Kelleher, Power, & Leff, 2004). Schools are also vitally important for the promotion of good nutrition and the provision of nutrition by means of school feeding schemes, where necessary. Schools reach young people during critical stages of their development and can play a crucial role in the development of healthy lifestyles and eating patterns. Schools have the potential to reach not only learners, but also parents and community members, including young people not attending school. Every child should be seen as a potential change agent, with the capacity to improve the health and nutrition of his or her community and should be used to promote change (World Health Organisation, 1998).

The school's health strategy relies on the children's eagerness to learn as well as the teachers' and families' willingness to become involved. New nutrition information that has been learned can lead to life-long positive dietary habits. Teachers must function as positive nutritional role methods for children and children can in turn influence the dietary behaviour of family members and thereby positively influence whole communities (Sifri, Ag Bendech, & Baker, 2003). Lytle and Achterberg (1995) identified several elements conducive to the establishment and implementation of successful nutrition education programmes:

- Relevant and theory-driven nutrition education programmes and teaching strategies which will induce the desired changes in dietary behaviour;
- Adequate provision of time and intensity to implement nutrition programmes effectively;

- Family involvement which will enhance the effectiveness of the nutrition programmes for younger children;
- Opportunities for self-assessment and feedback in the case of older children;
- School-initiated interventions in the larger community will enhance school nutrition programmes and health education programmes (Lytle & Achterberg, 1995).

2.5.1 The necessity of investing in nutrition education at schools

According to King and Burgess (1996), school children are our leaders, workers and parents of tomorrow and they will implement new ideas into a community. Most children attend primary school and some of the important things that they can learn at school are that good nutrition through healthy eating keeps people healthy; how to feed their families in the future; how to keep their food safe and clean and how to feed younger brothers and sisters when they are sick. At school they can learn why people become malnourished. Children of all ages share what they have learned with their parents and other members of the community. To educate children about nutrition helps other people in the community to learn about nutrition as well (King & Burgess, 1996).

Nutrition education at schools is important because if learners are healthy and well fed, they will learn better. If there is a feeding programme at a school, children are more likely to enrol and to attend school regularly and they are less likely to drop out of school (King & Burgess, 1996).

According to the World Health Organization (1996), good health and nutrition are necessary for concentration, regular school attendance and optimum class performance. Nutrition and health interventions will improve the school performance of learners. Studies in multiple countries have shown that academic performance and mental ability of learners with good nutritional status are significantly higher than those of learners with poor nutritional status. Furthermore, it has been found that nutrition education for schoolgirls has a positive impact on the health of their families. Educated girls are healthier than girls with no or little education. Educating young mothers-to-be is one of the best ways of ensuring the nutritional future of the next generation (World Health Organisation, 1996).

2.5.2 The necessity of increasing efforts to improve nutrition education

According to the World Health Organization (1998), it is estimated that over 800 million people do not have access to food to meet their basic daily nutritional needs for energy and protein, whilst 3 billion people experience deficiencies in essential micronutrients such as

iodine, vitamin A and iron. More than half of the 12.2 million deaths of children under the age of 5 in developing countries are associated with malnutrition. The many forms of malnutrition exceed the worldwide incidence of most other diseases (World Health Organisation, 1998).

Many bilateral, multilateral and non-governmental organisations as well as national and local governments invest in school-based health and nutrition programmes because these school health programmes can lead to the following:

1. **Better learning and educational outcomes:** In Africa, more than half of the children who go to school are stunted and anaemic and most suffer from parasitic infections, which impair cognitive ability. Ensuring good health can boost their educational achievement and school attendance.
2. **New opportunities, unfulfilled needs:** Initiatives aimed at achieving universal access to basic education mean that more children will have the opportunity to attend school and to realise their potential.
3. **Enhanced equity:** Children who start school with a poor health status have the most to gain from health and nutrition education programmes, because they show the greatest improvement in cognition as a result of health and nutrition interventions. School health programmes thus particularly benefit the poor and disadvantaged.
4. **Building on investments in early child development:** Integrated management of childhood illnesses and early child development and growth monitoring and promotion programmes help to ensure that a child enters school fit and ready to learn. School-aged children, especially girls, continue to be at risk of ill health. Thus, school health and nutrition programmes ensure that children remain healthy during the critical years of their education.
5. **Promoting youth development:** Achieving positive behaviour changes can promote the educational achievement of young people, which will in turn contribute to the social upliftment of society at large.
6. **A cost-effective investment in education (not just health):** School-based programmes promote learning and reduce repetition of grades and absenteeism and it can be used as leverage for existing investments in schools and teachers. It should also be emphasised that these programmes must be well-designed (ACC/SCN, 2000).

2.6 Summary

Nutrition is vital to all human beings and access to adequate food is considered a basic human right. Adequately nourished people enjoy optimal growth, health and well-being. Children, more than anyone, have the most to gain from being adequately nourished. The United Nations Children's Fund and the World Food Programme have been collaborating on an integrated package of health and nutrition interventions to improve the quality of education, nutrition and the health status of school children. The effective implementation of all these interventions requires a wider partnership with governments, non-governmental organisations, communities and the participation of the children themselves. Efforts are needed to make healthy nutrition accessible to everyone, everywhere and at all times. In chapter three an overview of nutrition programmes in developed and developing countries will be discussed.

Chapter 3

3 An overview of existing nutrition education programmes in developed and developing countries

3.1 Introduction

In order to gain an overview of nutrition education programmes and their impact on the nutritional status of school-aged children, it is important to look at research that has been done in this regard in both developing and developed countries. Little information on nutrition education programmes for school-aged children in developing countries is available, but a large body of information on nutrition education intervention programmes focuses on developed countries. In this chapter, some of these programmes will be discussed.

3.2 Nutrition education programmes for young school-aged children in developed countries

In the following section an overview of published research on the implementation of nutrition education intervention programmes for school-aged children in developed countries will be given. Based on the research reports, the following information will be given about the nutrition education programmes: (1) the place where the programme was implemented, (2) the most important aims and outcomes of each programme, the method(s) of programme implementation, (3) the reported content of the programme as well as (4) the duration of the programme. Lastly the reported effectiveness of each programme will be summarised.

The findings of the first research report to be summarised was conducted in Crete (Kafatos, Peponaras, Linardakis, & Kafatos, 2004)

Aims: The aims of this study were to explore the process of implementing a nutrition education programme in Cretan primary schools for ten-year-old children and to identify best teaching practices and principles.

Outcomes: The programme wanted to help children to develop an understanding of the basic principles of nutrition and the function and aims of food advertisements. The hypothesis was that making the grounds for advertising understandable and more accessible to children, while they were also given the basic knowledge and skills to improve their nutrition habits, would allow children to make better food choices not only for the duration of the program but also in the long term.

Content: The educational programme included media, nutrition and consumer education issues as its basic focus. The programme helped children to develop an understanding of how advertisements are developed by designing their own adverts. The programme taught the children the basic principles of good nutrition, how foods are presented through adverts and reading food labels. The children participated through discussing their feelings, experiences and thoughts and they also criticised television food advertisements.

Duration: 30 hours of teaching over a period of 5 months (November 1997 – March 1998). Eleven months after the programme was completed the researchers interviewed the pupils.

Effectiveness: All four teachers who presented the nutrition classes were volunteers who expressed an interest in the programme. The teachers were provided with the course material. The teachers' willingness and teaching skills were mainly responsible for the quality of teaching, the variety of educational methods used in classrooms and pupils' interest in the course. The research revealed that the actual programme implementation differed from class to class, and only two of the classes where the nutrition education programme was implemented were proved to be successful. Changes in the pupils' knowledge and recall of the programme content were related to teacher enthusiasm and also to the method of implementation. The researchers concluded that the introduction of the principles of a Mediterranean diet to children through nutrition education, requires innovative, enthusiastic and highly motivated teachers (Kafatos *et al.*, 2004).

The findings of the second research report to be summarised, was conducted in Alabama in the United States of America (Powers, Struempler, Guarino, & Parmer, 2005).

Aims: The aims of this study were to investigate the effects of a nutrition education programme on the dietary behaviour and nutrition knowledge amongst elementary school-aged children, participating in a social cognitive theory-based nutrition education program.

Method of implementation: Nutrition classes, based on the social cognitive theory, were presented to second and third grade students. Nutrition educators taught learners skills to select healthy foods both at school and home.

Content: The educators were provided with a curriculum guide with specific content and materials appropriate for the target group. Materials were from a variety of

sources such as the Dairy Council and the American Heart Association. The six-week classes were based on tenets of social cognitive theory, which incorporated the interdependent relationship between personal characteristics, behavioural factors and environmental influences. The nutrition educators taught children skills to select healthy foods both at school and home. The nutrition educators also served as role methods by eating with students in the lunchroom. The nutrition concepts were reinforced with hands-on activities and nutrition messages on bulletin boards and in cafeterias.

Duration: Nutrition educators conducted 6 nutrition classes in one week over a period of eight weeks.

Effectiveness: Results indicated that the intervention effectively increased nutrition knowledge. The dietary behaviour change was minimal because the children only received six hours of nutrition education lessons and according to Powers and co-workers (2005) children need at least 50 hours of nutrition education to have an impact on behaviour (Powers *et al.*, 2005).

The third study to be summarised was conducted in California in the USA (Robertson & Zallas, 2004).

Outcomes: This educational programme is designed to reinforce the food guide pyramid and to help children learn how to make healthy food and physical activity choices that minimises the risk of obesity and overweight.

Method: This programme was a three-day camp experience and addressed the day-to-day decisions that children made about food choices, physical activity, and interacting with other camp children. Through individual lessons and activities the nutrition knowledge of the children were determined. After acquiring this information the programme knew what the children had learned and what the children wanted to learn. The programme also included an internet-based support for parents, teachers and children.

Content: Workbook activities engaged the children in critiquing food advertisements, planning balanced meals, learning about food safety and reinforcing the importance of physical activity.

Time: Three days.

Effectiveness: The program increased the children's knowledge about nutrition. The attitudes of the children about the likeability of foods did not change much. Overall

the results suggested that an interactive school-based nutrition education programme could successfully influence student knowledge and attitudes towards nutrition. The data collected did not provide evidence of significant behaviour change (Robertson & Zallas, 2004).

The fourth study to be summarised was also conducted in California in the USA (Morris, Koumjian, Briggs, & Zilderiberg-Cherr, 2002).

Outcomes: The aim of this project was to join actively nutrition education lessons and gardening lessons together as a unit. The primary objective of this programme was to teach children about healthy eating habits while simultaneously teaching them where their food comes from by letting them plant and harvest their own vegetables. An additional objective was to promote the use of the garden as a tool for teaching maths, science and literacy.

Method: This programme consisted of nine nutrition lessons, each with its own gardening activity. To assist in motivation and enjoyment, fun activities were incorporated into each lesson. Each lesson included a family newsletter that could be sent home to provide information and activities for the family.

Content: The topics were plant parts, nutrients, food guide pyramid, serving sizes, food labels, physical activity, goal setting, consumerism and healthy snacks. The gardening activities were planting seeds indoors and outdoors, worms, weed identification, bugs, fertilization and watering, seed dispersal, butterflies, and harvest time.

Time: There was no time set for this programme and the only information published was that it consisted of nine lessons.

Effectiveness: The children's knowledge improved and the parents' knowledge also improved through the nutrition newsletters they received. The teachers were supportive of the program due to the fact that they received lessons which included objectives, material lists, a nutrition lesson plan, gardening lesson plan, background information and additional activities, all necessary handouts and a family newsletter. They also received a list of resources, a list of applicable California academic content standards and several questions that could be used for assessment purposes (Morris *et al.*, 2002).

The fifth study to be summarised was conducted by in Ireland (Friel, Kelleher, Campbell, & Nolan, 1999).

Outcomes: The outcome was to assess the impact and suitability of a pilot dietary educational programme for primary school pupils. The Nutrition Education at Primary School (NEAPS) programme aimed to build awareness of the benefits of healthy eating, induce positive behaviour change and increase the children's knowledge.

Method: Eight schools were selected by the Irish Department of Education. The 8 – 10-year-old children were chosen for this intervention programme. Participating teachers received training to identify nutritional principles and methods to teach children the skills necessary to make healthy decisions.

Content: The programme materials were developed around cartoon characters based on the *American Hearty Heart* method. The resource material consisted of lesson plans, activity worksheets for the learners, a material pack for the home to involve parents and food diaries.

Time: It was a 10-week intervention programme. Twenty 30-minute long lessons were given using a cross-curriculum approach.

Effectiveness: The authors concluded that the nutrition programme was adaptable to different cultural environments. Positive changes were seen in the school children's eating behaviour and preferences for healthier foodstuffs (Friel *et al.*, 1999).

The sixth study to be summarised was also conducted by in Crete (Manios, Moschandreas, Hatzis, & Kafatos, 1999).

Outcomes: The primary aim was increasing the awareness of parents and children predominately on issues related to healthy diet and regular physical activity and encouraging and supporting pupils to improve their dietary habits and physical fitness. A further aim was to establish an appropriate environment at both schools and home for support of the children's expected behavioural changes.

Method: This programme developed teaching materials that were suitable for the characteristics of the Greek culture. Workbooks covering dietary issues were produced for each child and they were supplied with this book once a year. In addition the teachers received teaching aids and training from instructors, which assisted them with the presentation of the lesson to reduce inherent variation between teachers (attitude, enthusiasm, etc.) in the delivery of these materials. This programme was also designed for parental involvement. Meetings were organized at

which parents were given a file containing their child's medical screening results. During these meetings there were presentations on topics relevant to the dietary and exercising habits of the children. The meetings were held annually in order to facilitate parental participations.

Content: The workbooks covered issues like physical activity and fitness, dental health hygiene, smoking, accident prevention and dietary issues. The teaching aids for the teachers included posters, audiotape fairy tales, workbooks and teaching manuals focussing on the principles of the intervention.

Time: The intervention took place over a period of 3 years with 13 to 17 hours of teaching over the academic year. The physical fitness and activity component of the programme included practical sessions of two 45-minute sessions per week in each year resulting in a total of about 60 classes per year.

Effectiveness: During the duration of this programme there was an increase in health knowledge and physical activity and fitness. The positive findings of this nutrition education programme can be attributed to both the effectiveness of the school-based intervention programme and to the seminars organised for the parents (Manios *et al.*, 1999).

The seventh study to be summarised was conducted in Texas in the USA (Kelder, Hoelscher, Barroso, Walker, Cribb, & Hu, 2005).

Outcomes: The aim was to implement a nutrition education programme into an after school day-care centre. This program wanted to provide a ready-made opportunity for health programmes that may be difficult to incorporate in an already full school day.

Method: The teacher-led lessons and activities were based on social cognitive theory. Specific conceptual elements for the education component included methodling, monitoring, goal setting, contracting, skill training, practice and reinforcement. The educational activities used a variety of educational strategies including whole literacy, individual practice, co-operative learning groups and large-group discussions.

Content: The lessons were designed to equip children with the knowledge, skills, self-efficacy and intentions to make healthy dietary and physical activity decisions. Topics like fruits and vegetables, fat, fibre and the food guide pyramid were presented. Activities were developed to be fun in order to compete with the after-

school activities in which children typically engage (e.g. watching television, playing computer games etc.)

Time: The nutrition activities were structured into 15 lessons divided into five 3-week units, which highlighted a particular concept. The lessons lasted for 15-30 minutes.

Effectiveness: Students responded well to the physical activity and snack components but were less interested in the five-module education component. Strong and significant effects were observed for the physical activity but not for the nutrition education component. It was concluded that lessons were too complex for the after-school setting and were probably more appropriate for classroom teachers to implement during the school day (Kelder *et al.*, 2005).

The eighth study to be summarised was conducted in Sweden (Lindberg, Stahle, & Ryden, 2005).

Outcomes: The aim of this study was to evaluate the impact of the Swedish health education programme (An adventure with Pelle Pump) on health knowledge and health behaviour among 10-year-old children.

Method: Teachers and learners received booklets with theoretical and practical material. Teachers were free to use the study material in classes to teach children about bodily functions and the consequences of healthy and unhealthy behaviour in any way they preferred. Some education seminars were held to inspire the teachers.

Content: In the booklets there were sections on respiratory function, smoking nutrition and physical activity.

Duration: The schools varied from one to four classes per week. The impact of the programme was evaluated two years after the implementation when the children were 12 years old to capture long-term knowledge and a possible behavioural gain.

Effectiveness: This programme had a beneficial effect on knowledge but did not have an impact on health behaviour. Lindberg *et al.* (2005) came to the conclusion that one should consider parental involvement to change health behaviour (Lindberg *et al.*, 2005).

After studying the eight nutrition education interventions in developed countries, the researcher has come to the conclusion that:

- The nutrition knowledge of children in primary schools can be improved through nutrition education programmes but that the impact on behaviour change in these programmes were very small.
- Community and parent involvement in collaboration with the school is essential for behaviour change.
- To change behaviour the duration of the nutrition education programme should at least be 50 hours per year.
- For real success, having motivated and enthusiastic teachers is imperative and the level of complexity of the messages and teaching methods must be carefully considered.
- Teachers need support from the Department of Health, Department of Education, scientific and professional bodies and other non-governmental organizations.
- Teachers should be supplied with the lesson plans, resource materials, teaching methods and assessment activities for implementing a nutrition education programme.

3.3 Nutrition education programmes for young school-aged children in developing countries

Very little information on nutrition education intervention programmes for school-aged children in developing countries is available. All the peer-reviewed articles that were found, following a comprehensive search, will be discussed in the following section. This section focuses on published nutrition education intervention programmes in school-aged children in developing countries. The following information will be provided for each study: the location where the study was done, the most important outcomes of each study, how the intervention was performed, and the reported content of the programme as well as the duration of the programme. Lastly the reported effectiveness of each study is summarised.

In India Puri & Mehta (1994) conducted the following study:

Outcomes: The aim of this study was to assess the success of the Nutrition and Health Education program in teaching low socio-economic pre-school children about personal hygiene, food hygiene and nutrition.

Method: Scientific teaching materials were developed for the purpose of this nutrition education programme. Songs, rhymes and role-play were used to present the lessons. The people in charge of the pre-school children presented the lessons.

Content: Topics like personal hygiene; food hygiene and recognition of foods were discussed. Personal hygiene referred to brushing teeth, taking baths, wearing clean clothes, combing hair, trimming nails, cleaning eyes and ears and having a clean handkerchief. Food hygiene included washing hands before and after meals; cleaning the mouth after eating; using a towel for cleaning hands and eating from one's own plate. Children learned about nutrition through recognition of nutritious foods.

Duration: The programme was implemented for one year.

Effectiveness: The results indicated that pre-school children are educable in nutrition health education provided participatory and appropriate material and methods are used (Puri & Mehta, 1994).

The second study to be summarised was conducted by Kitsao & Waudo (2002) in Kenya.

Outcomes: The objectives of this study were to investigate whether the health education acquired in school was put into practice and to identify diseases pupils in the school suffered from.

Method: The child-to-child approach was used to promote health education among primary school pupils. The child-to-child approach recognises that children learn many things from each other. Through this approach children were encouraged to take action to promote their health and the health of others.

Content: The message, which was passed on, was washing fruits before eating, washing hands after a latrine visit, washing clothes and sweeping the house.

Duration: The duration was not reported.

Effectiveness: The results indicated that the child-to-child approach can be applied in primary schools to enable pupils to translate the health education knowledge acquired in the classroom into health-promoting practices both at home and school (Kitsao & Waudo, 2002).

A third study was conducted in Iran (Salehi, Kimiagar, Shahbazi, Mehrabi, & Kolahi, 2004).

Outcomes: The aim was to teach suitable feeding and hygiene practices to a group of Qashqa'I tribe families, using a culturally appropriate community-based education approach.

Method: Using the Hubley's behavioural change method, and the components that deal with beliefs, attitudes, and subjective norms and enabling factors, the research team studied the behaviour of the family members and endeavoured to change their nutritional behaviour. This was achieved by designing a suitable education programme that was carried out over a period of 12 months. Trained female volunteers assisted in carrying out the intervention programme.

Content: The volunteers were trained on the following topics: Environmental health, personal hygiene, ways of obtaining clean drinking water, effective vaccination programmes, appropriate use of the child growth chart, daily intake of all food groups, appropriate food preparation and essential foods during pregnancy and lactation.

Duration: 12 months.

Effectiveness: The results indicated that the children in the study group gained body weight and height. The findings suggested that educational interventions involving parents and/or other family members, who might have played a role in the care, were important in feeding children hygienic, energy- and protein-enriched, affordable foods. Such practices could improve child growth even under conditions of poverty (Salehi *et al.*, 2004).

The fourth study to be summarised was conducted in Chilean primary schools (Olivares, Zacarias, Andrade, Kian, Lera, Vio, & Moron, 2005).

Outcomes: The purpose of this study was to incorporate nutrition education into Chilean primary schools.

Method: According to Olivares *et al.* (2005) the Ministry of Education in Chile did not allow new programmes to be incorporated into the curriculum. The educational strategy was based on the development of a textbook, teacher's guide, and five practical guides for the learners and a CD-rom for grade 3 to 7 children. Before the first version of the materials was published, the materials were submitted for revision by nutritionists and 16 primary school teachers. The revised materials were used during the teachers' training process. Teachers were trained to use the materials in a three-day course.

Content: The content was presented in five modules: healthy eating, nutrition requirements, nutrition and health, with a description of the reason of the main health problems and their prevention, safe and healthy foods, household food security, focused on the availability, access and utilisation of food by the low-income population.

Duration: 5 months.

Effectiveness: According to Olivares *et al.* (2005) the nutrition education materials for teachers and primary school children were effective and highly motivational. The nutrition education-training programme for teachers was successful and motivational. After this study the Chilean Ministry of Education gave orders to include this nutritional programme into the curriculum. It was estimated that in 2005 the Ministry of Education would incorporate all the contents of the project into the official textbooks used by school children attending public schools. In addition this programme was distributed to every Latin American country (Olivares *et al.*, 2005).

A fifth study was conducted in Madagascar in illiterate children (Mahr, Wuestefeld, Ten Haaf, & Krawinkel, 2004):

Outcomes: The aim of this study was to implement a nutrition education programme for illiterate children by using the child-to-child approach.

Method: The child-to-child approach was followed to involve the children in the planning and implementation of the programme. The methodology consisted of

participatory techniques. During this study the first three steps of the approach were applied:

- Step one: The children and the teachers identified a priority health or nutrition issue and afterwards they carried out activities to define the issue and increase their understanding of it.
- Step two: They gathered information in the community to find out more about the issue.
- Step three: They discussed the results and proposed actions to do something about it.

Content: The following topics were used: nutrition; health, aetiology of diseases, prevention and treatment of sickness; hygiene, sanitation and hygienic behaviour; social life, education methods and children's daily work and games. Communication channels such as songs, dances, storytelling and drama were used.

Duration: August to December 1999.

Effectiveness: The child-to-child approach worked well and such a programme should be expected to influence the health behaviours of children. It was suggested that this programme should be combined with a literacy programme to address the children's desire to learn reading and writing (Mahr *et al.*, 2004).

After studying the five nutrition education interventions in developing countries the researcher has come to the conclusion that:

- The child-to-child approach can be applied in primary schools to enable pupils to translate the health education knowledge acquired in the classroom into health-promoting practices both at home and school.
- A nutrition education-training programme for teachers would be successful and motivational.
- Time and resources should be allocated to the teachers.
- To be effective, nutrition education programmes must be school-based.
- Those educational interventions involving parents and/or other family members are important for the sustainability of such a programme.
- The school curriculum of each country should aim to provide learners and teachers with the required knowledge and support.

3.4 An overview of nutrition education programmes focussing on school-aged going children in South Africa

In South Africa, no research has been published focussing purely on nutrition education programmes for school-aged children. In general, nutrition education always formed part of a nutrition intervention programme, but it is difficult to distinguish the impact of nutrition education itself. In the next section, nutrition interventions coupled with some form of an education programme for school-aged South African children will be summarised.

In 1994 a study in Johannesburg aimed to assess the nutritional status of black schoolchildren who had participated in a feeding scheme project from 1990 (Reitsma, Vorster, Venter, Labadarios, de Ridder, & Louw, 1994). A further aim was to evaluate the efficacy of this scheme. The nutritional status of 50 randomly selected black children, between the ages of seven and twelve years was assessed using the following methods: a dietary survey; clinical observations; anthropometry and biochemical analysis. The study found that malnutrition continued to be highly prevalent, despite the feeding scheme. The authors recommended the need for nutrition education for the children and parents (Reitsma *et al.*, 1994).

Another paper published on data from a school feeding programme at a farm school just outside Johannesburg showed cognitive benefits in schoolchildren (Richter, Rose, & Griesel, 1997). The aim of the study was to determine the effect of a school breakfast programme on the cognitive and behavioural aspects of grade 3 children. Three different types of measures of attention, distractibility, and short-term memory and activity levels were used, namely: psychometric testing of the children; teacher ratings of children's classroom behaviour and coded video-recorded classroom behaviour. It was a six-week intervention programme. The results indicated significant changes from pre- to post-test assessment among the children in the experimental group. The children showed an increase in active participation in class and positive peer interaction. The conclusion is that a school breakfast programme had a beneficial effect on the cognitive and behavioural performance of socially disadvantaged, undernourished children in their first two years of school (Richter *et al.*, 1997).

Research published from a study on a low-income community in KwaZulu Natal showed clear benefits from home vegetable gardens (Faber, Venter, & Benade, 2002). The aim of the study was to implement a home-based food production

programme targeting B-carotene rich fruits and vegetables. Dietary intake of children was determined during a cross-sectional survey, before and one year after, the implementation of a home-based food production programme. The results demonstrated a significant increase in vitamin A intake in children from households with project gardens, as well as in children from households without gardens. However, children from households with gardens had a significantly higher vitamin A intake than children from households without gardens (Faber *et al.*, 2002).

A study conducted in the Northern Cape and Free State Province of South Africa aimed to determine the impact of a community-based nutrition education programme, using trained community nutrition advisors, on the anthropometry and nutritional status of mixed-race children aged between 2-5 years (Walsh, Dannhauser, & Joubert, 2002). The programme was implemented over 2 years, in four study areas in the Free State and Northern Cape Provinces. Two control areas were included to differentiate between the effect of the education programme and a food aid programme that was implemented simultaneously. Five hundred and thirty-six children were measured for weight-for-age, height-for-age and weight-for-height. The results showed that weight-for-age improved in all areas, but only significantly in boys and girls in the urban study area, and in boys in one rural study area. No significant improvement in height-for-age occurred in any area. Weight-for-height improved significantly in the urban study area. The conclusion was that the education programme in combination with food aid, succeeded in improving the weight status of children, but was unable to facilitate catch-up growth in stunted children after two years of intervention (Walsh *et al.*, 2002).

The Valley Trust is an organisation, which helps people in communities to take responsibility for improving their own health and quality of life within a democratic society (Brown, Hortop, Tilbury, & Clark, 2005). Through Whole School Development, nutrition education programmes were implemented in 41 primary schools in Kwazulu-Natal. These schools adopted the health promoting strategy, which includes the creation of a healthy supportive environment. Seventy five percent of these schools established their own school gardens and the vegetables that were harvested from these school gardens were used to feed the learners. All teachers of the 41 schools received training on how to implement a worked out nutrition education programme. Each grade received ten lesson plans with an information booklet. The topics in the book were nutrition, hygiene and health and

illness. To date there is no published literature available on the effectiveness of this project (Brown, 2006).

From the available literature about nutrition intervention programmes in South Africa, a number of conclusions can be drawn:

- A great deal of data describing the nutritional status of South African children is available.
- It was suggested that there is a need for nutrition education programmes for children and parents in South Africa.
- In South Africa nutrition advisors implement nutrition education programmes.
- Two of the programmes that took place in South Africa were home and community-based projects.
- The Valley Trust project is a school and community based project but it is restricted to a small part in Kwazulu-Natal.

The researcher has come to the conclusion that nutrition education programmes must form part of the school curriculum in South African primary schools. The nutrition education programmes should aim to provide the learners and teachers with the required knowledge and skills to make healthy food choices, which are in agreement with the national dietary guidelines of South Africa. Lindberg *et al.* (2005) suggests that when knowledge is achieved, changes in attitude accumulate over time resulting in behavioural change. Parental behaviour may influence what children learn, how they respond to external environment and their self-expectations. If parents behave in contrast to what the children have been taught at school it may be difficult to influence their behaviour. Therefore, health education strategies must involve parents, teachers and children to have a greater likelihood of succeeding (Lindberg *et al.*, 2005).

3.4.1 Research done on the effectiveness of nutrition education programmes for young school-aged children in South Africa

No literature in South Africa could be found where the effectiveness of nutrition education programmes was evaluated. After studying the nutrition interventions in South Africa the researcher has come to the conclusion that nutrition education always forms part of a nutrition intervention programme and it is often difficult to

distinguish the impact of nutrition education in itself. One programme that was evaluated was the school feeding intervention program.

The Primary School Nutrition Programme (PSNP) was evaluated by a number of research institutions, using a multi-disciplinary framework. Their findings were based on empirical research as well as local and international literature reviews. The findings were:

- Malnutrition amongst primary school children in South Africa is common and on the basis of nutritional status alone, a comprehensive primary school nutrition programme is appropriate;
- Primary school health and nutrition programmes are seen as a priority for children in developing countries;
- Despite all the objectives, the implementation of the PSNP was limited to a vertical school-feeding programme;
- School feeding was noted to be very expensive;
- Nutrition education, deworming and micronutrient supplementation are considered to be more cost-effective interventions than school feeding but these have not been implemented as part of the PSNP;
- Inadequate management was a problem and in several parts of the country the coverage of school feeding has been poor and inconsistent for significant periods of time;
- The food may have been of a sub-standard quality and quantity and some of the foods selected by the PSNP may also have had a negative impact on healthy eating habits;
- In some instances the PSNP has taken teachers away from their teaching functions (McCoy, 1997).

A further evaluation of the effectiveness of school feeding programmes identified various areas where school feeding could be implemented in a more effective and efficient manner (Louw, Bekker, & Wentzel-Viljoen, 2001). Due to this evaluation the South African government approved various steps that are to be implemented to improve the functioning of the school feeding system. All provinces had the prerogative to decide on the types of menus that they would like to serve, as long as they were within the framework of national nutrition, logistical, social, and cost

criteria, and they provided 25% of the recommended dietary allowance (RDA) for energy for the 7-10-year-old age group per day and 20% of the RDA for the 11-14 year-old age group. Energy provided by menus ranged between 12% and 22% of the RDA, with the menus from eight of the nine provinces providing less than 20% of the RDA. Although micronutrient deficiency eradication was included in the aims of the PSNP, there were no national guidelines with regard to the amount of micronutrients to be provided by school feeding. The evaluation also showed that only 9% of the children were fed before 10:00 in the morning and that in 48% schools, the children received their meals after 11:00. This defeats the main purpose of the school-feeding programme, which was to alleviate short-term hunger and thereby enhance active learning capacity. The numbers of feeding days were also inconsistent. The evaluation further pointed out that recommended targeting directives were not adhered to and that targeting was often driven from a political and financial perspective rather than from a needs perspective. Good quality food was often inferior and control of food safety poor. Storage facilities were inadequate and unhygienic and 30% of the schools did not have water on site, despite the fact that most menus require water for preparation (Louw *et al.*, 2001).

After the evaluation, a few recommendations were made, but there is one long-term recommendation that would have a tremendous impact on preventing malnutrition, namely that the PSNP should be transformed from being a vertical feeding programme to being a comprehensive school nutrition programme. As a comprehensive school nutrition programme, the PSNP should become part of a broader package of priority school health activities and become part of the national Integrated Nutrition Programme (INP). The PSNP should establish policies for the development of a comprehensive School Health Programme be integrated with other school health services as part of a School Health Programme; be utilised as a method for the development of school health programmes and for involving parent committees and develop school nutrition programmes with linkages to the community, other school health services and other non-health sectors (McCoy, 1997).

In 1992, the Nutrition Society of South Africa initiated a process to develop one set of food-based dietary guidelines for South Africa to optimise the nutritional status of all South Africans. The process culminated in the acceptance of eleven guidelines as the official dietary guidelines for South Africa in 2004. It has been suggested that the guidelines should be used as part of the Integrated Nutrition Programme of the

Department of Health and that they should form the basis of nutrition education in the Primary School Nutrition Programme (Vorster, Love, & Browne, 2001). In addition to this, they also proposed that they should be integrated in the national education curriculum of the Department of Education. The official dietary guidelines for South Africa are as follows:

1. Enjoy a variety of foods.
2. Be active.
3. Make starchy foods the basis of most meals.
4. Eat plenty of vegetables and fruit.
5. Eat dry beans, peas, lentils and soya often.
6. Meat, fish, chicken, milk and eggs can be eaten every day.
7. Use sugar and sugar-containing foods and drinks in moderation.
8. Eat fats sparingly.
9. Use salt sparingly.
10. Drink lots of clean, safe water.
11. If you drink alcohol, drink sensibly (Vorster *et al.*, 2001).

These guidelines could be implemented into the Revised National Curriculum Statement because objectives and assessment standards related to food, nutrition and adequate diet already exist as part of the National curriculum. In the Revised National Curriculum Statement these outcomes and assessment standards are too vague and general. To implement these eleven guidelines, as part of the Revised National Curriculum Statement would make this document more user-friendly for teachers with limited knowledge of nutrition.

3.5 Provision for nutrition education for young school-going children grades 1 to 3 in the National Curriculum Statement for Life Orientation

"In South Africa outcome-based education forms the foundation of the school curriculum. The curriculum strives to enable all learners to achieve their maximum ability. This it does by setting the outcomes to be achieved at the end of the process. The outcomes encourage a learner-centred and activity-based approach to education. The Revised National Curriculum Statement builds its Learning

Outcomes for the general education and training band for grades R-9 on the critical and developmental outcomes that were inspired by the Constitution and developed in a democratic process" (Department of Education, 2002).

The critical outcomes envisage learners who are able to:

- *"identify and solve problems and make decisions using critical and creative thinking;*
- *work effectively with others as members of a team, group, organisation and community;*
- *organise and manage themselves and their activities responsibly and effectively;*
- *collect, analyse, organise and critically evaluate information;*
- *communicate effectively using visual, symbolic and/or literacy skills in various modes;*
- *use science and technology effectively and critically, showing responsibility towards the environment and the health of others; and*
- *demonstrate an understanding of the world as a set of related systems by recognising that problem solving contexts do not exist in isolation"* (Department of Education, 2002).

The developmental outcomes envisage learners who are also able to:

- *"reflect on and explore a variety of strategies to learn more effectively;*
- *participate as responsible citizens in the life of local, national and global communities;*
- *be culturally and aesthetically sensitive across a range of social contexts;*
- *explore education and career opportunities and*
- *develop entrepreneurial opportunities"* (Department of Education, 2002).

Issues such as poverty, inequality, race, gender, age, disability and challenges such as HIV/AIDS all influence the degree and way in which learners can participate in schooling. The Revised National Curriculum Statement adopts an inclusive approach by specifying the minimum requirements for all learners. All the Learning Area Statements try to create an awareness of the relationship between social

justices, human rights, a healthy environment and inclusitivity. Learners are also encouraged to develop knowledge and understanding of the rich diversity of this country, including the cultural, religious and ethnic components of this diversity" (Department of Education, 2002).

The Revised National Curriculum Statement grades R-9 consists of an Overview and eight Learning Area Statements for:

- Literacy
- Numeracy
- Natural sciences
- Social sciences
- Arts and culture
- Life orientation
- Economic and management sciences and
- Technology

Each Learning Area Statement identifies the main Learning Outcomes to be achieved by the end of grade 9. Each Learning Area Statement also specifies the Assessment Standards that will enable the Learning Outcomes to be achieved. Assessment Standards are defined for each grade and describe the depth and breadth of what learners should know and be able to do. The Assessment Standards for each Learning Area Statement show how conceptual and skill development can take place over time. Assessment Standards can be integrated within grades as well as across grades. The achievement of an optimal relationship between integration across Learning Areas and conceptual progression from grade to grade, are central to this curriculum (Department of Education, 2002).

The Learning Area *Life Orientation* consists of four learning outcomes for grades R-3. They are: health promotion, social development, personal development and physical development and movement and orientation. Only the health promotion outcome and the assessment standards, which focus on nutrition, will be discussed in this section. The main aim of the health promotion outcome is that the learner will be able to make informed decisions regarding personal, community and environmental health (Department of Education, 2002).

In grade one the Assessment Standard for the Learning Area *Health Promotion* is:

- Assessment Standard 1: *"The learner should be able to identify nutritious choices from a range of commonly available foods and drinks"* (Department of Education, 2002).

In grade two the Assessment Standard for the Learning Outcome *Health Promotion* is:

- Assessment Standard 1: *"The learners should be able to describe sources of clean and unclean water and simple water purification methods"* (Department of Education, 2002).

In grade three the Assessment Standard for the Learning Outcome *Health Promotion* is:

- Assessment Standard 1: *"Learners must be able to compare healthy and poor dietary habits and describe the effects of such habits on personal health"* (Department of Education, 2002).

After reviewing the outcomes and assessment standards in the Learning Area *Life Orientation* the researcher has come to the conclusion that the outcome *Health Promotion* is appropriate but that the assessment standards are vague and require nutrition expertise beyond the competencies of the educator. The researcher has also realised that over the period of three years in the Foundation Phase the learner only comes into contact with two spot on nutrition assessment standards namely in grade one the learners need to identify **nutritious choices** and in grade three the learners have to **compare poor and healthy dietary habits.**

The Revised National Curriculum Statement allocates time limits for the different learning areas in the Foundation Phase. In the next section the time allocated for Life Orientation for grades 1-3 will be discussed.

3.5.1 Time allocated for the Learning Area Life Orientation in the Foundation Phase

In terms of the employment of educators the formal school day for teachers will be seven hours. The formal teaching time per school week is 35 hours. This is set out as follows:

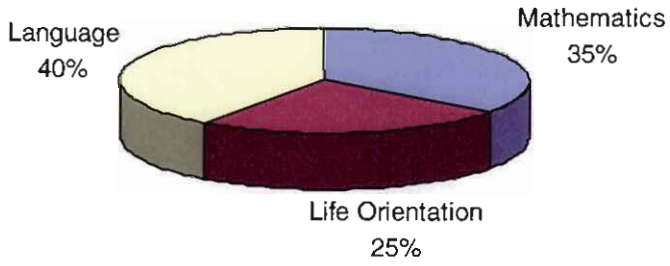
Table 3.1 The formal teaching time for learners in the Foundation Phase.

Phase	Grade	Time	
Foundation Phase	R, 1 and 2	22 hours	30minutes
	3	25 hours	

(Department of Education, 2002)

The formal teaching time allocations for the Foundation Phase are presented below as percentages of the times in the table above:

Figure 3.1: Formal teaching time allocations for the Foundation Phase (Department of Education, 2002)



The tables that follow indicate the formal teaching time allocations for the Learning Programmes in the Foundation Phase (Grades R, 1, 2 and 3) calculated in hours and minutes per week and per day. These times should inform planning and timetabling for the different grades in the Foundation Phase.

Table 3.2: The formal teaching time in hours and minutes per week and per day for grades R, 1 and 2

	Grades R, 1 and 2		
	22 h 30 min per week 4 hrs 30 min per day		
Learning Programme	Literacy	Numeracy	Life Orientation
Per week	9hrs 10 min	7hrs 30 min	5hrs 50 min
Per day	1h 50min	1h 30 min	1h 10 min

(Department of Education, 2002)

Table 3.3: The formal teaching time in hours and minutes per week and per day for grade 3.

	Grade 3		
	25 hrs per week 5 hrs per day		
Learning Programme	Literacy	Numeracy	Life Orientation
Per week	10 hrs	8 hrs 45 min	6 hrs 15 min
Per day	2 hrs	1 hr 45 min	1 hr 15 min

(Department of Education, 2002)

A school year consists of more or less 40 weeks. The Foundation Phase formally plans for 32 weeks in a year (this can differ from school to school). A Foundation Phase teacher must facilitate three learning programmes, Literacy, Numeracy and Life Skills. For the three learning programmes the Revised National Curriculum Statement has made provision for 22hrs and 30min for Grades one and two per week and 25hrs per week for Grade three. Within the Life Orientation curriculum there are four outcomes namely health promotion, social development, personal development and physical development and movement. Under these outcomes there are 18 assessment standards for Grade one, 19 for Grade two and 18 for Grade three. Assuming one spends equal proportions of time on each assessment standard there

should be 10.4 hrs available per assessment standard for Grade one per year, 9.84 hours in grade two and 11.11 hours available for grade three. Since the time allocated for nutrition education in the Learning Area Life Orientation is not enough to change behaviour it is imperative that educators integrate nutrition with all other Learning Areas. This is only a guideline as the real time spent per assessment standard depends on the complexity and magnitude of such a standard.

3.6 Summary

To lead healthy adult lives, children need to be targeted at an early age for dietary interventions (Omenzo, Omenzo, & D' Andrea, 1992). Schools provide an excellent setting for positively influencing children. If sound nutrition education programmes are included in the curriculum, children have the opportunity to expand their nutrition knowledge and learn to make healthy food choices at schools, homes and restaurant settings. In addition education programmes may enable children to grasp the significance of health-related problems (Winter, Stanton, & Bousley, 1999). Nutrition messages should be developmentally appropriate and convey specific behavioural directives would positively affect the food choices of children (Lytle, Eldridge, Kotz, Piper, Williams, & Katalina, 1997). The optimum time for nutrition education has been identified as between the ages of eight and twelve years. Since lifelong eating patterns and habits are formed during these years of development, preventive measures like nutrition education can encourage children to improve their dietary habits (Kandiah & Jones, 2002).

Taking into consideration the review of research being done on nutrition education in this chapter, a nutrition education programme based on the Food-Based Dietary Guidelines should be incorporated in the Revised National Curriculum Statements for Grades R to 12.

Chapter 4

4 Research method

4.1 Introduction

In Chapter two it was stated that there are many children in Africa who do not eat healthy food and that this has serious consequences for their health and well-being. The relevance of nutrition and nutrition education for the young children in South Africa was also addressed in this chapter. In Chapter three the researcher gave an overview of existing nutrition education programmes in developed and developing countries of the world. An overview of school feeding and nutrition programmes in South Africa was given as well.

The researcher came to the conclusion that a school-based nutrition education programme is an imperative for South African children.

In this chapter the research methodology implemented to achieve the aims of the present research will be described.

4.2 Research problems

The researcher formulated the following research questions:

- How knowledgeable are Foundation Phase teachers in rural schools about the curriculum guidelines and or requirements for nutrition education? (See 1.3.2)
- How knowledgeable are Foundation Phase teachers in rural schools about basic aspects of nutrition? (See 1.3.3)
- To what extent do these teachers address aspects of nutrition education in the different learning programmes of the Foundation Phase? (See 1.3.4)
- Which teaching strategies do these teachers implement when they teach learners about nutrition? (See 1.3.5)
- Do these teachers possess the knowledge and skills to develop a nutrition teaching programme for rural learners in the Foundation Phase? (See 1.3.6)

4.3 Research aims

In accordance with the above-mentioned research questions the aims of this research were to determine empirically:

- how knowledgeable Foundation Phase teachers in rural schools are about the curriculum guidelines and/or requirements for nutrition education;
- how knowledgeable Foundation Phase teachers in rural schools are about basic aspects of nutrition;
- to what extent these teachers address aspects of nutrition education in the different learning areas of the Foundation Phase;
- the teaching strategies that these teachers implement when they teach learners about nutrition;
- whether these teachers possess the knowledge and skills to develop a nutrition teaching programme for rural learners in the Foundation Phase, and
- a teaching programme for rural learners in the Foundation Phase, on the basis of the answers to the preceding research questions.

4.4 Empirical research

4.4.1 Research method

A qualitative method was implemented for the purposes of this research. Data was gathered by means of structured interviews (please consult Appendix 1) and classroom observations (please consult Appendix 2).

4.4.2 Study population and participants

Four farm schools in the Potchefstroom district have been selected by the Department of Education (North West Province), to participate in a research project on nutrition in the rural areas. These four schools would thus represent the study population of farm schools in the Potchefstroom district of the North-West Province.

In order to obtain consent for this study from the North-West Department of Education a letter was written to the Executive Manager of the Southern Region of Potchefstroom explaining the aims and the proposed methodology of the research. After consent was obtained from the Department of Education, consent was also obtained from the principals of the schools involved as well as the individual teachers who teach in the Foundation Phase at each of these schools. All the Foundation

Phase teachers (n=7) of the selected four farm schools voluntary participated in the research. All seven participants were employed by the North West Education Department. In Table 4.1 the individual details of the participants and a description of the sites are summarised.

Table 4.1 Details of the participants and descriptions of sites

Participant	***Details and description***
Participant No. 1 **School No. 1**	Type of school: Primary farm school Position: Principal Education: Grade 12 + Education Diploma Gender: Female Teaching responsibilities: Grades 1-3 in a multi-graded class Learning areas: Numeracy, Literacy and Life Skills

Description of site: School one

This Primary school is situated on a farm in a rural district outside Potchefstroom. There are approximately 80 learners in this school. There are two teachers at this school and this includes the principal.

During the time of this research study this school lost one Foundation Phase teacher due to the fact that the learner enrolment at this school has dropped tremendously. The principal facilitates a multi-graded class grade one to three and the other senior phase teacher facilitates the grade four to seven classes. The relationship between the two remaining teachers seemed very relaxed. There is one lady (mother of a learner) who prepares the food for the learners four times a week from a menu given by the Primary School Nutrition Programme. The Primary School Nutrition Programme is paying the lady and she uses an old classroom to prepare the meals.

The school, which is fairly old, has few physical resources. The grounds are large and undeveloped except for the small vegetable garden, which the learners maintain themselves. There are water and tools for the vegetable garden and the learners are very proud of their effort. The vegetable garden was initiated by the North-West University Nutrition Department. The classes are not decorated due to vandalism but every child in the school has a chair and desk and stationary.

The learners wear school uniforms, which is black and white. All the learners looked well nourished and clean. There are no official sport facilities but this does not stop the children from playing ball. The morning the researcher arrived there, everyone

on the school ground was involved in some sort of physical activity, the girls were skipping and the boys played with balls. At this school every attempt is being made to ensure that good quality education takes place.

Particpant No. 2 **School No. 2**	Type of school: Primary farm school Position: Principal Education: Grade 12 + Education Diploma Gender: Female Teaching responsibilities Grades R-3 in a multi-graded class Learning areas: Numeracy, Literacy and Life Skills

Description of site:

This Primary school is situated on a farm in a rural district outside Potchefstroom. There are approximately 65 learners in this school. There are two teachers at this school and this includes the principal. During the time of this research this school appointed another teacher due to the fact that they have increased in numbers. The principal facilitates a multi-graded class; Grades R to three and the other senior phase teacher facilitates the Grade four to seven classes. The relationship between the two teachers seemed very relaxed and the researcher felt very welcome at this school. The principal of the school prepares meals for the children at home (four times a week). She receives a gratification from the Primary School Nutrition Programme.

The school, which is fairly old, has few physical resources but the teachers, learners and farm owner made a joint effort to renovate the school. They painted the outside buildings with African patterns and they constructed toilets for the teachers and children. The grounds are large and undeveloped except for the huge vegetable garden, which the learners and the teachers maintain themselves. The garden is fenced in and there are water (from a rain tank) and tools for the vegetable garden.

Everybody at this particular school is very proud of their efforts. The vegetables, which are harvested, are being used for the daily meals the learners receive at school. The vegetable garden was initiated by the North-West University Nutrition Department. The classes are decorated and every child in the school has a chair and desk and basic stationary. The learners wear school uniforms, which is black and white. Most of the learners looked well nourished and clean. This school received bicycles to be used by the learners and the school felt that if the learners buy them from the school they would take better care of the bicycles. Each learner

paid R50 for a bicycle and this arrangement has worked well according to the principal of the school. There are no official sport facilities but this does not stop the children from playing ball. At this school every attempt is being made by the teachers and learners to ensure that a good quality of education takes place.

Participant No. 3 **School No. 3**	Type of school: Primary farm school Position: Teacher Education: Grade 12 +Education Diploma Gender: Female Teaching responsibilities: Grades 1-3 in a multi-graded class Learning areas: Numeracy, Literacy and Life Skills
Participant No. 4 **School No. 3**	Type of school: Primary farm school Position: Principal Education: Grade 12 + Education Diploma + Honours Degree Gender: Female Teaching responsibilities: Grades 2 and 3 (Literacy) Learning areas: Literacy (English)

Description of site:

This Primary school is situated outside Potchefstroom on a smallholding in a rural area. There are approximately 90 learners in this school. There are four teachers at this school and this includes the principal. This school is fortunate enough to have a secretary. The principal facilitates the English classes for grade one to three. There is one Foundation Phase, one intermediate phase and one senior phase teacher. The relationships between the four teachers tend to be relaxed.

There is one lady (mother of a learner) who prepares the food for the learners four times a week from a menu given by the Primary School Nutrition Programme. The Primary School Nutrition Programme is paying the lady. The school that is partly old and partly new due to the fact that extra classrooms and toilets were built has few physical resources. There are a few teaching aids in the school: television, overhead projectors and one computer for the secretary and teachers. In the office of the secretary there is one photocopier, which is fairly old and tends to break down frequently. As a result only the secretary is allowed to use the machine and this causes tension among the staff because teachers sometimes do not have the resources they require for a lesson since copies have not been made in time. There is electricity and a borehole for water.

At the time of the research project the principal and the farm owner had an argument about who is responsible for the broken water pump. The relationship between the farm owner and the schoolteachers is very tense. The grounds are large and undeveloped. The North-West University has also initiated a vegetable garden at this school but it does not seem to flourish like the ones at the above-mentioned schools. They also received a water tank and tools to sustain the garden but the initiative seems not to be there.

The classes are decorated and every child in the school has a chair and desk and stationary. The learners wear school uniforms that are black and white. Most of the learners looked well nourished and clean. There are no official sport facilities but this does not stop the children from playing soccer.

Participant No. 5 **School No. 4**	Type of school: Primary farm school Position: Teacher Education: Grade 12 + Education Diploma Gender: Female Teaching responsibility: Grade: 3 Learning areas: Numeracy, Literacy and Life Skills
Participant No. 6 **School No. 4**	Type of school: Primary farm school Position: Teacher Education: Grade 12 + Education Diploma Gender: Female Teaching responsibility: Grade: 2 Learning areas: Numeracy, Literacy and Life Skills
Participant No. 7 **School No. 4**	Type of school: Primary farm school Position: Teacher Education: Grade 12 Gender: Female Teaching responsibility: Grade: 1 Learning areas: Numeracy, Literacy and Life Skills

Description of site:

This Primary school is situated outside Potchefstroom. There are approximately 250 learners in this school. There are ten teachers at this school and this includes the principal and deputy principal. The relationship between teachers seemed very relaxed. There is one lady (mother of a learner) who prepares the food for the

learners four times a week from a menu given by the Primary School Nutrition Programme. The Primary School Nutrition Programme is paying the lady and she uses an extra office for this. She has a key of the school and she starts cooking at four o'clock in the morning.

The school, which is new, has few physical resources. There are a few teaching aids in the school: television, overhead projectors and one computer for the secretary and teachers. The grounds while quite large are untidy and undeveloped. There are few trees and plants, so little protection is offered to learners from the sun, wind and rain during breaks. The classes are not decorated due to vandalism but every child in the school has a chair and desk and stationary.

The day the researcher visited the school the teachers only arrived at half past nine and the principal at ten o'clock. There was a large amount of garbage lying around the school and no one made an effort to clean it up. As the researcher walked past the classrooms many of the teachers were talking and the learners listened passively. The learners wear school uniforms. All the learners looked well nourished and clean. There are no official sport facilities.

4.4.3 Data collection

A structured interview schedule (see Appendix 1) was compiled and conducted in order to gather as much information as possible about research questions 1.2 to 1.6. Interviews were conducted with the participants at the selected farm schools. Observations were also done (see Appendix 2) in the classrooms, focussing specifically on aspects related to the participants' teaching strategies.

Structured interviews were held with each of the participants, to explore:

- their knowledge about the directives of the Revised National Curriculum Statement with regards to nutrition education in the Foundation Phase. In this section five questions were asked to determine whether the participants were familiar with the Revised National Curriculum Statement and if they were able to implement this document when they taught nutrition to the learners.
- their knowledge, attitudes and skills regarding nutrition in general and specifically with regard to nutrition education. In this section nine questions about basic nutrition knowledge were asked. These questions were

formulated by using the South African Food-based Dietary Guidelines (Vorster *et al.*, 2001).

- the extent to which participants addressed aspects related to nutrition in their teaching. In this section two questions were asked to determine whether the participants knew which learning area includes aspects related to nutrition education and if they had an idea of the themes or topics about nutrition they would address when presenting a nutrition lesson.
- strategies implemented when teaching about nutrition. In this section seven questions were asked to determine whether teachers used a variety of teaching strategies when presenting a nutrition lesson.
- participants' knowledge of developing a nutrition teaching programme. In this section a scenario was given to the teachers. Seven questions were asked to determine whether the teachers would be able to develop a teaching programme for their school.

In addition to this, the researcher also observed the teaching strategies of the participants in the classrooms. Each participant was requested to present a nutrition lesson. Participants chose their own theme, learning outcomes and assessment standards for their lessons.

Table 4.2 Themes used to teach nutrition lessons.

Participants	*Theme of the lesson presented*
1	Birth of Jesus. What did people eat in the Bible times and what we should eat now?
2	Healthy eating habits.
3	Fruit.
4	Healthy eating habits.
5	Healthy food.
6	Counting healthy food.
7	Food we eat.

An observation sheet was filled in during the presentation of these nutrition lessons. The observation sheet consisted of two sections. In *section one*, twelve general items were observed to determine whether the teacher was using a particular teaching strategy to present the lesson. During the observations of the nutrition

lessons the researcher noted the lesson outcomes, connection with learners' previous knowledge, integration with other learning areas, teaching aids, learner participation, assessment strategies, practical value of lesson, expansion of knowledge, change in learner's attitude, strengths and weaknesses of the presentation. In *section two* the researcher determined which instructional strategy/method was used to present the lesson. The researcher noted if any of the following instructional methods, namely, the direct instruction method, concept attainment method, inquiry method, co-operative learning method and the values development method, were used to present the nutrition lesson.

On the basis of the findings emanating from the data, the researcher developed a teaching programme for the Foundation Phase learners in rural schools.

The data collection process is summarised in Figure 4.1.

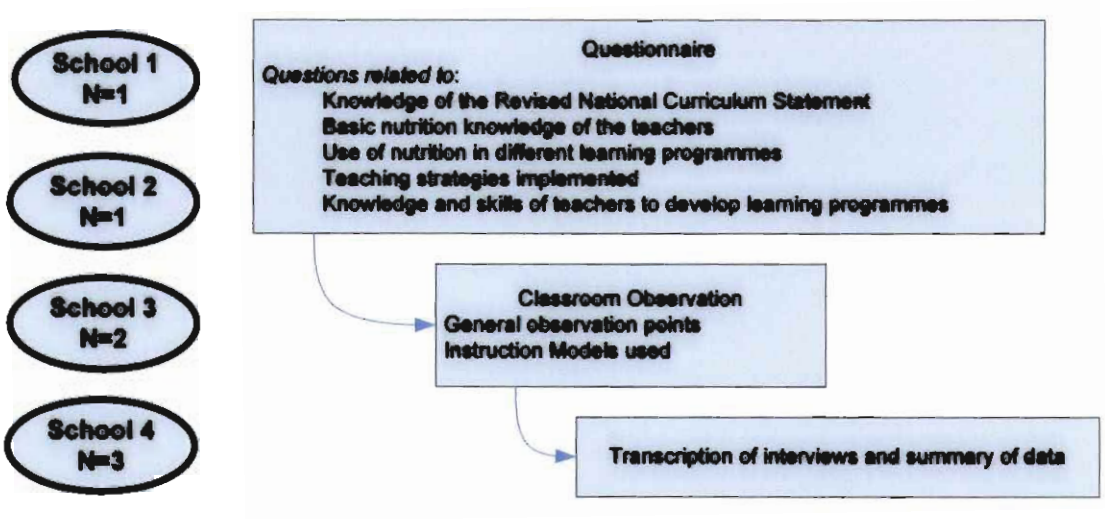


Figure 4.1 Summary of the study design and data collection.

4.4.4 Data analysis

A qualitative data analysis process was used to analyse the data. According to Leedy and Omrod (2001) there usually is no single "right way" to analyse the data in a qualitative study. The researcher began with a large body of information and through inductive reasoning, sorting and categorization of the data the researcher identified the underlying themes.

For the purposes of the data analysis in this study, Creswell's *data analysis spiral* was used (Creswell, 1998). The researcher worked through the data several times by using the following steps of the spiral:

- The researcher organised the data by using a computer database where the participants' responses to questions asked during the interviews were typed from a Dictaphone.
- By using the margins of the aggregated results "memos to self" was jotted down that suggested possible categories or interpretations.
- General categories and subcategories were identified and each piece of data was classified accordingly.
- The data was then integrated and summarised and the relations amongst the categories were described. Writing down all the interview questions and answering them.
- Observation lists were filled in during the presentation of the lessons and then all the information was tabulated.

4.4.5 Validation of the study

When validity in a study is considered Leedy and Omrod (2001) asked the question: Could we use what we have observed in the research situation, ensure that the conclusions we have drawn were truly warranted by the data? Triangulation is especially common in qualitative research, for instance, a researcher might engage in many informal observations in the field and conduct in-depth interviews, then look for common themes that appear in the data gleaned from both methods (Leedy & Omrod, 2001).

To ensure the internal validity of this research project precaution was taken to eliminate other possible explanations for the results the researcher observed. Triangulation was used to increase the reliability of the findings of the study.

4.4.6 Summary

A qualitative method was used in this study to gather information by means of structured interviews and classroom observations from seven Foundation Phase teachers at four rural schools in the Potchefstroom school district. Permission was obtained from the relevant authorities as well as the teachers themselves. The information gathered focussed on the teachers' knowledge of the Revised National Curriculum Statement, their basic nutrition knowledge, the use of nutrition in different learning programmes, the teaching strategies that they implement and their knowledge and skills to develop learning programmes. In the following chapter the results of this process are given in more detail.

Chapter 5

5 Results

5.1 Introduction

In this chapter the results emanating from the research will be presented, and discussed and on the basis of this, conclusions will be drawn and recommendations will be made.

5.2 The results emanating from the interviews

As described in Chapter four, interviews were conducted with the participants by making use of a structured interview schedule.

5.3 Section 1: Teacher's knowledge about the curriculum guidelines and requirements for nutrition education.

Five questions were asked in order to determine the participants' knowledge about the curriculum guidelines and requirements for nutrition education. The participants' responses to these questions are given below.

5.3.1 Question 1.1: Learning area(s), which covers/addresses/contains aspects related to the teaching of nutrition/healthy eating habits/healthy diet in the Foundation Phase.

All seven of the participants responded that the learning area that will address nutrition aspects would be *Life Skills*. In addition one participant suggested that aspects related to nutrition education could also be addressed in the learning areas *Numeracy and Literacy*.

5.3.2 Question 1.2: Which departmental document(s) will you consult to provide you with guidelines/directives/information to help you with/ promote the teaching of nutrition and general health of learners in the Foundation Phase?

Three out of seven participants indicated that they would consult the *Revised National Curriculum Statement* to assist in the teaching of nutrition and general health in the Foundation Phase. Four participants suggested that they would use other sources such as the *Primary School Nutrition Programme* documents, books and other documents on nutrition and health as sources of information.

5.3.3 Question 1.3: Have you consulted these documents?

All the participants claimed to have consulted departmental documents but only four of the seven consulted the Revised National Curriculum Statement.

5.3.4 Question 1.4: If you have consulted these documents, what is your opinion/how do you feel/what do you think about these departmental documents and guidelines?

Four out of the seven participants felt that the Revised National Curriculum Statement was very clear and they understood what was expected of them. Two of the participants felt that this document should be more specific, it should tell them exactly how and when to present the lessons. One participant felt that she could not give comments because she had not read it thoroughly.

5.3.5 Question 1.5: Do you know how to implement these departmental guidelines when you teach and assess learners about nutrition?

All the participants felt confident that they knew how to implement these departmental guidelines because they all attended workshops on how to implement it.

Three out of seven participants indicated that they would consult the *Revised National Curriculum Statement* to assist in the teaching of nutrition and general health in the Foundation Phase. Four participants suggested that they would use other sources such as the *Primary School Nutrition Programme* documents, books and other documents on nutrition and health as sources of information.

5.4 Section 2: Teacher's basic knowledge about aspects related to nutrition.

A number of true/false items were used to determine the participants' basic knowledge of some aspects related to nutrition. In Table 5.1 the results emanating from this section of the interview schedule is summarised.

Table 5.1 Participants' basic knowledge about aspects related to nutrition

Question	True	False	Correct answer
2.1 The best way to ensure that we obtain all of the nutrients we need is to eat three meals a day and to eat a variety of foods at these meals.	7	0	True
2.2 Children should have extra food between meals because their stomachs are smaller.	3	4	True
2.3 Starchy foods should make up the main part of the meal.	4	3	True
2.4 Chicken, fish, meat, milk or eggs could be eaten daily.	6	1	True
2.5 We should at least eat 2 portions of fruit and vegetables each day.	5	2	False
2.6 Dry beans, peas, lentils and Soya are rich sources of vitamin C	4	3	False
2.7 We should eat fats sparingly.	7	0	True
2.8 To be healthy we also need to be physically active.	7	0	True

5.4.1 Question 2.9: If you had to give a learner in your class guidelines on healthy eating, what would you say are the most important guidelines?

Four participants pointed out that learners should know that eating a variety of food would keep them healthy. Two participants felt that drinking water is an important guideline. Two participants felt very strongly about hygiene around the preparation of food. One respondent indicated that it is important for learners to know that they should not skip meals. According to one other respondent it is important for learners to know how to set up a vegetable garden.

The basic nutrition knowledge questions (Questions 2.1 to 2.8, Table 5.1) were based on the official Food-Based Dietary Guidelines for South Africa. Taking into account the answers of the participants it can be concluded that their nutrition

knowledge is quite good. All the participants knew that by eating a variety of food, doing exercise and by eating fats sparingly you will keep your body healthy. There was however some uncertainty as to whether small children needed extra food between meals. Children do indeed need extra food between meals because their stomachs are smaller. They also indicated that chicken, fish, meat, milk or eggs should be eaten daily because these foods are good sources of protein. Most of the participants knew that we should eat plenty of vegetables and fruit every day but two of them were unsure of the exact amount of portions we should eat daily. Three participants did not know that starchy food should make up the main part of a meal because these foods are rich sources of carbohydrates, which supply the body with energy. Most of the participants did not know that dry beans and lentils and soy are rich sources of protein and that the body needs them to repair and maintain our body's muscles and tissues.

5.5 Section 3: To which extent is nutrition education addressed in the different learning programmes of the Foundation Phase?

The participants were asked two questions related to the extent to which teachers address aspects of nutrition education in the different learning programmes of the Foundation Phase.

5.5.1 Question 3.1: Which aspects/themes on nutrition do you teach to learners in the Foundation Phase?

Three out of the seven participants indicated that they taught healthy and unhealthy food as themes in the Foundation Phase and one pointed out that she concentrated on eating habits as a theme on nutrition. Two out of seven participants pointed out that "my body" and "water" would also be possible themes. One respondent was not sure what to answer because she indicated that she only taught Literacy.

5.5.2 Question 3.2: In which learning areas would you teach these themes on nutrition?

Literacy, Numeracy and Life Skills were indicated by six of the seven participants as the learning areas where they would teach nutrition. One respondent pointed out that Life Skills and Literacy were the only learning areas that could be used.

All participants knew that nutrition could be taught in the three different learning areas of the Foundation Phase. Four participants indicated that they would teach healthy eating habits and healthy and unhealthy food as themes. "My body" and

"water" were also chosen for nutrition education as themes. The participants' choices of themes are in line with what the curriculum statement expects.

The Revised National Curriculum Statement under the outcome Health Promotion states: "*The learner will be able to make informed decisions regarding personal, community and environmental health*". It is expected of Grade one learners to make nutritious choices from a range of commonly available foods and drinks and that they should be able to explain the steps to ensure personal hygiene. In Grade two learners must describe sources of clean and unclean water and they should understand the importance of water purification. In Grade three learners should compare healthy and poor dietary habits with one another.

All participants knew that nutrition could be taught in the three different learning areas of the Foundation Phase. Four participants indicated that they would teach healthy eating habits and healthy and unhealthy food as themes. "My body" and "water" were also chosen for nutrition education as themes. The participants' choices of themes are in line with what the curriculum statement expects.

5.6 Section 4: Teaching strategies used when teaching nutrition

Seven questions were asked to explore the different teaching strategies the participants used when they taught nutrition in the classroom.

5.6.1 Question 4.1: Name some of the learning outcomes that you would formulate when you teach lessons about nutrition to learners

Three out of the seven participants indicated that it is imperative for learners to know what a balanced diet is. One participant felt that food hygiene is also one of the outcomes that should be addressed. Another participant suggested that the five food groups should be divided between the different grades and that each grade should be responsible for teaching one or two of the food groups. One participant chose the outcomes speaking, reading, thinking and reasoning in Literacy for her nutrition lesson outcome. One participant felt very unsure of what to answer because she indicated that she did not know the Revised National Curriculum Statement.

5.6.2 Question 4.2: If you have chosen nutrition as a lesson theme how would you teach it? (Which steps would you follow to present such a lesson?)

Six participants indicated that they would have an introduction and five participants said that they would discuss content with the learners. Two participants indicated

that they would do assessment after the lesson. One out of the seven participants pointed out that she would begin with selecting an outcome from the Revised National Curriculum Statement and that she would then integrate it with the other learning areas. Two of the participants replied that they would review previously learned material with the learners and one participant indicated that learners would get the opportunity to work individually and in groups.

5.6.3 Question 4.3: Why do you think it is important for the learners to know the learning outcomes of your lesson?

Three participants said that is important for learners to know the outcomes because learners must know exactly towards what they are working. One out of the seven participants replied that she would not identify the outcomes to the learners because according to her, they would not understand it. One respondent indicated that learners should know the learning outcomes and assessment standards for the lessons because they should be able to do self-assessment to see whether they have reached the outcome or not.

5.6.4 Question 4.4: How would you go about to involve learners during the lesson?

Five out of the seven participants felt that group work is a way to involve learners in the lesson. Three participants suggested involving learners by asking questions and one participant suggested that involvement should take place through discussions. One participant pointed out that role play and field trips are also ways to involve learners during a lesson.

5.6.5 Question 4.5: If you should give them an activity to do, would you let them work together / independently or both?

One out of the seven participants indicated that the activity planned for the lesson would indicate the way that the learners would work. Six out of the seven participants pointed out that they would work independently and together as a group.

5.6.6 Question 4.6: How would you organise this?

Two of the participants indicated that they would organise group work by appointing a leader for the group. One participant replied that she has a multi-graded class and that she would organise the groups into Grade one, two and three learners. Three participants indicated that the groups in their classes would be heterogeneous and

two participants replied that they did not use a structured way of organising learners into groups.

5.6.7 Question 4.7: How would you assess if the learners have achieved the outcomes that you have formulated for the lesson?

Three out of the seven participants said that they assess learners themselves and one participant indicated that learners do not have the ability to assess themselves. Two participants pointed out that learners could be assessed through worksheets. One participant indicated that there should be self, group and peer assessment.

Most of the participants knew some of the outcomes for nutrition education in the Revised National Curriculum Statement, for example they knew that learners should know about the different food groups and healthy and unhealthy food, which tells the researcher that their basic knowledge about nutrition is good, but they were unsure where to find and how to formulate the outcomes. However, one participant indicated that she would consult the Revised National Curriculum Statement before she would formulate her outcomes for a nutrition lesson.

5.7 Section 5: Teachers' knowledge and skills to develop a nutrition teaching programme

The participants were given a hypothetical situation were they were asked by the researcher to develop a nutrition teaching programme for the Foundation Phase at their school. A number of specific questions were asked to explore how they would do it.

5.7.1 Question 5.1: What would your first step(s) be in developing this teaching programme?

The first step that two out of the seven participants would take is to conduct some research on what the needs of the learners in their school and community are. Two participants pointed out that they would come together as a team, which would include the principal and all Foundation Phase teachers and then they would select the nutrition outcomes, assessment standards and the teaching aids, which they would use in their particular school. Two participants indicated that their first step would be to consult the Revised National Curriculum Statement for guidelines. One participant acknowledged the fact that she doesn't know where to start with such a programme and one participant said that she would consult the new textbooks which they received.

5.7.2 Question 5.2: Which learning outcomes and themes will you identify for grade one?

Four out of the seven participants indicated that they would use the theme "My body". "Healthy food", "Water", "Family" and "Hygiene" were chosen by only one respondent. In reply to this question no participants volunteered any information about learning outcomes.

5.7.3 Question 5.3: Which learning outcomes and themes will you identify for Grade two?

Two out of the seven participants were unsure of themes for Grade two. The theme "my body" was chosen by three of the participants. Other themes that were suggested were "hygiene", "healthy food", "clean water", "food groups" and how to prepare food. Not one of the participants volunteered any information about learning outcomes.

5.7.4 Question 5.4: Which learning outcomes and themes will you identify for Grade three?

One participant indicated that themes such as "alcohol misuse", "my body"," healthy food" and "clean water" should be part of the curriculum for Grade three. One participant suggested that all the work that was done in Grades one and two should be revised. Not one of the participants volunteered any information about learning outcomes.

5.7.5 Question 5.5: Which learning areas will be included in the teaching programme?

All the participants indicated that all the learning areas in the Foundation Phase could be used in the teaching programme.

5.7.6 Question 5.6: Which teaching methods and teaching and learning aids will you use to present these themes?

None of the participants identified teaching methods that could be used to present nutrition lessons. Some of the teaching aids that were suggested were pictures, books, real vegetable gardens, black boards and plastic fruit and vegetables.

Participants were not able to develop a nutrition teaching programme for Foundation Phase learners at their schools.

5.8 Observations of nutrition lessons

The researcher observed nutrition lessons presented by the participants by making use of an observation schedule. The following information emerged from the observations:

5.8.1 Observation 1: Were the lesson outcomes clear and were they communicated to the learners?

Five out of the seven participant's lesson outcomes were not clear. Two of the participants' lesson outcomes were clear and well formulated.

5.8.2 Observation 2: Was there a connection with previous knowledge and/or the environmental context of the learners?

Five out of the seven participants tested the prior knowledge of the learners before they started presenting the lesson. Two participants did not connect prior knowledge with the contents of the new lesson.

5.8.3 Observation 3: Was there any integration with other learning areas?

Not one of the seven participants integrated the contents of the nutrition lesson with other learning areas.

5.8.4 Observation 4: Were teaching and learning aids effectively used?

Four out of the seven participants used teaching aids effectively but three participants did not use it effectively.

5.8.5 Observation 5: Was there opportunity for learner participation?

All seven participants gave the learners in their class opportunities to participate.

5.8.6 Observation 6: Were various assessment strategies used?

None of the participants used different assessment strategies.

5.8.7 Observation 7: Did the lesson have practical value for the learners in the sense that they could develop new skills with regard to healthy nutrition?

Three of the participants succeeded to teach the learners new skills that would develop their nutrition knowledge. Four out of the seven participants did not succeed in teaching the learners skills about nutrition that would help them with healthy nutrition.

5.8.8 Observation 8: Did the lesson contribute to the expansion of the knowledge of the learners with regard to nutrition?

Two out of the seven participants successfully expanded the knowledge of the learners with regard to nutrition and five participants were unsuccessful.

5.8.9 Observation 9: Did the lesson contribute to a change in the learners' attitude towards healthy nutrition?

Three out of the seven participants contributed to a change in the learner's attitude towards healthy nutrition and three participants did not succeed. One respondent's lesson was too complicated for grade one learners.

5.8.10 Observation 10: Were the outcomes reached?

Only two of the seven participants reached their outcomes by the end of the lesson and five participants did not succeed to reach their lesson outcomes.

5.8.11 Observation 11: Strengths of the presentation.

All participants tried their best in their circumstances. Two out of the seven participants made sure that learners participated in the lesson and that learners worked together. Only one respondent was well prepared and organised.

5.8.12 Observation 12: Weaknesses of the presentation.

Two out of the seven participants did not make any differentiation between different age groups in their multi-graded classrooms. None of the participants made use of group work. Two out of the seven participants followed the teacher-centred strategy of teaching and two participants prepared lessons, which were too advanced for their learners. One respondent was not prepared at all.

5.8.13 Observation 13: Which one of the following instruction methods was used?

5.8.14 Which of the following instruction methods was/were used?

In order to determine if the participants used a variety of instruction/teaching methods during their lesson presentations, a selection was made of the teaching methods, which teachers would normally implement if they depart from an Outcome-Based approach in their lesson planning, preparation and presentation.

A brief discussion of these methods follows in the paragraphs below.

5.8.14.1 The direct instruction method

Teachers are frequently criticised for the promotion of rote learning in the classroom. The direct instruction method is a necessary but not a sufficient instructional tool because it depends in part on rote learning (Gunter *et al.*, 1999). The direct instruction method consists of six steps:

- Review previously learned material: Make sure that the learners have mastered the previously taught learning material and that they understand the connections with the new learning material, which is to be taught.
- State the outcomes of the lesson: The outcomes of the lesson should be presented to the learners at the beginning of the lesson in literacy they can comprehend.
- Present the new learning material: The new material should be presented in a creative manner. Frequent checks should be made to determine if the learners comprehend the information.
- Guide practice with corrective feedback: Guide the learners through practical applications of what they have been taught and make sure that the learners can apply their newly acquired knowledge or skills correctly.
- Provide corrective feedback: Continue to supervise the learners as they work independently, checking for errors. Homework should be assigned only if the teacher feels certain that the students can apply their newly acquired knowledge or skills correctly.
- Review periodically with corrective feedback if necessary: Homework should be checked before the teaching of new learning material can be considered and re-teaching must be conducted if necessary (Gunter *et al.*, 1999).

Gunter *et al.* (1999) state that the direct instruction method is a necessary but not a sufficient instructional tool. To be without this effective tool is a handicap because the steps in this method provide a framework for instructional design but to use this method exclusively, is numbing (Gunter *et al.*, 1999).

5.8.14.2 The concept attainment method

Concept development is the process of creating categories by grouping similar objects and ideas. This eases the burden of having so many different things to recall or understand. The concept attainment process in the classroom helps learners to

attain the meaning of concepts through the inductive process of comparing examples and non-examples of the concept until a definition is derived. In taking ownership of concepts that they developed, learners can become "authorities" of what they were taught (Gunter *et al.*, 1999). The concept attainment method consists of nine steps:

- Select and define a concept: Make sure that the concept is appropriate and teachable according to this method. The definition should be clear and the attributes should be identifiable.
- Select the attributes: Determine the qualities that are essential to the concept.
- Develop positive and negative examples: This step is imperative because the positive examples must contain all the essential attributes.
- Introduce the process to the learners: Take time to introduce this step to the learners so that they clearly know what you will be doing.
- Present the examples and list the attributes: All positive and negative attributes should be listed separately.
- Develop a concept definition: Use the positive attributes, which the learners write down and create an own concept definition.
- Give additional examples: Determine if the class understands the concept.
- Discuss the process with the class: Make sure that the learners know how they created the definition. This process helps them to see how concepts are formed.
- Evaluate: Evaluate periodically to determine if the concept has been retained by the students (Gunter *et al.*, 1999).

5.8.14.3 The Suchman inquiry method

This method is used to teach problem-solving through discovery and questioning. This method is based on the belief that we learn best that which intrigues and puzzles us. When learners ask *"why?"* out of genuine interest, they are likely to grasp the information and retain it as their own understanding. Any problem-solving process begins by recognising that a problem exists and accepting the challenge of finding a solution. This method consists of seven steps:

- Select a problem and conduct research: Choose an event that will challenge the learners to find a solution
- Introduce the process and present the problem: Present the problem to the learners in writing and provide them with a means for recording data.
- Gather data: The learners ask questions to the teacher and he/she responds to the posed questions. Make it clear to the class that this is a group process and that the entire class should participate.
- Develop a theory and verify: When a learner poses a theory, stop the questioning and write the theory on the board.
- State the rules and explain the theory: Once the group has verified a theory, lead them into an explanation and application of the theory.
- Analyse the process: Discuss the process with the class and discuss how the process can be improved.
- Evaluate: Test the learners to see if they have understood the theory derived from the process (Gunter *et al.*, 1999)

5.8.14.4 Cooperative teaching methods

According to Gunter *et al.* (1999) cooperative teaching and learning methods are not new; it is as old as formal education itself. Learners in a traditional classroom compete for grades, teacher's attention and help with their work. To work cooperatively may be the most critical social skill that learners may learn, when one considers the importance of cooperation in the workplace, in the family and in leisure activities (Gunter *et al.*, 1999). Gunter *et al.* (1999) identified five elements critical to implementing cooperative teaching and learning successfully:

- Positive interdependence: The learners have to believe they are in it together and they have to care about one another's learning.
- Verbal, face-to-face learning: The learners have to explain, argue, elaborate and connect newly learnt material with what they already know.
- Individual accountability: It must be clear that members of their group have to co-operate.

- Social skills: Learners need to be taught appropriate leadership, communication, trust building and conflict resolution skills so that they can operate effectively.
- Group processing: Periodically the groups must assess how well they are working together and how they could do better (Gunter *et al.*, 1999).

5.8.14.5 The values development method

There are values in history, sciences, literacy, social studies, numeracy, fine arts and there are values in every extracurricular activity. Most of the time these values are hidden or overlooked or ignored. Teachers have to plan how to accommodate values in their lessons. If teachers do not plan to teach values, they will be left to chance. The values development method consists of five steps:

- Identify the theme of what is to be taught.
- Specify the "big question" in what is to be taught.
- Select supplemental resources on the topic of study.
- Explore interdisciplinary connections to the topic.
- Teach the lesson to entice learners into caring about what they are learning (Gunter *et al.*, 1999).

In table 5.2 the teaching methods, which were used during the nutrition lessons, will be given.

Table 5.2 Observation list used for observing teaching methods

Teaching method	Steps	P 1	P2	P3	P4	P5	P6	P7
1. **Direct instruction method (Teaching basic skills, facts and knowledge)**	Review previously learned material	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	State objectives for the lesson	No	No	Yes	No	No	No	No
	Present new material	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Guide practice with feedback	No	Yes	Yes	Yes	No	No	No
	Assign independent practice with corrective feedback	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Review periodically with corrective feedback	Yes	Yes	Yes	Yes	Yes	No	No
2. **The Concept Attainment method (Defining Concepts Inductively)**		No	No	No	No	No	No	No
3. **The Suchman Inquiry method. (Teaching problem solving)**		No	No	No	No	No	No	No
4. **Co-operative Learning method. (Using small groups)**		No	No	No	No	No	No	No
5. **The Values development method. (Mining the curriculum for ethical and social values.**		No	No	No	No	No	No	No

P: Participant

As can be seen in Table 5.2, all seven participants implemented parts of the direct instruction method. One participant implemented all the steps of this method. Six participants only used some of the steps of the direct instruction method in their presentations. None of the participants implemented any of the other teaching methods.

All seven participants made use of parts of the direct instruction method. One respondent followed all the steps in this method. Six participants only used some of the steps in the direct instruction method to present their lessons. No of the participants made use of the other instruction methods.

5.9 Summary of results emanating from the research

Only the most prominent results emanating from the research will be presented in the following two paragraphs.

5.9.1 Results emanating from the interviews

- Participants have consulted the Revised National Curriculum Statement before and they acknowledged the fact that they would consult the Revised National Curriculum Statement for help to facilitate a nutrition lesson.
- Participants knew that nutrition should be taught in the Learning Area Life Orientation.
- The participants indicated that they felt confident in handling and consulting the Revised National Curriculum Statement and that this document was clear.
- The basic nutrition knowledge of the educators was adequate.
- The majority of participants indicated that nutrition could be taught in all other Learning Areas and not only in Life Orientation.
- The participants were reluctant to use different teaching strategies.
- They did not plan their lessons in advance.
- The participants knew they had to involve learners during a lesson.
- The participants did not know how to develop a nutrition teaching programme for implementation in the Foundation Phase at their schools.

5.9.2 Results emanating from the observations

- The outcomes and assessment standards for the nutrition lessons were not clearly formulated.
- The educators did not integrate the nutrition lessons with other Learning Areas.
- Learners were allowed to participate during the lesson presentations.
- None of the participants made use of a variety of teaching strategies.
- Educators did not differentiate between the different grades in their multi-graded classrooms.
- Group work was not implemented during the lessons.
- Educators primarily used the traditional teaching method of direct instruction

5.10 Discussion of results

The results emanating from the interviews and observations will be discussed in the following paragraphs.

The results of the interviews indicated, the majority of the participants knew where the teaching of nutrition and healthy eating habits fit into the curriculum however, the researcher came to the conclusion that the educators seemed to have a very narrow understanding of how nutrition fits into all the different learning areas. Integrated learning is central to Outcomes-Based Education. Educators need to have a clear understanding of the role of integration within their Learning Areas.

Educators must therefore look for opportunities for integration both within and across Learning Areas. The Outcome *Health Promotion* could also be linked up with Numeracy where the learners could plan and measure up a vegetable garden for the school. The Outcome *Personal Development* in the Learning Area Life Orientation could be linked up with the Outcome *Health Promotion* in the Learning Area Life Orientation where the learners are able to demonstrate personal and interpersonal skills through individual and group participation in arts and culture. The learners could show one another how to prepare a traditional food dish. The Outcome *Physical Development and Movement* in the Learning Area Life Orientation could be linked with the up to Literacy where the learners are able to write different kinds of factual and imaginative texts for a wide range of purposes for example the learners

could write down recipes, rhymes, stories, dialogues and letters about healthy nutrition.

The participants in general felt that they were aware of departmental guidelines and indicated that they had consulted them. It must, however, be noted that not all the participants were aware that the Revised National Curriculum Statement is the principal guiding document for the teaching of nutrition and general health of learners in the Foundation Phase. Participants who had consulted the Revised National Curriculum Statement felt positive about the document and felt confident in their ability to implement the Revised National Curriculum Statement when they teach and assess learners about nutrition. However the researcher has observed nutrition lessons and came to the conclusion that the Revised National Curriculum Statement's outcomes are clear but that the assessment standards are very vague and that educators need more explicit guidelines on how to implement them.

Most of the participants knew some of the outcomes for nutrition education in the Revised National Curriculum Statement, for example they knew that learners should know about the different food groups and healthy and unhealthy food, which told the researcher that their basic knowledge about nutrition is adequate, but they are unsure where to find and how to formulate the outcomes. After the researcher had observed the nutrition lesson plans she came to the conclusion that the educators use the Outcome for nutrition education but the Assessment Standards were left out.

The participants pointed out that the Assessment Standards were vague and that they did not understand what was expected of them when interpreting assessment standards. All educators received training on how to implement the Revised National Curriculum Statement but in practice some teachers are still unsure how to implement it. The researcher has come to the conclusion that teachers should receive follow-up training on how to implement the nutrition outcomes and this training should address aspects relating to content and teaching strategies.

The researcher observed the steps, which the participants followed when they presented a nutrition lesson and the researcher came to the conclusion that most of the participants don't vary their teaching strategies, they don't plan their lessons in advance and they were not well prepared for their lessons.

Group work was not part of the lesson plans even though group work and co-operative learning form an integral part of the teaching and learning approach Outcomes-Based Education. Participants indicated that it was too difficult to work in

groups due to their multi-graded classes. Some educators felt that the groups should be heterogeneous and from her teaching experience the researcher agreed with this point of view.

The participants used only the traditional (direct, teacher-centred) approach when teaching nutrition lessons In classes where the direct instruction method is the only way of instruction, most of the learners' experiences with the learning content are limited to listening. In classrooms where co-operative teaching methods are used the learners listen, write, tell, read, illustrate, repeat and interact. Learners are then actively involved with the subject matter rather than being passive receivers of information. These learners are given a multiple learning opportunity and they show greater achievement gains than learners where only the direct instruction method is used in classes (Gunter *et al.*, 1999).

According to Gunter *et al.* (1999) an instructional method is a step-by-step procedure that leads to specific learning outcomes. If a teacher creates a single environment in the classroom or utilizes the same instructional approach over and over, only those learners who learn well in that environment or with that approach will succeed. The teacher who utilises a variety of instructional approaches and methods is more likely to reach all learners in the classroom and the learners are encouraged to learn in a variety of ways. When teachers know multiple instructional methods, they don't have to rely on only one technique to gain the interest of the class and teach the material. When one method is ineffective they can switch to others and by doing so the teacher becomes a professional problem-solver and decision maker.

The direct instruction method has proven its worth in teaching basic facts or rules, and elementary action sequences, or when new material is introduced but when a higher order of learning like problem-solving, critical thinking and creativity is involved it is not so successful. Teachers are frequently criticized for the predominance of rote learning in the classroom. The direct instruction method is a necessary but not a sufficient instructional tool because it depends, in part, on rote learning. Many of the steps in the direct instruction method are useful in all the other methods and to be without this effective tool is a handicap, but to use this method exclusively is deadening. If the direct instruction method is used together with other methods in an instructional design it will provide the basis for good instructional practice (Gunter *et al.*, 1999).

The researcher has come to the conclusion that the participants in this research possess the basic nutrition knowledge but they have idea limited understanding and knowledge of how to develop and implement a nutrition teaching programme.

5.11 Conclusions

Based on the results emanating from this research, the following conclusions are drawn:

- Provision has been made for nutrition education for Foundation Phase learners in the Learning Area *Life Orientation.*
- The participants in this study should integrate the Outcomes and Assessment Standards for nutrition education with the other learning areas (*Numeracy and Literacy*) because the time allocation for nutrition education in the learning area *Life Orientation* is too limited.
- The participants in this study were familiar with the contents of the Revised National Curriculum Statement for *Life Orientation* but they were not sure how to practically implement this document successfully into their classrooms.
- The Foundation Phase teachers in this research were knowledgeable about basic aspects of nutrition.
- The participants in this study did not integrate aspects of nutrition education into the other learning areas of the Foundation Phase.
- The participants in this study did not use a variety of teaching methods to facilitate nutrition lessons.
- The participants in the present study were not able to develop a nutrition teaching programme for Foundation Phase learners.

5.12 Recommendations

In order to successfully implement a nutrition teaching programme at school level, stakeholders within and outside the school environment have important roles to play:

5.12.1 Recommendations for the Department of Education

- At all levels of government, there needs to be effective communication between the Department of Health and Department of Education about matters related to nutrition education.

- Nutrition advisors working for the Department of Health have the knowledge but often not the opportunity or expertise to effectively transfer their knowledge to school-aged children. Nutrition advisors should work hand in hand with the school management team and educators to ensure effective nutrition education.
- All educators received training on how to implement the Revised National Curriculum Statement but educators are still unsure what is expected of them when they have to present nutrition lessons. Teachers need more specific guidelines and support to fully utilize the Revised National Curriculum Statement.
- Better and more in service training programmes and support materials, are key factors that can enhance nutrition education.
- The working conditions of educators in rural areas need to be improved, in order for them to be able to pay adequate attention to teaching and matters related to nutrition and other health issues.
- For nutrition education programmes to be successful in South African schools the programmes must be creative, engaging, inexpensive and widely disseminated.
- The Food-Based Dietary Guidelines must be incorporated into the Revised National Curriculum Statement to ensure effective nutrition education. This is arguably the most important step that should be taken to ensure the short, medium and long-term nutritional well-being of children and adults in South Africa in the years to come.

5.12.2 Recommendations for the school

5.12.2.1 Recommendations for school management

- The ultimate accountability of the nutrition teaching programme rests with the management of each school.
- School management bodies should involve non-governmental organisations to support the nutrition policy at their schools.
- School management teams must develop school-based nutritional policies, which would support the nutrition teaching programme at individual schools

taking into account their own specific needs. The policy should be drawn up with the help and support of provincial authorities.

- Schools management teams and educators should target the communities around them by involving them into nutrition projects. The Primary School Nutrition Programme can play a very important role by presenting nutrition workshops to parents and other community members. Based on the eleven Food-Based Dietary Guidelines.

5.12.2.2 Recommendations for educators

- Educators should receive follow-up training on how to implement the nutrition outcomes and this training should address content and teaching strategies for teaching nutrition.
- Educators should implement the nutrition teaching programme as part of the Learning Area Life Orientation and the educator should integrate this programme into all other Learning Areas.

5.12.3 Recommendations for the community

- All parents and community members should be involved when nutrition and behavioural changes about nutrition are set as a goal.
- The parents and community members should be trained and become fully involved with the activities the nutrition education programme.
- Communities should always be involved in decision-making processes with regard to the need for the health rehabilitation of malnourished children.

5.12.4 Recommendations for non-governmental organisations and other institutions

- Non-governmental organisations should provide their specialised expertise which could be utilised at various levels of the school based nutrition programme such as development of educational and supporting material.
- Universities could help with the development of nutrition education programmes for schools and research the effectiveness of its implementation.

5.13 Recommendations for further research

The current research focused on a particular study population, namely selected rural farm schools in the Potchefstroom School District of North-West Province of South Africa. The participants were not al qualified educators and some were Intermediate Phase educators who teach to learners in the Foundation Phase. Thus, the results emanating from the research can only apply to the above-mentioned study population and cannot be generalised to the South African population of Foundation Phase educators at rural schools. Therefore, this study should be replicated involving a national sample of Foundation Phase educators at rural schools in South Africa.

The nutrition teaching programme (which is proposed in Chapter 6) should be implemented in rural farm schools and the effectiveness of the programme should be researched after a period of implementation.

5.14 Summary

In this chapter, the results emanating from the research were presented and discussed. Based on the results, conclusions were drawn and recommendations were made for the various stakeholders involved with nutrition education and for further research on the topic.

A nutrition teaching programme for Foundation Phase teachers in rural schools will be proposed in Chapter 6.

Chapter 6

6 A nutrition teaching programme for rural learners

6.1 Introduction

The research results in Chapter 5 indicated that the participants did not vary their teaching methods when presenting nutrition lessons to learners. It also became evident that the participants did not exactly know what was expected of them when presenting a nutrition lesson. Some of the participants were unclear about the directives of the Revised National Curriculum Statement with regard to nutrition education. Participants indicated that the outcomes and the assessment standards were vague and because of that they had no idea of how to implement a nutrition education programme at their school. The results also indicated that the participants at the selected rural farm schools had no idea of how to develop and implement a nutrition education programme at their schools.

In this final chapter a nutrition-teaching programme for Grades one, two and three learners will be proposed.

6.2 A nutrition teaching programme for rural learners in the Foundation Phase

The nutrition teaching programme to be proposed is based on (1) the findings of this research, (2) the Revised National Curriculum Statement for education *in* the Foundation Phase and (3) the National-Food-Based Dietary Guidelines for South Africa.

There are three learning programmes in the Foundation Phase namely Numeracy, Literacy and Life skills. All educational activities offered in the Foundation Phase fall under one of these three programmes, and the activities can also involve more than one programme. These learning programmes form a cluster of learning outcomes and assessment standards from the eight learning areas. These learning areas contain all the foundational knowledge, skills, values and attitudes required for further learning. The three learning programmes in the Foundation Phase are related to each other and assessment standards from one learning area may be used in another learning area. For example, teaching and learning activities related to the topic *Nutritious Food Choices* can be dealt with in all of the learning programmes,

e.g. Literacy – writing down the names of the different food types, Numeracy – counting or weighing the food, or in Life skills.

There are eleven National Food-Based Dietary Guidelines for South Africa (Vorster *et al.*, 2001) The scope of the Revised National Curriculum Statement allows for the incorporation of all of the eleven National Food-Based Dietary Guidelines in the Life skills programme of the Foundation Phase. For example, in Grade one the Revised National Curriculum Statement requires the learners to make healthy food choices from a range of commonly available foods and drinks. The National Food- Based Dietary Guideline, which is, related to this requirement "*Eating a variety of food*". In Grade two the Revised National Curriculum Statement requires the learners to describe sources of clean and unclean water and simple water purification methods. The National Food-Based Dietary Guideline that would apply in this case is *"Drink lots of clean, safe water"*. In Grade three the Revised National Curriculum Statement require the learners to compare healthy and poor dietary habits and it describe the effects of such habits on personal health This outcome makes it possible to incorporate all of the Food-Based Dietary Guidelines in Grade three. The Food-Based Dietary Guidelines are given below:

- Enjoy a variety of food.
- Make starchy foods the basis of most meals.
- Chicken, fish, meat, milk or eggs could be eaten daily.
- Eat plenty of vegetables and fruit everyday.
- Eat dry beans, peas, lentils and Soya regularly.
- Use salt sparingly.
- Use fats sparingly.
- Drink lots of clean, safe water.
- If you drink alcohol, drink it sensibly:
- Use food and drinks containing sugar sparingly and not between meals.
- Be active (Department of Health, 2005).

Teachers must decide how they will approach their teaching and what methods they will use. The nature of the lesson often determines what approach and which methods will best support the teaching, learning and assessment activities in a particular learning area. Since all learners have particular and preferred learning styles, every class will contain groups of learners who assimilate information and develop understanding in different ways. The teacher must also have a sense of those activities that are likely to succeed with particular individuals or groups and those that are unlikely to, and must plan to accommodate all learners in the class (Department of Education, 2002).

The proposed Nutrition Teaching Programme for the Foundation Phase serves as a guiding tool for teachers in the Foundation Phase. In Figures 6.1a and 6.1b the possible teaching methods that educators can use have been summarised. Educators can decide which combination of methods they would like to use in each lesson plan. In each lesson plan the researcher suggested teaching methods that might be used in a particular lesson that will enhance the teaching of the lesson. In Figure 6.2 the outcomes and assessment standards for nutrition in the Learning Area of Life skills have been summarised for Grades 1 to 3.

Figure 6.1a Possible teaching methods that could be used

The direct instruction method

Teachers are frequently criticised for the promotion of rote learning in the classroom. The direct instruction method is a necessary but not a sufficient instructional tool because it depends in part on rote learning (Gunter *et al.*, 1999). The direct instruction method consists of six steps:

- Review previously learned material: Make sure that the learners have mastered the previously taught learning material and that they understand the connections with the new learning material, which is to be taught.
- State the outcomes of the lesson: The outcomes of lesson should be presented to the learners at the beginning of the lesson in language they can comprehend.
- Present the new learning material: The new material should be presented in a creative manner. Frequent checks should be made to determine if the learners comprehend the information.
- Guide practice with corrective feedback: Guide the learners through practical applications of what they have been taught and make sure that the learners can apply their newly acquired knowledge or skills correctly.
- Provide corrective feedback: Continue to supervise the learners as they work independently, checking for errors. Homework should be assigned only if the teacher feels certain that the students can apply their newly acquired knowledge or skills correctly.
- Review periodically with corrective feedback if necessary: Homework should be checked before the teaching of new learning material can be considered and re-teaching must be conducted if necessary (Gunter *et al.*, 1999).

The concept attainment method

Concept development is the process of creating categories by grouping similar objects and ideas. The concept attainment process in the classroom helps learners to attain the meaning of concepts through the inductive process of comparing examples and non-examples of the concept until a definition is derived. In taking ownership of concepts that they developed, learners can become "authorities" of what they were taught. The concept attainment method consists of nine steps:

- Select and define a concept: Make sure that the concept is appropriate and teachable according to this method. The definition should be clear and the attributes should be identifiable.
- Select the attributes: Determine the qualities that are essential to the concept.
- Develop positive and negative examples: This step is imperative because the positive examples must contain all the essential attributes.
- Introduce the process to the learners: Take time to introduce this step to the learners so that they clearly know what you will be doing.
- Present the examples and list the attributes: All positive and negative attributes should be listed separately.
- Develop a concept definition: Use the positive attributes, which the learners *wrote down and create* an own concept definition.
- Give additional examples: Determine if the class understands the concept.
- Discuss the process with the class: Make sure that the learners know how they created the definition. This process helps them to see how concepts are formed (Gunter *et al.*, 1999).

Figure 6.1b Possible teaching methods that could be used

The Suchman inquiry method

This method is used to teach problem-solving through discovery and questioning. This method is based on the belief that we learn best that which intrigues and puzzles us. When learners ask *"why?"* out of genuine interest, they are likely to grasp the information and retain it as their own understanding. Any problem-solving process begins by recognising that a problem exists and accepting the challenge of finding a solution. This method consists of seven steps:

- Select a problem and conduct research: Choose an event that will challenge the learners to find a solution
- Introduce the process and present the problem: Present the problem to the learners in writing and provide them with a means for recording data.
- Gather data: The learners ask questions to the teacher and he/she responds to the posed questions. Make it clear to the class that this is a group process and that the entire class should participate.
- Develop a theory and verify: When a learner poses a theory, stop the questioning and write the theory on the board.
- State the rules and explain the theory: Once the group has verified a theory, lead them into an explanation and application of the theory.
- Analyse the process: Discuss the process with the class and discuss how the process can be improved.
- Evaluate: Test the learners to see if they have understood the theory derived from the process (Gunter *et al.*, 1999).

Cooperative teaching methods

According to Gunter et al (1999) cooperative teaching and learning methods are not new; it is as old as formal education itself. Learners in a traditional classroom compete for grades, teacher's attention and help with their work. To work cooperatively may be the most critical social skill that learners may learn, when one considers the importance of cooperation in the workplace, in the family and in leisure activities (Gunter *et al.*, 1999). Gunter et al. (1999) identified five elements critical to implementing cooperative teaching and learning successfully:

- Positive interdependence: The learners have to believe they are in it together and they have to care about one another's learning.
- Verbal, face-to-face learning: The learners have to explain, argue, elaborate and connect newly learnt material with what they already know.
- Individual accountability: It must be clear that members of their group have to co-operate.
- Social skills: Learners need to be taught appropriate leadership, communication, trust building and conflict resolution skills so that they can operate effectively.

Group processing: Periodically the groups must assess how well they are working together and how they could do better (Gunter *et al.*, 1999).

The values development method

There are values in history, sciences, languages, social studies, mathematics, fine arts and there are values in every extracurricular activity. Most of the time these values are hidden or overlooked or ignored. Teachers have to plan how to accommodate values in their lessons. If teachers do not plan to teach values, they will be left to chance. The values development method consists of five steps:

- Identify the theme of what is to be taught.
- Specify the "big question" in what is to be taught.
- Select supplemental resources on the topic of study.
- Explore interdisciplinary connections to the topic.
- Teach the lesson to entice learners into caring about what they are learning (Gunter *et al.*, 1999).

Figure 6.2 Outcomes and assessment standards for Grades 1-3

	Critical outcomes	Developmental outcomes	Learning outcomes	Assessment standard
Grade 1	1. Identify and solve problems and make decisions using critical and creative thinking. 2. Communicate effectively using visual, symbolic and / or language skills in various modes. 3. Work effectively with others as members of a team,	1. Reflect on and explore a variety of strategies to learn more effectively. 2. Participate as responsible citizens in the life of local, national, and global communities. 3. Develop entrepreneurial opportunities.	Health promotion The learner will be able to make informed decisions regarding personal, community and environmental health.	The learner will be able to identify nutritious choices from a range of commonly-available foods and drinks.
Grade 2	1. Identify and solve problems and make decisions using critical and creative thinking. 2. Communicate effectively using visual, symbolic and / or language skills in various modes. 3. Work effectively with others as members of a team, 4. Use Science and Technology effectively and critically showing responsibility towards the environment and the health of others.	1. Reflect on and explore a variety of strategies to learn more effectively. 2. Participate as responsible citizens in the life of local, national, and global communities. 3. Explore education and career opportunities.	Health promotion The learner will be able to make informed decisions regarding personal, community and environmental health.	The learner will be able to describe sources of clean and unclean water and simple water purification methods.
Grade 3	1. Identify and solve problems and make decisions using critical and creative thinking. 2. Work effectively with others as members of a team, 3. Collect, analyse, organise and critically evaluate information. 4. Communicate effectively using visual, symbolic and / or language skills in various modes. 5. Use Science and Technology effectively and critically show responsibility towards the environment and the health of others. 6. Demonstrate an understanding of the world as a set of related systems by recognising that problem-solving contexts do not exist in isolation.	1. Reflect on and explore a variety of strategies to learn more effectively. 2. Participate as responsible citizens in the life of local, national, and global communities. 3. Be culturally and aesthetically sensitive across a range of social contexts. 4. Explore education and career opportunities. 5. Develop entrepreneurial opportunities.	Health promotion The learner will be able to make informed decisions regarding personal, community and environmental health.	Compares healthy and poor dietary habits and describes the effects of such habits on personal health

6.2.1 Nutrition teaching programme for Grade one learners

The assessment standard "*Identify nutritious choices from a range of commonly available foods and drinks*" (Department of Education, 2002) is used as a basis for the Grade one lesson plans. The researcher used the National Food-Based Dietary Guideline "*Eating a variety food*" in conjunction with this assessment standard.

Table 6.1 A nutrition teaching programme for Grade one learners

Learning outcome 1 (According to the Revised National Curriculum Statement) "Health Promotion – The learner will be able to make informed decisions regarding personal, community and environmental health" (Department of Education, 2002).
Assessment standard (According to the Revised National Curriculum Statement) "Identifies nutritious choices from a range of commonly available foods and drinks" (Department of Education, 2002).
Topics Healthy eating / Protein / Carbohydrates / Fruit and Vegetables / Healthy drinks.
Duration Approximately 10.38 hours per year (as a guideline). Per term it would be approximately 2.5 hours.
Teaching methods Young learners need to be exposed to a variety of teaching methods to ensure that learners will be actively involved during lesson presentations. Examples of teaching methods, to be used in the Foundation Phase are: Direct teaching method, Suchman inquiry method, cooperative learning method and the value development method.
Teaching aids Dietary guideline brochures. The food pyramid. Pictures of all foods.

Real fruit and vegetables.

Video, DVD's or computer programmes about healthy food.

Content

Healthy eating means enjoying a variety of foods from each food group. Healthy eating also involves listening to and respecting you body's natural cues for hunger and fullness. The amount of food you need every day from the five food groups depends on your age, body size, activity level and whether you are male or female. It's important that children enjoy eating well and eat sufficient food to fuel their needs for energy and supply their bodies with essential nutrients.

- Enjoy a variety of foods: It means to eat more than one type of food. If we eat one type of food every day, our bodies will not get all the nutrients that they need to stay healthy. All people need a variety of foods to stay healthy. Children need a variety of foods to grow. (Dietary guideline)
- Introduce the five food groups to the learners. (Use food pyramid as a tool)
- Introduce commonly available foods and drinks.

Drinks: Water, milk, fruit juice (rather enjoy fresh fruit), drink tea and coffee and fizzy drinks occasionally (Department of Health, 2005).

Assessment

Term one

Teacher assessment: Observe whether the learners are able to identify different food groups. (Worksheets or real food, which they have to place in different groups.)

Term two

Group assessment: Learners in the group assess if the other learners in the group can identify and name foods in the protein food group. (Worksheets can be used or learners could cut out pictures of protein foods and create a poster with it.)

Peer assessment: Is your friend able to make a healthy sandwich? (Learners can assess one another in pairs while they are preparing a healthy sandwich for break time.)

Term three

Self-assessment: Can I identify fruit and vegetables? (Worksheet, real fruit and vegetables or flashcards with fruit and vegetables.)

Term four

Teacher assessment: Observe if the learners are able to identify healthy drinks. (Real drinks or dominos with pictures of healthy drinks could be used to assess whether the learners are able to identify healthy drinks.)

The following five nutrition lesson plans for Grade one will enhance the teacher's knowledge about nutrition and it will provide the teacher with skills to teach aspects of nutrition in Grade one.

Figure 6.3 Teaching programme for Grade 1 (Term 1)

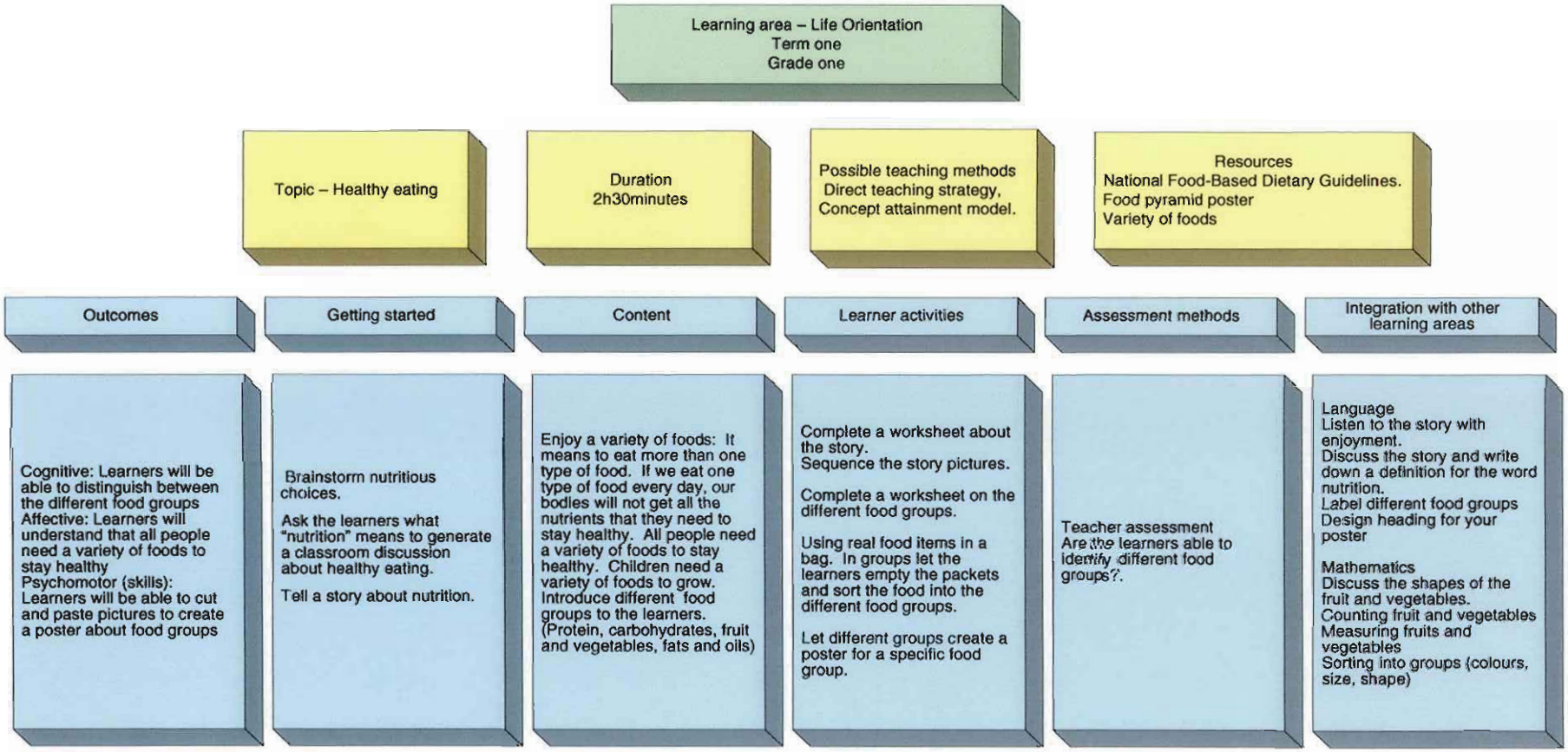


Figure 6.4 Teaching programme for Grade 1 (Term 2)

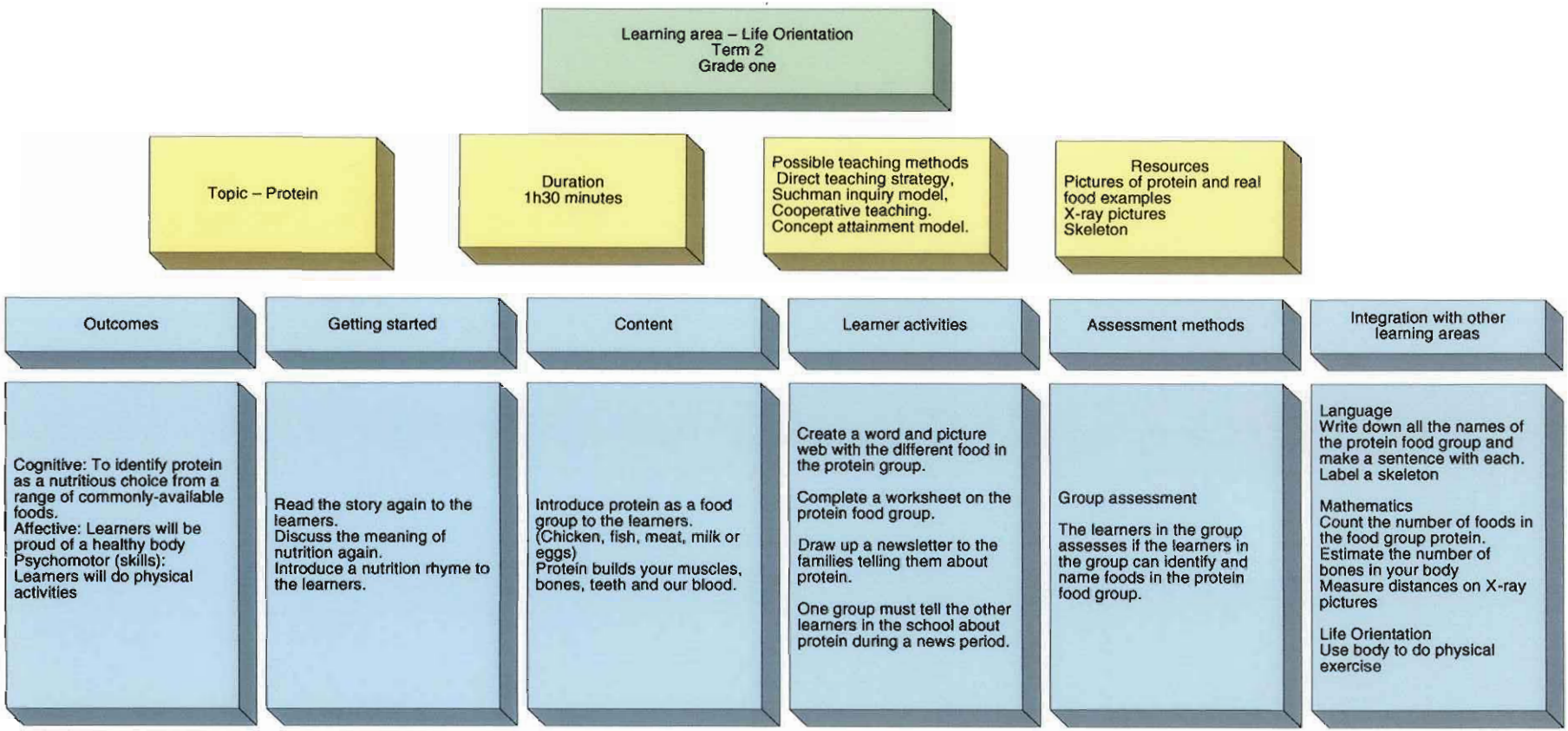


Figure 6.5 Teaching programme for Grade 1 (Term 2)

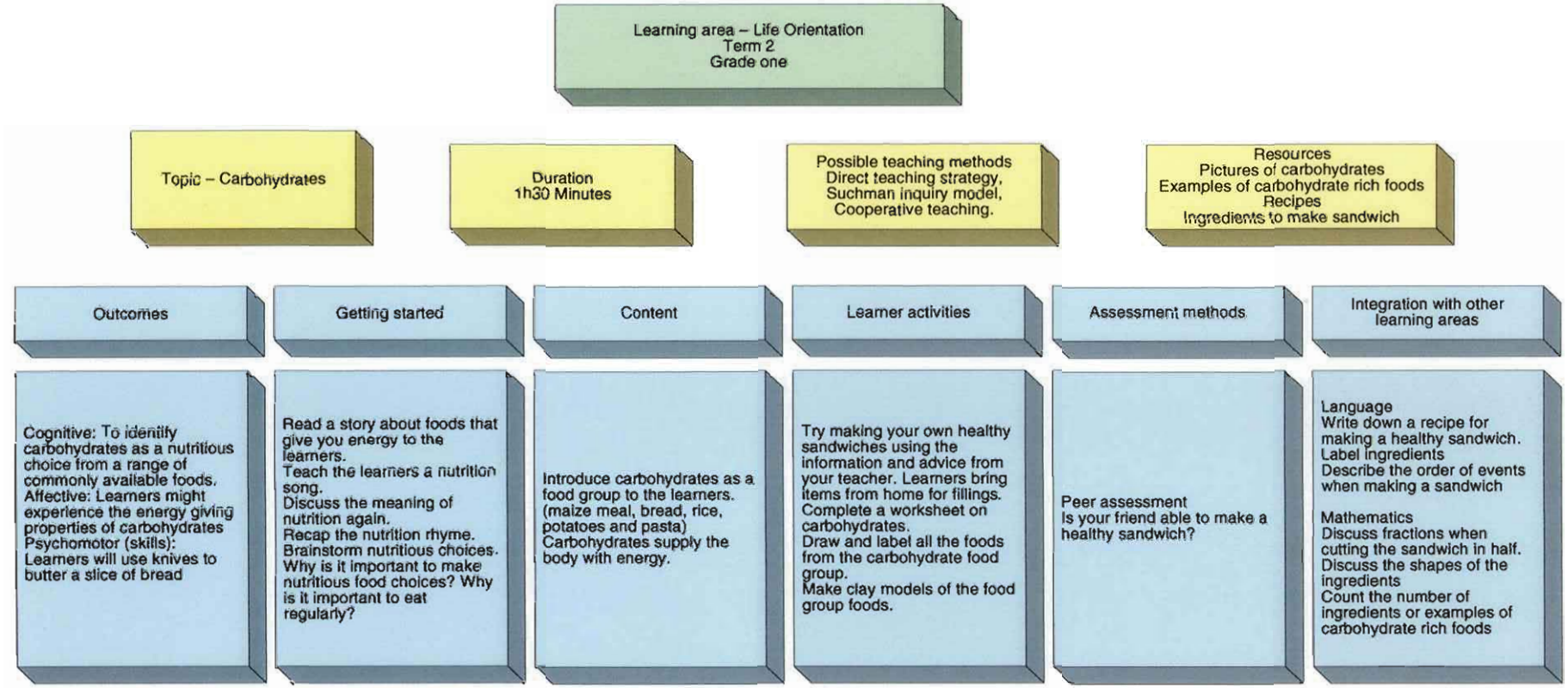


Figure 6.6 Teaching programme for Grade 1 (Term 3)

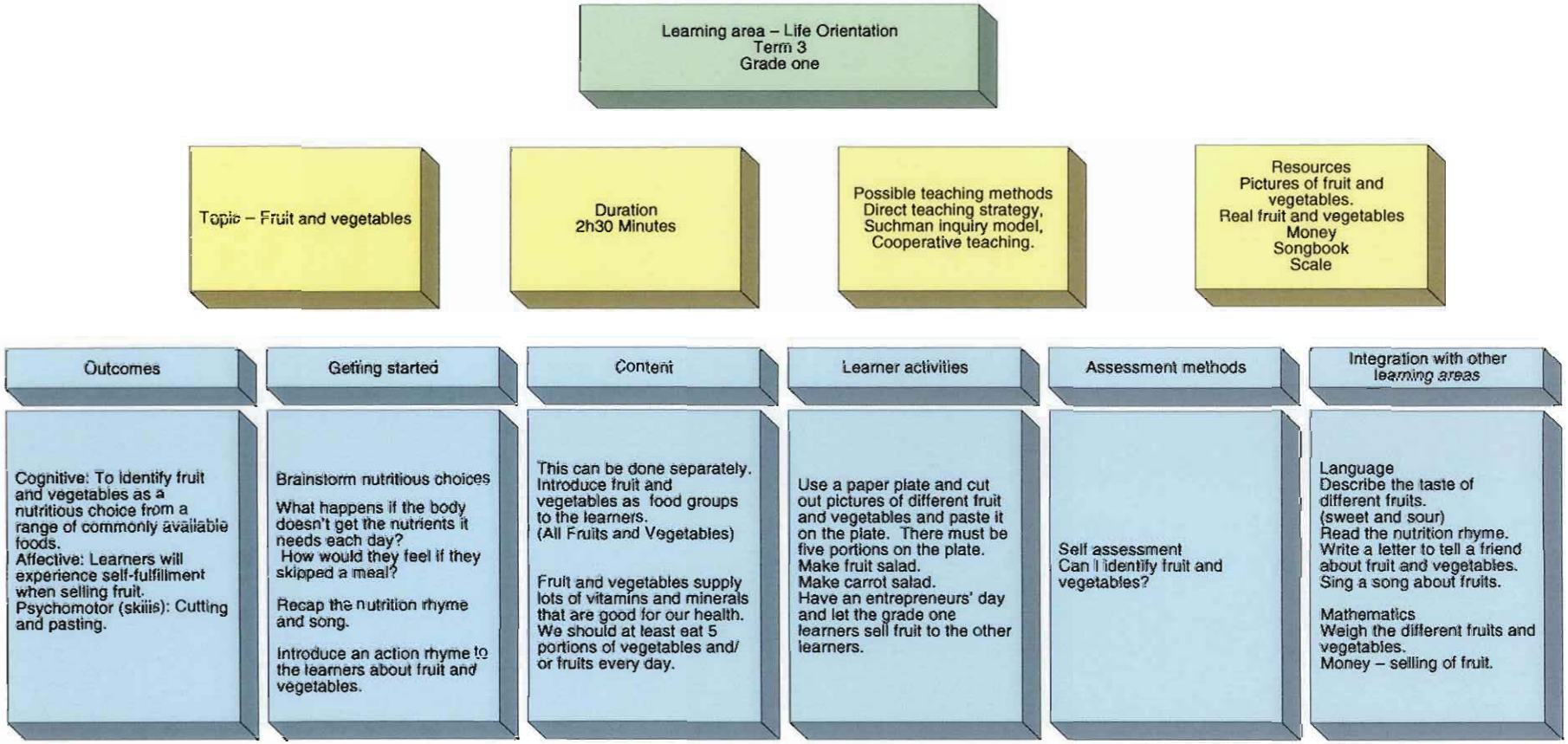
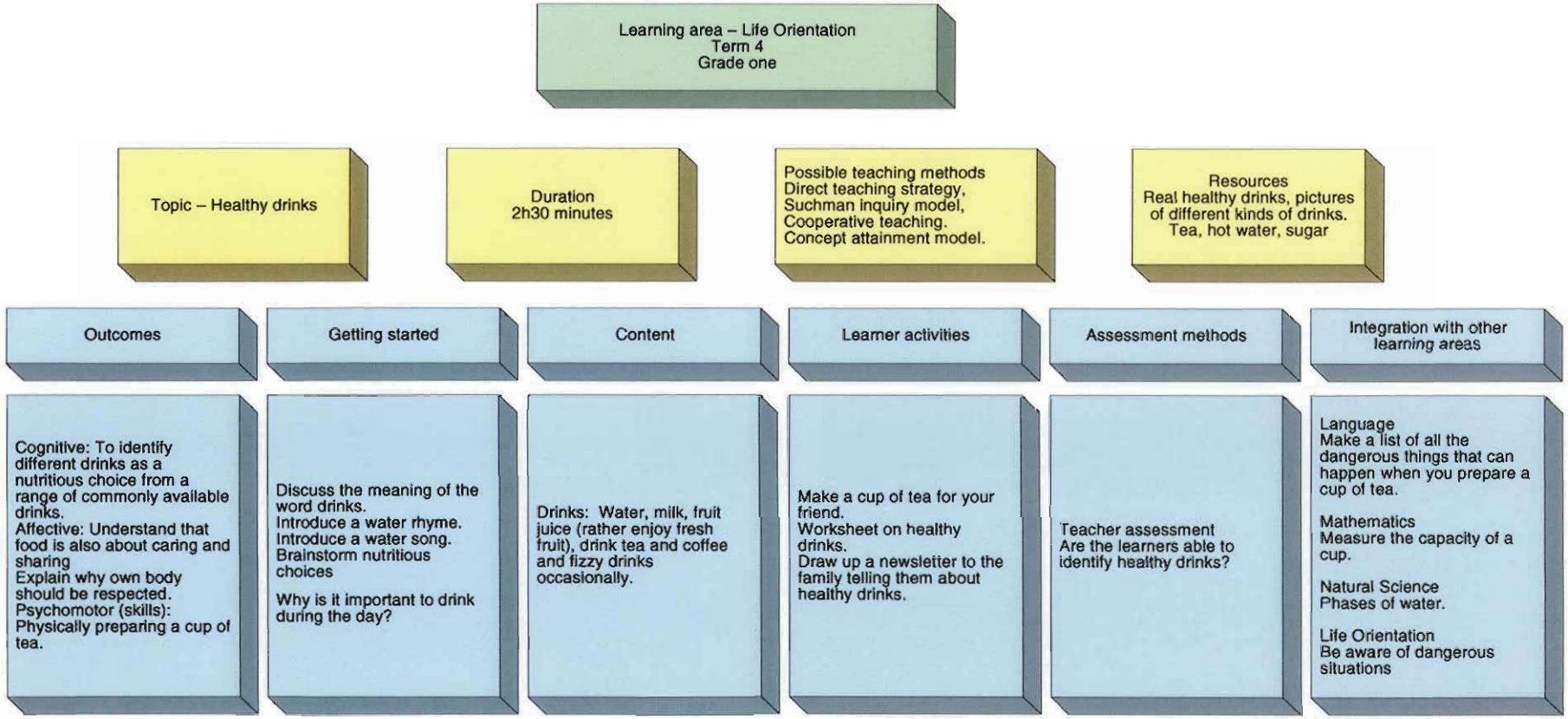


Figure 6.7 Teaching programme for Grade 1 (Term 4)



6.2.2 Nutrition teaching programme for Grade two learners

The assessment standard "*Describe sources of clean and unclean water and simple water purification methods*" (Department of Education, 2002) is used as basis for the grade two lesson plans. The researcher also used the National Food-Based Dietary Guideline "*Drink lots of clean, safe water*" in collaboration with this assessment standard.

Table 6.2 A nutrition teaching programme for Grade two learners

Learning outcome 1 (According to the Revised National Curriculum Statement)
"Health Promotion – The learner will be able to make informed decisions regarding personal, community and environmental health" (Department of Education, 2002).
Assessment standard (According to the Revised National Curriculum Statement)
"Describes sources of clean and unclean water and simple water purification methods" (Department of Education, 2002).
Topics
My body and water / Safe water / Water and illness / Sources of water /
Duration
10.38 hours per year (as a guideline). Per term it would be approximately 2.5 hours.
Teaching method
Direct teaching strategy, Concept attainment method, Suchman inquiry method, cooperative learning and value development method.
Teaching aids
Posters of my body. Pictures, posters, videos and slide shows of sources of water. Pictures of polluted water and real polluted water in a glass bottle. Pictures of clean water and real clean water in a glass bottle. Water containers.

Content

Drink lots of clean, safe water. (Dietary guideline)

Every part of your body contains large amounts of water. Your body loses water through the day; you have to drink water every day.

Your body and water:

- Tears consist mainly of water. Tears keep your eyes wet and prevent them from becoming dry.
- Water keeps your skin moist and supple.
- A large part of your blood consists of water.
- Breast milk contains lots of water.
- The water in your body moves the waste out of your body when you urinate.
- When you sweat you lose water. Sweating helps to keep your body temperature the same.

Sources and safety of water

- Tap water – always make sure whether it is safe to drink.
- Water from dams, rivers, fountains and streams are not always safe to drink. Boil this water first before drinking.
- If people in your area have diarrhoea or cholera, boil the drinking water.

Tips:

- Use safe water sources. If water is from an unsafe source, boil it before use or add a few drops of bleach.
- Use clean containers to store water in.
- Store water in closed containers in a cool dry place.
- Store drinking and cooking water in separate containers from water for washing.
- Wash fruit and vegetables in clean water to remove dirt and germs.
- Always wash your hands with soap and water before working with food and after having used the toilet.

- Make sure that children have access to clean, safe drinking water during the day. Give them a bottle of clean, safe water to take to school (Department of Health, 2005).

Assessment

Term one

Teacher assessment: Observe whether learners can identify the need of water for our bodies. (Worksheets or observe discussions in different groups.)

Term two

Group assessment: The learners work in small groups to compile a small book about water purification. Let each group assess the small books by using a checklist, which was compiled by the teacher.

Term three

Peer assessment: Are the learners able to distinguish between dams, streams, lakes and rivers? (Two-two learners assess one another after completing a match the word to the picture worksheet.)

Term four

Self-assessment: Observe if the learners are able to answer the following questions: Write down where you can find water. How can you collect and carry water home? How can you store water safely? (Learners write down the answers on a white board or chalkboard)

The following four-nutrition lesson plans for Grade two will enhance the teacher's knowledge about nutrition and it will provide the teacher with skills to teach nutrition in grade two.

Figure 6.8 Teaching programme for Grade 2 (Term 1)

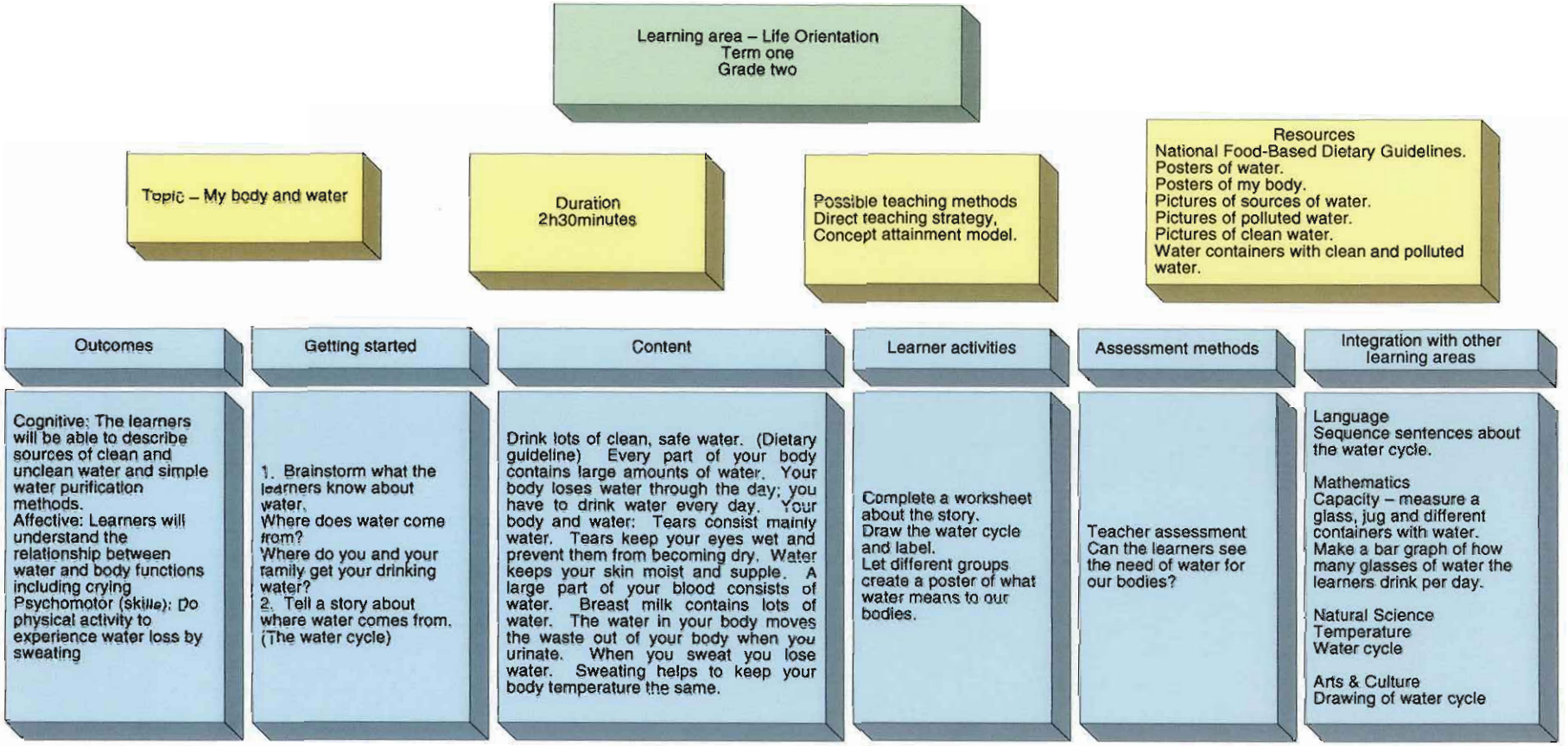


Figure 6.9 Teaching programme for Grade 2 (Term 2)

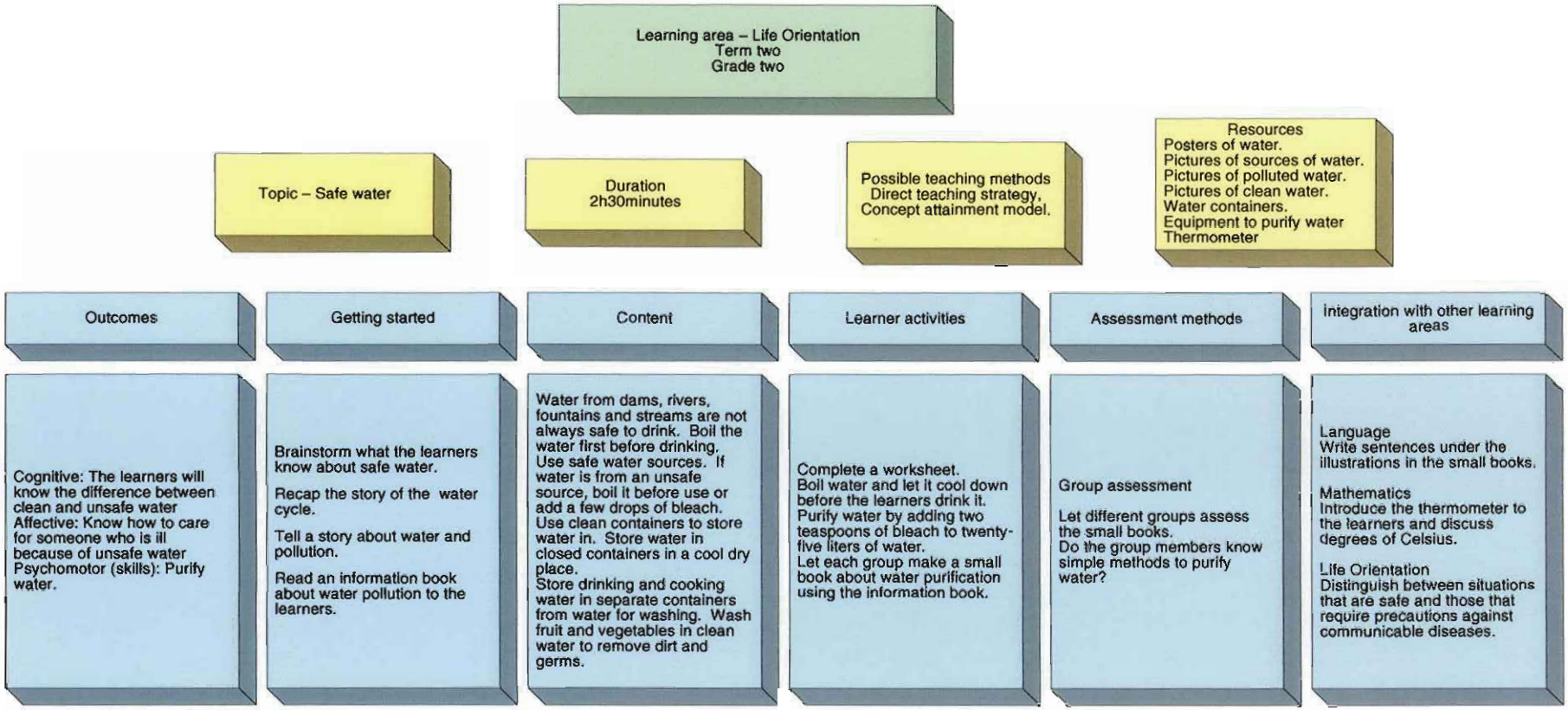


Figure 6.10 Teaching programme for Grade 2 (Term 3)

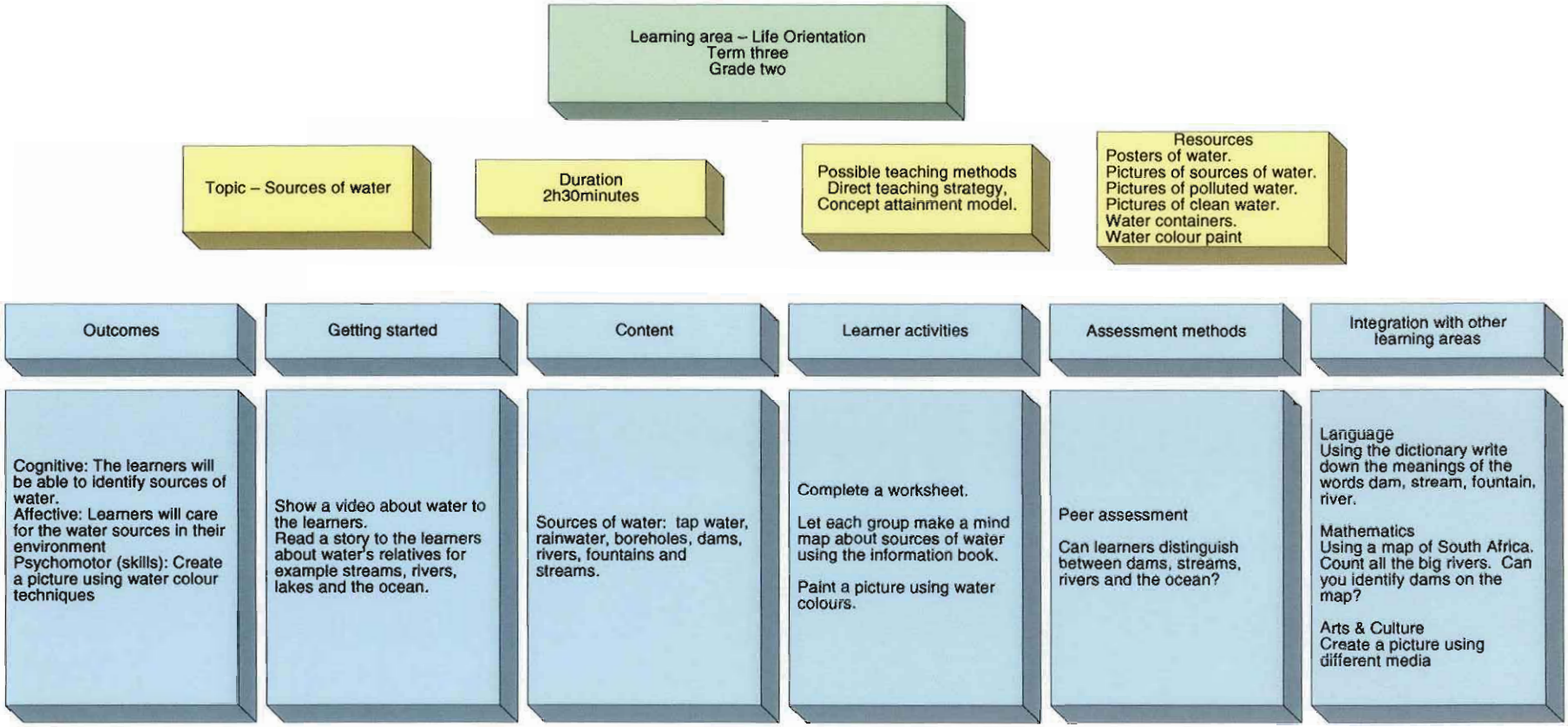
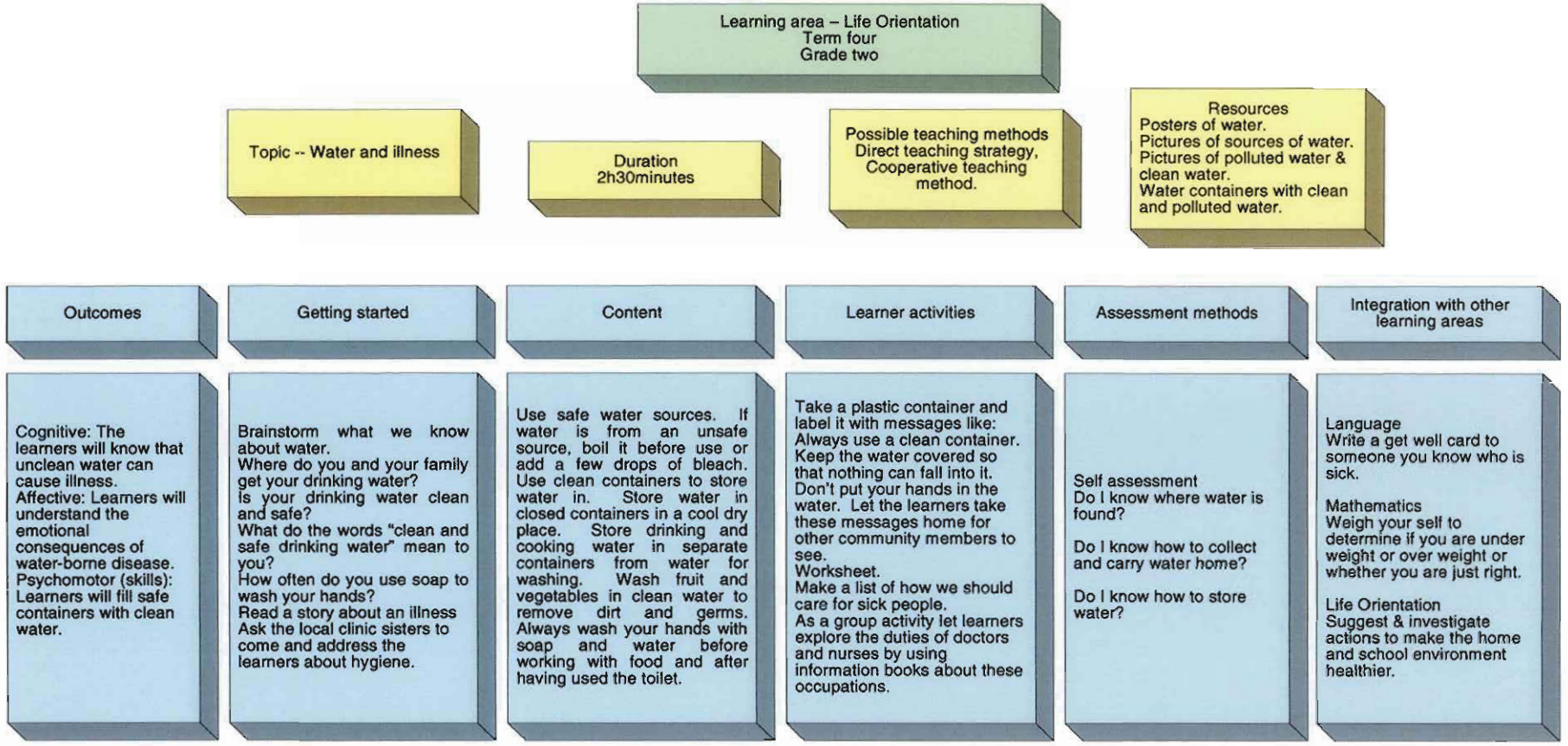


Figure 6.11 Teaching programme for Grade 2 (Term 4)



6.2.3 Nutrition teaching programme for Grade three learners

The assessment standard "*Compare healthy and poor dietary habits and describe the effects of such habits on personal health*" (Department of Education, 2002) is used as basis for the grade three lesson plans. The researcher used all eleven of the National Food-Based Dietary Guidelines.

Table 6.3 A nutrition teaching programme for Grade three learners

Learning outcome 1 (According to the Revised National Curriculum Statement)
"Health Promotion – The learner will be able to make informed decisions regarding personal, community and environmental health" (Department of Education, 2002).
Assessment standard (According to the Revised National Curriculum Statement)
"Compare healthy and poor dietary habits and describe the effects of such habits on personal health" (Department of Education, 2002).
Topics
Eat a variety of food / My favourite food / Food and illness.
Teaching methods
Direct teaching strategy, Suchman inquiry method, co-operative learning, concept attainment method and value development method.
Teaching aids
National Food Based Dietary Guideline brochures. Real fruit and vegetables. Advertisements of supermarkets. Information books. Posters of different food groups. Different healthy menu options. Videos, DVD's, computer programmes, slide shows. Field trip to a supermarket or greengrocer.

Visit a gymnasium.

Duration

11.11 hours per year (as a guideline). Per term it would be approximately 3.3 hours. This works out to 3 1hour lessons per term.

Content

Many South Africans are not as healthy as they could be. Some South Africans, especially children, are underweight, do not grow properly and get sick easily. This is because they eat too little food and/or do not eat a variety of foods to give them all the nutrients their bodies need. Others are overweight, which can lead to serious illnesses such as diabetes mellitus, heart disease, hypertension and stroke. This is because these people eat too much food, especially foods that are too high in fat, salt and/or sugar, and also because they do not engage in enough physical activity. South African nutrition experts have developed guidelines to provide our families and us with advice on how to eat healthily. When choosing food and planning meals for our families and ourselves it is important to apply these guidelines (Department of Health, 2005).

The Food-Based Dietary Guidelines

- ***Enjoy a variety of food*** (Was done in Grade one): It is important to eat different types of food, because one type of food does not contain all the nutrients we need. To eat wisely means to eat different types of food that contain all the nutrients our bodies need. The best way to ensure that we obtain all of the nutrients we need is to eat three meals a day and to eat a variety of foods at these meals. Young children should have extra food between meals because their stomachs are smaller.
- ***Make starchy foods the basis of most meals***: Choose a starchy food such as maize meal, bread, rice, potatoes or any other starchy foods that are available and affordable. Starchy foods are rich sources of carbohydrates, which supply the body with energy. Starchy foods should make up the main part of the meal, and other food should be served with them to provide extra nutrient. We should also ensure that we make fortified maize meal and/or fortified bread part of our family's daily meals. Add other foods to the starchy food such as chicken, fish, meat, eggs, vegetables, fruit, and dry beans, peas,

lentils and Soya.

- ***Chicken, fish, meat, milk or eggs could be eaten daily***: These foods are rich sources of many nutrients. These include protein and minerals to build our muscles, our bones, our teeth and our blood. We can eat small portions of this food daily.
- ***Eat plenty of vegetables and fruit everyday***: Vegetables and fruit supply lots of vitamins and minerals and other substances that are good for our health. We should eat at least 5 portions of vegetables and/or fruits a day. Add vegetables to starchy food.
- ***Eat dry beans, peas, lentils and Soya regularly***: These foods are rich sources of protein – needed to build, repair and maintain our body's muscles and tissues. Eat these foods at least three times a week with starchy foods.
- ***Use salt sparingly***: Add very little or no salt to foods at the table and during cooking. A high intake of salt has been linked with high blood pressure. High blood pressure damages the blood vessels and increases our risk for heart disease and stroke.
- ***Use fats sparingly***: An eating pattern, which is high in fat, has been linked with overweight, high cholesterol levels, heart disease, diabetes and certain cancers. Therefore, we should eat fats sparingly.
- ***Drink lots of clean, safe water***. (Was done in Grade two): Water helps with digestion and absorption of food and with the removal of waste products. Drinking too little water can lead to concentrated urine, reduced sweating, constipation and water retention. Water from taps is usually safe, but rather boil and cool water from a well, river or borehole before drinking it.
- ***If you drink alcohol, drink it sensibly***: Alcohol is not essential food for good health. A sensible limit is no more than two standard drinks per day for a woman and no more than three standard drinks a day for men. One standard drink is one can of beer (small) or one glass of wine (half a cup). Children, pregnant and breastfeeding women, and people who plan to drive or operate heavy machinery should not drink alcohol.
- ***Use food and drinks containing sugar sparingly and not between meals***: Food and drinks containing sugar should not be taken instead of mixed

meals, but can be enjoyed in small amounts on special occasions or as a treat after a mixed meal.

- ***Be active***: Being active and eating healthily are the best ways to prevent us from gaining weight, or developing osteoporosis, high cholesterol, high blood pressure or diabetes (Department of Health, 2005).

Food and illness

Undernutrition:

If a child is undernourished for a long time, his or her growth in height slows down. This means that a child who is stunted for a long time is shorter than he/she should be. This does not mean that the child will never grow. If such a child becomes well nourished he/she will start growing but just more slowly. Stunting is a problem because the child does not get enough nutrients and such a child can easily get infections and this may cause such a child to die. If children are undernourished they can't learn well. Stunted children may grow up to be weaker than other people (Brown *et al.*, 2005).

If a child starts losing weight and getting thin, we say that he/she is wasting. Becoming thin is a sign that there is a problem with the child's health. This can happen to children when they are undernourished or if they are sick for a long time. Increasing the amount of food the child eats can usually stop the wasting (Brown *et al.*, 2005).

Because all short children are not stunted, not all thin children are undernourished. Some children are naturally thin. Lean children look healthy and will continue to grow even though he/she is thin. A child who is wasting won't look healthy and he/she won't continue to grow. People who plan their eating patterns using the National Food-Based Dietary Guidelines are not likely to suffer from stunting and wasting (Brown *et al.*, 2005).

Overweight people:

People who are overweight or obese are also suffering from malnutrition. If somebody is overweight he/she has too much body fat and is too heavy for his/her height. If a person is very overweight, we say he/she is obese. People who are overweight are more likely to have health problems than people who are not overweight. The most common health problems that overweight people have are:

- Heart disease
- Stroke
- High blood pressure
- Diabetes
- Gall stones
- Painful joints.

These health problems can cause people to be disabled or die when they are still young (Brown *et al.*, 2005).

Caring for our teeth:

Tooth decay is a disease but it can be prevented. Bacteria in the mouth that ferment sugars in foods cause tooth decay. To keep your teeth healthy you should clean your teeth and mouth, use the right amount of fluoride, eat healthy food and visit your dentist once a year. Eating well for healthy teeth means you should eat regular good mixed meals because eating a variety of food supply nutrients needed by the body.

Sweets, cool drink and chips should be eaten as a treat and not all the time. It is best to have these treats after a meal. It is good to drink some water and rinse your mouth after eating sweets or snacks (Brown *et al.*, 2005).

Prevention of diarrhoea:

Diarrhoea is an infectious disease. Germs that enter the body through the mouth and go to the stomach cause it. If people don't use clean water and if they don't have good hygiene when they prepare food the germs that cause diarrhoea are usually passed from one person to another. Diarrhoea causes the person to have lots of runny stools. His/her body does this to wash the germs out of his/her system. A person who has diarrhoea becomes dehydrated (when the body dries out) and malnourished. To be dehydrated is dangerous because the body is made up of lots of water and it needs water to do many things. Diarrhoea kills many children. We could prevent all these deaths if we do the following things:

- Wash your hands with soap and water before eating and preparing food.
- Wash your hands before you eat food.
- Always use toilets.

- Keep the environment clean.
- Keep water in covered containers.
- Keep pests such as flies and cockroaches away from food.

If a child has diarrhoea we should treat such a person by giving extra drinks to keep the body from drying out. These drinks can be water, fruit juice mixed with clean water or a special drink.

How to make the special drink:

- Take 1 litre of clean water.
- Pour into a clean container.
- Add 8 level teaspoons of sugar.
- Add half a level teaspoon of salt.
- Stir well.
- Pour some into a mug.
- Give plenty of the mixture to the child often while the diarrhoea lasts.

This special drink will put water and salt back into a person's body and will help to stop him/her from getting dehydrated (Brown *et al.*, 2005).

Intestinal worms:

Worms grow inside our bodies and this can make us bleed from inside. This will make us loose blood and through this we will lose the nutrients that have built the blood especially iron. There are three ways we can get infected, we can swallow eggs, and we can get it through our skins and by eating infected food. We could prevent this by:

- Encouraging children to use a toilet.
- Children should was their hands before they eat and after they went to the toilet.
- Children should wash all vegetables and fruits before using them (Brown *et al.*, 2005).

Nutrition needs during infectious diseases, TB and HIV and AIDS:

If a person has learned that he/she has an infectious disease he/she must learn how

to follow a healthy eating plan. This can help to fight infections, prevent weight loss and help the medicine to work. The rules for planning a good mixed meal for a sick person with an infectious disease are:

- Make starchy foods the basis of most meals.
- Eat plenty of vegetables and fruits every day.
- Chicken, fish, meat, milk or eggs could be eaten daily.
- Include sugar, fat and oil in your food.
- Drink lots of clean and safe water
- Do not drink alcoholic drinks.

Assessment

Term one

Teacher assessment: Observe whether learners can identify the difference between healthy and poor dietary habits. (Worksheets, observe discussions in different groups where learners discuss two children's eating habits from a sequence of pictures)

Term two

Group assessment: The learners worked in small groups to compile a board game based on the principles of snakes and ladders. Let different groups assess the board games by checking whether healthy foods were used.

Term three

Group assessment: Groups have done projects by using information books about different topics, undernutrition, overweight, caring for teeth, diarrhoea, intestinal worms and nutrition needs during infectious diseases. Groups assess the project by using a checklist, which the teacher compiled for the projects.

Term four

Peer-assessment: Observe your friend closely and answer questions to see whether your friend is active or not? (Learners receive a questionnaire which they may keep for one week while they observe their friend, and they report back to the class after one week)

The following four-nutrition lesson plans for Grade three learners will enhance the teacher's knowledge about nutrition and it will provide the teacher with skills to teach nutrition in Grade three.

Figure 6.12a Teaching programme for Grade 3 (Term 1)

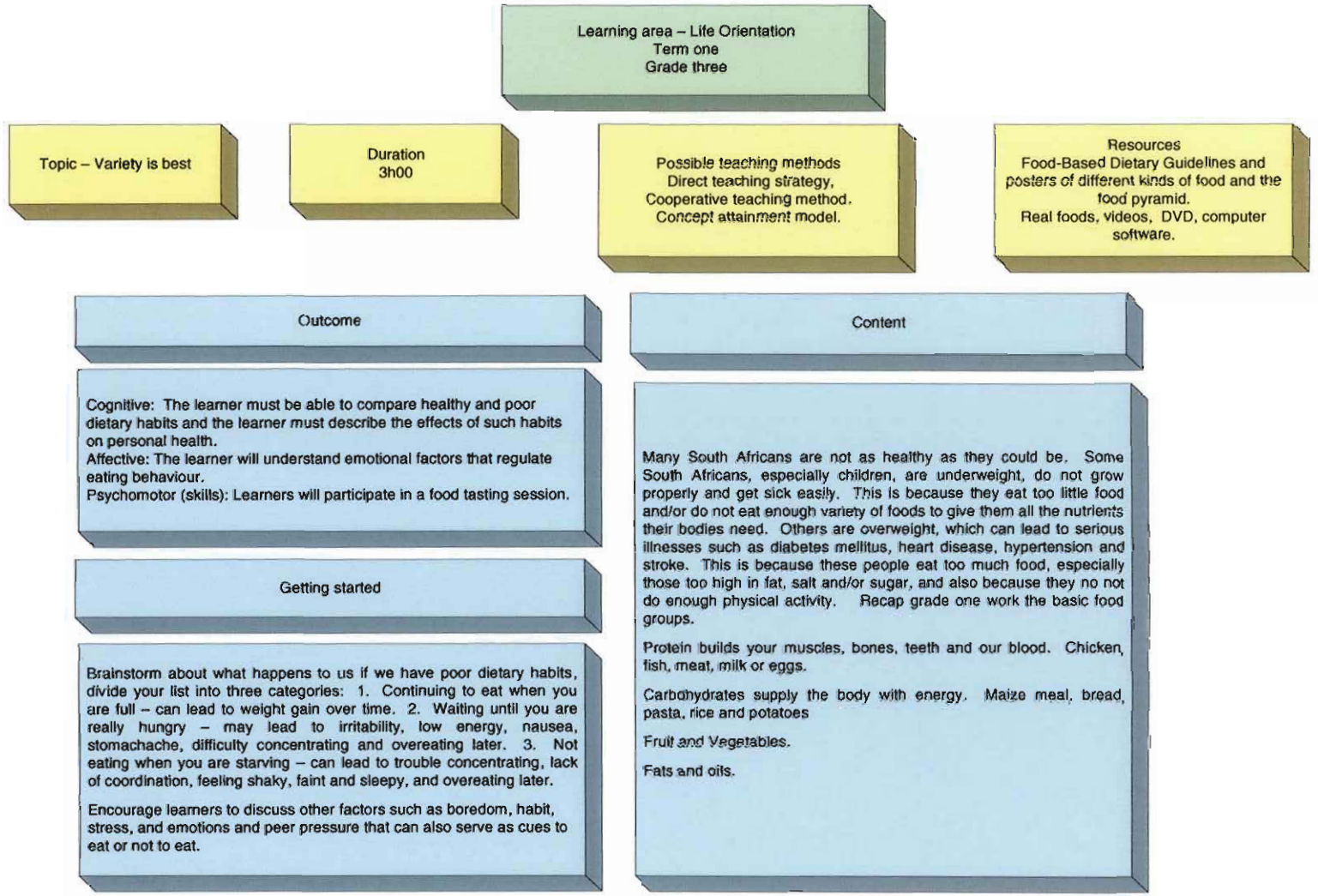


Figure 6.12b Teaching programme for Grade 3 (Term 1)

Activities	Assessment methods	Integration with other learning areas
Learners keep a food diary of what they have eaten over a certain period of time. Learners can have food tasting sessions to explore foods from different groups. Play an active game outside to explain energy to the learners. Worksheet. Sell fruit during break to other learners at school.	Teacher assessment: Are the learners able to distinguish between healthy and poor dietary habits?	Language Learner records and organises information in different ways: Learner take notes of daily food intake. Make mind maps. The learner uses language to compare healthy and poor dietary habits. Mathematics Collects data alone at home to answer questions posed by the teacher. Constructs pictographs and bar graphs. Learner reads and interprets data presented in simple tables and lists.

Figure 6.13a Teaching programme for Grade 3 (Term 2)

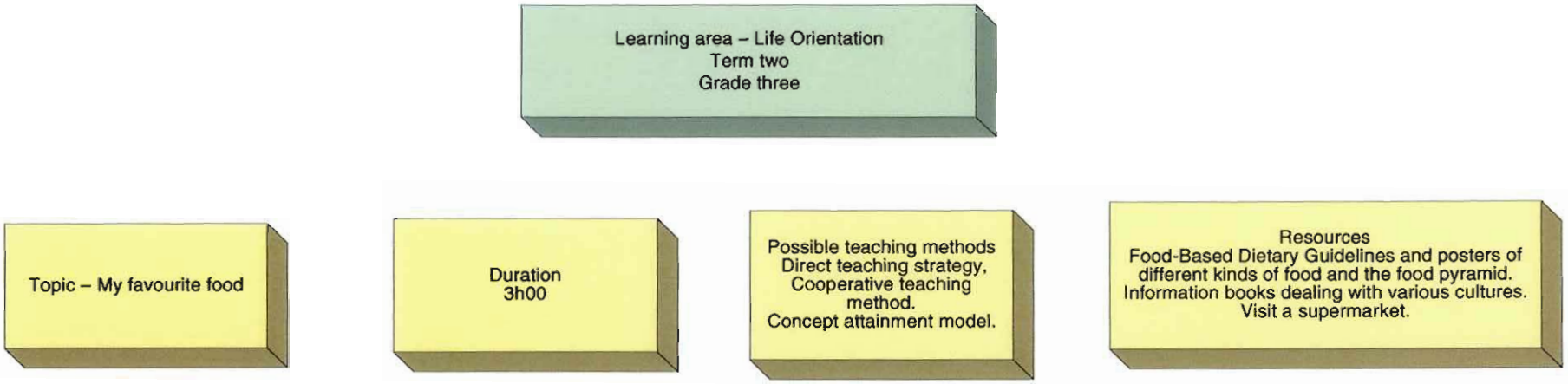


Figure 6.13b Teaching programme for Grade 3 (Term 2)

Outcomes	Content
Cognitive: The learner must be able to compare healthy and poor dietary habits and the learner must describe the effects of such habits on personal health. Affective: Learnes will understand the place of their favourite food in a healthy diet. Psychomotor (skills): Learners will design a board game.	¬ ***Make starchy foods the basis of most meals***: Choose a starchy food such as maize meal, bread, rice, potatoes or any other starchy foods that are available and affordable. Starchy foods are rich sources of carbohydrates, which supply the body with energy. Starchy foods should make up the main part of the meal, and other food should be served with them to provide extra nutrient. We should also ensure that we make fortified maize meal and/or fortified bread part of our family's daily meals. Add other foods to the starchy food such as chicken, fish, meat, eggs, vegetables, fruit, and dry beans, peas, lentils and Soya. ¬ ***Chicken, fish, meat, milk or eggs could be eaten daily***: These foods are rich sources of many nutrients. These include protein and minerals to build our muscles, our bones, our teeth and our blood. We can eat small portions of this food daily. ¬ ***Eat plenty of vegetables and fruit every day***: Vegetables and fruit supply lots of vitamins and minerals and other substances that are good for our health. We should eat at least 5 portions of vegetables and/or fruits a day. Add vegetables to starchy food. ¬ ***Eat dry beans, peas, lentils and Soya regularly***: These foods are rich sources of protein – needed to build, repair and maintain our body's muscles and tissues. Eat these foods at least three times a week with starchy foods. ¬ ***Use salt sparingly***: Add very little or no salt to foods at the table and during cooking. A high intake of salt has been linked with high blood pressure. High blood pressure damages the blood vessels and increases our risk of heart disease and stroke. ¬ ***Use fats sparingly***: An eating pattern which is high in fat, has been linked with overweight, high cholesterol levels, heart disease, diabetes and certain cancers. Therefore, we should eat fats sparingly. ¬ ***Drink lots of clean, safe water***. (Was done in grade two): Water helps with digestion and absorption of food and with the removal of waste products. Drinking too little water can lead to concentrated urine, reduced sweating, constipation and water retention. Water from taps is usually safe, but rather boil and cool water from a well, river or borehole before drinking it. ¬ ***If you drink alcohol, drink it sensibly***: Alcohol is not essential food for good health. A sensible limit is no more than two standard drinks per day for a woman and no more than three standard drinks a day for men. One standard drink is one can of beer (small) or one glass of wine (half a cup). Children, pregnant and breastfeeding women, and people who plan to drive or operate heavy machinery should not drink alcohol. ¬ ***Use food and drinks containing sugar sparingly and not between meals***: Food and drinks containing sugar should not be taken instead of mixed meals, but can be enjoyed in small amounts on special occasions or as a treat after a mixed meal. ¬ ***Be active***: Being active and eating healthily are the best ways to prevent us from gaining weight, or developing osteoporosis, high cholesterol, high blood pressure or diabetes (Department of Health, 2005).
Getting started	
Read an information book to the learners about food. Read a book about different cultures and their food choices. Introduce a song and rhyme to the learners. Play a game in class. (Blindfold learners and they must recognise food by smelling them).	

Figure 6.13c Teaching programme for Grade 3 (Term 2)

Activities	Assessment methods	Integration with other learning areas
Groups can investigate family meal patterns, family eating habits, and roles of family members in shopping, preparing and cooking food. Conducting surveys of favourite foods. Designing a board or card game based around food choices and nutritional value. The learners make their own books with the dietary guidelines which they have done up to now.	Group assessment Learners assess the board or card games.	Language The learners read for information in non-fiction books. The learners read books written by authors from different cultures about a range of different contexts. The learners publish their own writing by sharing work with others, by reading it aloud and/or displaying it in the classroom. Makes own book or contributes to class anthologies. Mathematics Describes, sorts and compares two-dimensional and three-dimensional objects in pictures and the environment using food as objects.

Figure 6.14a Teaching programme for Grade 3 (Term 3)

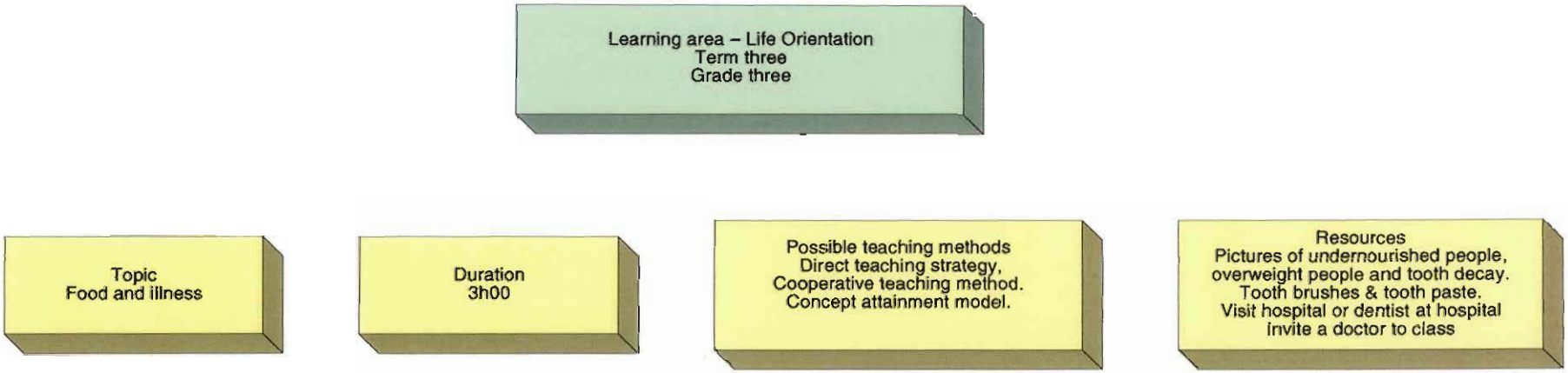


Figure 6.14b Teaching programme for Grade 3 (Term 3)

Outcomes	Content
Cognitive: The learner compares healthy and poor dietary habits and hygiene practices and describes the effects of such habits on personal health. Affective: Learners will realise that being healthy makes you feel good. Psychomotor (skills): Learners will be able to demonstrate how to brush teeth correctly	***Food and illness*** **Undernutrition:** If a child is undernourished for a long time, his or her growth in height slows down. This means that a child who is stunted for a long time is shorter than he/she should be. This does not mean that the child will never grow. If such a child becomes well nourished he/she will start growing but just more slowly. Stunting is a problem because the child does not get enough nutrients and such a child can easily get infections and this may cause such a child to die. If children are undernourished they can't learn well. Stunted children may grow up to be weaker than other people. If a child starts losing weight and getting thin, we say that he/she is wasting. Becoming thin is a sign that there is a problem with the child's health. This can happen to children when they are undernourished or if they are sick for a long time. Increasing the amount of food the child eats can usually stop the wasting. Just as not all short children are stunted, not all thin children are undernourished. Some children are naturally thin. Lean children look healthy and will continue to grow even though he/she is thin. A child who is wasting won't look healthy and he/she won't continue to grow. People who plan their eating patterns using the National Food-Based Dietary Guidelines are not likely to suffer from stunting and wasting. **Overweight people:** People who are overweight or obese are also suffering from malnutrition. If somebody is overweight he/she has too much body fat and is too heavy for his/her height. If a person is very overweight, we say he/she is obese. People who are overweight are more likely to have health problems than people who are not overweight. The most common health problems that overweight people have are: • Heart disease • Stroke • High blood pressure • Diabetes • Gall stones • Painful joints. These health problems can cause people to be disabled or die when they are still young (Brown *et al.*, 2004a). **Caring for our teeth:** Tooth decay is a disease but it can be prevented. Bacteria in the mouth that ferment sugars in foods cause tooth decay. To keep your teeth healthy you should clean your teeth and mouth, use the right amount of fluoride, eat healthy food and visit your dentist once a year. Eating well for healthy teeth means you should eat regular good mixed meals because eating a variety of food supply nutrients needed by the body. Sweets, cool drink and chips should be eaten as a treat and not all the time. It is best to have these treats after a meal. It is good to drink some water and rinse your mouth after eating sweets or snacks (Brown *et al.*, 2004a).
Getting started	
Tell a story about poor health. Use a dictionary and determine the definitions for the following concepts, under nutrition, obese, tooth decay, diarrhea, infectious diseases.	

Figure 6.14c Teaching programme for Grade 3 (Term 3)

Content (continued)	Activities	Assessment methods
Prevention of diarrhoea: Diarrhoea is an infectious disease. Germs that enter the body through the mouth and go to the stomach cause it. If people don't use clean water and if they don't have good hygiene when they prepare food the germs that cause diarrhoea are usually passed from one person to another. Diarrhoea causes the person to have lots of runny stools. His/her body does this to wash the germs out of his/her system. A person who has diarrhoea becomes dehydrated (when the body dries out) and malnourished. To be dehydrated is dangerous because the body is made up of lots of water and it needs water to do many things. Diarrhoea kills many children. We could prevent all these deaths if we do the following things: Wash your hands with soap and water before eating and preparing food. Wash your hands before you eat food. Always use toilets. Keep the environment clean. Keep water in covered containers. Keep pests such as flies and cockroaches away from food. If a child has diarrhoea we should treat such a person by giving extra drinks to keep the body from drying out. These drinks can be water, fruit juice mixed with clean water or a special drink. How to make the special drink: Take 1 litre clean water. Pour into a clean container. Add 8 level teaspoons sugar. Add half a level teaspoon salt. Stir well. Pour some into a mug. Give plenty of the mixture to the child often while the diarrhoea lasts. This special drink will put water and salt back into a person's body and will help stop him/her from getting dry. **Intestinal worms:** Worms grow inside our bodies and this can make us bleed from inside. This will make us lose blood and through this we will lose the nutrients that have built the blood especially iron. There are three ways we can get infected, we can swallow eggs, and we can get it through our skins and by eating infected food. We could prevent this by: • Encouraging children to use a toilet. • Children should was their hands before they eat and after they went to the toilet. • Children should wash all vegetables and fruits before using them.. **Nutrition needs during infectious diseases, TB and HIV and AIDS:** If a person has learned that he/she has an infectious disease he/she must learn how to follow a healthy eating plan. This can help to fight infections, prevent weight loss and help the medicine to work. The rules for planning a good mixed meal for a sick person with an infectious disease are: Make starchy foods the basis of most meals. Eat plenty of vegetables and fruits every day. Chicken, fish, meat, milk or eggs could be eaten daily. Include sugar, fat and oil in your food. Drink lots of clean and safe water. Do not drink alcoholic drinks.	Worksheets. Class visit to the hospital. Invite a doctor to the class for an information session. Group project: Each group chooses a topic about this theme and they use information books to do an assignment.	Group assessment Assess the projects.

Integration with other learning areas
Language Write get well soon cards to sick people. Write a report about a sick person. Mathematics Estimates, measures, compares and orders three dimensional objects using non-standard and standard measures: mass and capacity.

Figure 6.15a Teaching programme for Grade 3 (Term 4)

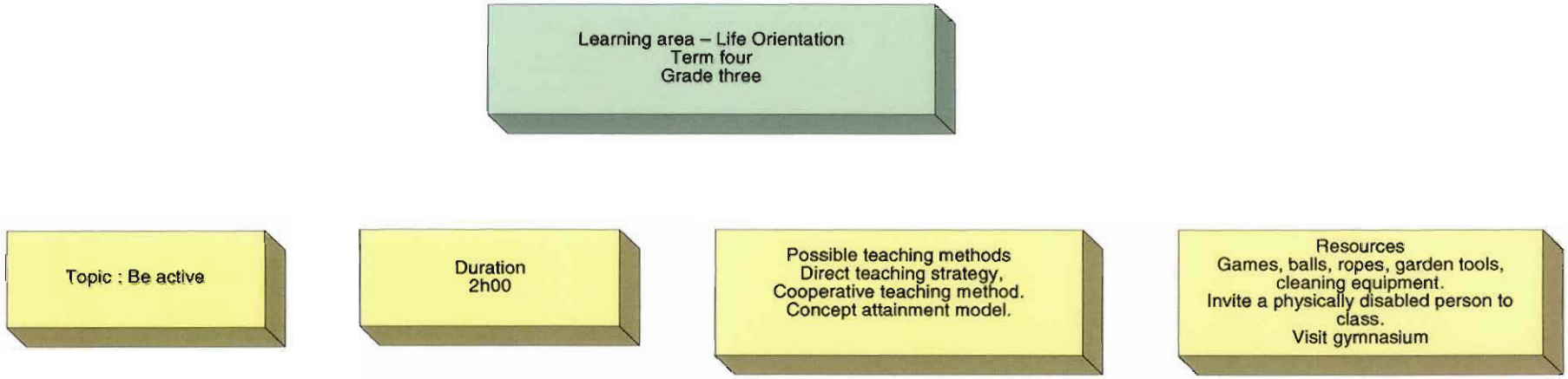


Figure 6.15b Teaching programme for Grade 3 (Term 4)

Outcomes	Content
Cognitive: The learner will know how physical activity contributes to health. Affective: Learners will be proud of the fact that they are able to be physically active. Psychomotor (skills): Learners will be able to do various activities such as gardening or cleaning as part of physical exercise.	***Be active***: Being active and eating healthily are the best ways to prevent us from gaining weight, or developing osteoporosis, high cholesterol, high blood pressure or diabetes. Key words: Osteoporosis: When you don't have enough calcium in your body. Cholesterol: There is too much fat in your veins. High blood pressure: The force of blood against the walls of the blood vessels. Diabetes: Some people's body cells can't use the sugar that is in their blood because they don't have enough insulin. These people have diabetes. Physical activity is essential for good health. Children, teenagers, adults and old people can all promote good health by being active. Physical activity involves moving your body. Everyone should try to have some moderate physical activity for at least 30 minutes most days of the week, preferably daily. Children should try to have 60 minutes daily. Choose activities that you can enjoy and that you can do regularly. Working in the garden, cleaning the house, walking to school are all physical activities. Children like to be active if their families are involved. Families can play ball games together, go for a walk, work in the garden, wash windows together or even go shopping together. Health benefits of regular physical activity: Increases physical fitness. Helps build and maintain healthy and strong bones, muscles and joints. Builds endurance. Helps maintain body weight. Lowers risk factors for diseases such as heart disease, some cancer and type 2 diabetes. Helps control blood pressure. Promotes a feeling of wellbeing.
Getting started	
Introduce words like weight, osteoporosis, cholesterol, high blood pressure and diabetes. Read a story about games children can play.. Play a game outside. Free play on the apparatus outside.	

Figure 6.15c Teaching programme for Grade 3 (Term 4)

Activities	Assessment methods	Integration with other learning areas
Worksheet. Make flashcards of activities. Write a newsletter to your family about being active. Arrange a game of netball and soccer between the grade 3 boys and girls. Make posters for the school promoting "Being active" Work in the school garden and clean the class.	Peer assessment Is my friend active during the day?	Language Write down the rules for a game. Describe to a friend how to play a game. Mathematics Measure the soccer field, rugby field and netball court at school. Sorting different types of sporting equipment Arts & Culture Draw yourself doing your favourite sport

6.3 Importance of using an integrated approach

After researching the time allocation for nutrition education in the Foundation Phase the researcher has come to the conclusion that the time for nutrition education in the Learning Area Life skills would not be enough to make significant nutritional changes in the lives of so many South African children. The researcher also came to the conclusion that the educators seemed to have a very narrow understanding of how nutrition fits into all the different learning areas. Integrated learning is central to Outcomes-Based Education. Educators must look for opportunities for integration both within and across Learning Areas.

It is important that Foundation Phase educators integrate nutrition with Numeracy and Literacy. In the next paragraphs examples of how an educator could integrate nutrition across Learning Areas follows:

The Outcome Health promotion could be linked up with:

Numeracy

- Learners could do counting using rice, beans, eggs, and slices of bread etc.
- Learners could discuss the shapes of the fruit and vegetables.
- Word problems could be chosen to enhance healthy eating for example, Jim eats 3 kinds of fruit during one day, and how many fruits will he have eaten over one week?
- Learners could gather data about how many learners like apples, pears, peaches, apricots, bananas, etc. and give the results by using graphs.

Literacy

- Learners could listen to rhymes, stories and songs about nutrition.
- Learners could read paragraphs, stories and rhymes about nutrition.
- Learners could present dialogues about nutrition.
- Learners could do recounts about their daily dietary behavior.
- Write letters to parents about nutrition.
- Do comprehension using nutrition paragraphs.
- Do punctuation using a nutrition topic.

6.4 Concluding remarks

It was suggested in Chapter 5 that the National Food-Based Dietary Guidelines should be incorporated into the Revised National Curriculum Statement to ensure that effective nutrition education can take place.

The researcher has based the proposed nutrition-teaching programme for Foundation Phase learners in rural schools on the contents of the above-mentioned two documents. It is expected that this nutrition teaching programme will improve the knowledge, skills, values and attitudes of learners in the Foundation Phase. This will however not be proved until a thorough evaluation of the effectiveness of the teaching programme is done after a period of the implementation.

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Appendix 1: Interview schedule

The researcher introduces herself and thanks the participant for participating.

The researcher explains the general purpose of the questionnaire.

I am going to ask a few questions and I am interested in your ideas and opinions about these questions. All answers will be treated with confidentiality. I would like to tape record the discussion as this makes it easier for me to remember what everyone has said. All tapes will be treated with confidentiality and will be erased when I am finished with them.

1. **Teacher's knowledge about the curriculum guidelines and requirements for nutrition education.**

- In your opinion which learning area(s) covers/addresses/contains aspects related to the teaching of nutrition/healthy eating habits/healthy diet in the Foundation Phase?
- Which departmental document(s) will you consult to provide you with guidelines/directives/information to help you with/promote the teaching of nutrition and general health of learners in the Foundation Phase?
- Have you consulted these documents?
- If you have consulted these documents, what is your opinion/how do you feel/what do you think about these departmental documents and guidelines?
- Do you know how to implement these departmental guidelines when you teach and assess learners about nutrition?

2. **Teacher's basic knowledge about aspects related to nutrition.**

Please just say whether you think the following statements are true or false

- The best way to ensure that we obtain all of the nutrients we need is to eat three meals a day and to eat a variety of foods at these meals.
- Children should have extra food between meals because their stomachs are smaller.
- Starchy foods should make up the main part of the meal.

- Chicken, fish, meat, milk or eggs should be eaten daily.
- We should at least eat 2 portions of fruit and vegetables each day.
- Dry beans, peas, lentils and Soya are rich sources of vitamin C.
- We should eat fats sparingly.
- To be healthy we also need to be physically active.
- If you had to give a learner in your class guidelines on healthy eating, what would you say are the most important guidelines?

3. To which extent do teachers address aspects of nutrition education in the different learning programmes of the Foundation Phase?

- Which aspects/themes on nutrition do you teach to learners in the Foundation Phase?
- In which learning areas would you teach these themes on nutrition?

4. Which teaching strategies do teachers implement to teach/when teaching learners about nutrition?

- Name some of the learning outcomes that you would formulate when you teach lessons about nutrition to learners?
- If you have chosen nutrition as a lesson theme how would you teach it? (Which steps would you follow to present such a lesson)
- Why you think it is important for the learners to know the learning outcomes of your lesson?
- How would you go about to involve learners during the lesson?
- If you should give them an activity to do, would you let them work together / independently or both?
- How would you organize this?
- How would you assess if the learners have achieved the outcomes that you have formulated for the lesson

5. Teacher's knowledge and skills to develop nutrition programme

Let us explore the following situation: You are being asked by the subject advisor to develop a Nutrition Teaching Programme for the Foundation Phase at your school.

- What would your first step(s) be in developing this teaching programme?
- Which learning outcomes and themes will you identify for grade one?
- Which learning outcomes and themes will you identify for grade two?
- Which learning outcomes and themes will you identify for grade three?
- Which learning areas will be included in the teaching programme?
- Which teaching methods and teaching and learning aids will you use to present these themes?
- Which assessment strategies will you use to assess the outcomes of the programme?

6. Concluding remarks, suggestions and further comments

Allow participants to alter, clarify and add on their previous opinions/comments.

7. Closure

Thank you for your presence and your input.

Appendix 2: Observation sheet

Name of teacher: _____

School: _____

Grade: _____

Learning area: _____

Lesson topic: _____

Date: _____

1. Were the lesson outcomes clear and were they communicated to the learners?

2. Was there a connection with previous knowledge and/or the environmental context of the learners?

3. Was there integration with other learning areas?

4. Were teaching and learning aids effectively used?

5. Was there opportunity for learner participation?

6. Were various assessment strategies used?

7. Did the lesson have practical value for the learners in the sense that they could develop new skills with regard to healthy nutrition?

8. Did the lesson contribute to the expansion of the knowledge of the learners with regard to nutrition?

9. Did the lesson contribute to a change in the learners' attitude towards healthy nutrition?

10. Were the outcomes reached?

11. Strengths of the presentation.

12. Weaknesses of the presentation.

Which one of the following instruction methods was used?

1. Direct instruction method (Teaching basic skills, facts and knowledge)	
1. Review previously learned material	
2. State objectives for the lesson	
3. Present new material	
4. Guide practice with feedback	
5. Assign independent practice with corrective feedback	
6. Review periodically with corrective feedback	
2. The Concept Attainment Method (Defining Concepts Inductively)	
1. Select and define a concept	
2. Select the Attributes	
3. Develop positive and negative examples	
4. Introduce the process to the learners	
5. Present the examples and list the attributes	
6. Develop a concept definition	
7. Give additional examples	
8. Discuss the process with the class	
9. Evaluate	
3. The Suchman Inquiry Method. (Teaching problem solving through discovery and questions)	
1. Select a problem and conduct research	
2. Introduce the process and present the problem	
3. Gather data	
4. Develop a theory and verify	
5. State the rules and explain the theory	
6. Analyse the process	
7. Evaluate	
4. Cooperative Learning Methods. (Improving learner's achievement using small groups)	
5. The values development method. (Mining the curriculum for ethical and social values)	
1. Identify the theme of what is to be taught	
2. Specify the "big question" of what is to be taught	
3. Select supplemental resources on the topic of study	
4. Explore interdisciplinary connections to the topic	
5. Teach the lesson to entice students into caring about what they are learning	

Appendix 3: Consent form

Title of this project: The development of a teaching programme for Foundation Phase learners in rural schools.

Name: _____

Name of the school: _____

Teaching grade one / two / three.

INFORMED CONCENT

I, the undersigned_____

(Full names in print), have listened to the oral presentation of the project, and I declare that I understand it. I also understand that the interview will be recorded on tape and that all answers will be treated with confidentiality and they will be erased when the project is finished.

I have had the opportunity to discuss relevant aspects with the researcher and declare that I voluntarily participate in the project. I hereby give consent to participate in the project.

_____

Signature of volunteer